1.1.1 Curricula developed and implemented have relevance to the local, national,regional and global developmental needs which are reflected in Programme Outcomes (POs), Programme Specific Outcomes (PSOs) and Course Outcomes (COs) of the various Programmes offered by the Institution.

S.No	PROGRAMME CODE	COURSE CODE	COURSE NAME
1.	104,105,106,114,118,205,243	20MGMC301	Constitution of India
2.	104,106,205	OCE551	Air Pollution And Control Engineering
3.	106,205	GE8071	Disaster Management
4.	205	OCY751	Waste Water Treatment
5.	105,205	GE8076	Professional Ethics in Engineering
6.	205	OCE751	Environmental and Social Impact Assessment
7.	105	GE8074	Human Rights
8.	104,106	GE8291	Environmental Science And Engineering

PRINCIPAL

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20MGMC301	CONSTITUTION OF INDIA	L	T	P	C
SDG NO.4		2	0	0	0

OBJECTIVES:

- To know about Indian constitution
- To know about central government functionalities in India
- To know about state government functionalities in India
- To know about Constitution function
- To Know about Constitutional remedies

UNIT I : INTRODUCTION 6

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties

UNIT II : STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT 6

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India.

UNIT III : STRUCTURE AND FUNCTION OF STATE GOVERNMENT 6

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts

UNIT IV CONSTITUTION FUNCTIONS 6

Indian Federal System – Centre – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries.

UNIT V CONSTITUTIONAL REMEDIES 6

Enforcement of fundamental rights - Power of parliament to modify the rights conferred by this part in their application to forces.

Total: 30 Periods

TEXT BOOKS

1. Durga Das Basu (2013), "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
3. M.V. Pyle (2019), "An Introduction to the Constitution of India, 5/e", Vikas Publishing, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalandhar.

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OUTCOMES

Upon completion of the course, the student should be able to

1. Explain the Constitution & Fundamental rights of citizens. (K2)
2. Discuss the structure, hierarchy and functions of Central Government. (K2)
3. Explain the functions of Supreme Court and Judiciary Systems in the state. (K2)
4. Discuss the structure, hierarchy and functions of State Government. (K2)
5. Recall the Centre-State relationship, constitutional amendments and functionaries (K1)
6. Discuss the remedies and rights available to India Citizens. (K2)

CO - PO, PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	-	-	1
CO4	-	-	-	-	-	1	1	-	-	-	-	-	-	3
CO5	-	-	-	-	-	2	1	3	-	-	-	-	-	2
CO6	-	-	-	-	-	2	1	2	3	-	-	-	-	3

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OCE551 AIR POLLUTION AND CONTROL ENGINEERING L T P C b 3 0 0 3

OBJECTIVES

To gain knowledge about the ambient air quality

- To understand effects of meteorology on air pollution and wind profiles.
- To know the control measures to overcome the particulate contaminants.
- To implement the preventive measures for gaseous contaminants.
- To impart knowledge on the principle and design of control of Indoor air pollutants.
- To understand the atmospheric process and pollutant transport mechanism
-

UNIT I INTRODUCTION 7

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II METEOROLOGY 6

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V INDOOR AIR QUALITY MANAGEMENT 10

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.

2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.

3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

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REFERENCES:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.

2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.

3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.

4. M.N Rao and HVN Rao, "Air Pollution", Tata Mcgraw Hill Publishing Company limited,2007.

5. C.S.Rao, "Environmental Pollution Control Engineering", New Age International(P) Limited Publishers,2006.

OUTCOMES:

- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable standards.
- ability to select appropriate pollution control equipments.
- ability to ensure quality, control and preventive measures.
- ability to identify the methods involved in pollutant transport mechanism

CO - PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	1	2	2					2		
CO2	3	1	2	2	2	1	1					1		
CO3	2	2	2	2	2	1	1				1	1		
CO4	2	2	2	2	2	1	1				1	1		
CO5	3	2	1	2	1	1	2	1				1		
CO6	3	3	2	2	2	1		2						

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OCY751 WASTE WATER TREATMENT L T P C 3 0 0 3

OBJECTIVES

- To make the student conversant with the water treatment methods including adsorption and Oxidation process.
- To provide basic under standings about the requirements of water, its preliminary treatment.

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT 9

Water Quality-physical- chemical and biological parameters of water- water quality requirement -potable water standards -wastewater effluent standards -water quality indices. Water purification systems in natural systems-physical processes-chemical processes and biological processes primary, secondary and tertiary treatment-Unit operations-unit processes. Mixing, clarification -sedimentation; Types; aeration and gas transfer – coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids- transport of colloidal particles, clariflocculation.

UNIT II INDUSTRIAL WATER TREATMENT 9

Filtration – size and shape characteristics of filtering media – sand filters hydraulics of filtration –design considerations – radial, upflow, highrate and multimedia filters, pressure filter. Watersoftening – lime soda, zeolite and demineralization processes – industrial water treatment for boilers.

UNIT III CONVENTIONAL TREATMENT METHODS 9

Taste and odour control – adsorption – activated carbon treatment – removal of color – iron and manganese removal – aeration, oxidation, ion exchange and other methods – effects of fluorides – fluoridation and defluoridation – desalination - corrosion prevention and control – factors influencing corrosion – Langelier index – corrosion control measures.

UNIT IV WASTEWATER TREATMENT 9

Wastewater treatment – pre and primary treatment – equalization neutralization – screening and grid removal – sedimentation – oil separation gas stripping of volatile organics – biological oxidation – lagoons and stabilization basins – aerated lagoons – activated sludge process –trickling filtration – anaerobic decomposition.

UNIT V ADSORPTION AND OXIDATION PROCESSES 9

Chemical process – adsorption – theory of adsorption – ion exchange process – chemical oxidation – advanced oxidation process – sludge handling and disposal – miscellaneous treatment processes.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Metcalf and Eddy, "Wastewater Engineering", 4th ed., McGraw Hill Higher Edu., 2002.

2. W. Wesley Eckenfelder, Jr., "Industrial Water Pollution Control", 2nd Edn., McGraw Hill Inc., 1989.

REFERENCES:

1. S.P. Mahajan, "Pollution control in process industries", 27th Ed. Tata McGraw Hill Publishing Company Ltd., 2012.

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2. M. Lancaster, "Green Chemistry: An Introductory Text", 2nd edition, RSC publishing, 2010.

3. C.S. Rao, "Environmental Pollution Control Engineering", New Age International, 2007

OUTCOMES

- Will gain idea about waste water and its characteristics.
- Will gain knowledge on industrial water treatment.
- Will appreciate the necessity of water and acquire knowledge of preliminary treatment.
- Will gain idea about various methods available for water treatment.
- Will have knowledge about adsorption and oxidation process.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	-	1	1	3	2	3	2	2	3	2
CO2	-	3	3	1	1	2	3	3	2	3	3	2	3	2
CO3	2	1	1	2	-	1	2	3	1	3	1	2	3	2
CO4	-	3	3		2	3	3	3	2	3	3	2	3	2
CO5	-	1	2	2	-	1	1	3	1	3	2	1	3	2
CO6	2	1	2	2	-	1	1	3	2	3	2	2	3	2

GE8071 DISASTER MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability – Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation
- Understand the Relationship between Disaster and Development
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context
- Disaster damage assessment and management

TEXTBOOKS:

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3	2		2	2	2				
CO2	1							2	1	1		2	2	
CO3	1					2		2	2	3		2	2	
CO4								3				2	2	
CO5					2	2		3	2	2		2	2	
CO6					3	2		2	2	2				

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OCE751 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT LPTC 3003

OBJECTIVES:

- To understand the basic concepts of EIA
- To assess various environmental impacts
- To understand the process of report preparation
- To understand the socio economic impacts

UNIT I INTRODUCTION 9

Impacts of Development on Environment – Rio Principles of Sustainable Development- Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework.

UNIT II ENVIRONMENTAL ASSESSMENT 9

Screening and Scoping in EIA – Drafting of Terms of Reference,Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing-Environmental Clearance

UNIT IV SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis-

UNIT V CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems - Airports - Dams and Irrigation projects - Power plants.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Canter, R.L, "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
3. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009.

REFERENCES:

1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing,2003.
2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme,2002.

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3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.
4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

OUTCOMES:

The students completing the course will have ability to

- carry out scoping and To screening of developmental projects for environmental and social assessments
- able to explain different methodologies for environmental impact prediction and assessment
- able to plan environmental impact assessments and environmental management plans
- to evaluate environmental impact assessment reports
- to understand the impacts of projects on environment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO
CO1					3	2		2	2	2				
CO2	1							2	1	1		2	2	
CO3	1					2		2	2	3		2	2	
CO4								3				2	2	
CO5					2	2		3	2	2		2	2	
CO6					3	2		2	2	2				

GE8076 PROFESSIONAL ETHICS IN ENGINEERING **L T P C** **3 0 0 3**

OBJECTIVES:

- The student should be able to apply ethics in society.
- To Discuss the ethical issues related to engineering and realize the responsibilities.
- To Learn about Rights of Engineers in the society.
- To learn about Intellectual property rights (IPR) and to get knowledge about Patents obtaining
- To learn about corporate working environment, and work ethics

UNIT I HUMAN VALUES **10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.UNIT V GLOBAL ISSUES 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

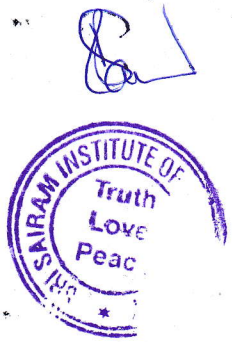
TOTAL: 45 PERIODS

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003



4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, ' Value Education', Vethathiri publications, Erode, 2011.

OUTCOMES:

- To acquire the basic knowledge of human values, moral, ethics, industrial standards, code of ethics and role of professional ethics in engineering field.
- To have an awareness of professional rights and responsibilities of an engineer, and to have an understanding for safety and risk benefit analysis.
- To imbibe the various ethical theories developed and apply them for a professional and societal advancement.
- To imbibe adequate knowledge about the culture & the value system adopted by MNC's, local business houses and to create an ethical based work environment.
- To understand and solve the employees' conflict & grievances in an amicable and ethical way.
- Formulate and provide solutions to overcome ethical issues for win-win outcome.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3			1	1	3	2	2		2	2	3
CO2	2	2	2			1	1	3	2	2		2	2	2
CO3	2	1	1			1	1	3	2	2		2	2	3
CO4	2	2	2			1	1	3	2	2		2	2	2
CO5	2	1	1			1	1	3	2	2		2	2	3
CO6	2	1	1			1	1	3	2	2		2	2	3

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GE8074 HUMAN RIGHTS LT P C 3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I 9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II 9

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III 9

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV 9

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V 9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabilityd persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

COURSE OUTCOMES

- Recognize the human rights and its types(K1)
- Describe the concepts of human rights belongs to everybody(K2)
- Select the appropriate laws for rights and responsibilities(K2)
- Explain the Constitutional Provisions Involved in Human Rights(K2)
- Interpret the usage of Human Rights for Special Category People(K2)
- Explain the contribution of Society developing organizations towards Human Rights(K2)

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CO - PO, PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2	2	2	-	-	-	1	-	-	-	-	1	2	1
CO2	2	2	2	-	-	-	1	-	-	-	-	1	2	1
CO3	2	2	2	-	1	-	-	-	-	-	-	1	2	1
CO4	2	2	2	-	1		-	-	-	-	-	1	2	1
CO5	2	2	2	-	1	-	-	-	-	-	-	1	2	1
CO6	2	2	2	-	1	-	1	-	-	-	-	1	2	1

GE8291 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth‟s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in

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conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare-programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, _Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, _Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, _Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
2. Erach Bharucha, —Textbook of Environmental Studies‖, Universities Press(I) PVT, LTD, Hydrabad, 2015.
3. Rajagopalan, R, _Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, —Environmental Science‖, Cengage Learning India PVT, LTD, Delhi, 2014.

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OUTCOMES

- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes
- Develop interactive Java programs using swings
- Design and build simple Graphical User Interfaces

CO - PO, PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	0	0	0	0	0	0	0	0	0	0	0
CO2	2	2	3	0	3	0	0	0	0	0	0	1
CO3	2	2	3	0	3	0	0	0	0	0	0	1
CO4	2	2	3	0	3	0	0	0	0	0	1	1
CO5	2	2	3	3	3	0	0	0	0	0	0	1
CO6	2	2	3	3	3	0	0	0	0	0	0	1

1.1.2 Programmes where syllabus revision was carried out during the last five years

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No.SSIT, Ch-44/CSE/BOS-3/2022

Date: 12.04.2022

NOTICE

A Third meeting of the **Board of Studies** in **Department of Artificial Intelligence and Data Science** will be held at 11.**00 a.m.** on **Saturday the 23rd April 2022** in **II Floor CSE – Innovation Lab** Sri Sai Ram Institute of Technology, Chennai-44.

Sitting fee will be paid as per Rules.
Kindly make it convenient to attend the meeting.

PRINCIPAL

AGENDA

1 **Recommendation regarding the curriculum and syllabus of UG –B.Tech-AI&DS.**
2 **Others, if any**

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To

Department of Artificial Intelligence and Data Science

Board of Studies (BOS)
Members

SL NO	NAME	DESIGNATION
1	Dr.K.Devaki	Professor / Rajalakshmi Engineering College, Rajalakshmi Nagar , Thandalam,Tamil Nadu-602105
2	Dr.K.Selva Kumar	Professor & Head Of Department / IT, Annamalai University, Chidambaram -608002.
3	Mr.R .Sundar	Scientist -D, National Institute of Ocean Technology,Velacherry - Tambaram Main road, Narayanapuram , Pallikaranai, Chennai -600100
4	Mr.R.Karthic\k	Associate Director ,Ramco Systems, No. 64, Sardar Patel Rd, Sriram Nagar,Tharamani ,Chennai, Tamilnadu 600113.
5	Mr. King Prakatheesh.C	Software Engineer, Chennai.
6	R.Priyadharshini	Senior Software Engineer, Chennai.
7	DR Pachhaiammal Alias Priya M	Professor &Head Department of AI&DS, Sri Sai Ram Institute of Technology, Chennai.
8	Dr.B.Sreedevi	Professor & Head of the Department, Department of CSE, Sri Sai Ram Institute of Technology, Chennai.
9	Dr.V.Brindha Devi	Professor & Head of the Department, Department of IT, Sri Sai Ram Institute of Technology, Chennai.
10	Dr.K.C.Suresh	Associate Professor, Department of CSE, Sri Sai Ram Institute of Technology, Chennai.
11	Mrs.D.Rajalakshmi	Assistant Professor, Department of CSE, Sri Sai Ram Institute of Technology, Chennai.

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Department of Artificial Intelligence and Data Science

AGENDA

BOS.AI.2022.03.01

Review and Approval of Second BOS Meeting

BOS.AI.2022.03.02

To review and approve the Curriculum and Syllabus of B.Tech- AI&DS

BOS.AI.2022.03.03

To review and approve the Professional Elective Curriculum and Syllabus of UG programme in B.Tech- AI&DS

BOS.AI.2022.03.04.

To review and approve the Open Elective Curriculum and Syllabus of UG programme in B.Tech- AI&DS

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Department of Artificial Intelligence and Data Science

Minutes of the third Board of Studies meeting

The third Board of Studies (BOS) meeting of the department of AI&DS was conducted on on **Saturday the 23rd April 2022** in **II Floor CSE – Innovation Lab** Sri Sai Ram Institute of Technology, Chennai-44.

Following members were present.

1. Dr.K.Devaki
   Professor / Rajalakshmi Engineering College,.
   Rajalakshmi Nagar, Thandalam, Tamil Nadu
   602105
   — External stakeholder (University Representative) 23/4/22

2. Dr.K.Selva kumar
   Professor & Head Of Department / IT
   Annamalai University
   Chidambaram -608002.
   — External stakeholder (Subject Expert) 23/4/22

3. Mr.R .Sundar
   Scientist -D,
   National Institute of Ocean Technology
   Velacherry - Tambaram Main road,
   Narayanapuram , Pallikaranai, Chennai -600100
   — External stakeholder (Subject Expert) 23/4/22

4. Mr.R.Karthik
   Associate Director, Ramco Systems
   No. 64, Sardar Patel Rd, Sriram Nagar,
   Tharamani, Chennai, Tamilnadu 600113.
   — External stakeholder (Industrial Expert)

5. Mr.King Prakatheesh.C
   Software Engineer
   Chennai.
   — External stakeholder (Alumni Member)

6. R.Priyadharshini
   Senior Software Engineer
   Chennai.
   — External stakeholder (Alumni Member)

7. Dr.B.Sreedevi — Internal stakeholder
8. Dr.V.Brindha Devi — Internal stakeholder
9. DR Pachhaiammal Alias Priya M — Internal stakeholder Dr.
10. Dr.K.C.Suresh — Internal stakeholder
11. Mrs.D.Rajalakshmi — Internal stakeholder

Dr B.Sreedevi
Professor& Head, CSE
Sri Sai Ram Institute of Technology

Chairman, BOS/CSE

Dr B Sreedevi, Chairman of BOS opened the meeting by welcoming and introducing the external members to the internal members. The chairman placed the following agenda for the deliberations and discussions of the members. The following are the deliberations made during the meeting (as per the items of circulated agenda).

BOS.AI.2022.03.01 Review of Minutes of Second BOS Meeting.

The Suggestions given in the Second BOS were incorporated and the same was presented to the members. The reformations presented were approved.

BOS.AI.2022.03.02 To Review and approve the Curriculum and Syllabus B.Tech-AI&DS

1. Mr Sundar suggested to include Software Engineering
2. Dr Selvakumar suggested including Agile Methodologies.
3. Alumni proposed their satisfaction towards the framing of Curriculum & Syllabi

BOS.AI.2022.03.03 To Review and Approve the Professional Elective Curriculum and Syllabus

1. Dr Devaki suggested maintaining hierarchy in all semesters.

BOS.AI.2022.03.04 To Review and Approve the Open Elective Curriculum and syllabus of UG Programme in B.Tech-AI&DS

1. Mr Karthik asked to include software engineering oriented courses as an elective.

Based on the suggestions given by the members, the chairman of BOS concluded that fruitful suggestions will be incorporated appropriately in the Curriculum and Syllabi.

BOS resolved to recommend the following to the Academic Council for further Approval.

a) Syllabus for core courses of **B.Tech Artificial Intelligence and Data Science Programme as enclosed in Annexure-I.**
b) List of **Professional and Open Elective Courses** in **B.Tech Artificial Intelligence and Data Science Programme as enclosed in Annexure-II.**

In the concluding remarks, the chairman stated that the suggestions of Credits in UG and PG Curriculum and other recommendations suggested by the members would be considered.

Meeting then ended with a vote of thanks by Dr S Rajarajan, Professor / Dean-Academic, Sri Sairam Institute of Technology.

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Dr.K.Devaki
Professor / Rajalakshmi Engineering College,.

Dr.K.Selva kumar
Professor & Head Of Department / IT
Annamalai University

Mr.R .Sundar
Scientist -D,
National Institute of Ocean Technology

Mr.R.Karthick
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Mr.King Prakatheesh.C
Software Engineer
Chennai

R.Priyadharshini
Senior Software Engineer Chennai.

Dr Pachhaiammal @Priya m

Dr.V.Brindha Devi

Dr.K.C.Suresh

Mrs.D.Rajalakshmi

Dr B.Sreedevi
Chairman, BOS/CSE
Professor& Head, CSE
Sri Sai Ram Institute of Technology

ANNEXURE-I

As per the suggestion and modifications prescribed by the respected members of the BOS, the UG Curriculum for the B.Tech. Degree in AI&DS has been modified and presented below.

a) Software Engineering was included in Professional Elective-I.
b) Agile Methodologies were included as a concept in Software Engineering
c) Hierarchies were maintained in framing the syllabus and the concept of Data Mining is included in Data Science.
d) The Concept of Data mining is incorporated in Data Science.

B.TECH- (AI&DS) Curriculum

Semester V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20AIPC501	Computer Vision	3	0	0	3	3
2	20AIPC502	Deep Learning	3	0	0	3	3
3	20AIPC503	Natural language Processing and Chat Bot	3	0	0	3	3
4	20AIPC504	IoT & Sensors Technologies	3	0	0	3	3
5	20AI EL XXX	Professional Elective-I	3	0	0	3	3
PRACTICAL							
6	20AIPL501	Deep Learning Laboratory	0	0	3	3	1.5
7	20AIPL502	NLP & Chatbot Laboratory	0	0	3	3	1.5
8	20AIPL503	IoT Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - V							
9	20AITE501	Live-in-Lab III	0	0	2	2	1
10	20AITP501	Skill Enhancement	0	0	2	2	1
TOTAL						**28**	**21.5**

Semester VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20AIPC601	Robotics Process Automation	3	0	0	3	3
2	20AIPW602	Big Data Analytics with Lab	3	0	2	5	4
3	20AIPW603	Optimization Techniques for Programming with Lab	3	0	2	5	4
4	20XXELXXX	Professional Elective-II	3	0	0	3	3
5	20XXOEXXX	Open Elective-I	3	0	0	3	3
PRACTICAL							
6	20AIPL601	Robotics Laboratory	0	0	3	3	1.5
7	20HSPL501	Communication and Soft Skills Lab	0	0	2	2	1
8	20AIP 601	Innovative Design Project	0	0	2	2	1
VALUE ADDITIONS - VI							
9	20AITP601	Skill Enhancement	0	0	2	2	1
TOTAL						**28**	**21.5**

Annexure II

As per the suggestions and modifications prescribed by the respected members of BOS, **the Professional and Open Electives of IG Curriculum for the B.Tech. Degree in AI&DS** has been modified and presented below.

PROFESSIONAL ELECTIVE-I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTAC THOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL501	Control Systems	3	0	0	3	3	Robotics/ Biomedical
2	20AIEL502	Software Engineering	3	0	0	3	3	Testing
3	20AIEL503	Distributed Systems	3	0	0	3	3	Cloud/Security
4.	20AIEL504	Intellectual Property Rightsand Design Thinking	3	0	0	3	3	Management
5.	20AIEL505	Social Network Analysis	3	0	0	3	3	AI
6	20AIEL506	Software Project Management	3	0	0	3	3	Cloud/IoT

7	20AIEL507	Human Computer Interaction	3	0	0	3	3	AI
8	20AIEL508	Embedded Systems	3	0	0	3	3	IoT
9	20AIEL509	Ethics in Data Science	3	0	0	3	3	Data Science
10	20AIEL510	Principles of ComputerSecurity	3	0	0	3	3	Security

PROFESSIONAL ELECTIVES-II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL601	Ethical Hacking and Systems Défense	3	0	0	3	3	Security
2	20AIEL602	Wireless Sensor Networks	3	0	0	3	3	IoT
3	20AIEL603	Information Retrieval Techniques	3	0	0	3	3	Data Mining
4.	20AIEL604	Fundamentals of Artificial Intelligence for Robotics	3	0	0	3	3	Robotics
5.	20AIEL605	Cryptography and Network Security	3	0	0	3	3	Security
6	20AIEL606	Statistics for Business Analytics	3	0	0	3	3	Mathematics
7	20AIEL607	Fuzzy Control and Systems	3	0	0	3	3	Biomedical
8	20AIEL608	Agent Based Intelligent System	3	0	0	3	3	AI
9	20AIEL609	Biomedical Instrumentation	3	0	0	3	3	Biomedical
10	20AIEL610	Robotic Sensors	3	0	0	3	3	Robotics

PROFESSIONAL ELECTIVE-III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL701	Block Chain Technology	3	0	0	3	3	Security
2	20AIEL702	Biosensors & Transducers	3	0	0	3	3	Biomedical
3	20AIEL703	Virtual Reality and Augmented Reality	3	0	0	3	3	Artificial Intelligence
4.	20AIEL704	Secure Coding Practices	3	0	0	3	3	Security

5.	20AIEL705	Expert System	3	0	0	3	3	AI/IoT
6	20AIEL706	Nano robotics	3	0	0	3	3	Robotics
7	20AIEL707	Reinforcement Learning	3	0	0	3	3	Artificial Intelligence
8	20AIEL708	Mining Massive Datasets	3	0	0	3	3	Data Mining
9	20AIEL709	Database Security and Auditing	3	0	0	3	3	Data Science
10	20AIEL710	Game Theory	3	0	0	3	3	AI/IoT

PROFESSIONAL ELECTIVE-IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
11	20AIEL711	Cyber Crime & Computer Ethics	3	0	0	3	3	Cyber Security
12	20AIEL712	Quantum Computing	3	0	0	3	3	AI/ Biomedical
13	20AIEL713	Decision Making under Uncertainty	3	0	0	3	3	AI/IoT
14	20AIEL714	Artificial Intelligence Search Methods for Problem Solving	3	0	0	3	3	AI
15	20AIEL715	Cyber Security Techniques and Tools	3	0	0	3	3	Security
16	20AIEL716	Cyber Forensics	3	0	0	3	3	Security
17	20AIEL717	Time Series Analysis	3	0	0	3	3	AI/ Biomedical
18	20AIEL718	Robot Economics	3	0	0	3	3	Robotics
19	20AIEL719	Business Intelligence	3	0	0	3	3	AI
20	20AIEL720	Artificial Intelligence Constraint Satisfaction	3	0	0	3	3	AI

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No. SSIT,Ch-44/IT/BOS-5/2023 Date: 09.01.2023

NOTICE

The Fifth meeting of the **Board of Studies** in **Department of Information Technology** will be held at **10.30 a.m.** on **Thursday, 12th January 2023** through online mode for our Sri Sai Ram Institute of Technology, Chennai-44.

The meeting I.D & Password will be sent through email.
Sitting fee will be paid as per Rules.
Kindly make it convenient to attend the meeting.

PRINCIPAL

AGENDA

1. **Action taken on the Fourth BoS Meeting**
2. **Approval of NPTEL courses**
3. **Others if any**

Department of Information Technology

Board of Studies (BoS) Members

SL NO	NAME	DESIGNATION
1	Dr.K.Devaki	Professor / Rajalakshmi Engineering College, Rajalakshmi Nagar , Thandalam,Tamil Nadu-602105
2	Dr.K.Selva Kumar	Professor & Head of the Department, Department of IT, Annamalai University, Chidambaram -608002.
3	Mr.R .Sundar	Scientist -D, National Institute of Ocean Technology, Velacherry - Tambaram Main road, Narayanapuram , Pallikaranai, Chennai -600100
4	Mr.R.Karthick	Associate Director ,Ramco Systems, No. 64, Sardar Patel Rd. Sriram Nagar,Taramani ,Chennai-600113.
5	Mr. King Prakatheesh.C	Software Engineer, Chennai.
6	R.Priyadharshini	Senior Software Engineer, Chennai.
7	Dr.B.Sreedevi	Professor & Head of the Department, Department of CSE, Sri Sai Ram Institute of Technology, Chennai.
8	Dr.V.Brindha Devi	Professor & Head of the Department, Department of IT, Sri Sai Ram Institute of Technology, Chennai.
9	Dr. D.Muruga Radha Devi	Professor, Department of IT, Sri Sai Ram Institute of Technology, Chennai.
10	Dr. K.C. Suresh	Associate Professor, Department of CSE, Sri Sai Ram Institute of Technology, Chennai.
11	Dr.D. Rajalakshmi	Associate Professor, Department of CSE, Sri Sai Ram Institute of Technology, Chennai.
12	Ms.K.Anuratha	Associate Professor, Department of IT, Sri Sai Ram Institute of Technology, Chennai.

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DEPARTMENT OF INFORMATION TECHNOLOGY
Minutes of the Fifth Board of Studies meeting

The fifth Board of Studies (BoS) meeting of the department of IT was conducted on 12.01.2023 through online mode (ZOOM) at 10.30 A.M (IST). Following members were present.

1.	Dr.K.Devaki Professor / Rajalakshmi Engineering College,. Rajalakshmi Nagar ,Thandalam ,Tamil Nadu 602105	External stakeholder (University Representative)
2.	Dr.K.Selva kumar Professor & Head Of Department / IT Annamalai University Chidambaram -608002.	External stakeholder (Subject Expert)
3.	Mr.R .Sundar Scientist -D, National Institute of Ocean Technology Velacherry - Tambaram Main road, Narayanapuram , Pallikaranai, Chennai -600100	External stakeholder (Subject Expert)
4.	Mr.R.Karthick Associate Director ,Ramco Systems No. 64, Sardar Patel Rd, Sriram Nagar, Tharamani ,Chennai, Tamilnadu 600113.	External stakeholder (Industrial Expert)
5.	Mr.King Prakatheesh.C Software Engineer Chennai.	External stakeholder (Alumni Member)
6.	R.Priyadharshini Senior Software Engineer Chennai.	External stakeholder (Alumni Member)
7.	Dr.V.Brindha Devi	Internal stakeholder
8.	Dr. D.Muruga Radha Devi	Internal stakeholder
9.	Dr.K.C.Suresh	Internal stakeholder
10.	Dr .D.Rajalakshmi	Internal stakeholder
11.	Mrs.K.Anuratha	Internal stakeholder
12.	**Dr B.Sreedevi** Professor& Head, Department of CSE Sri Sai Ram Institute of Technology	**Chairman, BoS/CSE**

Dr B.Sreedevi, Chairman of BoS opened the meeting by welcoming the external members and internal members. The chairman placed the following agenda for the deliberations and discussions of the members. The following are the deliberations made during the meeting (as per the items of the circulated agenda).

BOS.IT.23.01.01 **To ratify the action taken for the fourth BoS meeting.**

All expert members accepted the action taken for the fourth BOS meeting.

BOS.IT.23.01.02 **To approve the NPTEL courses to be offered to UG programme in B.Tech IT**

S.No.	Duration of courses	Credit
1.	12 Weeks	3
2.	8 Weeks	2
3.	4 Weeks	1

To earn 3 credits in NPTEL course, student has to complete "One Twelve Week course/ One Eight Week Course and One Four Week Course/ Three Four Week Courses". BOS resolved to recommend the following to the Academic Council for further approval.

BOS.IT.23.01.03 **To review the evaluation process of Innovative Design Project and the and approve the syllabus of Skill Enhancement for VI and VII Semester**

Academic Experts suggested having more practical sessions in the Skill Enhancement courses to meet the industrial needs.

S.No	Semester	Course Code	Course Title	Tools/ Programming Language
1.	V	20ITTP501	Skill Enhancement	Scilab
2.	VI	20ITTP601	Skill Enhancement	Blender
3.	VII	20ITTP701	Skill Enhancement	Product and Service oriented process

BOS.IT.23.01.04 **To include the AICTE directed "20HSMC501 Universal Human Values II: Understanding Harmony" course**

To approve the "20HSMC501 Universal Human Values II: Understanding Harmony" course to be offered to Sixth Semester under Regulation 2020 in IT UG programme as Open Elective.
BOS resolved to recommend the following to the Academic Council for further approval.

In the concluding remarks, the chairman stated that the suggestions by the members would be considered.

Meeting then ended with a vote of thanks by Dr. S. Rajarajan, Professor / Dean – Academic, Sri Sai Ram Institute of Technology.

Dr.K.Devaki
Professor / Rajalakshmi Engineering College,.

Dr.K.Selva kumar
Professor & Head Of Department / IT
Annamalai University

Mr.R .Sundar
Scientist -D,
National Institute of Ocean Technology

Mr.R.Karthick
Associate Director, Ramco Systems

Mr.King Prakatheesh.C
Software Engineer
Chennai

R.Priyadharshini
Senior Software Engineer Chennai.

Dr. V.Brindha Devi

Dr. D.Muruga Radha Devi

Dr.K.C.Suresh

Mrs.D.Rajalakshmi

Mrs.K.Anuradha

Dr B.Sreedevi
Chairman, BOS/CSE
Professor& Head, CSE
Sri Sai Ram Institute of Technology

1.1.3 Courses focused on Employability, Entrepreneurship and Skill Development offered

Sri

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DEPARTMENT OF COMPUTER & COMMUNICATION ENGINEERING

AUTONOMOUS

CURRICULUM AND

SYLLABUS

I - VIII

SEMESTERS

REGULATIONS

2020

Academic Year 2020-21 onwards

SRI SAIRAM INSTITUTE OF TECHNOLOGY

VISION

To be identified as a "Centre of Excellence" with high standards of Knowledge Dissemination and Research opportunities and to transform the students to imbibe qualities of technical expertise of international standards and high levels of ethical values, who in turn shall contribute to the advancement of society and human kind.

MISSION

We shall dedicate and commit ourselves to attain and maintain excellence in Technical Education through commitment and continuous improvement of infrastructure and equipment and provide an inspiring environment for Learning, Research and Innovation for our students to transform them into complete human beings with ethical and social values.

QUALITY POLICY

We at Sri Sai Ram Institute of Technology are committed to build a better nation through Quality Education with team spirit. Our students are enabled to excel in all values of Life and become Good Citizens. We continually improve the System, Infrastructure and Services to satisfy the Students, Parents, Industry and Society.

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

VISION

To produce globally competent and socially responsible engineers who can address the engineering challenges and excel at an international level, in the advancement of Computer and Communication Engineering through research and academia.

MISSION

M1 To provide a good environment with latest technological infrastructure facilities, teaching-learning ambience and interaction with industry in the area of Computer and Communication Engineering.

M2 To inculcate graduates with high social responsibility, right attitude, discipline and an inclination towards offering their professional expertise in serving the society.

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA101	Engineering Mathematics-I	3	1	0	4	4
2	20HSEN101	Technical English-I	3	0	0	3	3
3	20BSPH101	Engineering Physics	3	0	0	3	3
4	20BSCY101	Engineering Chemistry	3	0	0	3	3
5	20ESCS101	Problem solving and Programming in C	3	0	0	3	3
6	20ESGE101	Engineering Graphics	1	2	0	3	3
PRACTICAL							
7	20BSPL101	Physics and Chemistry Laboratory	0	0	3	3	1.5
8	20ESPL101	Programming in C Laboratory	0	0	3	3	1.5
VALUE ADDITIONS – I							
9	20TPHS101	Skill Enhancement	0	0	2	2	1
10	20HSMG101	Personal Values	2	0	0	2	0
TOTAL						**29**	**23**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA201	Engineering Mathematics -II	3	1	0	4	4
2	20HSEN201	Technical English - II	3	0	0	3	3
3	20ESIT201	Python Programming with Laboratory	3	0	2	5	4
4	20BSPH201	Physics of Electronic Devices	3	0	0	3	3
4	20BSCY201	Environmental Science and Engineering	3	0	0	3	3
PRACTICAL							
6	20ESGE201	Engineering Practices Laboratory	0	0	3	3	1.5
7	20ECPL201	Circuits and Devices Laboratory	0	0	3	3	1.5
8	20ECTE201	PCB Design	0	0	2	2	1
VALUE ADDITIONS - II							
9	20TPHS201	Skill Enhancement	0	0	2	2	1
10	20HSMG201	Interpersonal Values	2	0	0	2	0
TOTAL						**30**	**22**

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20ITPC301	Data Structures	3	0	0	3	3
2	20CCPC301	Digital logics and system design	3	0	0	3	3
3	20ECPC303	Signals and Systems	3	1	0	4	4
4	20ITPC303	Computer Organization and Architecture	3	0	0	3	3
5	20BSMA301	Linear Algebra, Partial Differential Equations and Transforms	3	1	0	4	4
PRACTICAL							
6	20ITPL301	Data Structures Laboratory	0	0	3	3	1.5
7	20CCPL301	Digital Circuits Laboratory	0	0	3	3	1.5
8	20CCTE301	Live-in-Lab - 1	0	0	2	2	1
VALUE ADDITIONS - III							
9	20CCTP301	Skill Enhancement	0	0	2	2	1
10	20MGMC301	Constitution of India	2	0	0	2	0
TOTAL						**29**	**22**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CCPC401	Analog & Digital Communication	3	0	0	3	3
2	20CSPC402	Data Base Management systems	3	0	0	3	3
3	20CCPW401	Operating Systems with Laboratory	3	0	2	5	4
4	20ECPC302	Electromagnetic Fields and Waveguides	3	1	0	4	4
5	20BSMA401	Probability Theory and Stochastic Processes	3	1	0	4	4
PRACTICAL							
6	20CCPL401	Communication Systems Laboratory	0	0	3	3	1.5
7	20CSPL402	Database Management Systems Laboratory	0	0	3	3	1.5
8	20CCTE401	Live-in-Lab -II	0	0	2	2	1
VALUE ADDITIONS - IV							
9	20CCTP401	Skill Enhancement	0	0	2	2	1
TOTAL						**29**	**23**

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CSPC301	Object Oriented Programming	3	0	0	3	3
2	20ECPC402	Microcontrollers and Embedded systems	3	0	0	3	3
3	20CSPW401	Computer Networks with Laboratory	3	0	2	5	4
4	20XXELXXX	Professional Elective-1	3	0	0	3	3
5	20XXOEXXX	Open Elective-1	3	0	0	3	3
PRACTICAL							
6	20ECPL401	Microcontrollers and Embedded Systems Laboratory	0	0	3	3	1.5
7	20CSPL301	Object Oriented Programming Laboratory	0	0	3	3	1.5
8	20CCTE501	Live-in-Lab III	0	0	4	4	2
VALUE ADDITIONS - V							
9	20CCTP501	Skill Enhancement	0	0	2	2	1
TOTAL						**29**	**22**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20ECPW501	Discrete Time Signal Processing with Laboratory	3	0	2	5	4
2	20CSPC403	Object Oriented Software Engineering	3	0	0	3	3
3	20CSPC601	Artificial Intelligence	3	0	0	3	3
4	20CCPW601	Wireless Communication and Computing with Laboratory	3	0	2	5	4
5	20XXELXXX	Professional Elective-2	3	0	0	3	3
6	20XXOEXXX	Open Elective-2	3	0	0	3	3
PRACTICAL							
7	20HSPL501	Communication and Soft Skills Laboratory	0	0	2	2	1
8	20CSPL601	Artificial Intelligence laboratory	0	0	3	3	1.5
9	20CCPJ601	Innovative Design Project	0	0	2	2	1
VALUE ADDITIONS – VI							
10	20CCTP601	Skill Enhancement	0	0	2	2	1
TOTAL						**31**	**24.5**

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CCPW701	Cryptography and Network security with Laboratory	3	0	2	5	4
2	20CSPC701	Big Data Analytics	3	0	0	3	3
3	20ITPC601	Cloud computing and Virtualisation	3	0	0	3	3
4	20CCPC701	Mobile Communication	3	0	0	3	3
5	20XXELXXX	Professional Elective-3	3	0	0	3	3
6	20HSMG601	Principles of Engineering Management	3	0	0	3	3
PRACTICAL							
7	20CSPL701	Big Data Analytics Laboratory	0	0	3	3	1.5
8	20CCPJ701	Project Phase -1	0	0	4	4	2
VALUE ADDITIONS - VII							
9	20CCTP701	Skill Enhancement	0	0	2	2	1
		TOTAL				**29**	**23.5**

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20XXELXXX	Professional Elective - 4	3	0	0	3	3
PRACTICAL							
2	20CCPJ801	Project Phase - II	0	0	8	8	4
		TOTAL				**11**	**7**

CREDIT DISTRIBUTION

Category	BS	ES	HS	EL	PC+PL	PW	OE	TE	PJ	TP	IS	MC	TOTAL
Credit	29.5	13	10	12	57.5	20	6	5	7	7	3	Y	170
Percentage	17.3	7.6	5.8	7.0	33.8	11.7	3.5	2.9	4.1	4.1	1.7	-	

*IS-Internship

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20CSPC501	Internet Programming	3	0	0	3	3	Web Development
2	20CSEL501	Data Warehousing and Data Mining	3	0	0	3	3	Data Mining
3	20CCEL503	Embedded Real Time Systems	3	0	0	3	3	Embedded
4	20CCEL504	System on chip Architecture	3	0	0	3	3	Embedded
5	20MGEL703	Foundation skills in Integrated product Development	3	0	0	3	3	Product Development
6	20CSEL607	Agile Methodologies	3	0	0	3	3	Software Engineering
7	20CCEL507	Computational Linguistics	3	0	0	3	3	NLP
8	20CCEL508	Distributed Database	3	0	0	3	3	Data Base
9	20ECEL709	Digital image processing	3	0	0	3	3	Image Processing
10	20CCEL510	Sensor Networks and IOT	3	0	0	3	3	Wireless Network
11	20MGEL501	Intellectual Property Rights	3	0	0	3	3	Management
12	20CSEL504	Foundation of Data Science	3	0	0	3	3	Data Science
13	20ECEL501	Advanced Communication Systems and Techniques	3	0	0	3	3	Wireless

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20CCEL601	Wireless Sensor Networks	3	0	0	3	3	Wireless
2	20ECEL701	Cognitive Radio	3	0	0	3	3	Wireless
3	20CCEL602	Networking Engineering and Management	3	0	0	3	3	Network
4	20ECEL502	Industrial IoT	3	0	0	3	3	IoT
5	20CSEL704	Natural Language Processing	3	0	0	3	3	NLP
6	20MGEL601	Total Quality Management	3	0	0	3	3	Management
7	20CCEL603	Advanced Datastructures and Algorithms	3	0	0	3	3	Data Structure
8	20ITEL601	Software Testing	3	0	0	3	3	Software Engineering
9	20CCEL604	Infometrics	3	0	0	3	3	Data Mining
10	20CSEL702	Software Defined Networks	3	0	0	3	3	Network
11	20CSPC702	Machine Learning Techniques	3	0	0	3	3	Machine Learning
12	20ITEL707	Robotic Process Automation	3	0	0	3	3	IoT
13	20ECEL504	Programmable Logic Controllers	3	0	0	3	3	VLSI

PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20CCEL701	Adhoc and Sensor Networks	3	0	0	3	3	Sensor Networks
2	20CCEL702	Human Computer Interaction	3	0	0	3	3	User Interface
3	20CCEL703	Quantum Computing	3	0	0	3	3	Cloud
4	20ECPC702	Optical Communication	3	0	0	3	3	Wireless
5	20CCEL704	Database security and privacy	3	0	0	3	3	Security
6	20CCEL705	Parallel Architecture and Algorithms	3	0	0	3	3	Cloud
7	20CSPC602	Compiler Design	3	0	0	3	3	Compiler
8	20ITEL710	Service Oriented Architecture	3	0	0	3	3	Cloud
9	20CCEL706	Advanced Wireless Communication	3	0	0	3	3	Wireless
10	20CCEL707	Principles of Multimedia	3	0	0	3	3	Multimedia
11	20CSEL802	Deep Learning Principles and Practices	3	0	0	3	3	Data Science
12	20ITEL708	Full Stack Software Development	3	0	0	3	3	Cloud Computing
13	20ECEL706	Microwave and Millimeter Wave Circuits and Systems	3	0	0	3	3	RF & Green

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20CCEL801	Hardware Software Codesign	3	0	0	3	3	Design
2	20CCEL802	Fuzzy Logic and Neural Networks	3	0	0	3	3	Fuzzy Logic
3	20CCEL803	Satellite Communication	3	0	0	3	3	Wireless
4	20CCEL804	Ethical Hacking and Digital Forensics	3	0	0	3	3	Ethical Hacking
5	20MGEL801	Professional Ethics and Values	3	0	0	3	3	Management
6	20CCEL805	Database Tuning	3	0	0	3	3	Database
7	20CCEL806	Android Application Development	3	0	0	3	3	Mobile Development
8	20CSEL706	Multi-core Architectures and Programming	3	0	0	3	3	Parallel Processing
9	20CSEL806	Cognitive Science	3	0	0	3	3	Artificial Intelligence
10	20ITEL802	Virtual and Augmented Reality	3	0	0	3	3	IoT
11	20CSEL803	Block Chain and Crypto Currency Technologies	3	0	0	3	3	Cloud Computing & Security
12	20CSEL703	Information Retrieval Techniques	3	0	0	3	3	Artificial Intelligence
13	20ECEL801	5G and 6G Wireless Communication Systems	3	0	0	3	3	Wireless

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Impart strong foundation in basic sciences, mathematics and engineering fundamentals, knowledge and capability.

PEO2 Apply design principles and best practices for developing quality products for scienti□c and business applications.

PEO 3 Inculcate high professionalism among the students by providing technical and soft skills with ethical standards.

PEO 4 Promote collaborative learning and spirit of team work through multidisciplinary projects and diverse professional activities.

PEO 5 Indoctrinate an attitude in the graduates for life- long learning process.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1 Apply appropriate technology for the implementation of modern communication systems

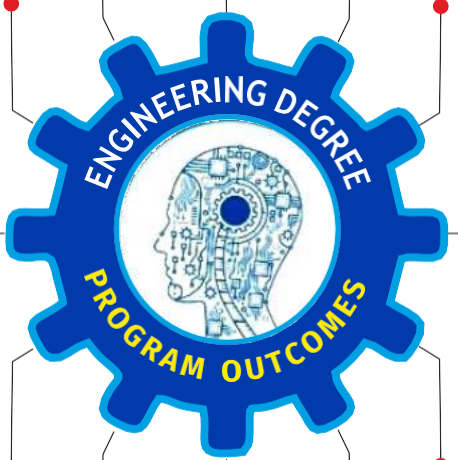
PSO2 Develop quality software for scienti□c and business applications by applying software engineering principles and practices .

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences (BS)	17.3	31	29.5
Engineering Sciences (ES)	7.6	17	13
Humanities and Social Sciences (HS)	5.8	15	10
Professional Electives (EL)	7.0	12	12
Program Core + Program Lab (PC+PL)	33.8	71	57.5
Program theory with Lab (PW)	11.7	25	20
Open Electives (OE)	3.5	06	6
Talent Enhancement (TE)	2.9	10	5
Project (PJ)	4.1	14	7
Training & Placement (TP)	4.1	14	7
Internships/Seminars (IS)	1.7	-	3
Mandatory Courses (MC)	NA	02	NA
Total number of Credits		**217**	**170**

PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM



01 Engineering knowledge
Apply the basic principle and knowledge of mathematics, science and engineering principles to solve technical problems.

02 Problem Analysis
Identify and analyze complex engineering problems reaching logical conclusions using the basic principles of mathematics, science and engineering.

03 Development of solutions
Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

04 Investigate complex problems
Perform investigations, use research based knowledge and conduct experiments, analyze and interpret the results to provide valid conclusions.

05 Modern tool usage
Create, select and apply the latest techniques, resources and modern engineering / IT tools to develop appropriate solutions with an understanding of the limitations.

06 The Engineer and Society
Apply reasoning based on contextual knowledge to assess societal, legal and cultural issues with competency in professional engineering practices.

07 Environment & Sustainability
Demonstrate professional skills, knowledge and contextual reasoning to assess / environmental / societal issues for sustainable development.

08 Apply ethical principles
Apply ethical principles and commit to professional ethics and responsibilities based on the norms of professional engineering pratices.

09 Individual & Teamwork
Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary professional settings.

10 Communicate effectively
Communicate effectively amongst the engineering community, being able to comprehend & write effective reports, make presentations & give/receive clear instructions.

11 Project management
Demonstrate knowledge and apply the principles of engineering & management in their own / team projects in multidisciplinary environments.

12 Life-long learning
Recognize the need for, and have the preparation, ability to engage in independent and life-long learning in the context of technological change.

SEMESTER - I

20BSMA101 SDG NO. 4 & 9	ENGINEERING MATHEMATICS-I	L	T	P	C
		3	1	0	4

OBJECTIVES:

The intent of this course is

- The intent of the course is to understand, gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives and maxima and minima.
- To acquaint the concept of improper integrals and the properties ofdefinite integrals.
- To provide understanding of double integration, triple integration and their application.
- To introduce the concept of sequence and series and impart the knowledge of Fourier series.

UNIT I MATRICES **12**

Symmetric, skew symmetric and orthogonal matrices; Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem(excluding proof) – Reduction of a Quadratic form to Canonical form using Orthogonal Transformation - Nature of Quadratic forms.

UNIT II DIFFERENTIAL CALCULUS **12**

Limit, continuity, Differentiation rules - Maxima and Minima of functions of one variable, partial derivatives, Taylor's series for functions of two variables, Jacobian, Maxima & Minima of functions of several variables, saddle points, Method of Lagrange multipliers.

UNIT III INTEGRAL CALCULUS **12**

Evaluation of definite and improper integral - Techniques of Integration- Substitution rule - Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions - Applications of definite integrals to evaluate surface areas and volumes of revolution.

UNIT IV MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V SEQUENCES AND SERIES **12**

Introduction to sequences and series – power series – Taylor's series – series for exponential, trigonometric, logarithmic, hyperbolic functions – Fourier series – Halfrange Sine and Cosine series – Parseval's theorem.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

REFERENCES:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
3. T. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
4. N.P. Bali and Manish Goyal, "A text-book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2014.

WEB REFERENCES:

1. https://math.mit.edu/~gs/linearalgebra/ila0601.pdf
2. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter30/
3. https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/2.-partial-derivatives/
4. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter31/

ONLINE RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
2. https://www.khanacademy.org/math/differential-calculus

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the concepts of symmetric, skew symmetric, orthogonal matrices, properties of Eigen values and eigen vectors, the nature of a quadratic form, sequences and series, power series representation of

functions, series representation of exponential, trigonometric logarithmic andhyperbolic functions. (K2)

2. Compute the eigen values, eigen vectors of a matrix, diagonalize the quadratic form using orthogonal transformation and find the inverse and higher powers of a matrix using Cayley Hamilton theorem. (K3)
3. Calculate the limit, derivative, partial derivatives, Jacobians of simple functions and evaluate integrals of single variable using the rules of integration. (K3)
4. Determine the Taylor series representation of functions of one variable and two variables and evaluate maxima and minima of functions of one variable, two variables and several variables. (K3)
5. Evaluate double integrals using change of order technique, double and triple integrals using change of variables technique and calculate surface areas and volume of solids of revolution. (K3)
6. Compute the Fourier series, Sine and Cosine series representation of functions defined in a period and use Fourier series and Parseval's theorem to find the value of infinite series. (K3)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	1
CO3	3	3	2	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO6	3	3	2	1	-	-	-	--	-	-	-	1

SEMESTER - I

20HSEN101 SDG NO. 4	TECHNICAL ENGLISH - I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop the basic LSRW skills of the students
- To encourage the learners to adapt to listening techniques
- To help learners develop their communication skills and converse fluently in real contexts

- To help learners develop general and technical vocabulary through reading and writing tasks
- To improve the language proficiency for better understanding of core subjects

UNIT I INTRODUCTION 9

Listening – short texts – formal and informal conversations - **Speaking** – basics in speaking – speaking on given topics & situations – recording speeches and strategies to improve - **Reading –** critical reading – finding key information in a given text – shifting facts from opinions - **Writing –** free writing on any given topic – autobiographical writing - **Language Development** – tenses – voices- word formation: prefixes and suffixes – parts of speech – developing hints

UNIT II READING AND LANGUAGE DEVELOPMENT 9

Listening - long texts - TED talks - extensive speech on current affairs and discussions -Speaking – describing a simple process – asking and answering questions - **Reading** comprehension – skimming / scanning / predicting & analytical reading – question & answers – objective and descriptive answers –identifying synonyms and antonyms - process description - **Writing** instructions – **Language Development** – writing definitions – compound words - articles – prepositions

UNITIIISPEAKINGANDINTERPRETATION SKILLS 9

Listening - dialogues & conversations - **Speaking** – role plays – asking about routine actions and expressing opinions - **Reading** longer texts & making a critical analysis of the given text - **Writing** – types of paragraph and writing essays – rearrangement of jumbled sentences - writing recommendations - **Language Development** – use of sequence words - cause & effect expressions - sentences expressing purpose - picture based and newspaper based activities – single word substitutes

UNIT IV VOCABULARY BUILDING AND WRITING SKILLS 9

Listening - debates and discussions – practicing multiple tasks – self introduction – **Speaking** about friends/places/hobbies - **Reading** -Making inference from the reading passage – Predicting the content of the reading passage - **Writing** – informal letters/e-mails - **Language Development** - synonyms & antonyms - conditionals – if, unless, in case, when and others – framing questions.

UNIT V LANGUAGE DEVELOPMENTAND TECHNICAL WRITING 9

Listening - popular speeches and presentations - Speaking - impromptu

speeches & debates - **Reading** - articles – magazines/newspapers **Writing** – essay writing on technical topics - channel conversion – bar diagram/ graph – picture interpretation - process description - **Language Development** – modal verbs- fixed/ semi-fixed expressions – collocations

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al.Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. http://engineeringvideolectures.com/course/696

ONLINERESOURCES:

1. https://www.pearson.com/english/catalogue/business-english/technical-english.html
2. https://www.cambridgeenglish.org/learning-english/free-resources/

OUTCOMES:

Upon completion of the course, the student should be able to

- Comprehend conversations and talks presented in English (K2)
- Speak fluently in informal and formal contexts (K1)
- Read articles of any kind and be able to comprehend (K2)
- Write technical concepts in simple and lucid style (K2)
- Prepare informal letters and e-mails efficiently (K3)
- Present technical concepts and summaries in correct grammar and vocabulary (K1)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Co1	-	2	-	-	-	-	1	-	-	3	-	-
CO2	1	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	3	2
CO4	-	3	-	-	-	-	-	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	-	3	-	-	-	2	-

SEMESTER - I

20BSPH101 SDG NO. 4	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To educate and enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology

UNIT I CRYSTAL PHYSICS 9

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - Powder diffraction method - Debye Scherer formula - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - packing factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy - Diamond and Graphite structure (qualitative) - Growth of single crystals: Solution and Melt growth Techniques.

UNIT II PROPERTIES OF MATTER 9

Elasticity - Stress - strain diagram and its uses - Poisson's ratio - Relationship between three moduli of elasticity (qualitative) - Factors affecting elastic modulus and tensile strength - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III QUANTUM PHYSICS 9

Black body radiation - Planck's theory (derivation) - Compton effect: theory -

wave particle duality - electron diffraction - progressive waves - wave equation - concept of wave function and its physical significance - Schrödinger's wave equation - Time independent and Time dependent equations - particle in a box (one dimensional motion) - Tunneling (qualitative) - scanning tunneling microscope.

UNIT IV LASERS AND FIBEROPTICS 9

Lasers: population of energy levels, Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - three level and four level laser - CO_2 laser - Semiconductor lasers: Homojunction and Heterojunction.

Fiber optics: Principle, Numerical aperture and Acceptance angle - Types of optical fibers (material, refractive index, mode) - Losses associated with optical fibers - Fiber Optical Communication system (Block diagram) - Fiber optic sensors: pressure and displacement.

UNIT V THERMAL PHYSICS 9

Transfer of heat energy - thermal expansion of solids and liquids - bimetallic strips - thermal conduction, convection and radiation - heat conduction in solids (qualitative) - thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - thermal insulation - applications: heat exchangers, refrigerators and solar water heaters.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. D.K. Bhattachary & T.Poonam, “Engineering Physics”. Oxford University Press, 2015.
2. R.K. Gaur& S.L. Gupta, “Engineering Physics”. Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S.Chaturvedi, “Engineering Physics”, Cengage Learning India, 2017.
4. V. Rajendran, “Engineering Physics”, Mc Graw Hill Publications Ltd. New Delhi, 2014.
5. M.N. Avadhanulu& P.G. Kshirshagar, “A textbook of Engineering Physics”, S. Chand & Co Ltd. 2016.

REFERENCES:

1. D. Halliday,. Resnick & J. Walker, “Principles of Physics”, Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, “Physics for Scientists and Engineers”, Cengage Learning, 2010.
3. N.K. Verma,” Physics for Engineers”, PHILearning Private Limited, 2014.

4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H.Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the basics of crystals, structures and crystal growth techniques (K3)
2. Select a right choice of materials based on their properties for potential applications / acquire fundamental knowledge on elasticity and its applications relevant to the field of engineering (K3)
3. Apply the advanced physics concepts of quantum theory to characterize the matter (K4)
4. Understand the basic concepts in laser and its types and fiber optics (K3)
5. Acquire adequate knowledge on the fundamental concepts of thermal properties of materials (K2)
6. Evaluate the applications of powder diffraction method, optical fibers in sensors, quantum mechanical tunneling and thermal materials in expansion joints and heat exchangers (K4)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	-	-	-	-	-	-	-	1
CO2	3	2	3	3	-	-	2	-	-	-	-	3
CO3	3	3	3	2	-	-	3	-	-	-	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	3	3	3	-	-	3	-	-	-	-	3
CO6	3	3	3	3	-	-	3	-	-	-	-	3

SEMESTER - I

20BSCY101 SDG NO. 4,6&7	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques
- To illustrate the principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials
- To categorize types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels
- To demonstrate the principles and generation of energy in batteries, nuclear reactors, solar cells, windmills and fuel cells
- To recognize the applications of polymers, composites and nano-materials in various fields

UNIT I WATER TECHNOLOGY AND SURFACE CHEMISTRY 9

Water Technology : Introduction – Hard water and Soft water. Hardness of water – types – expression of hardness (numerical problems). Boiler troubles – scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion. Treatment of boiler feed water – Internal treatment (carbonate, phosphate, calgon, colloidal and sodium aluminate conditioning). External treatment – Ion exchange process, Zeolite process –Domestic water treatment (break point chlorination) –Desalination of brackish water – Reverse Osmosis.

Surface Chemistry: Adsorption – types – adsorption of gases on solids – adsorption of solutes from solution – applications of adsorption –role of adsorbents in catalysis and pollution abatement.

UNIT II ELECTROCHEMISTRY AND CORROSION 9

Electrochemistry: Cells – types (electrochemical and electrolytic cell) Redox reaction – single electrode potential (oxidation potential and reduction potential) – measurement and applications –Nernst equation (derivation and problems) – electrochemical series and its significance.

Corrosion: Causes, factors and types – chemical and electrochemical corrosion (galvanic, differential aeration). Corrosion control – material selection and design aspects, cathodic protection methods (sacrificial anodic and impressed current cathodic method) and corrosion inhibitors. Paints: Constituents and its functions. Electroplating of Copper and electroless plating of Nickel.

UNIT III FUELS ANDCOMBUSTION 9

Fuels: Introduction – classification of fuels – Coal – analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – octane number and cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gases (LPG). Biofuels – Gobar gas and Biodiesel.

Combustion of Fuels: Introduction – calorific value – higher and lower calorific values- theoretical calculation of calorific value – flue gas analysis (ORSAT Method).

UNIT IV ENERGY SOURCES AND STORAGE DEVICES 9

Energy sources: Nuclear fission – nuclear fusion – differences between nuclear fission and fusion – nuclear chain reactions – nuclear energy – light water nuclear power plant – breeder reactor – solar energy conversion – solar cells – wind energy.

Storage devices: Batteries – types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium–ion–battery), fuel cells – H_2-O_2 fuel cell and super capacitors.

UNIT V POLYMERS AND NANOMATERIALS 9

Polymers: Classification – types of polymerization – mechanism (Free radical polymerization) –Engineering polymers: Nylon–6, Nylon–6,6, Teflon, Kevlar and PEEK – preparation, properties and uses – Plastic and its types – Conducting polymers – types and applications. Composites – definition, types, polymer matrix composites – FRP.

Nanomaterials: Introduction – Nanoparticles, Nanoclusters, Nanorods, Nanotubes (CNT: SWNT and MWNT) and Nanowires – Properties (surface to volume ratio, melting point, optical and electrical), Synthesis (precipitation, thermolysis, hydrothermal, electrodeposition, chemical vapour deposition, laserablation, sol-gel process) and Applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.
2. P. C. Jainand Monika Jain, "Engineering Chemistry" DhanpatRai Publishing Company(P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

OUTCOMES

Upon completion of the course, the student should be able to

1. Identify the origin of water resources and develop innovative methods to produce soft water for industrial use and potable water at cheaper cost. (K2)
2. Recognize the basic design of adsorption systems and its industrial applications and the basics concepts of electrochemistry to understand battery technology. (K2)
3. Apply the principles of electrochemistry to corrosion process and the applications of protective coatings to overcome the corrosion. (K3)
4. Disseminating the knowledge about the chemistry of fuels and combustion and its application in various levels. (K2)
5. Acquire the basics of non-conventional sources of energy and understand the principles and the reaction mechanism of batteries and fuel cells.. (K3)
6. Illustrate the synthesis and applications of polymers, composites and nano-materials. (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	-	1	2	-	-	-	-	1
CO2	3	2	2	2	1	1	2	-	-	-	-	3
CO3	3	2	3	2	1	1	2	-	-	-	1	1
CO4	3	1	2	2	-	1	2	-	-	-	1	1
CO5	3	2	3	1	1	1	2	-	-	-	1	3
CO6	3	2	3	1	-	1	1	-	-	-	1	2

SEMESTER - I

20ESCS101 SDG NO. 4&9	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand about the programming language
- To develop C Programs using basic Programming Constructs, Loops Arrays and Strings
- To develop applications in C using Functions , Pointers and Structures
- To perform I/O operations and File Handling in C

UNIT I INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING 10

The Basic Model of Computation, Programming Paradigms- Program Development Life Cycle - Algorithm –Pseudo Code – Flow Chart - Programming Languages - Compilation - Linking and Loading - Testing and Debugging - Documentation - Control Structures – Algorithmic Problem Solving- Problems Based on Sequential, Decision Making - Branching and Iteration.

UNIT II BASICS OF C PROGRAMMING 8

Structure of C program - C programming: Data Types – Storage Classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions – Input / Output Statements - Assignment Statements – Decision making Statements - Switch Statement - Looping Statements – Pre-Processor Directives - Compilation Process

UNIT III ARRAYSAND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One Dimensional Array – Example Program: Computing Mean, Median and Mode - Two Dimensional Arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String Operations: Length, Compare, Concatenate - Copy– Selection Sort - Linear and Binary Search.

UNIT IV FUNCTIONS AND POINTERS 9

Introduction to Functions: Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) – Recursion – Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions – Pointers – Pointer Operators – Pointer Arithmetic – Arrays and Pointers –

Array of Pointers – Example Program: Sorting of Names – Parameter Passing: Pass by Value - Pass by Reference – Example Program: Swapping of Two Numbers using Pass by Reference.

UNIT V STRUCTURES and FILEPROCESSING 9

Structure - Nested Structures – Pointer and Structures – Array of Structures – Example Program using Structures and Pointers – Self Referential Structures – Dynamic Memory Allocation - Singly Linked List – Typedef.

Files – Types of File Processing: Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files – Command Line Arguments.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2012.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication.
2. Jeri R. Hanly & Elliot B. Koffman, "Problem Solving and Program Design in C", Pearson Education, 2013.
3. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
6. Kanetkar Y, "Let us C", BPB Publications, 2007.
7. Hanly J R & Koffman E.B, "Problem Solving and Programme design in C", Pearson Education, 2009.

WEB REFERENCES:

1. https://www.learn-c.org/
2. https://codeforwin.org/
3. https://www.cprogramming.com/

ONLINE RESOURCES:

1. https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial
2. https://nptel.ac.in/courses/106105171
3. https://swayam.gov.in/nd1_noc19_cs42/preview

OUTCOMES:

Upon completion of the course, the student should be able to

1. Develop efficient algorithms for solving a problem. (K2)
2. Use the various constructs in C to develop simple applications. (K3)
3. Design and Implement applications using Array & Strings. (K3)
4. Develop applications using Functions and Pointers. (K6)
5. Design and Develop applications using Structures. (K3)
6. Design and Develop applications using Files. (K4)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	-	2	2	-	3	2	3
CO2	3	3	3	3	2	-	1	1	2	2	3	3	2	3
CO3	3	3	3	3	2	1	1	1	2	-	3	-	3	2
CO4	3	3	3	3	2	1	-	1	2	2	3	3	1	2
CO5	3	3	3	3	2	1	1	1	2	2	3	3	2	1
CO6	3	3	3	3	2	1	1	1	2	2	3	3	3	2

SEMESTER - I

20ESGE101 SDG NO. 4,6,7, 9, 12,14 &15	ENGINEERING GRAPHICS	L	T	P	C
		1	2	0	3

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To visualize the job in three dimensions
- To have a clear conception and appreciation of the shape, size, proportion and design
- To expose the student community to existing national standards related to technical drawings

CONCEPTS ANDCONVENTIONS (Not for Examination) 3

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning- Projection of Points

UNIT I PLANECURVES AND FREEHAND SKETCHING 6+9

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid on Horizontal Surfaces – construction of involutes of circle for one complete revolution – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF LINES AND PLANE SURFACE 6+9

Orthographic projection- principles-Principal planes- Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method- Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OFSOLIDS 6+9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+9

Sectioning of prisms, pyramids, cylinder and cone in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and truncated solids in vertical position – Prisms, pyramids cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+9

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinder, cone- Perspective projection of simple solids-Prisms, pyramids and cylinder by visual ray method.

TOTAL: 78 PERIODS

TEXT BOOKS:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
3. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
5. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
6. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
7. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

WEB REFERENCES:

1. https://nptel.ac.in/courses/112/103/112103019/

ONLINERESOURCES:

1. https://nptel.ac.in/courses/105/104/105104148/

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS15021 (Parts 1 to 4)– 2001: Technical drawings – Projection Methods

OUTCOMES:

Upon completion of the course, the student should be able to

1. Relate thoughts and ideas graphically in a neat fashion and ability to perform sketching of engineering curves used in engineering practices, multiple views of objects. (K1)
2. Understand the concepts of orthographic projections for basic geometrical constructions. (K2)
3. Acquire the knowledge of orthographic projection in three dimensional object. (K2)
4. Develop knowledge about Sectioning and apply interior shapes of solids. (K3)
5. Analyze the concepts of design in developing various 3 dimensional projections. (K4)
6. Build a strong foundation to analyze the design in various dimensions. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO2	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO3	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO4	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO5	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO6	3	2	2	-	-	-	-	-	2	2	-	2	2	2

SEMESTER - I

20BSPL101 SDG NO. 4	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	3	1.5

PHYSICS LABORATORY

OBJECTIVES:

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis

LISTOF EXPERIMENTS (Any 5 Experiments)

1. Determination of Young's modulus by non-uniform bending method.
2. Determination of rigidity modulus –Torsion pendulum.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4. (a) Determination of wavelength and particle size using Laser.
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's bridge.
7. Determination of wavelength of mercury spectrum – spectrometer grating.
8. Determination of band gap of a semiconductor.
9. Determination of Hall coefficient by Hall Effect experiment.
10. Determination of solar cell characteristics.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 6 (max.) STUDENTS PER EXPERIMENT

1. Young's modulus by non-uniform bending method-experimental set-up – 12 sets
2. Rigidity modulus - Torsion pendulum experimental set-up – 12 sets
3. Ultrasonic Interferometer to determine velocity of sound and compressibility of liquid – 6 sets
4. (a) Experimental set-up to find the wavelength of light, and to find particle size using Laser – 6 sets
   (b) Experimental set-up to find acceptance angle in an optical fiber – 6 sets
5. Lee's disc method- experimental set up to find thermal conductivity of a bad conductor – 6 sets
6. Experimental set-up to find specific resistance of a coil of wire-Carey Foster's Bridge – 6 sets
7. Experimental set-up to find the wavelength of mercury spectrum-spectrometer grating – 6 sets
8. Experimental set-up to find the band gap of a semiconductor – 12 sets
9. Experimental set-up to find the Hall coefficient by Hall Effect Experiment – 6 sets
10. Experimental set-up to study characteristics of solar cells – 6 sets

TEXTBOOKS:

1. J.D. Wilson& C.A. Hernandez Hall "Physics Laboratory Experiments" Houghton Mifflin Company, New York, 2010.
2. M.N. Srinivasan, S. Balasubramanian &R. Ranganathan, "Practical Physics", S. Chand & Sons educational publications, New Delhi, 2011.
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

CHEMISTRY LABORATORY

(Any five experiments to be conducted)

OBJECTIVES:

- To acquaint the students with practical knowledge of the basic concepts of chemistry, the student faces during the course of their study in the industry and engineering field
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis
- To understand and develop experimental skills for building technical competence

LISTOFEXPERIMENTS (Any five experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water samples.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Conductometric titration of strong acid vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
9. Estimation of sodium and potassium present in water using flame photometers.
10. Determination of molecular weights of polymers using Ostwald's Viscometer.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 6 (MAX.) STUDENTS PER EXPERIMENT.

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample - 6 sets
2. Determination of total, temporary & permanent hardness of water by EDTA method - 6 sets
3. Determination of DO content of water sample by Winkler's method - 6sets
4. Determination of chloride content of water sample by argentometric method – 6 sets
5. Determination of strength of given hydrochloric acid using pH meter - 6 sets
6. Conductometric titration of strong acid vs strong base - 6 sets
7. Estimation of iron content of the given solution using potentiometer - 6 sets
8. Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method) - 2 sets
9. Estimation of sodium and potassium present in water using flame photometer - 2 sets
10. Determination of molecular weights of polymer using Ostwald's Viscometer. - 6 sets

TOTAL: 30 PERIODS

TEXTBOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply the principles of thermal physics and properties of matter to evaluate the properties of materials and to determine the physical properties of liquid using ultrasonic interferometer. (K1)
2. Understand measurement technique and usage of new instruments in optics for real time application in engineering. (K2)
3. Apply the knowledge of semiconductor materials to evaluate the band gap and Hall coefficient of materials and to study the characteristics of solar cell for engineering solutions. (K3)
4. Apply the different techniques of quantitative chemical analysis to generate experimental skills in building technical competence.(K2)
5. Apply basic techniques used in chemistry laboratories for water

analyses/purification and estimates the ions/metal ions present in domestic/industry wastewater. (K2)

6. Utilize the fundamental laboratory techniques for analyses such as volumetric titrations, conductometric, potentiometric and spectroscopy. (K2)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	3	3	2	2	1	1	3
CO2	3	3	3	3	3	3	3	2	2	2	2	3
CO3	3	3	3	3	3	3	3	2	1	1	2	3
CO4	3	2	3	3	1	1	2	2	2	2	3	2
CO5	3	2	3	3	1	1	2	2	2	2	3	2
CO6	3	2	3	3	1	1	2	2	2	2	3	2

SEMESTER - I

20ESPL101 SDG NO. 4&9	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop programs in C using basic Programming Constructs
- To develop applications in C using Arrays and Strings
- To design and implement applications in C using Functions, Structures
- To develop applications in C using Files

LISTOFEXPERIMENTS

1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is nota leap year)
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is Armstrong number

or not?

6. Write a program to check whether a given number is odd or even?
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to display array elements using two dimensional arrays.
10. Write a program to perform swapping using function.
11. Write a program to display all prime numbers between two intervals using functions.
12. Write a program to reverse a sentence using recursion.
13. Write a program to get the largest element of an array using the function.
14. Write a program to concatenate two strings.
15. Write a program to find the length of String.
16. Write a program to find the frequency of a character in a string.
17. Write a program to store Student Information in Structure and Display it.
18. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
    (a) Total marks obtained by each student.
    (b) The highest marks in each subject and the marks of the student who secured it.
    (c) The student who obtained the highest total marks.
19. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
20. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FORA BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Solve some simple problems leading to specific applications. (K3)
2. Demonstrate C programming development environment, compiling, debugging, linking and executing a program. (K3)
3. Illustrate C programs for simple applications making use of basic constructs , arrays and strings. (K3)

4. Construct C programs involving functions and recursion. (K6)
5. Demonstrate C programs involving pointers, and structures. (K6)
6. Interpret applications using sequential and random access file. (K6)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	1	2	2	3	3	2	3
CO2	3	3	3	3	2	1	-	1	2	2	3	3	1	3
CO3	3	3	-	3	2	-	1	1	-	2	-	3	3	2
CO4	3	3	3	3	2	1	1	1	2	2	3	3	1	3
CO5	3	3	3	-	2	-	1	-	2	2	3	-	2	1
CO6	3	3	3	3	2	1	1	1	2	-	3	3	3	2

SEMESTER - I

20TPHS101 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To enrich social network ethics
- To develop and enhance browsing culture
- To understand the concepts of networking
- To promote self professionalism
- To acquire knowledge about various digital identification procedures

UNIT I SOCIAL NETWORK ETIQUETTES 6

Introduction to social network – Social Networking Etiquettes - Pros and Cons - Usage of Facebook, Instagram, WhatsApp , Telegram, Youtube, Evolution of Android and IOS, Introduction to Linkedin & Benefits. (Practicals – Official Mail id- Linkedin Id Creation, Linkedin Profile Bulilding , Facebook Id and Creation and Modifying the existing FB ID)

UNIT II BROWSING CULTURE 6

Introduction to browsing – Search Engines-Google - Bing -Yahoo!-AOL -MSN –DuckDuckGo ,browsers, phishing – Cookies - URL – https:// extensions , browsing history, Incognito mode- VPN – Pros and Cons – Book mark.

UNIT III NETWORKING **6**

Basics of networking - LAN, MAN, WAN, Introduction to network topologies, Protocols , IP Commands (Command line prompt), Define online complier and editor (Practical – Find Your System IP,Ping Command, Firewall Fortinet, Basic DOS Commands)

UNIT IV PROFESSIONALISM **6**

Dress Code, Body Language, Appropriate Attire ,Communication Skills, Interview preparation – Introducing yourself - How to greet Superiors, Importance of Eye Contact During conversation.

UNIT V DIGITAL IDENTIFICATION **6**

Introduction to NAD - Importance of Aadhar, PAN Card, Passport, Bank Account, Bar Code, QR scan, Payment Gateway (Gpay, Phone Pe, UPI, BHIM, Paytm), Mobile Banking (Practicals - NAD registration Step by Step, Linking bank account with net banking , Register for payment gateway).

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Social Network Etiquettes:

1. https://sproutsocial.com/glossary/social-media-etiquette/
2. https://www.shrm.org/resourcesandtools/tools-and-samples/hr-qa/pages/socialnetworkingsitespolicy.aspx
3. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02711/full
4. https://medium.com/@sirajea/11-reasons-why-you-should-use-telegram-instead-of-whatsapp-ab0f80fbfa79
5. https://buffer.com/library/how-to-use-instagram/
6. https://www.webwise.ie/parents/what-is-youtube/
7. https://www.androidauthority.com/history-android-os-name-789433/
8. https://www.mindtools.com/pages/article/linkedin.htm

Unit II: Browsing Culture:

1. https://sites.google.com/site/bethanycollegeofteacheredn/unit--ict-connecting- with- world/ national- policy- on- information- and-communication-technology-ict/accessing-the-web-introduction-to-the-browser-browsing-web
2. https://www.wordstream.com/articles/internet-search-engines-history
3. https://www.malwarebytes.com/phishing/
4. https://www.adpushup.com/blog/types-of-cookies/

5. https://www.eff.org/https-everywhere
6. https://www.sciencedirect.com/topics/computer-science/browsing-history\
7. https://www.vpnmentor.com/blog/pros-cons-vpn/
8. https:// www.tech-wonders.com/2016/10/use-hush-private-bookmarking-extension-chrome.html

Unit III:Networking

1. https://www.guru99.com/types-of-computer-network.html
2. https://www.studytonight.com/computer-networks/network-topology-types
3. https://www.cloudflare.com/learning/network-layer/what-is-a-protocol/
4. https://www.howtogeek.com/168896/10-useful-windows-commands-you-should-know/
5. https://paiza.io/en

Unit IV : Professionalism

1. https://career.vt.edu/develop/professionalism.html
2. https://englishlabs.in/importance-dress-code/
3. https://www.proschoolonline.com/blog/importance-of-body-language-in-day-to-day-life
4. https://www.thespruce.com/etiquette-of-proper-attire-1216800
5. https://shirleytaylor.com/why-are-communication-skills-important/
6. https://www.triad-eng.com/interview-tips-for-engineers/
7. https://www.indeed.co.in/career-advice/interviewing/interview-question-tell-me-about-yourself
8. https://toggl.com/track/business-etiquette-rules/

Unit V: Digital Identification

1. https://nad.ndml.in/nad-presentation.html
2. https://www.turtlemint.com/aadhaar-card-benefits/
3. https://www.bankbazaar.com/pan-card/uses-of-pan-card.html
4. https://www.passportindex.org/passport.php
5. https://consumer.westchestergov.com/financial-education/money-management/benefits-of-a-bank-account
6. https://en.wikipedia.org/wiki/QR_code
7. https://www.investopedia.com/terms/p/payment-gateway.asp
8. https://www.paisabazaar.com/banking/mobile-banking/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Learn and apply social network ethics. (K3)
2. Understand the browsing culture. (K2)
3. Analyze the networking concepts . (K4)
4. Develop self professionalism. (K3)
5. Gain hands-on experience in various digital identification procedures. (K2)
6. Analyse and apply the different digital payment gateway methods. (K4)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

SEMESTER - I

20HSMG101 SDG NO. 4&5	PERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I SELFCONCEPT **6**

Understanding self Concept – Identify Yourself – Who am I – an individual, engineer, citizen – Attitude – Measuring Behaviour – Change of Behaviour – Personality – Characteristics in personal, professional life.

UNIT II INDIVIDUAL VALUES **6**

Personal Values – Attributes –Courage – Creativity, Honesty, Perfection, Simplicity, Responsibility – Measuring personal values

UNIT III MORAL VALUES **6**

Moral – Understanding right and wrong – Positive thoughts – Respect to others – Doing good tosociety.

UNIT IV PHYSICAL AND MENTAL WELL-BEING **6**

Health – Physical fitness –Mental vigour – Diet management – Yoga – Meditation – Peaceful life – Happiness in life

UNIT V DECISION MAKING **6**

Goal Setting – Decision making skill – Overcome of Barriers – Success – Mental strength and weakness

TOTAL: 30 PERIODS

Note:

Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development" McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Becomeanindividual in knowing the self. (K4)
2. Acquireandexpress Personal Values, Spiritual values and fitness. (K4)
3. Practice simple physical exercise and breathing techniques. (K2)
4. Practice Yogaasana which will enhance the quality of life. (K1)
5. Practice Meditation and get benefitted. (K1)
6. Understanding moral values and need of physical fitness. (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Co1	-	-	-	-	-	2	2	3	3	1	1	1
CO2	-	-	-	-	-	2	2	3	3	1	1	1
CO3	-	-	-	-	-	2	2	3	3	1	1	1
CO4	-	-	-	-	-	2	2	3	3	1	1	1
CO5	-	-	-	-	-	2	2	3	3	1	1	1
CO6	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - II

20BSMA201 SDG NO. 4	ENGINEERING MATHEMATICS - II	L	T	P	C
		3	1	0	4

OBJECTIVES:

- The objective of this course is to familiarize the prospective engineers with techniques in Vector Calculus, Ordinary differential equations, Complex variables and Laplace transforms. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

UNIT I VECTOR CALCULUS 12

Gradient and Directional derivatives - Divergence and Curl- Vector identities - Irrotational and Solenoidal vector fields - Line integral over a plane curve - Surface integral - Volume integral – Gauss divergence, Green's and Stoke's theorems - Verification and application in evaluating line, Surface and volume integrals.

UNIT II ORDINARYDIFFERENTIAL EQUATIONS 12

Second and higher order linear differential equations with constant coefficients - Method of variation of parameters - Homogeneous equation of Euler's and Legendre's types - System of simultaneous linear differential equations with constant coefficients.

UNIT III COMPLEX DIFFERENTIATION 12

Analytic functions- Necessary and sufficient conditions for analyticity in cartesian and polar coordinates (without proof) - Properties - Harmonic conjugate - construction of analytic functions- Conformal mapping - Mapping by functions $w= z+a, w=az, w=1/z, w=z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Contour integrals, Cauchy- Goursat theorem (without proof) - Cauchy Integral formula (without proof) - Taylor's series - Zeroes of Analytic functions - Singularities - Laurent's Series - Residues – Cauchy Residue theorem (without proof) – Application of Residue theorem for evaluation of real integrals – use of circularcontour andsemicircular contour(without poles on real axis).

UNIT V LAPLACE TRANSFORM 12

Existence conditions – Transforms of elementary functions – Transform of Unit step function and Unit impulse function – Basic properties – Shifting

theorems – Transforms of derivatives and integrals – Initial and Final value theorems – Convolution theorem – Transform of Periodic functions – Application of solution of linear second order ordinary differential equations with constant coefficients.

TEXT BOOKS:

1. Ramana.B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2008.
2. Erwin Kresizg, "Advance Engineering Mathematics", 9th Edition, John Wiley &Sons, 2006.

REFERENCES:

1. Dass, H.K., and Er. Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2010.
3. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.
4. E.A.Coddinton, "An Introduction to Ordinary Differential Equations", Prentice Hall India, 1995.
5. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th Edition, 2014.
6. N.P.Bali and Manish Goyal, "A text Book of Engineering Mathematics", Laxmi Publications, Reprint 2008.

WEB COURSES:

1. https://nptel.ac.in/courses/122107036/
2. https://nptel.ac.in/courses/111105134/
3. https://ocw.mit.edu/courses/mathematics/18-04-complex-variables-with-applications-spring-2018/
4. https://ocw.mit.edu/courses/mathematics/18-02-multivariable-calculus-fall-2007/
5. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/

ONLINERESOURCES:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/lecture-1-introduction/
2. http://www.nptelvideos.com/course.php?id=90

COURSE OUTCOMES:

Upon completion of the course, the student should be able to

1. Compute the derivatives of scalar point, vector point functions and evaluate line, surface and volume integrals of vector point functions using Stokes, Greens, and Gauss divergence theorems. (K3)
2. Solve Ordinary differential equations of second and higher order with constant coefficients, variable coefficients and simultaneous linear differential equations. (K3)
3. Construct an analytic function and find the harmonic conjugate, apply the properties of analytic functions to check for harmonic and orthogonal functions and find the images of regions, straight lines and points in the Z-plane under the mappings $w = z + a, w = az, w = \frac{1}{z}, w = z^2$ and bilinear transformation. (K3)
4. Find the Taylor's series about a point and Laurent's series in an annular region of analytic functions and Evaluate integrals of analytic functions and real integrals over circular and semicircular contour using Cauchy Goursat theorem, Cauchy integral formula and Cauchy Residue theorem. (K3)
5. Find the Laplace transforms of simple and periodic functions by applying the definitionand theorems on Laplace transforms. (K3)
6. Determine the Inverse Laplace transform using the theorems, the method of partial fractions, Convolution and solve linear second order ordinary differential equations with constant coefficients using Laplace transforms. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	1
CO3	3	3	2	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO6	3	3	2	1	-	-	-	-	-	-	-	1

SEMESTER - II

20HSEN201 SDG NO. 4	TECHNICAL ENGLISH - II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To strengthen the listening skills for comprehending and critically analyzing passages
- To enhance students' ability with multiple strategies and skills for making technical presentations
- To participate in group discussions for developing group attitude
- To develop skills for preparing effective job application
- To write effective technical reports

UNIT I LANGUAGE DEVELOPMENT 9

Listening – Listening conversations involving two participants – multiple participants – **Speaking** – conversation methods in real life occurrences using expressions of different emotions and imperative usages – **Reading** passages and short stories - **Writing** – preparation of checklist – extended definition – **Language Development** – tenses - subject - verb agreement

UNIT II VOCABULARY BUILDING 9

Listening – listening formal and informal conversation and participative exercises – **Speaking** - creating greetings/wishes/excuses and thanks – **Reading** – articles/novels-**Writing** summary of articles and concise writing identifying new words – homonyms, homophones, homographs – one-word substitutions – easily confused words - creating SMS and using emoticons - sharing information in social media. **Language Development** - reported speeches – regular andirregular verbs - idioms & phrases

UNIT III WRITING TECHNICAL REPORTS 9

Listening – listening conversation – effective use of words and their sound aspects, stress, intonation & pronunciation – **Speaking** - practicing telephonic conversations – observing and responding. **Reading** – regular columns of newspapers/magazines - **Writing** – reports – feasibility, accident, survey and progress - preparation of agenda and minutes – **Language Development** - using connectives – discourse markers

UNIT IV TECHNICAL WRITING 9

Listening – Model debates & documentaries - **Speaking** – expressing agreement/disagreement, assertiveness in expressing opinions – **Reading**

biographies/autobiographies – **Writing** – note-making – formal letters – inviting guests – acceptance/declining letters - **Language Development** – degrees of comparison- numerical adjectives – embedded sentences

UNIT V GROUP DISCUSSION AND JOB APPLICATION 9

Listening – Listening - classroom lectures – recommending suggestions & solutions – **Speaking** – participating in group discussion – learning GD strategies – **Reading** – journal articles - Writing – Job application – cover letter - résumé preparation – **Language Development** – purpose statement – editing – verbal analogies.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.
2. Ashraf Rizvi. M, Effective Technical Communication. 2nd ed. McGraw Hill, New Delhi, 2018.

REFERENCES

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York,2011.
2. Raman, Meenakshi and Sharma, Sangeetha. Technical Communication Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan& Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamilnadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Suresh Kumar, E. Engineering English. Orient Blackswan, Hyderabad, 2015
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

WEB REFERENCES :

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://freevideolectures.com/course/3250/introduction-to-film-studies/10

ONLINE RESOURCES

1. https://www.ef.com/wwen/english-resources/
2. https://www.smilesforlearning.org/gclid=EAIaIQobChMI49DF9 bnd6AIVSY6PCh1d_gV9EAAYASAAEgIBPvD_BwE.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Acquire the ability to speak effectively in real life situations (K1)
2. Adapt group behaviour and execute the role as a contributing team member (K1)
3. Employ active and passive vocabulary in oral and written communication (K2)
4. Share opinions and suggestions effectively in conversations, debates and discussions (K2)
5. Prepare winning job applications (K3)
6. Write technical reports convincingly (K3)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	2
CO2	-	2	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	1	-	-	2	-	-	3	-	-
CO4	-	-	-	-	-	2	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	3	-	2

SEMESTER - II

20ESIT201 SDG NO. 4	PYTHON PROGRAMMING WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To Develop Python Programs with Conditionals and Loops
- To Use Python Data Structures – Lists, Tuples, Dictionaries, Sets
- To Define Python Functions and Work with Modules and Packages
- To Work with Python Classes, Objects and Handling Exceptions

UNIT I BASICS OF PYTHONPROGRAMMING 9

Python Interpreter and Interactive Mode - Features – History of Python – Literals – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved Words – Indentation – Operators and Expressions – Operator Precedence– Operations on Strings – Other Data types – Type Conversion - Illustrative Programs: Use of various Operators, Evaluation of expressions, String Operations.

UNIT II DECISIONCONTROL STATEMENTS 9

Conditionals: Boolean Values and Operators, Conditional (if) - Alternative (if-else) - Chained Conditional (if-elif-else) - Iteration: state - while - for - break - continue - pass - Illustrative Programs: Exchange the Values of Two Variables - Circulate the values of N Variables - Distance Between Two Points - Square Root- GCD- Exponentiation - Sum and Array of Numbers.

UNIT III STRING, LISTS, TUPLES, DICTIONARIES, SETS 9

Strings: String Slices - Immutability - String functions and methods - String Module - Lists: List Operations - List Slices - List methods - List Loop - Mutability - Aliasing - Cloning lists - List Parameters - Tuples: Tuple Assignment - Tuple as return value - Dictionaries: Operations and Methods - Advanced List Processing - List Comprehension - Sets: Creating Sets – Operations and Methods – Set Comprehension - Illustrative programs: Linear Search - Binary Search - Selection Sort - Insertion Sort - Merge Sort - Histogram.

UNIT IV FUNCTIONS, MODULES ANDPACKAGES 9

Functions - Function Definition and Use - Flow of Execution - Parameters and Arguments - Fruitful Functions: Return values - Parameters - Local and Global Scope - Function Composition - Recursion - Modules – from-import Statement

– Name of Module – Making your own modules - Packages - Standard Library Modules – globals(), locals() and reload() - Illustrative programs: Fibonacci Series using functions - Arithmetic Operations using Module - Area of different shapes using Packages.

UNIT V CLASSES, OBJECTS AND EXCEPTION HANDLING 9

Classes and Objects – Defining Classes – Creating Objects – Data Abstraction and Hiding through Classes - init() method – Class Variables and Object Variables – Introduction to Errors and Exception Handling – Handling Exceptions – Multiple Except Blocks – else Clause – Raising Exceptions – Built-in and User-defined Exceptions – Finally Block.

LISTOFEXPERIMENTS 15

1. Write a Python program to perform
   a. Linear Search
   b. Binary Search
2. Write a Python program to perform Selection Sort.
3. Write a Python program to sort the given numbers using Insertion Sort.
4. Write a Python program to do sorting using Merge sort.
5. Write a Python program to find first n prime numbers.
6. Write a Python program to Multiply two matrices.
7. Write a Python program to create Student class and instantiate its Object.
8. Write a Python License verification process using Exception handling.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. ReemaThareja. "Python Programming Using Problem Solving Approach", Oxford University Press 2018.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, O'Reilly Publishers, 2016.

REFERENCES:

1. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python" Revisedand updated for Python 3.2, Network Theory Ltd., 2011.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revisedandexpanded Edition, MIT Press, 2013.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-Disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.

4. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
6. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
7. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

WEB REFERENCES:

1. http://greenteapress.com/wp/think-python/
2. www.docs.python.org
3. https://nptel.ac.in/courses/106/106/106106182/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the syntax, semantics and control flow statements of Python programming. (K2)
2. Implement simple programs using control structures in Python. (K3)
3. Explain the methods to create and manipulate strings, lists, dictionaries, tuples and sets. (K2)
4. Articulate the concepts of functions, modules and packages in Python. (K2)
5. Implement simple programs using Python Data types and functions. (K3)
6. Apply the concepts of Exception handling, classes and objects. (K3)

CO - PO, MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	2	1	2	-	-	-	1	-	3	3
CO2	1	2	3	3	3	2	1	1	1	1	1	3
CO3	-	1	3	3	2	1	-	-	-	-	1	3
CO4	1	2	3	3	2	-	-	-	-	-	1	3
CO5	2	3	3	3	3	1	1	2	2	1	2	3
CO6	2	3	3	3	3	1	1	2	2	1	2	3

SEMESTER - II

20BSPH201 SDG NO. 4	PHYSICS OF ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To acquaint the electrical properties of materials.
- To present the principles of semiconductor physics and its applications.
- To educate the properties of magnetic and dielectric materials and their uses.
- To introduce the bipolar junction transistors.
- To explicit the field effect transistors, power and display devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity expression - Wiedemann-Franz law - Success and failures - electrons in metals - Particle in a three dimensional box - degenerate states - Fermi- Dirac statistics - Density of energy states - Electron in periodic potential- Energy bands in solids - Tight binding approximation - Electron effective mass- concept of hole.

UNIT II SEMICONDUCTOR DIODES 9

Semiconductors - Intrinsic, Extrinsic semiconductor, Carrier concentration, PN junction diode- Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes, Special purpose diodes - Schottky barrier diode, Zener diode, Varactor diode ,Tunnel diode, LASER diode and LDR.

UNIT III MAGNETIC ANDDIELECTRIC PROPERTIES OFMATERIALS 9

Magnetism in materials - magnetic field and induction - magnetization - magnetic permeability and susceptibility - types of magnetic materials - microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction - saturation magnetization and Curie temperature - Domain Theory - Hysteresis phenomenon - Ferrites. Dielectric materials: Polarization processes - dielectric loss - internal field - Clausius-Mosotti relation - dielectric breakdown.

UNIT IV BIPOLAR JUNCTION TRANSISTOR 9

NPN -PNP -Operations-Early effect-Current equations – Input and Output characteristics of CE, CB, CC - Hybrid -π model - h-parameter model, Ebers Moll Model- Gummel Poon- model, Multi Emitter Transistor.

UNIT V FIELD EFFECT TRANSISTORS, POWER AND DISPLAY DEVICES 9

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage - Channel length modulation, D- MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.Power Devices-UJT, SCR, Diac, Triac, Display Devices-LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Donald A Neaman, "Semi-conductor Physics and Devices", Fourth Edition, TataMcGrawHill Inc.2012.
2. Salivahanan.S, Suresh Kumar. N, Vallavaraj.A, "Electronic Devices and circuits", Third Edition, Tata McGraw- Hill,2008.

REFERENCES:

1. Robert Boylestadand Louis Nashelsky, "Electron Devices and Circuit Theory", Pearson Prentice Hall, 10th edition, July2008.
2. R.S.Sedha, "A Text Book of Applied Electronics" S.Chand Publications, 2006.
3. Yang, "Fundamentals of Semiconductor Devices", McGraw Hill International Edition, 1978.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the electrical properties of materials. (K1)
2. Analyze the principles of semiconductor physics and its applications. (K2)
3. Explore the properties of magnetic and dielectric materials and their uses. (K2)
4. Understand the theory, construction and operation of the bipolar junction transistors. (K3)
5. Analyse the concept of field effect transistors, power and display devices (K2)
6. Learn the concepts of Physics towards engineering applications.(K1)

CO - PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	2	1	1	-	3	-	-	1	2	-
CO2	3	2	3	2	3	1	1	-	1	1	-	1	3	-
CO3	3	2	3	3	3	1	1	-	1	-	-	1	3	-
CO4	1	1	3	1	-	-	1	-	2	-	-	-	2	-
CO5	2	2	1	2	3	-	1	-	2	-	-	1	2	-
CO6	3	3	2	1	2	2	1	-	2	-	-	1	2	-

SEMESTER - II

20BSCY201 SDG NO. 4,17	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the nature and facts aboutenvironment
- To find and implement scientific, technological, economic and political solutions to environmental problems
- To study the interrelationship between livingorganism and environment
- To provide the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.
-

UNITI ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 10

Definition, scope and importance of environment – need for public awareness – Ecosystem: concept of an ecosystem – structure and functions of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – food chains, food webs and ecological pyramids – ecological succession. Introduction to biodiversity definition: genetic, species and ecosystem diversity – values of biodiversity. Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – man-wildlife conflicts – endangered and endemic species of India. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION **9**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies. Disaster management: floods, earthquake, cyclone and landslides – nuclear accidents and holocaust – case studies. Field study of local polluted site – Urban / Rural / Industrial /Agricultural.

UNIT III NATURAL RESOURCES **9**

Forest resources: Use and over – exploitation, deforestation, case studies – Water resources: Use and over- utilization of surface and ground water – dams-benefits and problems, conflicts over water – Mineral resources: Environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources: Growing energy needs, use of alternate energy sources - renewable and non renewable energy sources – Land resources: land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources. Field study of local area to document environmental assets – river / forest/ grassland / hill / mountain.

UNIT IV SOCIALISSUES AND THE ENVIRONMENT **9**

From unsustainable to sustainable development – Sustainable Development Goals – Water conservation: rain water harvesting, watershed management – Climate change: global warming, chemical and photochemical reactions in the atmosphere – acid rain, ozone layer depletion – environmental ethics: Issues and possible solutions – 12 Principles of green chemistry – Environmental Legislation & Laws: Environment (Protection) Act – 1986 Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments - scheme of labelling of environmentally friendly products (Ecomark) – Issues involved in enforcement of environmental legislation - central and state pollution control boards, role of non-governmental organization – Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT **8**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value

education – HIV / AIDS – women and child welfare – Environmental Impact Assessment(EIA) - role of information technology in environment and human health – Casestudies.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt Ltd., Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt. Ltd., Delhi, 2014.
4. Rajagopalan. R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

OUTCOMES:

Upon successful completion of this course, student should be able to

1. Understand the relationship between the environment and human activities to maintain the ecological balance. (K1)
2. Identify societal issues and implement suitable technological solutions to eradicate. (K3)
3. Acquire skills for scientific problem solving related to environmental pollution and Disaster Management. (K3)
4. Disseminate the need for the natural resources and its application to meet the modern requirements. (K2)
5. Aware of environmental issues and Protection Acts to achieve the Sustainable Development Goals. (K2)
6. Recognize the need for population control measures and the environmental based value.education concepts for attaining an eco-friendly environment. (K2)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	1	2	-	1	1	-	2
CO2	2	2	2	-	2	2	3	1	2	2	-	2
CO3	1	1	1	1	-	1	1	-	1	2	-	1
CO4	2	2	2	2	1	1	1	-	1	1	1	1
CO5	2	2	1	-	-	1	1	-	-	-	1	-
CO6	1	1	1	1	1	1	1	1	1	1	1	1

SEMESTER - II

20ESGE201 SDG NO. 4,9,12	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Electrical and Electronics Engineering, Civil and Mechanical Engineering

ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.

4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

CIVIL ENGINEERING PRACTICE

Buildings: Study of plumbing and carpentry components of residential and industrial buildings, safety aspects.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows inhousehold fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing linesketches for water supply and sewage works.
4. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection– Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentryusing Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE

Welding:

1. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
2. Gas welding practice.

Basic Machining:

1. Simple Turningand Taper turning.
2. Drilling Practice.

Sheet Metal Work:

1. Forming & Bending.
2. Model making – Trays andfunnels.
3. Different type of joints.

Machine assembly practice:

1. Study of centrifugal pump.
2. Study of air conditioner.

Demonstration on:

1. Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
2. Foundryoperations like mould preparation for gear andstep cone pulley.
3. Fitting– Exercises – Preparation of square fitting and V – fitting models.

Total : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. Electrical

1	Assorted electrical components for house wiring	15 Sets
2	Electrical measuring instruments	10 Sets
3	Study purpose items: Iron box, fan and regulator, emergency lamp	1 Each
4	Megger (250V/500V)	1 No
5	Power Tools: Range Finder Digital Live-wire detector	 2 Nos 2 Nos

2. Electronics

1	Soldering guns	10 Nos
2	Assorted electronic components for making circuits	50 Nos
3	Small PCBs	10 Nos
4	Multimeters	10 Nos

3. Civil

1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2	Carpentry vice (fitted to work bench)	15 Nos
3	Standard woodworking tools	15 Sets
4	Models of industrial trusses, door joints, furniture joints	5 each
5	Power Tools: Rotary Hammer Demolition Hammer Circular Saw Planer Hand Drilling Machine Jigsaw	 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos

4. Mechanical

1	Arc welding transformer with cables and holders	5 Nos

2	Welding booth with exhaust facility	5 Nos
3	Welding accessories like welding shield, chipping hammer, wire brush, etc	5 Sets
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5	Centre lathe	2 Nos
6	Hearth furnace, anvil and smithy tools	2 Sets
7	Moulding table, foundry tools	2 Sets
8	Power Tool: Angle Grinder	2 Nos
9	Study-purpose items: centrifugal pump, air-conditioner	1 each

OUTCOMES:

Upon completion of the course, the students should be able to

1. Elaborate on the components, gates, soldering practices. Calculate electrical parameters such as voltage, current, resistance and power. (K1)
2. Design and implement Rectifier and Timer circuits (K2)
3. Measure the electrical energy by single phase and three phase energy meters. (K2)
4. Prepare the carpentry and plumbing joints. (K2)
5. Perform different types of welding joints and sheet metal works (K2)
6. Perform different machining operations in lathe and drilling. (K2)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	-	-	1	1	1	1
CO2	3	2	1	1	2	1	-	-	1	1	1	1
CO3	2	2	1	1	1	1	-	-	1	1	1	1
CO4	1	1	1	-	-	2	-	-	1	1	1	2
CO5	2	1	1	-	-	1	1	1	1	1	1	2
CO6	2	1	1	-	-	1	-	1	1	1	1	2

SEMESTER - II

20ECPL201 SDG NO. 4	CIRCUITS AND DEVICES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Analyse the characteristics of basic electronic devices
- Design RL and RC circuits
- Verify KVL & KCL, Thevinin, Norton and Super Position Theorems
- Verify Reciprocity and Maximum Power Transfer Theorem
- Analyse the characteristics of Waveshaping circuits and Rectifier

LISTOFEXPERIMENTS :

1. Characteristics of PN Junction Diode.
2. Zener diode Characteristics & Regulator using Zener diode .
3. Common Emitter input-output Characteristics.
4. Common Baseinput-output Characteristics.
5. FET Characteristics.
6. SCR Characteristics.
7. Clipper and Clamper & FWR.
8. Verifications of Thevinin& Norton theorem.
9. Verifications of KVL & KCL.
10. Verifications of Super Position Theorem.
11. Verifications of maximum power transfer & reciprocity theorem.
12. Determination of Resonance Frequency of Series & Parallel RLC Circuits.

TOTAL: 45 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

S.No.	EQUIPMENTS	
1.	BC 107, BC 148, 2N2646, BFW10	- 25 each
2.	1N4007, Zener diodes	- 25 each
3.	Resistors, Capacitors, Inductors	- sufficient quantities
4.	Bread Boards	- 15 Nos
5.	CRO (30MHz)	- 10 Nos
6.	Function Generators (3MHz)	- 10 Nos

OUTCOMES :

Oncompletion ofthis laboratory course, the student should be able to

1. Analyze the characteristics of basic electronic devices . (K4)
2. Design RL and RC circuits. (K5)
3. Verify Thevinin& Norton theorem KVL & KCL, and Super Position Theorems. (K6)
4. Test the performance of clipper and clamper & FWR.(K6)
5. Analyze the characteristics of basic electronic devices such as Diode, BJT, FETand SCR. (K4)
6. Examine the input-output characteristics of CE and CB amplifiers. (K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1	-	-	-	-	-	2	3	3	2
CO2	3	3	1	3	1	-	-	-	-	-	2	3	3	2
CO3	3	3	1	3	1	-	-	-	-	-	2	3	3	2
CO4	3	3	1	3	1	-	-	-	-	-	2	3	3	2
CO5	3	3	1	3	1	-	-	-	-	-	2	3	3	2
CO6	3	3	1	3	1	-	-	-	-	-	2	3	3	2

SEMESTER - II

20ECTE201 SDG NO. 9	PCB DESIGN	L	T	P	C
		0	0	2	1

OBJECTIVES:

- Analyzeand interpret test results andmeasurements on electric circuits
- To predict the performance of electric circuits from device characteristics
- Design an electronic printed circuit board for a specific application using industry standard software

LISTOFEXPERIMENTS :

1. Introduction to PCB and OrCAD software.
2. Designing of schematic.
3. Designing of capture from OrCAD and getting positive for PCB manufacturing.

4. Soldering shop: Fabrication of DC regulated power supply.
5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.
6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
7. Testing of regulated power supply fabricated.

TOTAL: 30 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

S.No.	EQUIPMENTS	
1.	Coppercladded base board	-15 Nos.
2.	Hand Drilling machine	-15 Nos.
3.	Soldering guns	-15 Nos.
4.	Assorted electronic components for making circuits	-50 Nos.
5.	OrCAD software	(15 users)
6.	Copper solvent	-as required
7.	PCs - 15 Nos	-15 Nos.

OUTCOMES:

On completion of this course, the student should be able to

1. Perform the chemical processes by using negative/positive masks(K3)
2. Design the PCB mask using ORCAD software(K6)
3. Perform the routing optimization processes by using ORCAD or its equivalent software.(K3)
4. Apply the mechanical processes by using drilling and etching machines on raw PCB(K3)
5. Perform the soldering process(K3)
6. Design and test the PCB for regulated power supply(K6)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS02
CO1	2	1	3	3	2	1	-	-	-	-	2	1	2	2
CO2	2	1	2	3	1	1	-	-	-	-	2	3	2	2
CO3	2	3	2	2	1	1	-	-	-	-	2	2	3	2
CO4	3	2	2	3	3	2	-	-	-	-	2	1	3	2
CO5	3	2	2	3	1	1	-	-	-	-	3	2	2	3

SEMESTER - II

20TPHS201 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the nuances in resume building
- To explore various virtual meeting tools
- To gain knowledge about online certification courses
- To develop knowledge in Google Suite products
- To enhance presentation skills

UNIT I RESUME BUILDING 6

Your Strength, Projects, Internship, Paper Presentation, uploading your coding in github, Introduction to HackerRank, HackerEarth virtual online assessment (Auto Proctored) (Practicals - Construct a resume, Register for a online Mock Assessment / Contest)

UNIT II VIRTUAL MEETINGS 6

Basic Etiquette of virtual meeting – Introduction to Skype - Zoom - Webex - Google Meet – Goto webinar - Jio meet – Screen Share - Jamboard - Feedback polling - Chatbox

(Practicals - Accept and Register for a mock class to attend - How to host a meeting).

UNIT III ONLINE LEARNING 6

Online Certification - Coursera – Udemy – Edx – Cisco – Online Practice Platforms - SkillRack – Myslate - FACEprep - BYTS - aptimithra - Contest Registrations - TCS Campus Commune - HackwithInfy, InfyTQ - Virtusa NurualHack - Mindtree Osmosis – Online assessment - AMCAT-PGPA.

(Practicals - Campus Commune Registration , Coursera registration - Mock Registration (KAAR Technologies assample).

UNIT IV GOOGLE SUITE 8

Define google suite - Benefits of google suite - Google Search - Sheet - Docs - Forms - Calender - Drive - Slide - Translate - Duo - Earch - Maps - Hangouts- Sites - Books - Blogger

(Practicals – Create google sheets and share - Create google Forms and share, Create Google Slide and share , Google drive creation and share (Knowledge of Rights), Create poll and share.

UNIT V PRESENTATION SKILLS **4**

Email Writing– Group Discussion- Power Point Presentation

(Practicals- Create a self SWOT Analysis report. A PowerPoint Slide Preparation)

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Resume Building:

1. https://zety.com/blog/resume-tips
2. https://resumegenius.com/blog/resume-help/how-to-write-a-resume
3. https://www.hackerearth.com/recruit/
4. https://www.hackerrank.com/about-us

Unit – II:Virtual Meetings

1. https://www.claphamschool.org/our-community/blog/online-learning-etiquette-guide-14-principles-to-guide-students
2. https://online.hbs.edu/blog/post/virtual-interview-tips?c1=GAW_SE_NW&source=IN_GEN_DSA&cr2=search_____nw__-__ in_-__dsa__-_general&kw=dsa__-_general& cr5=459341920955&cr7=c&gclid=Cj0KCQjw8fr7BRDSARIsAK0Qqr4dRRbboL3kltrwDsr7hm8oIHtN5dfjD3NIFZULuzNwEXxhjpNFQ2caApn5EALw_wcB
3. https://hygger.io/blog/top-10-best-group-meeting-apps-business/
4. https://www.zdnet.com/article/best-video-conferencing-software-and-services-for-business/

Unit – III: Online Learning

1. https://www.coursera.org/browse
2. https://support.udemy.com/hc/en-us/articles/229603868-Certificate-of-Completion
3. https://www.edx.org/course/how-to-learn-online
4. https:// www.cisco.com/c/en/us/training-events/training-certifications/certifications.html
5. https://campuscommune.tcs.com/en-in/intro
6. https://www.freshersnow.com/tcs-campus-commune-registration/
7. https://www.infosys.com/careers/hackwithinfy.html
8. https://www.mindtree.com/blog/osmosis-2013-my-experiences
9. https://www.myamcat.com/knowing-amcat
10. https://www.admitkard.com/blog/2020/02/06/amcat/

Unit IV: Google Suite

1. https://www.inmotionhosting.com/blog/what-is-g-suite-and-why-should-i-consider-using-it/
2. https://en.wikipedia.org/wiki/G_Suite
3. https://blog.hubspot.com/marketing/google-suite
4. https://kinsta.com/blog/g-suite/

Unit V: Presentation Skills

1. https://www.mindtools.com/CommSkll/EmailCommunication.htm
2. https://www.grammarly.com/blog/email-writing-tips/
3. https://business.tutsplus.com/articles/how-to-write-a-formal-email--cms-29793
4. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
5. https://www.mbauniverse.com/group-discussion/tips
6. https://slidemodel.com/23-powerpoint-presentation-tips-creating-engaging-interactive-presentations/
7. https://business.tutsplus.com/articles/37 -effective-powerpoint-presentation-tips--cms-25421

8 https://blog.prezi.com/9-tips-on-how-to-make-a-presentation-a-success/

9. http://www.garrreynolds.com/preso-tips/design/

OUTCOMES:

On completion of this course, the student should be able to

1. Construct a suitable resume and registration procedure for online mock assessments. (K1)
2. Handle various virtual meeting tools. (K3)
3. Acquire exposure about online certification courses. (K4)
4. Get involved and work in a collaborative manner. (K2)
5. Gain knowledge in various presentation methodologies. (K1)
6. Apply knowledge to practice Google suite features and SWOT analysis. (K3)

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

SEMESTER - II

20HSMG201 SDG NO. 4 & 5	INTERPERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I INTERPERSONAL VALUES **6**

Interpersonal Relationships and Values – Importance and Barriers – Building and maintain relationships – Mutual understanding – Respect to others.

UNIT II EFFECTIVE COMMUNICATION **6**

Communication skills –Importance and Barriers - Impressive formation and management – Public speaking

UNIT III GROUP DYNAMICS **6**

Group formation –Teamwork – Identify others attitude and behaviour – Formation of relationship– Personal and professional.

UNIT IV MUTUAL RELATIONSHIP **6**

Building mutual understanding and cooperation – Enhancing decision making skills – Problemsolvingskills – Comparative Appraisal – Interpersonal needs.

UNIT V POSITIVE ATTITUDE **6**

Fostering trust and cooperation – Developing and maintain positive attitude – Improving socialization – Development of security and comfort.

TOTAL: 30 PERIODS

Note: Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development", McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Developa healthy relationship & harmony with others. (K1)
2. Practice respecting every human being. (K3)
3. Practice to eradicate negative temperaments. (K3)
4. Acquire Respect, Honesty, Empathy, Forgiveness and Equality. (K4)
5. Manage the cognitive abilities of an Individual. (K5)
6. Understanding the importance of public speaking and teamwork. (K2)

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	3	3	1	1	1
CO2	-	-	-	-	-	2	2	3	3	1	1	1
CO3	-	-	-	-	-	2	2	3	3	1	1	1
CO4	-	-	-	-	-	2	2	3	3	1	1	1
CO5	-	-	-	-	-	2	2	3	3	1	1	1
CO6	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - III

20ITPC301 SDG NO. 4	DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of ADT's
- To learn Linear Data Structures – Lists, Stacks, and Queues
- To understand Sorting, Searching and Hashing Algorithms
- To learn Dynamic Data Structures – Tree and Graph

UNIT I LINEAR DATA STRUCTURES – I 9

Stacks and Queues : Abstract Data Types (ADTs) – Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to Postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue –Dequeue – Applications of Queues.

UNIT II LINEAR DATA STRUCTURES – II 9

Linked List: List ADT – Array-Based Implementation – Linked List Implementation –– Singly Linked Lists- Circularly Linked Lists- Doubly-Linked Lists – Applications of Lists –Polynomial Manipulation – All Operations (Insertion, Deletion, Merge, Traversal).

UNIT III NON LINEAR DATA STRUCTURES – I 9

Trees : Tree ADT – Tree Traversals - Binary Tree ADT – Expression Trees – Applications of Trees – Binary Search Tree ADT –Threaded Binary Trees- AVL Trees – B-Tree- B+Tree -Heap– Applications of Heap.

UNIT IV NON LINEAR DATA STRUCTURES – II 9

Graphs : Definition– Representation of Graph – Types of Graph – Breadth First Traversal –Depth First Traversal – Topological Sort – Bi-Connectivity – Cut Vertex – Euler Circuits – Dijkstra‟s algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms – Applications of Graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search - Sorting - Bubble Sort - Selection Sort - Insertion Sort - Shell Sort – Radix Sort – Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2002.
2. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2011.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
3. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.

WEB REFERENCES :

1. https://www.programiz.com/dsa
2. http://masterraghu.com/subjects/Datastructures/ebooks/remathareja.pdf

OUTCOMES:

Upon completion of the course, the student should be able to

1. Implement abstract data types for linear data structures.(K3)
2. Implement abstract data types for non-linear data structure.(K3)
3. Apply the different linear and non-linear data structures to problem solutions.(K3)
4. Implement the various sorting and searching algorithms. (K3)
5. Solve Problem involving Graph, Trees and Heap. (K3)
6. Choose appropriate data structures to solve real world problems efficiently.(K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	1	1	1	0	2	2	3	3	1	1
CO2	2	2	1	2	1	1	1	0	2	2	3	3	1	1
CO3	3	3	2	3	3	1	1	1	2	2	3	3	1	1
CO4	2	2	1	2	3	2	1	0	1	1	2	1	1	2
CO5	2	2	1	2	3	0	0	1	2	1	2	2	1	2
CO6	3	3	3	3	1	0	0	0	1	1	2	1	2	2

SEMESTER - III

20CCPC301 SDG NO. 4 & 9	DIGITAL LOGICS AND SYSTEM DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study various number systems and simplify the logical expressions using Boolean functions.
- To study combinational circuits.
- To designvarious synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLDs
- To introduce digital simulation for development of application oriented logiccircuits.

UNITI NUMBER SYSTEMS AND DIGITALLOGIC FAMILIES 9

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) – Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logicfamily.

UNIT II COMBINATIONAL CIRCUITS 9

Combinational logic – representation of logic functions-SOP and POS forms, K-map representations – minimization using K maps – simplification and implementation of combinational logic – multiplexers and de multiplexers – codeconverters, adders, subtractors, Encoders and Decoders

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Sequential logic- SR, JK, D and T flip flops – level triggering and edge triggering – counters asynchronous and synchronous type – Modulo counters – Shift registers – design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES 9

Asynchronous sequential logic circuits-Transition table, flow table-race conditions, hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V INTRODUCTION TO VERILOG HDL 9

Structure of Verilog module, Operators, data types, Styles of description- Data flow description, Behavioral description, Implement logic gates,

Combinational circuits using Verilog data flow description.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Morris Mano and Michael D. Ciletti, "Digital Design", 5th edition, Prentice Hall of India,2012(Unit I – IV)
2. Samir Palnitkar, "Verilog HDL", 2nd Edition, Pearson Education, 2003 (Unit V)

REFERENCES:

1. Mandal, Digital Electronics Principles and Application, McGraw Hill Edu, 2013.
2. Thomas L.Floyd, Digital Fundamentals, 11th edition, Pearson Education, 2015.
3. D.P.Kothari, J.S.Dhillon, Digital circuits and Design,Pearson Education, 2016.
4. JBhasker, "Verilog Hdl Primer", 3rd Edition, Bs Publications, 2015.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_ee51/preview
2. https://nptel.ac.in/courses/117106086/
3. https://www.researchgate.net/publication/224645209_Online_Development_of_Digital_Logic_Design_Course

ONLINERESOURCES:

1. https://www.udemy.com/course/digital-electronics-logic-design/
2. https://www.intel.com/content/www/us/en/programmable/support/training/course/ohdl1120.html

OUTCOMES :

Upon completion of the course, the student should be able to:

1. Understand the basics of Number Systems, Error Correction and Detection codes and Digital Logic Families (K2)
2. Apply the Reduction Techniques like Boolean laws and theorems, K-map for the design Of Combinational Circuits (K3)
3. Execute and simulate the VERILOG code for digital circuits (K3)
4. Understand the analysis and design of Synchronous Sequential digital circuits (K2)
5. Understand the analysis and design of Asynchronous Sequential digital circuits (K2)
6. Explain the working of Memory Devices PROM – PLA –PAL- CPLD-FPGA (K2)

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	2	-	-	-	-	1	1	3	2	2
CO2	3	3	3	1	2	-	-	-	-	2	2	3	2	2
CO3	3	3	-	1	3	-	1	1	1	2	3	3	3	2
CO4	3	3	3	1	2	-	-	-	-	2	2	3	2	2
CO5	3	3	2	1	2	-	-	-	-	2	2	2	2	2
CO6	3	2	-	-	1	-	1	1	-	1	2	3	2	2

SEMESTER - III

20ECPC303 SDG NO. 3,4,11	SIGNALS AND SYSTEMS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand the fundamentals and properties of signal & systems
- To know the methods of characterization of LTI systems in time domain and frequency domain
- To analyze continuous time signals and system using Fourier and Laplace transforms
- To analyze discrete time signals and system using Fourier and Z transforms
- To analyze analog and discrete time systems, connected in series and parallel

UNIT I CLASSIFICATIONOFSIGNALS ANDSYSTEMS 9

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids_ Representation of Continuous and discrete time signals, Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems-CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT II ANALYSISOFCONTINUOUS TIME SIGNALS 9

Fourier series representation of continuous time periodic signals - properties

of continuous time Fourier series, Fourier Transform of continuous time aperiodic signals and periodic signals, properties of continuous time Fourier transform - Laplace Transforms and properties.

UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Impulse response - convolution integrals- Properties of continuous time LTI system - Differential Equation- Causal continuous time LTI system described by differential equations -Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.

UNIT IV ANALYSISOF DISCRETE TIME SIGNALS 9

Baseband signal Sampling – properties of discrete time LTI system, Causal discrete time LTI system described by difference equations. Fourier series representation of discrete time periodic signals, properties of discrete time Fourier series, Fourier Transform of discrete time signals (DTFT) – Properties of DTFT- Z Transform & Properties.

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Impulse response – Difference equations-Convolution sum-Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2015. (Unit 1- V).

REFERENCES:

1. B. P. Lathi, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
3. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.

WEB REFERENCES:

1. https://www.tutorialspoint.com/signals_and_systems/index.htm

ONLINERESOURCES:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-

2011/lecture-notes/

2. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/assignments/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Predict the different types of signals and systems to represent in time domain. (K3)
2. Interpret the Continuous time signals in frequency domain using Fourier series and its properties. (K2)
3. Examine the Continuous time signals using Fourier Transform and Laplace Transform to analyze their properties. (K3)
4. Determine the response of the Continuous LTI system in the time domain and frequency domain and realize their interconnections. (K3)
5. Interpret the Continuous time signals in terms of discrete time signals and examine the Discrete time signals using Fourier and Z transform to analyze their properties. (K2)
6. Determine the response of the Discrete LTI system in the time domain and frequency domain and realize their interconnections. (K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	1	-	-	-	-	-	-	-	1	2
CO2	3	3	1	-	-	-	-	-	-	-	-	-	1	2
CO3	3	3	1	1	-	-	-	-	-	-	-	-	1	2
CO4	3	3	1	2	1	-	-	-	-	-	-	-	1	2
CO5	3	3	1	-	1	-	-	-	-	-	-	-	1	2
CO6	3	3	1	2	-	-	-	-	-	-	-	-	1	2

SEMESTER - III

20ITPC303 SDG NO. 4 & 9	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the basic structure andoperations of a Computer
- To study the implementation of Fixed-Point and Floating Point Arithmetic unit
- To understand Parallelism and Multi-core processors using Pipelined execution
- To understand the Cache memories, Virtual memories and Communication of I/O devices

UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM 7

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations –Decision Making– MIPS Addressing.

UNIT II ARITHMETIC OPERATIONS IN PROCESSORS 11

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism.

UNIT IIIPROCESSOR AND CONTROL UNIT 11

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined Datapath and Control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT IV PARALLELISM 7

Parallel Processing Challenges – Flynn's classification – SISD, MIMD, SIMD, SPM and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT V MEMORY AND I/O SYSTEMS 9

Memory Hierarchy – memory technologies – Cache Memory – Measuring and Improving Cache Performance – Virtual Memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus Operation – Arbitration – Interface circuits – USB.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/106/106106147/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the physical and logical aspects of Computer System (K2)
2. Analyze the various parameters of the processor to improve system performance. (K4)
3. Evaluate the fixed and floating-point arithmetic operations. (K5)
4. Design data path and control unit of computer system (K6)
5. Understand parallel processing architectures with pipelining and avoidance of hazards (K2)
6. Define the various components of computer system hardware (K1)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	3
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO5	3	1	1	-	-	-	-	-	-	-	-	3	3	3
CO6	3	1	1	-	-	-	-	-	-	-	-	3	2	3

SEMESTER - III

20BSMA301 SDG NO. 4	LINEAR ALGEBRA, PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- The aim of this course is to impart knowledge in the concepts of linear algebra as a prerequisite for the recent thrust areas of technological advancement
- To know the importance of partial differential equations in modeling variousengineering problems
- To introduce the techniques of Fourier and Z- Transforms to analyze continuous and discrete signals

UNIT I VECTOR SPACES 15

Vector spaces – Subspaces – Linear combinations– Linear independence and linear dependence – Bases anddimensions.

UNIT II LINEAR TRANSFORMATION AND INNER PRODUCT SPACES 15

Linear transformation - Null and range spaces - Dimension theorem (Statement only) - Matrix of a linear transformation - Inner product - norm - Gram Schmidt orthogonalization process.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Integral surface passing through a given curve - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT IV FOURIER TRANSFORMS 9

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z- TRANSFORMS ANDDIFFERENCEEQUATIONS 9

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. Friedberg A.H., Insel A.J. and Spence L., "Linear Algebra", Prentice Hall of India, New Delhi, 2004. Unit I (Sec. 1.2, 1.3, 1.4 (linear combinations only), 1.5 & 1.6), Unit II (Sec. 2.1, 2.2, 6.1 & 6.2) (In Units I & II to include theorem statements only).
2. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., 3rd Edition, New Delhi. Unit III (Sec. 1.2, 1.5, 1.7, 1.11, 1.13, 1.14), Unit IV (Sec. 4.1, 4.2, 4.3, 4.6), Unit V(Sec. 5.1, 5.2, 5.3, 5.4, 5.5).

REFERENCES:

1. Strang G., "Linear Algebra and its applications", Thomson (Brooks/Cole), New Delhi, 2005.
2. Lay D. C., "Linear Algebra and its Applications", 5th Edition, Pearson Education, 2015.
3. Kumaresan S., "Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
4. James G., "Advanced Modern Engineering Mathematics", Pearson Education, 2007.

WEB RESOURCES

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
2. https://nptel.ac.in/courses/111/106/111106135/
3. https://nptel.ac.in/courses/111/103/111103021/

ONLINERESOURCES:

1. https://www.khanacademy.org/math/linear-algebra
2. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/
3. https://freevideolectures.com/course/3244/advanced-engineering-mathematics

OUTCOMES:

Upon completion of the course, the students should be able to

1. Determine the basis and dimension of a finite dimensional vector space. (K3)
2. Compute the Matrix, Range space and Null space of a linear transformation. (K3)
3. Construct orthonormal bases for inner product spaces using Gram Schmidt process. (K3)

4. Formulate and Solve Linear and non-linear Partial differential equations. (K3)
5. Find the Fourier transform, Inverse Fourier Transform, Fourier sine and cosine transforms ofsimple functions. (K3)
6. Apply Z-transforms to solve differenceequations. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	2	1	-	-	-	-	-	-	1
CO3	3	3	2	2	1	-	-	-	-	-	-	1
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	2	2	1	-	-	-	-	-	-	1
CO6	3	3	2	2	1	-	-	-	-	-	-	1

SEMESTER - III

20ITPL301 SDG NO. 4	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To implement Linear and Non-linear Data Structures
- To understand the different operations of Search Trees
- To implement Graph Traversal algorithms
- To get familiarized to Sorting and Searching algorithm

LISTOFEXPERIMENTS :

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Treesand operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Graph representation and Traversal algorithms

10. Applications of Graphs- Implementation of searching and sorting algorithms
11. Implementation of any two Collision Techniques in Hashing

TOTAL: 45 PERIODS

LAB REQUIREMENTS :

Turbo C/Dev C++, Borland C

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Write functions to implement linear and non-linear data structure operations. [K1]
2. Suggest appropriate linear / non-linear data structure operations for solving a given problem. [K2]
3. Design and analyze the time and space efficiency of data structure [K2]
4. Apply sorting and searching techniques. [K3]
5. Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval. [K3]
6. Choose and implement efficient data structures and apply them to solve problems. [K3]

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	2	1	1	-	-	-	-	2	2
CO2	2	3	2	2	2	1	-	-	-	-	2	3
CO3	3	3	2	2	1	1	-	-	-	-	2	2
CO4	3	3	2	2	1	1	-	-	-	-	2	3
CO5	1	2	2	1	2	1	-	-	-	-	1	1
CO6	1	2	2	1	1	-	-	-	-	-	1	1

SEMESTER - III

20CCPL301 SDG NO. 4 & 9	DIGITAL CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To understand the various basic logic gates
- To design and implement the various combinational circuits

- To design and implement combinational circuits using MSI devices.
- To design and implement sequential circuits
- To understand andcode with HDL programming

LISTOFEXPERIMENTS :

1. Verify
   (a) Demorgan's Theorem for 2 variables.
   (b) The sum-of product and product-of-sum expressions using universal gates.
2. Design and implement
   (a) Full Adder using basic logic gates.
   (b) Full subtractor using basic logic gates.
3. Designandimplement 4-bit Parallel Adder/ subtractor using IC 7483
4. Designand Implementation of 4-bit Magnitude Comparator using IC 7485.
5. Demonstrate Multiplexer and Demultiplexer
6. Implement Encoder and Decoder
7. Implement shift register using sequential circuit
8. Realize the Mod-N Counter using Ic7490.
9. Simulate Combinational circuits using Verilog HDL.
10. Simulate sequential circuits using Verilog HDL.

TOTAL: 45 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

S.No.	EQUIPMENTS
1.	Digital trainer kits – 30
2.	Digital ICs required for the experiments in sufficient numbers
3.	HDL simulator

OUTCOMES

On completion of this laboratory course, the student should be able to:

1. Implement simplified combinational circuits using basic logic gates. (K3)
2. Illustrate the basics of Adder and Sub tractor (K3)
3. Evaluate combinational circuits using MSI devices (K5)
4. Examine sequential circuits like registers and counters. (K4)
5. Develop Verilog HDL codes for combinational circuits. (K6)
6. Develop Verilog HDL codes for sequential circuits. (K6)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	-	-	-	1	2	-	-	-	3	3
CO2	3	3	2	3	-	-	-	1	2	-	-	-	3	3
CO3	3	3	2	2	-	-	-	1	2	-	-	-	3	3
CO4	3	3	2	3	-	-	-	1	2	-	-	-	3	3
CO5	3	3	2	3	-	-	-	1	2	-	-	-	3	3
CO6	3	3	2	3	-	-	-	1	2	-	-	-	3	3

SEMESTER - III

20CCTE301 SDG NO. 4,11 &15	LIVE-IN-LAB - I	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To enable hands-on experience in the latest Software domain
- To be familiarized with the requirements of an enterprise and address its major design areas
- To bring out the creativity in each student – build innovative applications that are usable, effective and efficient for intended users

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
2. This course engages students with little or no programming experience to create Java programs. Participants are introduced to object oriented programming concepts, terminology, and syntax, and the steps required to create basic Java programs using the Alice, Green foot, and Eclipse interactive development environments. Hand-on practices figure prominently throughout this course so students can experience first-hand, the power of computer programming.
3. To engage students in Information Technology beyond their robust academic curriculum that sparks curiosity and imagination while teaching critical knowledge and skills.

4. This practice will engage beyond curriculum using industry-relevant technologies that help students get ready for the next step in their educations or careers. It helps the learners expand knowledge, develop skills, and their innovativeness.
5. The initiative is designed to provide students with foundational knowledge and skills in areas of IT that are universally in high demand across computing jobs.
6. Our Java- and database-focused curriculum is designed to be delivered as part of an academic program of study, has educational learning objectives,is mapped and aligned to relevant standards and exams globally, and is available in multiple languages to improve learning experiences.

EVALUATION:

1. Firstevaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 30marks.
3. Final evaluation (Last week of the semester) : 50marks

Note: *All the three evaluations are mandatory for course completion and for awarding the final grade.*

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

1. List the problems and conduct literature survey to identify the gap and come up with an application oriented research problem in the specific domain.(K1)
2. Understand the project characteristics and explore necessary tools and components needed at various stages of the project(K2)
3. Design and validate the proposed system using simulation.(K3)
4. Develop the Prototype of the proposed system by adapting Industrial safety standards and best financial management practices(K5)
5. Analyze the obtained results and prepare a technical report.(K4)
6. Evaluate the project and go for journals and patents publication.(K5)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - III

20CCTP301 SDG NO. 4,11 &15	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

COURSE OBJECTIVE:

- To educate and enrich the students on quantitative ability, reasoning ability, and verbal ability.

UNIT I QUANTITATIVE ABILITY – I **6**

Problems on Trains, Time and Distance, Height and Distance, Time and Work

UNIT II QUANTITATIVE ABILITY – II **6**

Problems on Ages, Alligation or Mixture, Chain Rule, Simple Interest, Simple Equation, Theory Of Equation

UNIT III REASONING ABILITY– I **6**

Analytical Reasoning, Pipes and Cistern, Logical Problems, Logical Games, Logical Deduction, Data Sufficiency, Arithmetic Reasoning

UNIT IV VERBAL ABILITY – I **6**

Idioms & Phrases, Synonyms, Antonyms, Classification

UNIT V CREATIVITY ABILITY – I **6**

Venn Diagrams, Cube and Cuboids, Dice, Cubes and Dice, Figure Matrix

TOTAL : 30 PERIODS

REFERENCES:

1) Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2) Quantum CAT by Sarvesh Verma
3) AModern Approach to Logical Reasoning by R. S. Agarwal
4) Verbal Ability and Reading Comprehension by Arun sharma

PROBLEM SOLVING USING C PROGRAMMING, WEB DESIGNING BASICS, VERILOG DESIGN – PHASE 2

COURSE OBJECTIVE:

- To provide exposure to problem-solving through programming.
- To train the student to the basic concepts of the C-programming language.
- To provide exposure to problem-solving through programming.
- To train the student to the basic concepts of the C-programming and MATLAB programming language.
- To give the student hands-on experience with the concepts

UNIT I INTRODUCTION TO PRINCIPLES OF PROGRAMMING **6**

Introduction to Programming , Programing Domain : Artificial Intelligence, Systems Programming, Assembly Level Languages, Problem solving using Algorithms and Flowcharts.

UNIT II INTRODUCTION TO C PROGRAMMING **6**

Features of C and its Basic Structure, Simple C programs, Constants, Integer Constants, Real Constants, Character Constants, String Constants Floating-point Numbers, The type cast Operator, Interactive Programming.

Operators Expressions and Control statement, The goto statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The break statement and continue statement.

UNIT III ARRAYS, STRINGS AND POINTERS **6**

Arrays, Multidimensional Arrays, Strings, Basics of Pointers, Pointer Arithmetic, Similarities between Pointers and One-dimensional Arrays Structures, Unions And Functions, Basics of Structures, Arrays of Structures, Pointers to Structures, Function Basics, Function Prototypes, and Passing Parameters, Structures and Functions Recursion.

UNIT IV INTRODUCTION TOHTML **6**

What is HTML? And its uses - HTML Documents -Basic structure of an HTML document - Creating an HTML document- Mark up Tags- Heading-Paragraphs - Line Breaks - HTML Tags- Elements of HTML-Working with Text - Working with HYPER LINK AND IMAGES.

UNIT V BASICS OF VERILOG **6**

Structure - Operators - data types - Styles of description - Data flow description - Behavioral description - Implement logic gates using Verilog data flow description.

TOTAL : 30 PERIODS

REFERENCES:

1. Programming in ANSI C - Balagurusamy - Tata McGraw-Hill Education, 2008.
2. Programming in C (3rd Edition), by Stephen G. Kochan, Sams, 2004 .
3. Programming in C- Stephen G. Kochan, III Edition, Pearson Education.
4. HTML Black Book by steven Holzner, DREAMTECH PRESS
5. Learn HTML for Beginners,author:JO FOSTER.
6. VIDEOREFERNCES in general about basic HTML available in youtubes.
7. Samir Palnitkar,"Verilog HDL", 2nd Edition, Pearson Education, 2003.
8. JBhasker, “Verilog Hdl Primer”, 3rd Edition, Bs Publications, 2015.

ONLINERESOURCES

1. https://nptel.ac.in/courses/108/102/108102045/

COURSE OUTCOMES :

Upon completion of this course, the students will be able to:

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K6)
4. Evaluate the situations to analyse the computational methods in order to identify and abstract the programming task involved. (K5)
5. Analyse tasks in which the numerical techniques are applicable in order to apply them to write, edit, compile, debug, correct, recompile and run programs. (K4)
6. Design of Simple Webpage using HTML and Stimulate the VERILOG code for digital circuits (K6).

CO- PO& PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO2	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO3	-	-	-	-	3	2	-	-	1	3	-	2	-	-
CO4	-	-	-	-	3	2	-	3	3	3	-	2	2	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2	2	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2	2	2

SEMESTER - III

20MGMC301 SDG NO. 4	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

OBJECTIVES:

At the end of the course, the student is expected to

- To know about Indian constitution
- To know about central government functionalities in India
- To know about state government functionalities in India
- To know about Constitution function
- To Know about Constitutional remedies

UNIT I INTRODUCTION **6**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT **6**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT **6**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS 6

Indian Federal System – Centre – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries.

UNIT V CONSTITUTIONAL REMEDIES 6

Enforcement of fundamental rights - Power of parliament to modify the rights the conferred by this part in their application to forces.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
3. M.V. Pyle (2019) , "An Introduction to The Constitution of India, 5/e", Vikas Publishing, New Delhi.

4 P.M. Bakshi, (2018) , "Constitution of India", Universal Law Publishing, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalandhar.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand about Constitution & Fundamental rights of citizens. (K2)
2. Interpret the structure and hierarchy of Central and State Government. (K2)
3. Analyze the functions of Judiciary, Parliament and its constituent members. (K4)
4. Evaluate the functions and boundaries of Central and State Governments in respect of their powers, duties and Centre-State relationship. (K5)
5. Remember the Indian social structure in respect of caste, religion, language, rights to citizens particularly rights to women, children and weaker sections. (K1)
6. Analyze remedies and rights available to India Citizens. (K4)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	-	-	-	-	-	-
CO2	-	-		-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	1	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	-	-	-	-	-
CO5	-	-	-	-	-	2	-	3	-	-	-	-
CO6	-	-	-	-	-	2	-	2	-	-	-	-

SEMESTER - IV

20CCPC401 SDG NO. 4	ANALOG & DIGITAL COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To acquaint knowledge with the fundamental concepts of AM and FM Modulation techniques.
- To understand the basics of Pulse Modulation and Baseband Formatting techniques.
- To compare the Error Performance of Bandpass Signaling Schemes and Data Communication concepts.
- To impart essential knowledge on Information Theory and Coding Techniques.
- To learn the significance of Multiple Access Techniques and Cellular Concepts.

UNIT I ANALOGCOMMUNICATION SYSTEMS 9

Analog Modulation, Need for Modulation, Principles of Amplitude Modulation – DSBFC, DSBSC, SSB and VSB, AM Transmitters, AM Receivers – TRF, Super heterodyne Receiver.

Angle Modulation, Mathematical Analysis, Deviation Sensitivity, FM and PM Waveform, Phase Deviation and Modulation Index, Frequency Deviation and Modulation Index, Phase and Frequency Modulators and Demodulators, FM Transmitters, Pre-emphasis and Deemphasis.

UNIT II PULSE MODULATIONSYSTEMS 9

Overview of Sampling and Quantization Techniques, Types of Sampling-Impulse Sampling, Natural Sampling, Flat Top Sampling, Generation and Detection of PAM, PWM & PPM.

Principles of PCM, Signal to Quantization Noise of PCM, Companding, DPCM Transmitter and Receiver, ADPCM, DM, Drawbacks of DM, ADM, Vocoders, Line Coding Techniques.

UNIT III DIGITAL MODULATION AND DATA COMMUNICATION SYSTEMS9

Amplitude Shift Keying, Binary Frequency Shift Keying, Binary Phase Shift Keying, Quadrature Phase Shift Keying, Quadrature Amplitude Modulation, Differential Phase Shift Keying, Signal Space Representations, Probability of Error and Bit Error Rate, Error Performance.

Introduction to Data Communication and Networking, Fundamental Concepts of Data Communication.

UNIT IV INFORMATION THEORY AND CODING TECHNIQUES 9

Information Rate, Discrete Memoryless Source, Entropy, Source Coding Theorem, Discrete Memoryless Channel, Mutual Information, Channel Capacity, Channel Coding Theorem, Information Capacity Theorem.

Error Control Coding – Linear Block Codes, Cyclic Codes, Convolutional Codes and Viterbi Decoding.

UNIT V MA TECHNIQUES AND MULTIUSER RADIOCOMMUNICATION 9

Multiple Access Techniques - TDMA, FDMA, CDMA, OFDM, Cellular Telephony Concepts and Frequency Reuse, Global System for Mobile Communication, GPRS, AMPS, 2G, 3G, 4G, VoLTE Architecture, Bluetooth.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Wayne Tomasi, "Electronic Communication Systems", Pearson Education, Fifth Edition, 2008. (Unit I, III, V)
2. Simon Haykin, "Communication Systems", John Wiley & Sons INC, 4th Edition, 2001 (Unit II, IV)

REFERENCES:

1. H.Taub, D L Schilling and G.Saha, "Principles of Communication", Pearson Education, 3rd Edition, 2007.
2. B.P.Lathi, "Modern Analog and Digital Communication systems", Oxford Press, 3rd Edition, 2007.
3. Rappaport TS, "Wireless Communication Principles and Practice", Pearson Education, 2nd Edition, 2007.
4. Dennis Roddy and John Coolen, "Electronic Communications", Pearson Education, 4thEdition, 2008.
5. George Kennedy, Bernard Davis, "Electronic communication systems", Tata McGraw Hill, 4th Edition, 2008.
6. Martin.S.Roden, "Analog and Digital Communication systems", Prentice Hall of India, 3rd Edition, 2002.

WEB REFERENCES:

1. https://nptel.ac.in/courses/117/105/117105143/
2. https://nptel.ac.in/courses/117/101/117101051/
3. http://web.stanford.edu/class/ee179/lectures/notes12.pdf

ONLINE RESOURCES:

1. https://freevideolectures.com/course/4902/nptel-error-control-coding
2. https://futureskillsnasscom.edcast.com/insights/ECL-2313b997-6188-4081-9439-b8850dc15884

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the basic concepts of the analog communication systems. (K1)
2. Compute modulation index, bandwidth and power requirements for various analog modulation schemes. (K3)
3. Analyze various data and pulse transmission schemes. (K3)
4. Compare different types of shift keying techniques (K2)
5. Evaluate the knowledge of Information theory and describe the error control codes like block code, cyclic code. (K4)
6. Analyze the digital communication system about multi user communication concepts, radio communication and wireless technology. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	-	-	-	-	-	2	2	3	2
CO2	3	3	2	-	3	-	-	-	-	-	2	2	3	2
CO3	3	3	2	-	3	-	-	-	-	-	2	2	3	2
CO4	3	3	2	-	3	-	-	-	-	-	2	2	3	2
CO5	3	3	2	-	-	-	-	-	2	3	2	2	3	2
CO6	3	3	2	-	3	-	-	-	-	-	2	2	3	2

SEMESTER - IV

20CSPC402 SDG NO. 4 & 9	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To design a database using ER diagrams, convert them to Relational Databases and to write SQL Queries
- To understand the fundamental concepts of Transaction Processing, Concurrency Control techniques and Recovery procedures
- To understand the Internal Storage structures and about the Query Processing Techniques
- To have an introductory knowledge about the Object Databases, XML Databases and NoSQL Databases

UNIT I DATABASE DESIGN **7**

Purpose of Database System – Views of Data –Database System Architecture-Data Models– Entity Relationship Model – ER Diagrams – Enhanced ER Model.

UNIT II RELATIONAL DATABASES **11**

Introduction to Relational Databases – Relational Model-ER-to-Relational Mapping– Keys –Relational Algebra – SQL Fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL-Functional Dependencies – Non-loss Decomposition – First – Second - Third Normal Forms - Dependency Preservation – Boyce/CoddNormal Form – Multi Valued Dependencies and Fourth Normal Form– Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTIONS **9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV IMPLEMENTATION TECHNIQUES **9**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ Tree Index Files – B Tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics - Cost Estimation.

UNIT V ADVANCED TOPICS **9**

Distributed Databases – Architecture - Data Storage - Transaction Processing – Object Based Databases - Object Database Concepts – Object Relational Features - ODMG Object Model – ODL - OQL – XML Databases - XML Hierarchical Model – DTD - XML Schema –Xquery.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2020.
2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill Education, 2015.
3. G.K.Gupta,"Database Management Systems", Tata McGraw Hill, 2011.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs46/
2. http://www.nptelvideos.in/2012/11/database-management-system.html
3. https://www.classcentral.com/course/swayam-database-management-system-9914
4. http://learnsql.com
5. https://www.w3schools.com/sql/default.asp
6. https://www.khanacademy.org/computing/computer-programming/sql

OUTCOMES:

Upon completion of the course, the student should be able to

1. Discuss the concepts of database to apply the Relational, ER model for design and SQL for implementation of the database. (K2)
2. Recognize and identify the use of normalization and functional dependencies to refine the database system. (K1)
3. Demonstrate various SQL queries for the Transaction Processing & Lockingusing concept of Concurrency control (K2)
4. Build the query processing techniques for the optimization of SQL queries.(K3)

5. Implement the indexing and hashing techniques for the organisation of database records. (K3)
6. Illustrate how the advanced databases differ from the traditional databases. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	2	1	0	0	0	0	0	0	2	2
CO2	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO3	2	1	2	1	2	1	0	0	0	0	0	0	2	2
CO4	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO5	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO6	2	2	2	1	2	1	0	0	0	0	0	0	2	2

SEMESTER - IV

20CCPW401 SDG NO. 4	OPERATING SYSTEMS WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT I OPERATING SYSTEM OVERVIEW **7**

Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multi core Organization. Operating system overview-objectives and functions, Evolution of Operating System - Computer System

Organization Operating System Structure and Operations- System Calls, System Programs, OS Generationand System Boot.

UNIT II PROCESS MANAGEMENT 11

Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple- processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III STORAGE MANAGEMENT 9

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV FILE SYSTEMS AND I/O SYSTEMS 9

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

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UNIT V LAB COMPONENT – LIST OF EXPERIMENTS 24

1. Linux Commands
2. Shell Programming
3. Process Management using System Calls: Fork, Exit, Getpid, Exit, Wait, Close, Stat
4. Interprocess Communication using Pipes, Shared Memory and Message Queues
5. CPU Scheduling Algorithms
6. Banker‘s Algorithm
7. Memory Management Schemes.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Silberschatz A, Galvin P and Gagne G "Operating Systems Concepts", John Wiley & Sons, USA, 2009.
2. Andrew S Tanenbaum and Herbert Bos, "Modern Operating Systems", Prentice Hall of India, New Delhi, 2015.

REFERENCES:

1. Andrew S Tanenbaum, "Modern Operating Systems Design and Implementation", Prentice Hall of India, New Delhi, 2009.
2. William Stallings, —"Operating Systems: Internals and Design Principles" Pearson, 2013.
3. Gary Nutt, "Operating Systems", Addison Wesley, USA, 2009.
4. Harvey M Deitel, "Operating System", Prentice Hall of India, New Delhi, 2008.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_cs04/preview
2. https://www.udacity.com/course/introduction-to-operating-systems--ud923

ONLINERESOURCES:

1. https://freevideolectures.com/course/5031/nptel-operating-systems
2. https://www.tutorialspoint.com/operating_system/os_overview.htm

OUTCOMES :

Upon completion of the course, the student should be able to

1. Illustrate the role of Operating System and to understand the design of control unit. (K2)
2. Compare and Contrast CPU Scheduling algorithms and demonstrate the Inter Process Communication. (K3)
3. Interpret Threading Concepts, Process Synchronization and Deadlock Handling methods (K2)
4. Articulate the role of paging, segmentation and virtual memory in operating systems. (K3)
5. Summarize I/O systems, Device Management Policies and Disk Scheduling Algorithms. (K2)
6. Demonstrate the various operations of file system and Implementation Schemes(K2)

CO-PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	2	-	-	-	-	1	2	3	2
CO2	3	2	3	2	1	2	-	-	-	-	1	2	3	2
CO3	3	2	3	2	1	2	-	-	-	-	1	2	3	2
CO4	3	2	3	2	1	2	-	-	-	-	1	2	3	2
CO5	3	2	3	2	1	2	-	-	2	3	1	2	3	2
CO6	3	2	3	2	1	2	-	-	-	-	1	2	3	2

SEMESTER - IV

20ECPC302 SDG NO. 3,4,7,15	ELECTROMAGNETIC FIELDS AND WAVEGUIDES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To gain conceptual and basic mathematical understanding of electric and magnetic fields in free space and in materials
- To understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To understand wave propagation in lossless and in lossy media
- To be able to solve problems based on the above concepts
- To understand signal propagation at radio frequencies and analyse the rectangular and circular waveguides

UNIT I INTRODUCTION 9

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem.

UNIT II ELECTROSTATICS 9

Electric charge, Coulomb's law, Electric field due to Line, Surface, Volume charge densities, Electric flux, Electric flux density, Gauss's law and applications, Electric potential, Potential gradient-Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Capacitance, Parallel, cylindrical

and spherical capacitors, Electrostatic energy and energy density, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Point form of Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law.

UNIT III MAGNETOSTATICS 9

Lorentz force equation, Law of no magnetic monopoles, Ampere's law, Biot-Savart law and applications, Magnetic field intensity, Magnetic flux density, Gauss's law, Magnetic vector potential, Lorentz force equation, Boundary conditions and idea of relative permeability, Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy and Magnetic energy density, Magnetic forces and torques Applications – CRT – magnetic deflection, Magnetic brake, Linear motor, Time Varying Field: Induction, Faraday's law, Lenz's law.

UNIT IV TIME-VARYINGFIELDS AND MAXWELL's EQUATIONS 9

Faraday's law, Lenz's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flowand Poynting vector.

UNIT V WAVEGUIDES 9

Introduction to Rectangular and Circular Waveguides, Solutions of field Equations in Rectangular Co-ordinates, TEmn & TMmn Modes in Rectangular Waveguides, solutions of a field equations in cylindrical coordinates, TEmn & TMmn Modes in Circular Waveguides, Impossibility of TEM waves in Rectangular wave guides, Waveguide Parameters — Cut-off wavelength, Guide wavelength, Free space Wavelength, Phase velocity, Group velocity, Dominant and Degenerated Modes, Power Transmission and Power losses in Rectangular and Circular Waveguides

TOTAL : 45 PERIODS

TEXT BOOKS

1. D.K. Cheng, "Field and Wave Electromagnetics", 2nd Edition, Pearson (India), 1989. (UNIT I - IV).
2. John. D. Ryder, "Network Lines and Fields", 2nd Edition, PHI Learning,2005. (Unit V).

REFERENCES:

1. D.J. Griffiths, "Introduction to Electrodynamics", 4th Edition, Pearson (India), 2013.

2. M.N.O. Sadiku and S.V. Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford (Asian Edition), 2015.
3. E. C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 2006.

WEB RESOURCES :

1. https://ocw.mit.edu/resources/res-6-002-electromagnetic-field-theory-a-problem-solving-approach-spring-2008/textbook-contents/

ONLINERESOURCES :

1. https://freevideolectures.com/course/2340/electromagnetic-fields
2. https://ocw.mit.edu/resources/res-6-001-electromagnetic-fields-and-energy-spring-2008/index.htm

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply fundamentals of Vector analysis in 3D coordinate systems. (K1)
2. Review the basic concepts and laws in Electromagnetics to Compute the field quantities. (K2)
3. Examine the behavior of materials in Electric and Magnetic fields.(K3)
4. Derive Maxwell's equations and wave equations for static and time varying fields. (K3)
5. Discuss propagation of Electromagnetic waves in lossy and lossless mediums. (K3)
6. Analyze the characteristics of TE and TM waves in rectangular and cylindrical waveguides. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	1	1	-	1	1	1	1
CO2	3	2	2	-	-	-	-	1	1	-	1	1	1	1
CO3	3	2	2	-	-	-	-	1	1	-	1	1	1	1
CO4	3	2	2	-	-	-	-	1	1	-	1	1	1	1
CO5	3	2	2	-	-	-	-	1	1	-	1	1	1	1
CO6	3	2	2	-	-	-	-	1	1	-	1	1	1	1

SEMESTER - IV

20BSMA401 SDG NO. 4	PROBABILITY THEORY AND STOCHASTIC PROCESSES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To provide the mathematical background of random variables, standard distributions and random processes for application to signal processing and Communication theory

UNIT I RANDOMVARIABLESAND STANDARD DISTRIBUTIONS 12

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal Distributions - Functions of Random variables.

UNIT II TWO - DIMENSIONAL RANDOMVARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III INTRODUCTION TO STOCHASTIC PROCESS 12

Classification – Auto correlation functions – Cross correlation functions - Stationary process –Ergodic process-Power Spectral Density.

UNIT IV MODELS OF RANDOMPROCESSES 12

The Bernoulli process - The Gaussian process - Poisson process - Markov process - Markov chain.

UNIT V LINEARSYSTEMS WITH RANDOM INPUTS 12

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and Cross correlation functions of input and output.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. Ibe O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007. Unit-I Chapter-2, Chapter-3 (Sections 3.1-3.5), Chapter-4 (Sections 4.1-4.8,4.10 & 4.11), Chapter 6 (Section 6.2) Unit-II Chapter 5 (Sections 5.1-5.7), Chapter 6 (6.8 & 6.10) Unit-III Chapter-8 (8.1-8.7),10.5 Unit-IV Chapter 10 (Section 10.2,10.4, 10.5(10.5.1-10.5.6),10.6, 10.7) Unit-V Chapter 9 (Sections 9.1-9.3)

REFERENCES:

1. Peebles P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.
2. Veerarajan T., "Probability and Statistics, Random Processes and Queueing theory", Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi.
3. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes" PHI, 4th Edition, 2002.
4. Davenport, Probability and Random Processes for Scientist and Engineers, McGraw-Hill.
5. H. Stark &J.W. Woods: Probability, Random Processes and Estimations Theoryfor Engineers, (2/e), Prentice Hall.
6. E. Wong: Introduction to Random Processes, Springer Verlag.
7. W. A. Gardner: Introduction to Random Processes,(2/e), McGraw Hill.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_ma30/preview
2. https://nptel.ac.in/courses/111102111/
3. https://nptel.ac.in/courses/111/104/111104032/
4. http://www.ifp.illinois.edu/~hajek/Papers/probabilityJan13.pdf
5. https://www.ee.iitb.ac.in/~bsraj/courses/ee325/

ONLINERESOURCES:

1. https://freevideolectures.com/course/2324/probability-and-random-processes.
2. http://www.nptelvideos.com/course.php?id=572.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Compute the probability and statistical averages of one dimensional, two-dimensional discrete, continuous random variables and their standard distributions. (K3)
2. Calculate the Autocorrelation, Cross correlation, power spectral density and cross power spectral density of a random processes and linear system. (K3)
3. Calculate the limiting state probabilities of Markov chains and use Central limit theorem to find the approximate probabilities of the sum of large numbers of independent and identically distributed random variables and use transformation of random variables to find the joint and marginal probability density functions. (K3)

4. Explain Stationary, Ergodic, Markov, Poisson, Bernoulli and Gaussian processes. (K2)
5. Explain the properties of statistical averages of a random variable, random processes, Poisson process and linear system. (K2)
6. Determine the spectral properties of output when the input function is given to a linear system. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-		-	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	1
CO3	3	3	2	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO6	3	3	2	1	-	-	-	-	-	-	-	1

SEMESTER - IV

20CCPL401 SDG NO. 4 & 9	COMMUNICATION SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To implement AM and FM Modulation and Demodulation
- To visualize the effect of Sampling and TD
- Observe and plot the different Baseband Formatting Techniques like PCM,DM
- Generate Digital Modulation signals for ASK, FSK, PSK and perform their detection
- Simulate and plot the different Digitally Modulated Signal and Error Coding Schemes.

LIST OF EXPERIMENTS :

1. Signal Sampling and Reconstruction
2. AM Modulation and Demodulation
3. FM Modulation and Demodulation
4. Time Division Multiplexing
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation

7. Generation and Detection of ASK, FSK & PSK
8. Line Coding Techniques
9. Simulation of AM and FM using MATLAB
10. Simulation of ASK, FSK, PSK using MATLAB
11. Simulation of QPSK and QAM using MATLAB
12. Error Detection and Correction techniques.

TOTAL: 45 PERIODS

LAB REQUIREMENTS

1. Communication Trainer kits for Sampling, TDM, AM, FM, Pulse Modulation, PCM, DM, ASK, FSK, PSK
2. CRO (30MHz) – 15 Nos
3. MATLAB or equivalent software package for simulation
4. PC- 10 Nos
5. Communication Trainer kits for Sampling, TDM, AM, FM, Pulse Modulation, PCM, DM, ASK, FSK, PSK
6. CRO (30MHz) – 15 Nos

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Study and design Sampling and Reconstruction. (K2)
2. Design AM and FM Modulators. (K4)
3. Analyze the performance characteristics of TDM (K4)
4. Demonstrate various Pulse Modulation and Digital Modulation Techniques. (K5)
5. Apply various Channel Coding Schemes to improve the Noise Performance of the Communication System. (K3)
6. Simulate and validate the various Functional Modules of Digital Communication System. (K5)

CO-PO,PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	1	-	-	-	1	-	2	3	3	2
CO2	3	3	1	2	1	-	-	-	1	-	2	3	3	2
CO3	3	3	1	3	1	-	-	-	1	-	2	3	3	2
CO4	3	3	1	2	1	-	-	-	1	-	2	3	3	2
CO5	3	3	1	1	1	-	-	-	1	-	2	3	3	2
CO6	3	3	1	2	1	-	-	-	1	-	2	3	3	2

SEMESTER - IV

20CSPL402 SDG NO. 4 & 9	DATABASE MANAGEMENT SYSTEM LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn the use of Data Definition, Data Manipulation Commands, Nested and Join queries
- To understand Functions, Procedures and Procedural extensions of databases
- To be familiar with the use of a Front End tool
- To understand design and implementation of typical Database applications
-

LIST OF EXPERIMENTS :

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Implementation of Views, Sequences and Synonyms.
4. Database Programming: Implicit and Explicit Cursors.
5. Procedures and Functions.
6. Triggers.
7. Exception Handling.
8. Database Design using ER Modeling, Normalization and Implementation for any application.
9. Database Connectivity with Front End Tools.
10. Case Study using Real Life Database applications.

TOTAL: 45 PERIODS

LAB REQUIREMENTS

SOFTWARE

Front end: VB/VC ++/JAVA or Equivalent

Back end: Oracle / SQL / MySQL/ Postgres / DB2 or Equivalent

OUTCOMES :

On completion of this laboratory course, the student should be able to

1. Use typical data definitions and manipulation commands. (K1)
2. Design applications to test Nested and Join Queries. (K3)
3. Implement simple applications that use Views. (K3)

4. Critically analyze the use of Tables, Views, Functions and Procedures. (K4)
5. Make use of ER modeling and normalization to design and implement database. (K3)
6. Implement real life applications that require a Front-end Tool as a Team. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	2	1	0	0	0	0	0	0	2	2
CO2	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO3	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO4	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO5	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO6	2	2	2	1	2	1	0	0	0	0	0	0	2	2

SEMESTER - IV

20CCTE401 SDG NO. 4,11&15	LIVE-IN-LAB - II	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To enable hands-on experience in the electronics hardware/Software domain
- To enable development of skill set for designing and realizing prototype electronic systems/simulation model

COURSE METHODOLOGY

- This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
- The project work must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development.

- Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project.
- On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION

- First evaluation (Immediately after first internal examination) : 20 marks
- Second evaluation (Immediately after second internal examination): 30marks
- Final evaluation Last week of the semester) : 50marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

1. Conduct literature survey to identify the gap and an application oriented research problem in the specific domain(K4)
2. Design and validate the proposed system using simulation(K6)
3. Prototype the proposed system(K5)
4. Analyze the obtained results and prepare a technical report(K4)
5. Publish the work in journals and apply for the patents.(K3)
6. Prepare for industrial environment and real time work(K3)

CO- PO& PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	2	3	2	2	2	2	2	3	3	3	3

SEMESTER - IV

20CCTP401 SDG NO. 4	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

PROBLEM SOLVING SKILLS – PHASE 1

COURSE OBJECTIVE:

- Improve their quantitative ability.
- Improve their reasoning ability.
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVE ABILITY – III **6**

Compound Interest - Profit and Loss - Partnership - Percentage - Set Theory

UNIT II QUANTITATIVE ABILITY – IV **6**

True Discount - Ratio and Proportion - Simplification - Problems on H.C.F and L.C.M.

UNIT III REASONING ABILITY– II **6**

Course of Action - Cause and Effect - Statement and Conclusion - Statement and Argument - Data Sufficiency (DS) - Statement and Assumption - Making Assumptions.

UNIT IV VERBAL ABILITY – II **6**

Change of Voice - Change of Speech - Letter and Symbol Series - Essential Part - Verbal Reasoning - Analyzing Arguments.

UNIT V CREATIVITY ABILITY – II **6**

Seating Arrangement - Direction Sense Test - Character Puzzles - Missing Letters Puzzles - Mirror &Water Images.

TOTAL : 30 PERIODS

REFERENCES:

1) R. S. Agarwal, "Quantitative Aptitude for Competitive Exams"
2) Sarvesh Verma, "Quantum CAT"
3) R. S. Agarwal, "A Modern Approach to Logical Reasoning"
4) Arun sharma, "Verbal Ability and Reading Comprehension"

ADVANCED C PROGRAMMING AND MATLAB AND SIMULINK PROGRAMMING - PHASE 2

COURSE OBJECTIVE:

- To improve C programming skills with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To understand procedural programming methods using MATLAB & SIMULINK.

UNIT I INTRODUCTION TO RECURSION AND GROWTH FUNCTIONS 6

Introduction to Recursion - Recurrence Relation - Deriving time complexity and space complexity using recurrence relation Polynomial Equations - Compare growth functions - Nth Fibonacci Number - Exponent Function - Taylor Series - Tower of Hanoi.

UNIT II STORAGE CLASSES, THE PREPROCESSOR AND DYNAMIC MEMORY ALLOCATION 6

Storage Classes and Visibility - Automatic or local variables - Global variables - Macro Definition and Substitution - Conditional Compilation - Dynamic Memory Allocation - Allocating Memory with malloc and callo Allocating Memory with calloc - Freeing Memory - The Concept of linked list - Inserting a node by using Recursive Programs - Deleting the Specified Node in a Singly Linked List.

UNIT III FILE MANAGEMENT AND BIT MANIPULATION 6

Defining and Opening a file - Closing Files - Input/output Operations on Files - Predefined Streams - Error Handling during I/O Operations - Random Access to Files - Command Line Arguments - The hexadecimal number system - C bitwise operators - How to generate all the possible subsets of a set - Tricks with Bits - Applications of bit operations.

UNIT IV INTRODUCTION TO MATLAB 6

Introduction to MATLAB-Commands-MATLAB Desktop and Editor-Basic Operations-Vectors and Matrices-Array Calculation-Calling Function-Obtaining Help-Plotting Data-Applications- Basic Programming.

UNIT V SIMULINK AND MATLAB OPTIMIZATION TOOLBOX 6

Introduction SIMULINK models - blocks - Systems and sub-systems - Simulating Dynamic System - Solving a model - Solvers - MATLAB SIMULINK for signal processing - Solving linear and quadratic optimization problems.

TOTAL : 30 PERIODS

REFERENCES:

1. R. G. Dromey,"How to Solve It By Computer", Pearson, 1982
2. A.R. Bradley,"Programming for Engineers", Springer, 2011
3. Kernighan and Ritchie, "The C Programming Language", (2nd ed.) Prentice Hall, 1988
4. Amos Gilat, “Matlab, An Introduction With Applications”, Wiley Publication, 4th edition
5. Brian R. Hunt, Jonathan Rosenberg, and Ronald L Lipsman, “A Guide to MATLAB”, Cambridge University press.
6. Basics of MATLAB programming by R. Balaji
7. MATLAB Guide, Third Edition Third Edition by Desmond J. Higham (Author), Nicholas J. Higham (Author).
8. MATLAB For Beginners: AGentle Approach by Peter I. Kattan (Author)

REFERENCES

1. Agam Kumar Tyagi, “Matlab and Simulink for Engineering” Oxford Higher Education
2. Rudra Pratap “Getting Started with MATLAB”Oxford Higher Education
3. Stephen J Chapman, “MATLAB Programming for Engineers”, 6E, CENGAGE

ONLINERESOURCES

1. https://matlabacademy.mathworks.com/
2. https://www.tutorialspoint.com/matlab/index.htm
3. https://medium.com/quick-code/top-tutorials-to-learn-matlab-for-beginners-d19549ecb7b7
4. https://nptel.ac.in/courses/103/106/103106118/

WEB RESOURCES

1. https://www.mathworks.com/academia/books.html
2. https://in.mathworks.com/support/learn-with-matlab-tutorials.html

COURSE OUTCOMES :

Upon completion of this course, the students should be able to:

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K6)

4. Evaluate code organization and functional hierarchical decomposition with complex data types. (K5)
5. Understand to improve C programming skills to apply advance structured and procedural programming. (K2)
6. Apply the Matlab Simulink and optimization toolbox for signal processing applications. (K3)

CO- PO& PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO2	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO3	-	-	-	-	3	2	-	-	1	3	-	2	-	-
CO4	-	-	-	-	3	2	-	3	3	3	-	2	2	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2	2	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2	2	2

SEMESTER - V

20CSPC301 SDG NO. 4,9	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Object Oriented Programming concepts and principles of Packages, Inheritance and Interfaces
- To define Exceptions and use I/O streams
- To develop a Java application with threads and generic classes
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming – Abstraction – Objects and Classes – Encapsulation– Inheritance – Polymorphism– OOP in Java – Characteristics of Java – The Java Environment – Java Source File – Compilation - Fundamental Programming Structures in Java – Defining Classes in Java – Constructors - Methods - Access Specifiers – Static Members - Comments - Data Types Variables - Operators- Control Flow- Arrays- Packages – Javadoc Comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super Classes– Sub Classes –Protected Members – Constructors in Sub Classes– The Object Class – Abstract Classes and Methods – Final Methods and Classes – Interfaces – Defining an Interface - Implementing Interface - Differences between Classes and Interfaces and Extending Interfaces – Object Cloning-Inner Classes -Array Lists -Strings.

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions – Exception Hierarchy – Throwing and Catching Exceptions – Built in Exceptions-Creating own Exceptions - Stack Trace Elements - Input / Output Basics – Streams – Byte Streams and Character Streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTI-THREADING AND GENERIC PROGRAMMING 8

Differences between Multi-Threading and Multitasking - Thread Life Cycle - Creating Threads - Synchronizing Threads - Inter-Thread Communication - Daemon Threads - Thread Groups - Java Concurrency Packages - Generic Programming – Generic Classes – Generic Methods – Bounded Types – Restrictions and Limitations.

UNIT V LAMBDAS STREAMS AND REACTIVE PROGRAMMING 9

Lambda Expressions – Library Enhancements to Support Lambdas – No Parameter-Single Parameter - Multiple Parameters – With or Without Return Keyword-Comparator– Filter Collection Data-Streams-Generating Streams Java Stream Interface Methods – For each-Map-Filter-Limit-Sorted - Parallel Processing - Reactive Programming– ReactiveX– ReactiveX Classes– Creating Operator– Reactive Subjects.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Herbert Schildt, "Java - The Complete Reference", 8 Edition, McGrawHill Education, 2011. th
2. E.Balagursamy- "Programming with Java", 6 Edition, McGrawHill Education, 2019.

REFERENCES:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for Programmers", 3 Edition, Pearson, 2015.
2. Steven Holzner, "Java 2 Blackbook", Dream Tech Press, 2011.
3. Timothy Budd, "Understanding Object-Oriented Programming with Java", Updated Edition, Pearson Education, 2000.

WEB REFERENCES:

1. https://www.w3schools.com/java/java_oop.asp
2. https://www.edureka.co/blog/object-oriented-programming/
3. https://www.ntu.edu.sg/home/ehchua/programming/java/J3a_OOPBasics.html

ONLINERESOURCES:

1. https://www.ntu.edu.sg/home/ehchua/programming/java/J3a_OOPBasics.html
2. https://introcs.cs.princeton.edu/java/lectures/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Comprehend Object Oriented Programming Concepts in Java. (K2)
2. Illustrate the purpose of packages, Java documents and Analyze the various types of Inheritance. (K4)
3. Apply the Object Oriented Programming Concepts to develop the reusable Applications. (K3)
4. Illustrate the java applications using Java Exceptions and I/O Streams. (K4)

5. Understand the concept of Multithreading and Generic Classes in Java. (K2)
6. Design and implement Lambda expressions, streams and reactive programming. (K6)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	-	2	-	-	-	-	-	2	3	2
CO2	3	1	3	2	-	2	-	-	2	-	-	2	3	2
CO3	3	1	3	2	-	2	-	-	-	-	-	2	3	3
CO4	3	1	3	2	-	2	-	-	-	-	-	2	3	2
CO5	3	1	3	2	3	2	-	-	-	-	-	2	3	2
CO6	3	1	3	2	3	2	-	-	1	-	-	2	3	2

SEMESTER - V

20ECPC402 SDG NO. 4,11	MICROCONTROLLERS AND EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051microcontroller and ARM processor.
- To design a microcontroller based system.

UNIT I MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts andinterrupt service routines – Byte and String Manipulation.

UNIT II MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboarddisplayinterface and Alarm Controller.

UNIT IV INTRODUCTION TO EMBEDDED SYSTEM DESIGN AND REAL TIME SYSTEMS 9

Embedded system design process –Design example: Model train controller- Design methodologies- Design flows - Requirement Analysis – Specifications- System analysis and architecture design – Structure of a Real Time System –- Estimating program run times – Task assignment and scheduling.

UNIT V ARM PROCESSOR AND PERIPHERALS 9

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3MCU.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, 2nd Edition, Prentice Hall of India, 2007. (UNIT I & III).
2. Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, 2nd Edition, Pearson education, 2011. (UNIT II).
3. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT IV, V).
4. Jane W.S.Liu, “Real Time Systems”, Pearson Education, Third Indian Reprint, 2003.(UNIT IV).

REFERENCES:

1. DoughlasV.Hall, “Microprocessors and Interfacing, Programming andHardware”,TMH, 2012.
2. A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals", 3rd Edition, Tata McGraw Hill, 2012.
3. Lyla B.Das, “Embedded Systems: An Integrated Approach”, Pearson Education, 2013.
4. C.M.Krishna, Kang G.Shin, “Real-Time Systems”, International Editions, McGraw Hill, 2017.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_ee42/preview
2. https://nptel.ac.in/courses/108105102/

ONLINERESOURCES:

1. https://freevideolectures.com/course/3018/microprocessors-and-microcontrollers
2. http://www.satishkashyap.com/2012/02/video-lectures-on-microprocessors-and.html

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the architecture of 8086,instruction set, concepts of modular programming, interrupt service routine and write basic Assembly Language Programs in 8086. (K2)
2. Explain the internal organization of 8051,Port structures instruction set and write Assembly Language Programs in 8051..(K2)
3. Describe the architecture of peripheral ICs(8255, 8253, 8251, 8259, 8257, 8279 ,8080, DAC and ADC0080).(K2)
4. Apply the interfacing concepts to develop programs for interfacing LED LCD, ADC/DAC, keyboard, traffic light controller and alarm controller with 8086 and 8051. (K3)
5. Describe the design process and scheduling concepts of real time embedded systems.(K2)
6. Illustrate the features, peripheral units and instruction set of ARM9, LPC214X, ARM Cortex M3MCU processors.(K2)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	2	1	3	3	2	-	-	-	2	2	3
CO2	3	1	3	1	2	3	2	1	-	-	-	2	2	3
CO3	2	1	3	2	1	2	3	2	-	-	-	2	2	2
CO4	2	1	2	3	2	2	3	2	2	-	-	2	2	3
CO5	3	1	3	1	2	3	3	2	-	-	-	3	2	3
CO6	3	1	2	2	1	3	3	2	-	-	-	2	2	2

SEMESTER - V

20CSPW401 SDG NO. 4	COMPUTER NETWORKS WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the protocol layering and physical level communication
- To understand the various components required to build different networks and analyze the performance of a network
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer

UNIT I INTRODUCTION AND PHYSICAL LAYER **9**

Networks – Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II DATA LINK LAYER & MEDIA ACCESS **9**

Introduction – Data Link Layer - Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs– Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III NETWORK LAYER **9**

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV TRANSPORT LAYER **9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram protocol – Transmission Control Protocol – SCTP.

UNIT V APPLICATION LAYER **9**

WWW and HTTP– FTP– Email –Telnet–SSH – DNS– SNMP.

LISTOFEXPERIMENTS : **15**

1. Simple client server program.
2. Socket program for echo/ping commands.
3. Implementing Link state routing algorithm.

4. Implementing distance vector routing algorithm.
5. Study of Network Simulator (NS2 or NS3) and Simulation of Congestion Control Algorithms using NS.
6. Study of TCP/UDP performance using Simulation tool.
7. Simulation of error correction code (like CRC).
8. Traffic Analysis using Wireshark.

TOTAL: 60 PERIODS

LAB REQUIREMENTS:

1. C/C++/JAVA/Equivalent compiler
2. Network Simulator like NS2/OPNET/Wireshark

TEXT BOOKS:

1. Behrouz A. Forouzan, “Data communications and networking with TCP/IP protocol suite", Sixth Edition, McGraw Hill, cop. 2022.
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

REFERENCES:

1. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2014.
2. Nader F. Mir, “Computer and Communication Networks”, Second Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
5. Andrew S. Tanenbaum, David J. Wetherall,"Computer Networks ", 5th edition, Pearson Education,2011

WEB REFERENCES:

1. https://swayam.gov.in/nd2_cec19_cs07/preview
2. https://nptel.ac.in/courses/106105081/
3. https://www.isi.edu/nsnam/ns/

ONLINERESOURCES:

1. https://ptgmedia.pearsoncmg.com/images/9780789749048/samplepages/0789749041.pdf
2. https://www.cse.iitb.ac.in/~sri/cs348/cs378-lab00-overview.pdf
3. https://freevideolectures.com/course/2276/computer-networks

4. https://www.youtube.com/watch?v=g8iY36onLeM&list=PLWPirh4EWFpHJrW1D9UB24wsbM3zx7QMx

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the basic layers and its functions in computer networks. (K2)
2. Demonstrate the performance of a network. (K2)
3. Explain the basics of how data lows from one node to another. (K2)
4. Understand IEEE standards, analyze and design routing algorithms. (K2)
5. Describe the working of various transport and application layer protocols (K2)
6. Apply the protocols for various functions in the network. (K3)

CO-PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2	2	-	2	1	-	1	3	2
CO2	3	3	2	-	-	-	1	-	-	-	-	-	2	1
CO3	3	3	3	-	1	-	1	-	-	1	-	1	3	1
CO4	3	3	3	-	-	-	1	-	-	1	-	-	2	2
CO5	3	3	3	-	1	-	2	-	-	1	-	1	3	2
CO6	3	3	3	-	1	-	1	-	-	1	-	-	3	2

SEMESTER - V

20ECPL401 SDG NO. 4,11	MICROCONTROLLERS AND EMBEDDED SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To Introduce ALP concepts, features and Coding methods
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Interface different I/Os with Microprocessors
- Be familiar with MASM
- Write programs for ARM

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations.
2. Move a data block without overlap.
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching.

8051 Experiments using kits and MASM

1. Basic arithmetic and Logical operations.
2. Square and Cube program, Find 2's complement of a number.
3. Unpacked BCD to ASCII.

Peripherals and Interfacing Experiments

1. Traffic light controller.
2. Stepper motor control.
3. Digital clock.

ARM programs

1. Interfacing ADC and DAC.
2. Interfacing LED and PWM.
3. Interfacing LCD.

TOTAL: 45 PERIODS

OUTCOMES

At the end of the course, the student should be able to

1. Write ALP for fixed and Floating Point and Arithmetic operations.(K3)
2. Execute Programs in 8051 (K5)
3. Interface various peripherals in 8086/8051.(K3)
4. Execute Programs in ARM.(K5)
5. Interface memory, A/D and D/A convertors with ARM system(K3)
6. Formulate a mini project. (K6)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	3	2	2	-	-	-	2	2	1	2	2
CO2	3	1	2	3	1	2	-	-	-	2	2	3	2	2
CO3	3	2	2	2	1	2	-	-	-	2	2	2	3	2
CO4	3	2	2	3	3	2	-	-	-	2	2	1	3	2
CO5	2	2	2	2	5	2	-	-	-	3	1	2	3	3
CO6	2	2	2	3	1	2	-	-	-	2	3	2	3	3

SEMESTER - V

20CSPL301 SDG NO. 4,9	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of Packages, Inheritance and Interfaces
- To develop a Java application with Threads and Generic classes
- To make the students understand life cycle of the Applets and its functionality

LIST OF EXPERIMENTS :

1. Basic JAVA Programs
   a. Write a program to find the sum of individual digits of a positive integer.
   b. Write a program to generate the first n terms of the sequence.
   c. Write a program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
   d. Write a program to find both the largest and smallest number in a list of integers.
   e. Write a program to find factorial of list of number reading input as command.
2. Write a program to calculate bonus for different departments using method overriding.
3. Write a program to sort list of elements in ascending and descending order and show the exception handling.
4. Write a program to implement the concept of importing classes from user defined package and creating packages.

5. Write programs that illustrate how the following forms of inheritance are supported:
   a) Single inheritance
   b) Multiple inheritance
   c) Multi level inheritance
   d) Hierarchical inheritance
6. Write a program to demonstrate use of implementing interfaces.
7. Write a program to implement interfaces all string operations.
8. Write a program to create student report using applet, read the input usingtext boxes and display the output using buttons.
9. Write a program to implement thread priorities.
10. Write a program to implement thread, applets and graphics to animate ballmovement.
11. JAVA Applet program
    a) Write a Applet program using paint brush
    b) Write a program to display analog clock using Applet
    c) Write a program to create different shapes and fill colors using Applet
12. JAVA Event Handling program
    a) Write a program that display the x and y position of the cursor movement using Mouse
    b) Write a program that identifies key-up key-down event user entering text in a Applet
13. JAVA programs on Swings
    a) Write a program to build a Calculator in Swings
    b) Write a program to display the digital watch in swing
    c) Write a program that to create a single ball bouncing inside a JPanel.
    d) Write a program JTree as displaying a real tree upside down

TOTAL : 45 PERIODS

LAB REQUIREMENTS :

Hardware :

Desktop Systems - Pentium IV with 2 GB RAM
160 GB HARD Disk
Monitor 1024 x 768 colour

Software :

Windows operating system
JDK 1.8

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Write Java programs in accordance with the object oriented programming concepts. (K6)
2. Design user defined java packages. (K6)
3. Create Java programs using Inheritance and Polymorphism. (K6)
4. Implement Error-handling techniques using Exception handling and Multithreading. (K6)
5. Develop Applet program and GUI using Swing components. (K6)
6. Enumerate the event handling techniques in Java Programming. (K5)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	2	-	-	-	-	2	2	3	2
CO2	2	2	3	2	-	2	-	-	-	-	2	2	3	2
CO3	2	2	3	2	-	2	-	-	2	2	2	2	3	2
CO4	3	3	2	2	-	2	-	-	-	-	2	2	3	2
CO5	3	3	3	2	-	2	-	-	-	-	2	2	3	2
CO6	2	3	3	2	-	2	-	-	2	2	2	2	3	2

SEMESTER - V

20CCTE501 SDG NO. 4,11,15	LIVE-IN-LAB - III	L	T	P	C
		0	0	2	2

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To enable hands-on experience in the electronics hardware/Software domain
- To enable development of skill set for designing and realizing prototype electronic systems/simulation model

COURSE METHODOLOGY:

- This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.

- The project work must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development.
- Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project.
- On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION

- First evaluation (Immediately after first internal examination) : 20 marks
- Second evaluation (Immediately after second internal examination): 30marks
- Final evaluation Last week of the semester) : 50marks

Note: All the three evaluations are mandatory for course completion and for awarding thefinal grade.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

1 Perform literature survey to identify the gap and an application oriented research problem in the specific domain (K2)
2 Design and validate the proposed system using simulation (K3)
3 Implement the proposed system (K3)
4 Examine the obtained results and prepare a technical report(K4)
5 Publish the work in journals and apply for the patents(K3)
6 Prepare for industrial environment and real time work (K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	2	3	2	2	2	2	2	3	3	3	3

SEMESTER - V

20CCTP501 SDG NO. 4,11,15	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVEABILITY – V **6 Hours**

Square Root And Cube Root, Logarithm, Volume and Surface Area, Permutation and Combination

UNIT II QUANTITATIVE ABILITY– VI **6 Hours**

Probability, Averages, Area, Odd Man Out, Crypt Arithmetic, Flowcharts

UNIT III REASONING ABILITY – III **6 Hours**

Data Interpretation Table Charts, Data Interpretation Bar Charts, Blood Relationship, Puzzles

UNIT IV VERBAL ABILITY – III **6 HOURS**

Spellings, Selecting Words, Spotting Errors, Ordering of Words, Logical Sequence of Words

UNIT V CREATIVITY ABILITY– III **6 Hours**

Logical Puzzles, Playing Cards Puzzles, Clock Puzzles, Number Puzzles, Sudoku

TOTAL : 30 PERIODS

REFERENCES

- Quantitative Aptitude for Competitive Exams by R. S. Agarwal
- Quantum CAT by Sarvesh Verma
- AModern Approach to Logical Reasoning by R. S. Agarwal
- Verbal Ability and Reading Comprehension by Arun Sharma

PYTHON PROGRAMMING AND CCNA - PHASE 2

COURSE OBJECTIVES

To enablestudents to,

- Thecourse is designed to provide Strong knowledge of Python.
- Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.
- Understand the basics of configuration and routing in networks.

UNIT I INTRODUCTION, DATATYPES AND STRINGS, LIST & TUPLES **10**

DataTypes - Integer, Float , Boolean , String , List , Tuple , Dictionary and Sets. String - Concatenation and Replication, isalnum functions, Slicing Operation sorted() , reversed() , min() , max() , index() and count() function, packing and unpacking of data in a tuple

UNIT II DICTIONARY AND SETS and HANDLING **10**

Dictionary - del Keyword,. Sets - Frozen sets, Internal working of sets, add() , union() , intersection() and difference() method, symmetric_difference, clear() method, Operators in sets, Higher Order Functions - map , filter , reduce and lambda function, Random Library

UNIT III EXCEPTIONAL HANDLING, REGULAR EXPRESSIONS AND OBJECT ORIENTED PROGRAMMING **10**

Exception Handling - All Error Categories, try , except , finally blocks, Raising an exception, Regular Expression, Object Oriented Programming - Types of Inheritence, Data encapsulation and Abstraction, Polymorphism, Method

OverRiding, Operator overloading, operator overRiding,

UNIT IV CCNA TOPOLOGY AND CONFIGURATION 8

Introduction to Cisco Packet Tracer- Configure the basic switch and router settings- Forming a simple network - Implementing various network topology - Securing switch ports - Configure EtherChannel - Configuration of IPv4 - Configuration of IPv6

UNIT V ROUTING AND NETWORKING 7

Subnetting a network - Implementing static routing - Implementing dynamic routing- Implementing VLAN - Configuring DHCP

TOTAL : 45 HOURS

REFERENCES

1 Python-(Mark Lutz)
2 Python Training guide (BPB Publications)
3 Zobel, Justin (2014), Writing for Computer Science. Third edition. Springer Verlag London Ltd (270 p).

ONLINERESOURCES

1. https://www.tutorialandexample.com/ccna-tutorial
2 https://www.computernetworkingnotes.com/ccna-study-guide/types-of-static-routes- explained.html

COURSE OUTCOMES

Upon completion of this course, the students should be able to:

1. Explain basic principles of Python programming language (K2)
2 Implement object oriented concepts (K2)
3 Implement database and GUI applications (K2)
4 Install, configure and operate LAN and WAN services for small networks (K3)
5 Manage Network for a small Organization (K2)

CO - PO - PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3	2	-	3	2	3	-	2	-	-
CO2	3	3	3	2	3	2	-	3	2	3	-	2	-	-
CO3	3	2	3	1	2	2	-	-	1	3	-	2	-	-
CO4	3	2	2	2	3	2	-	3	3	3	-	2	2	2
CO5	2	2	2	1	3	2	-	-	2	3	-	2	2	2
CO6	3	2	2	-	1	2	-	-	2	3	-	2	2	2

SEMESTER - VI

20ECPW501 SDG NO. 4,9	DISCRETE TIME SIGNAL PROCESSING WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To learn discrete Fourier transform, fast Fourier transform, properties of DFTand its application to linear filtering
- To understand the characteristics of digital filters, design digital IIR filters and apply these filters to filter undesirable signals in various frequency bands
- To understand the characteristics of digital linear phase FIR filters, design digital FIR filters and apply these filters to filter undesirable signals in variousfrequency bands
- To understand the effects of finite precision representations on digital filters and obtain knowledge and ability to use the digital Signal Processors to build DSP systems for real time problems
- Perform basic operations on signal processing and design filters using MATLAB, and to study the architecture of DSP Processor and Implement certain DSP algorithms on Digital Signal Processors

UNIT I DISCRETEFOURIER TRANSFORM 9

Summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF), Fast Fourier transform (FFT). Linear filtering using FFT.

UNIT II INFINITEIMPULSERESPONSE FILTERS 9

Characteristics of practical frequency selective filters, characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, directform II, cascade, parallel realizations.

UNIT III FINITEIMPULSERESPONSEFILTERS 9

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using

windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations

UNIT IV FINITE WORD LENGTH EFFECTS 9

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.

UNIT V INTRODUCTION TO DIGITAL SIGNAL PROCESSORS 9

DSP functionalities - circular buffering – DSP architecture – Fixed and Floating point architecture principles – Programming – Application examples.

LAB COMPONENT – LIST OF EXPERIMENTS 15

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of elementary Discrete-Time sequences, Linear and Circular convolutions, Auto correlation and Cross Correlation.
2. Frequency Analysis using DFTand FFT.
3. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation.
4. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations.

DSP PROCESSOR BASED IMPLEMENTATION

1. Study of architecture of Digital Signal Processor and Perform MAC operation using various addressing modes.
2. Generation of signals – Square, Triangular, Sawtooth.
3. Convolution.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fifth Edition, 2021.
2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete Time Signal Processing", Eighth Indian Reprint, Pearson, 2004.

REFERENCES:

1. Emmanuel C. Ifeachor & Barrie. W. Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach",

Tata McGraw Hill, 2007.
3. Andreas Antoniou, “Digital Signal Processing”, Tata Mc Graw Hill, 2006.
4. K. P. Soman and K. I. Ramachandran, "Insight into Wavelets - From Theory to Practice", Prentice Hall of India, Third Edition, 2010.
5. B. Venkataramani, M. Bhaskar, “Digital Signal Processors: Architecture, Programming and Application”, Tata McGraw Hill Education, 2002.

WEB REFERENCES:

1. https://www.tutorialspoint.com/digital_signal_processing/index.htm
2. https://www.analog.com/en/design-center/landing-pages/001/beginners-guide-to-dsp.html
3. https://101science.com/dsp.htm

ONLINE RESOURCES:

1. https://swayam.gov.in/nd1_noc20_ee31https://nptel.ac.in/courses/117105134/
2. https://nptel.ac.in/courses/117105134/
3. https://www.edx.org/course/discrete-time-signal-processing-4

OUTCOMES:

Upon completion of the course, the student should be able to

1. Examine the signals in the frequency domain using DFT, DIT, DIF - FFT algorithms and compute the response of the system using linear filtering. (K3)
2. Apply Butterworth and Chebyshev methods to design analog IIR filters. (K3)
3. Use approximation of derivatives, impulse invariance mapping, and bilinear transformation methods to design a digital IIR filter. (K3)
4. Use the Fourier series method, windowing technique, and frequency sampling methods to design a digital FIR filter. (K3)
5. Summarize the effect of finite word length in digital filters to compute the quantization noise. (K2)
6. Illustrate the architecture of Digital signal processors and program the DSP processors for signal processing applications. (K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	3	-	-	-	1	-	-	2	3	-
CO2	3	3	2	2	2	-	-	-	1	-	-	3	3	2
CO3	3	1	2	1	2	-	-	-	1	-	-	3	3	1
CO4	3	2	2	3	2	2	-	-	1	-	-	3	3	2
CO5	3	3	2	2	2	2	-	-	-	-	-	3	3	2
CO6	3	3	2	2	2	2	-	-	-	-	3	2	3	2

SEMESTER - VI

20CSPC403 SDG NO. 4	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To address the real time complex Engineering problems using innovative approaches with strong core computing skills
- To apply Core-analytical knowledge and appropriate techniques and provide solutions to real time challenges of National and Global society
- To understand the concepts of OOAD and Design projects using UML diagrams
- To improve the Software Design with Design Patterns

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering - Software Process - Perspective and Specialized Process Models - Introduction to Agility-Agile process-Extreme Programming-XP Process.

UNIT II REQUIREMENTS ANALYSIS AND SOFTWARE DESIGN 9

Software Requirements: Functional And Non-Functional - User Requirement - System Requirements - Software Requirements Document – Requirement Engineering Process - Feasibility Studies - Requirements Elicitation and Analysis -Requirements Validation - Requirements Management - Design Process – Design Concepts - Design Model – Design Heuristic – Architectural Design -Architectural Styles - Architectural Design - Architectural Mapping using Data Flow.

UNITIII STATIC AND DYNAMIC UML DIAGRAMS 9

Introduction To OOAD with OO Basics-Unified Process-Usecase – Case Study-The Next Gen Pos System, Inception –Use Case Modeling - Relating Use Cases-Include, Extend And Generalization-Class Diagram-Elaboration-Domain Model-Finding Conceptual Classes And Description Classes-Associations-Attributes-Aggregation And Composition-Dynamic Diagrams-UML Interaction Diagrams-System Sequence Diagram-Collaboration Diagram-State Machine Diagram And Modeling-Activity Diagram.

UNIT IV IMPLEMENTATION UML DIAGRAMS AND DESIGN PATTERNS 9

Implementation Diagrams-Package Diagram-Component and Deployment Diagrams - GRASP: Designing Objects with Responsibilities - Creator - Information Expert - Low Coupling-High Cohesion-Controller Design Patterns - Creational - Factory Method - Structural - Bridge - Adapter - Behavioral-Strategy-Observer-Applying GoF Design Patterns-Mapping Design to Code.

UNIT V TESTING AND MAINTENANCE 9

Software Testing Fundamentals-Internal And External Views of Testing-White Box Testing – Basis Path Testing - Control Structure Testing - Black Box Testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging –Software Implementation Techniques: Coding Practices - Refactoring - Maintenance and Reengineering-BPR Model - Reengineering Process Model - Reverse and Forward Engineering.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Roger S. Pressman, “Software Engineering – A Practitioner's Approach”, Sixth Edition, McGraw Hill International Edition, 2005
2. Craig Larman, “Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development”, Third Edition, Pearson Education, 2005.

REFERENCES:

1. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India, 2010.
3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley, 1995.

4. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.
5. Ian Sommerville, "Software Engineering", Seventh Edition, Pearson Education Asia, 2007.
6. Ali Bahrami, "Object Oriented Systems Development", McGraw Hill International Edition, 1999.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs69/preview
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs69
3. https://nptel.ac.in/courses/106/105/106105182/
4. https://en.wikipedia.org/wiki/Object-oriented_analysis_and_design
5. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

ONLINERESOURCES:

1. http://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf
2. https://freevideolectures.com/course/2318/software-engineering
3. https://courses.cs.washington.edu/courses/cse403/01au/lectures/
4. https://cosmolearning.org/courses/introduction-to-software-engineering/video-lectures/
5. https://www.ece.rutgers.edu/~marsic/books/SE/instructor/slides/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Identify the key activities in managing a software project and Compare different process models.(K1)
2. Understand Concepts of requirements engineering and Analysis Modeling. (K2)
3. Apply systematic procedure for software design and deployment. (K3)
4. Compare and contrast the various testing and maintenance. (K5)
5. Express software design with UML diagrams.(K2)
6. Convert UML based software design into pattern based design using design patterns. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	3	3	2	3	3	3	3	-	-	3
CO2	3	2	-	2	3	3	2	2	3	3	3	-	-	3
CO3	3	2	-	3	3	3	3	1	3	3	3	1	1	3
CO4	3	3	3	3	3	3	3	2	3	2	2	2	3	2
CO5	3	3	3	3	3	3	3	2	3	2	2	2	3	2
CO6	3	2	-	2	3	3	2	3	3	3	3	-	-	3

SEMESTER - VI

20CSPC601 SDG NO. 4	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents and about the various applications of AI

UNIT I INTRODUCTION **9**

Introduction - Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI Problems – Search Strategies - Uninformed - Heuristics - Informed.

UNIT II PROBLEM SOLVING METHODS **9**

Local Search Algorithms and Optimization Problems - Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing – Optimal Decisions in Games – Alpha-Beta Pruning - Stochastic Games.

UNIT III REPRESENTATION OF KNOWLEDGE **9**

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining - Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects - Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT IV PLANNING AND LEARNING 9

Planning – Planning with State Space Search- Partial Order Planning Algorithm – Planning Graphs - Logical Formulation of Learning - Knowledge in Learning - Explanation-based Learning - Learning using Relevance Information.

UNIT V NATURAL LANGUAGEPROCESSING 9

Language models - Phrase Structure Grammars - Syntactic Analysis – Augmented Grammars and Semantic Interpretation - Application with NLP: Developing a Simple Chatbot - Types of Chatbot.

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Stuart J Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.

2 Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Tata McGraw-Hill Education, Third Edition, 2008.

REFERENCES:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008.
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Springer, Fifth Edition, 2003.
4. George F Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Pearson Education, New Delhi, Fifth Edition, 2017.
5. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly, 2009, https://www.nltk.org/book/.
6. I. Bratko, "Prolog: Programming for Artificial Intelligence", Addison-Wesley Educational Publishers Inc., Fourth Edition, 2011.

WEB REFERENCES:

1. https://books.google.co.in/books?id=uSvYmki2yg0C&printsec=frontcover&dq=Supervised+Learning&hl=en&sa=X&ved=0ahUKEwigkNa1xN3oAhWawjgGHe8hAzoQ6AEIKDAA#v=onepage&q=Supervised%20Learning&f=false

OUTCOMES:

Upon completion of the course, the students should be able to

1. Infer the agent characteristics and its problem solving approaches.(K2)

2. Select appropriate search algorithms for any AI problem.(K1)
3. Apply the principles of AI in game playing.(K3)
4. Construct and solve a problem using first order and predicate logic.(K3)
5. Identify the methods of solving problems using planning and learning.(K3)
6. Implement applications for Natural Language Processing that use Artificial Intelligence.(K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	1	1	-	1	-	-	1	2	3
CO2	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO3	2	3	2	3	2	1	1	-	1	-	-	1	3	2
CO4	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO5	2	3	2	3	3	1	1	-	2	-	-	1	2	2
CO6	2	3	2	3	3	1	1	-	2	-	-	1	2	3

SEMESTER - VI

20CCPW601 SDG NO. 4	WIRELESS COMMUNICATION AND COMPUTING WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To learn the basic concepts of wireless communication.
- To learn the concepts of cellular networks.
- To understand about multiple access in wireless system.
- To learn about IEEE standards.
- To learn the concepts of Bluetooth

UNIT I INTRODUCTION **9**

Introduction, Transmission Fundamentals-Signals for Conveying Information, Analog and Digital Data Transmission, Channel Capacity, Transmission Media, Multiplexing Communication networks LANs, MANs, and WANs, Switching Techniques, Circuit Switching, Packet Switching, Protocols and the TCP/IP Suite-Need for a Protocol Architecture, TCP/IP Protocol Architecture, OSI Model, Internetworking.

UNIT II CELLULAR WIRELESS NETWORKS **9**

Principles of Cellular Networks, First Generation Analog Second-Generation TDMA Second-Generation CDMA, Third-Generation Systems Antennas and Propagation-Antennas, Propagation Modes, Line-of Sight Transmission, Fading in the Mobile Environment Modulation Techniques-Signal Encoding Criteria, Digital Data- Analog Signals, Analog Data-Analog Signals, Analog Data-Digital Signals Spread Spectrum-The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum, Code Division Multiple Access, Coding and Error Control-Error Detection, Block Error Correction Codes , Convolution Codes, Automatic Repeat Request

UNIT III MULTIPLE ACCESS IN WIRELESS SYSTEM 9

Multiple access scheme-FDMA, TDMA,CDMA, SDMA, packet radio access, multiple access with collision avoidance. Global system for mobile communication - Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM,PLMN interface, GSM addresses and identifiers, network aspects in GSM,GSM frequency allocation, authentication and security General packet radio service(GPRS) and packet data network, GPRS- network architecture, network operation, data services, Applications, Billing and charging in GPRS Wireless System Operations and standards - Cordless Systems, Wireless Local Loop, Wi-MAX and IEEE 802.16 Broadband Wireless Access Standards Mobile IP and Wireless Application.

UNIT IV IEEE STANDARDS 9

Wi-Fi and the IEEE 802.11 Wireless LAN Standard – IEEE 802 architecture, IEEE 802.11 architecture and services, IEEE 802.11 Medium access control, IEEE 802.11 physical layer, Wi-Fi protected access.

UNIT V BLUETOOTH 9

Bluetooth - Radio specification, baseband specification, link manager specification, logical link control andadaption protocol.

LIST OF EXPERIMENTS 15

1 Wireless Channel Simulation including fading effects
2 Wireless Channel Simulation including Doppler effects.
3 Simulation of Channel Estimation, Synchronization
4 Simulation of Equalization techniques.
5 Analyzing Impact of Pulse Shaping and Matched Filtering using Software Defined Radios.
6 OFDM Signal Transmission using Software Defined Radios.
7 OFDM Signal Reception using Software Defined Radios.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Wireless Communications & Networks, Second Edition,William Stallings by Pearson
2. Mobile ComputingTechnology,Applications and service creation ,Asoke K Telukder, Roopa R Yavagal by TMH

REFERENCES:

1. Wireless and mobile networks, Dr. Sunilkumar S. Manvi, Dr. Mahabaleshwar S.Kakkasageri by WILEY Wireless networks, P. Nicopolitidis,M.S. Obaidat,G.I.Papadimitriou,A.S.Pomportsis by WILEY
2. Mobile Computing,Raj Kamal by Oxford
3. Mobile Computing Theory and Practice-Kumkum Garg-Pearson
4. Wireless Communications & Networks, Second Edition,William Stallings by Pearson

WEB REFERENCES:

1. https://www3.nd.edu/~cpoellab/teaching/cse40814_fall08/Lesson1.pdf
2. https://www.cse.wustl.edu/~jain/refs/wir_refs.htm

ONLINE RESOURCES:

1. https://onlinelibrary.wiley.com/doi/pdf/10.1002/9780470167960.fmatter

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Summarize the Concepts of Networks (K2)
2 Interpret the Concepts of Cellular Wireless Networks. (K2)
3 Understand the Concepts of Multiple Access in Wireless System. (K2)
4 Interpret the Concepts of IEEE Standards (K2)
5 Understand the working of Bluetooth. (K2)
6 Implementation of Wireless Simulation and OFDM Transmission and Reception (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	-	2	3	2	2	3	2
CO2	3	3	3	3	2	1	1	-	2	3	3	3	3	2
CO3	3	3	2	2	3	2	2	-	3	2	3	2	3	3
CO4	3	2	2	2	3	2	2	-	3	2	2	2	2	2
CO5	3	3	2	3	2	1	2	-	2	2	2	1	3	2
CO6	3	2	2	2	3	2	2	-	3	2	2	2	2	2

SEMESTER - VI

20HSPL501 SDG NO. 4,8	COMMUNICATION AND SOFT SKILLS LAB	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To develop effective communication and presentation skills
- To enhance the employability and career skills of the learners
- To enable the learners for preparing job application and e-portfolio
- To make the learners use soft skills efficiently
- To develop their confidence and help them in attending interviews successfully

UNIT I LISTENING AND SPEAKING SKILLS 6

Conversational skills participate in formal and informal talks – general, – group discussion – time management – group dynamics – GD strategies - making effective presentations - listening/watching interviews conversations, documentaries - listening to lectures, discussions from social media – improving articulation.

UNIT II ADVANCED READING AND WRITING SKILLS 6

Reading different genres of texts - writing job applications – cover letter – resume – emails – memos - writing abstracts – summaries – interpreting visual texts.

UNIT III SKILLS FOR COMPETITIVE EXAMS 6

Reading passages for competitive exams – language focus exercise – building vocabulary tasks - FAQs related to competitive exams – current affairs -

improving global reading skills – elaborating ideas – summarizing – understanding arguments – identifying opinion/attitude and making inferences - critical reading.

UNIT IV SOFT SKILLS **6**

Motivation – emotional intelligence – managing changes – stress management – leadership straits – team work – career planning – intercultural communication – creative and critical thinking

UNIT V INTERVIEW SKILLS **6**

Different types of interview – personal interview – panel interview – telephone/online interview - interview etiquette - answering questions – offering information – mock interviews – FAQs related to job interviews

TOTAL: 30 PERIODS

REFERENCES:

1. Business English Certificate Materials, Cambridge University Press.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge, 2011.
3. International English Language Testing System Practice Tests, Cambridge University Press.
4. Personality Development (CD-ROM), Times Multimedia, Mumbai.

WEB REFERENCES:

1. http://www.slideshare.net/rohitjsh/presentation-on-group-discussion
2. http://www.oxforddictionaries.com/words/writing-job-applications
3. http://www.skillsyouneed.com/ips/interview-skills.html
4. http://www.personalitydevelopment.org/
5. https://nptel.ac.in/courses/109/107/109107121/
6. https://swayam.gov.in/nd1_noc19_hs33/preview
7. https://ict.iitk.ac.in/courses/enhancing-soft-skills-and-personality/

ONLINERESOURCES:

1. https://www.britishcoucil.my/english/courses-adults/learning-tips/importance-of-soft-skills
2. https://www.skillsoft.com/content-solutions/business-skills-training/soft-skills-training/

OUTCOMES:

Upon completion of the course learners should be able to

1. Demonstrate a better understanding of the communication process by articulating effectively (K2)
2. Exhibit soft skills & technical skills and construct e-portfolio

effectively(K3)

3. Apply critical thinking abilities and perform well in group discussions (K2)
4. Adapt the skills towards grooming as a professional continuously (K2)
5. Identify different types of personal interview skills through mock interviews and practices (K2)
6. Execute the employability and career skills in their chosen profession(K3)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	2	3	1	1
CO2	-	-	-	-	-	-	-	2	3	3	2	1
CO3	-	-	-	-	-	-	-	2	3	2	-	1
CO4	-	-	-	-	-	-	-	1	1	3	2	2
CO5	-	-	-	-	-	2	-	1	2	3	-	1

SEMESTER - VI

20CSPL601 SDG NO. 4	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn Prolog Program
- To Implement in Prolog, Cand its working environment
- To Implement N-Queen problem and puzzle problem using Prolog
- To Analyze the problem using BFSand DFS algorithm

LISTOFEXPERIMENTS :

1. Study of Prolog.
2. Write simple fact for the statements using Prolog.
3. Write predicates - one converts centigrade temperature to Fahrenheit, other checks if a temperature is below freezing.
4. Write a program to solve 4-Queen problem.
5. Write a program to solve 8-Puzzle problem.
6. Write a program to solve any problem using Breadth First Search.
7. Write a program to solve any problem using Depth First Search.
8. Write a program to solve Travelling Salesman Problem.

9. Write a program to solve Water Jug problem.
10. Write a program to solve Missionaries and Cannibal problem.
11. Write a program to implement Library Management System.

TOTAL: 45 PERIODS

LAB REQUIREMENTS :

SOFTWARE : Prolog, Turbo C

OUTCOMES:

On completion of this laboratory course, the student should be able to

1 Interpret the concepts of Turbo and Prolog programming in AI. (K3)
2 Examine First order predicate logic to solve AI problems. (K4)
3 Apply Informed search strategies to solve AI problems. (K3)
4 Apply Uninformed search strategies to solve AI problems. (K3)
5 Select State Space Searching method to solve AI problems. (K3)
6 Demonstrate an application using Natural Language Processing. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO2	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO3	2	3	2	3	2	1	1	-	1	-	-	1	3	2
CO4	2	3	2	3	3	1	1	-	2	-	-	1	2	2
CO5	2	3	2	3	3	1	1	-	2	-	-	1	2	3

SEMESTER - VI

20CCPJ601 SDG NO. 4, 11, 15	INNOVATIVE DESIGN PROJECT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products
- To develop design that add value to products and solve technical problems.
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used

COURSE PLAN :

Study: Take minimum three simple products, processes or techniques in the area of specialization, study, analyze and present them. The analysis shall be focused on functionality, construction, quality, reliability, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

Design: The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality; design for strength is not expected.

Note: *The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.*

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 20 marks
3. Final evaluation (Last week of the semester) : 60 marks

Note: *All the three evaluations are mandatory for course completion and for awarding the final grade.*

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand how to approach innovation challenges from a human-centred perspective [K2]
2. develop many creative ideas through structured brainstorming sessions [K3]
3. Apply the perspectives of different people that lead to best innovations [K3]
4. Comprehend the importance of incorporating multidisciplinary approach that address human needs and sustainable development [K3]
5. The significance of developing innovation projects with a prototyping mind set, where iterations, trial and error, and even failure are all part of a valuable, creative learning process [K4]

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	2	3	3	3	2	3	3
CO2	3	3	3	3	3	3	2	2	3	3	3	2	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - VI

20CCTP601 SDG NO. 4,11,15	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.

UNIT I QUANTITATIVE ABILITY – VII **6**

Races And Games, Boats and Streams, Surds and Indices, Pipes and Cistern, Allegations And Mixtures

UNIT II QUANTITATIVE ABILITY – VIII **6**

Numbers, Problems on Numbers, Pick Wrong Number, Missing Number, Areas, Shapes, Perimeter.

UNIT III REASONING ABILITY – IV **6**

Data Interpretation Pie Charts, Data Interpretation Line Charts, Data Sufficiency (DS), Data Arrangements, LR – Arrangements, LR – Ranking.

UNIT IV VERBAL ABILITY – IV **6**

Sentence Correction, Sentence Improvement, Completing Statements, Sentence Formation, Paragraph Formation.

UNIT V CREATIVITY ABILITY – IV **6**

Dot Situation, Rule Detection, Embedded Images, Grouping Of Images, Image Analysis.

TOTAL : 30 PERIODS

REFERENCES

- Quantitative Aptitude for Competitive Exams by R. S. Agarwal
- Quantum CAT by Sarvesh Verma
- AModern Approach to Logical Reasoning by R. S. Agarwal
- Verbal Ability and Reading Comprehension by Arun Sharma

PROBLEM SOLVING USING BASIC DATA STRUCTURES AND TENSOR FLOW – PHASE 2

COURSE OBJECTIVES

To enable students to

- The objective of the course is to familiarize students with basic data structures and their use in fundamental algorithms.
- Understand the basic and advanced concept of machine learning and deep learning

UNIT I LINKEDLIST& STACK, QUEUE & HEAP **10**

Linked List - Doubly Linked List Traversal, Circular Linked List, Structure, Node creation, Traversal Stack, Stack –Time Complexities of the Operations, Infix to Postfix/Prefix Conversation, Histogram Problem, Implementation - Using Array, Using Linked List, Queue Implementation - Queue using Stack

UNIT II BINARY TREE AND HASHING **10**

Binary Tree - Types of Binary Tree, Balanced Tree, Degenerate or pathological Tree, Binary Search Tree, Inorder , Preorder , PostOrder and Level Order Traversal, Hashing, Linear Probing for Collision Handling, Union and Intersection of two Linked Lists

UNIT III TREES AND GRAPH **10**

AVL Tree -Right-Left Imbalance, Left and Right Rotation, - Red Black Tree, Rules of coloring Left and Right Rotation, Graph terminology –Representation of graphs –Path matrix –Graph Traversal –BFS (breadth first search) –DFS (depth first search) –Minimum spanning Tree –Kruskal's Algorithm & Prim's Algorithm –Warshall's algorithm (shortest path algorithm).

UNIT IV BASICS OF TENSOR FLOW **8**

Tensors- Create a Tensor - Tensor Operations - The nn. Module -A word about Layers - Datasets and Data Loaders - Understanding Custom Datasets -

Understanding Custom Data Loaders.

UNIT V TRAINING A NEURALNETWORK **7**

Training a Neural Network - Loss functions - Custom Loss Function - Optimizers - Using GPU/Multiple GPUs

TOTAL : 45 PERIODS

REFERENCES

1. Weiss, Mark. A. (2012), Data structures and algorithm analysis in Java. 3 edition. Harlow, Essex : Pearson(632 p).
2 Zobel, Justin (2014), Writing for Computer Science. 3 edition. Springer Verlag London Ltd (270 p).

ONLINERESOURCES

1. https://www.tensorflow.org/guide/basics
2 https://www.javatpoint.com/tensorflow-introduction

COURSEOUTCOMES

Upon completion of this course, the students will be able to:

1. Understand Data abstraction and information hiding. (K2)
2. Learn linear data structures and their applications in problem solving and programming. (K3)
3. Learn non linear data structures and their applications in problemsolving and programming. (K3)
4. Understand Internal and external sort and search techniques. (K2)
5. Synthesize efficient algorithms in common engineering design situations. (K3)
6. Train and run the deep neural networks (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2		-	-	-	-	-	1	2	3	2
CO2	3	3	3	2	-	-	-	-	-	-	1	2	3	2
CO3	3	2	3	2	-	-	-	-	-	-	1	1	3	2
CO4	3	2	2	2	-	-	-	-	-	-	1	2	3	2
CO5	2	2	2	1	-	-	-	-	-	-	2	2	3	2
CO6	3	2	2	2	-	-	-	-	-	-	2	2	3	2

SEMESTER - VII

20CCPW701 SDG NO. 9	CRYPTOGRAPHY AND NETWORK SECURITY WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- To understand Cryptography Theories, Algorithms and Systems.

UNIT I INTRODUCTION **9**

Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT II: SYMMETRIC KEY CIPHERS **9**

Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT III CRYPTOGRAPHIC HASHFUNCTIONS **9**

Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

UNIT IV NETWORK AND INTERNETSECURITY **9**

Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls - Network Access Control and Cloud Security – Transport Level Security – Wireless Network Security – Email Security

UNIT V LABCOMPONENT – LISTOF EXPERIMENTS 24

1. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms:
   a) Ceaser Cipher b) Substitution Cipher c) Hill Cipher
4. Write a Java program to implement the DES algorithm logic
5. Write a Java program to implement RSA Algoithm
6. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: CK Shyamala, N Harini, Dr T R Padm anabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security :Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the concepts of Network Security and Remember the various mathematical techniques applied in Cryptography (K2)
2. Discuss the mathematical formulas used to implement symmetric key cryptography techniques (K2)

3. Understand and analyze public key cryptosystems (K3)
4. Analyze and design hash, MAC algorithms and digital signatures. (K3)
5. Understand the key management and distribution schemes (K2)
6. Understand the network security concepts, protocols and application (K2)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2							2		2	2	
CO2	2	2	2							2		2	2	
CO3	2	2	2							2		2	2	
CO4	2	2	2							2		2	2	
CO5	2	2	2							2		2	2	
CO6	2	2	2							2		2	2	

SEMESTER - VII

20CSPC701 SDG NO. 9	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To describe the basic concepts of Big Data Characteristics and Analytics
- To examine the Hadoop and MapReduce framework for processing large volume of data sets
- To demonstrate Hive, Pig, MongoDB and Report generation
- To analyze the Big Data for useful Business applications and get familiarized with the Visualization

UNIT I INTRODUCTION TO BIG DATAANALYTICS 9

Classification of Digital Data - Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Why Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop Environment - Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics importance - Data Science - Data Scientist - Terminologies used in Big Data Environments - Basically Available Soft State Eventual Consistency - Top Analytics Tools.

UNIT II HADOOP AND MAPREDUCE PROGRAMMING 9

Hadoop: Features – Advantages – Versions – Ecosystems – Distributions – Hadoop Versus RDBMS - Distributed Computing Challenges – History - Hadoop Overview - Use Case of Hadoop - Hadoop Distributors - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem – MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

UNIT III DATA PROCESSING SERVICES: HIVE & PIG 9

Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub-Query – Joins – Aggregation - Group By and Having - RCFile Implementation - Hive User Defined Function - Serialization and Deserialization - Hive Analytic Functions - Pig: Introduction - History and Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive.

UNIT IV NOSQL: MONGODB ANDJASPER REPORTS 9

NoSQL Databases: Advantages - Usage - Vendors - New SQL - Comparison of SQL, NoSQL and NewSQL - MongoDB: Why Mongo DB - Terms used in RDBMS and MongoDB - Data Types - MongoDB Query Language Methods: Insert - Save - Update - Remove - Find - NULL - Count - Limit- Sort - Skip - Arrays - Aggregate - MapReduce - Cursors in MongoDB - Indexes - Import and Export - Jasper Report using Jaspersoft - Connecting to MongoDB NOSQL Database.

UNIT V FRAMEWORKS ANDVISUALIZATION 9

Apache Hbase - Architecture/Storage - Features - Data Model - Shell and Implementation - Hbase Vs RDBMS - Zookeeper - Installation and Configuration - Running Zookeeper - Sqoop - Architecture - Import and Export Data – Sqoop Job - Flume - Log Collection - Working with Twitter Stream - Oozie - Simple and Complex Flow - Components - Service/Scheduler - Workflow - Apache Spark - Lambda Architecture - Spark Streaming - Spark Processing - Apache Kafka - Operations - Visualizations - Visual Data Analysis Techniques - Interaction Techniques.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition, 2015.
2. TomWhite, "Hadoop:The Definitive Guide", 3rd Edition, O'Reilly, 2012.

REFERENCES:

1. Seema Acharya, “Data Analytics using R”, McGraw Hill Publications, New Edition, 2018.
2. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, “Big data for dummies”, John Wiley & Sons, Inc. , 2013.
3. Donald Miner, “Map Reduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems”, O'Reilly Media, 2012.
4. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, 1 st Edition, Packet Publishing Limited, 2013.
5. Kyle Banker, “Mongo DB in Action”, Manning Publications Company, 2012.

WEB REFERENCES:

1. https://www.mongodb.org
2. https://hadoop.apache.org/
3. https://hive.apache.org/
4. https://pig.apache.org/
5. https://community.jaspersoft.com

OUTCOMES:

Upon completion of the course, the students should be able to

1. Describe the characteristics and challenges of big data analytics (K2)
2. Apply Hadoop and MapReduce framework for processing massive volume of data (K3)
3. Use Hive and Pig to demonstrate the structured and semi structured data (K3)
4. Illustrate CRUD operations using MongoDB and Report generation using Jaspersoft studio (K3)
5. Explore the usage of Hadoop and its integration tools to manage Big Data and Use Visualization techniques (K3)
6. Apply suitable frameworks and NoSQL Database to solve the real time problems. (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	1	3	-	-	-	-	3	-	-	2	2
CO3	3	3	3	3	3	-	-	-	2	3	1	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	-	-	-	-	2	2	2	3	2
CO6	3	3	3	3	3	-	-	-	-	2	2	3	3	2

SEMESTER - VII

20ITPC601 SDG NO. 4	CLOUD COMPUTING AND VIRTUALISATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concept of cloud computing
- To understand virtualization concepts
- To appreciate the emergence of cloud technologies and advancements
- To learn the concepts of Container Networking, Docker and Kubernetes

UNIT I INTRODUCTION 9

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT II VIRTUALIZATION 9

Basics of Virtualization – Types of Virtualization – Implementation levels of Virtualization – Load Balancing and Virtualization - Understanding Hypervisors - Virtualization Structures – Tools and Mechanisms – Full Virtualization vs Para Virtualization - Virtualization of CPU – Memory – I/O Devices –Virtual Clusters and Resource Management - Physical Vs Virtual Clusters-Live Migration-Migration of Memory, Files and Network Resources-Dynamic Deployment of virtual Clusters-Virtualization for Data Center Automation.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service –

Advantages of Cloud Storage – Cloud Storage Providers – S3 - Disaster Recovery.

UNIT IV CLOUD TECHNOLOGIES AND ADVANCEMENTS 9

Hadoop– MapReduce – Virtual Box - Cloud Platforms in Industry-Google App Engine – Programming Environment for Google App Engine –Microsoft Azure – Amazon Web Services- Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

UNIT V CONTAINER NETWORKING, DOCKER AND KUBERNETES 9

Motivation-The Container Networking Stack-Introduction to Container Networking-Single Host Container Networking-Modes for Docker Networking-Multi Host Networking -Multi Host Container Networking-Docker Networking- Kubernetes Networking – A Gentle Kubernetes Introduction - Overview - Intra-Pod Networking - Inter-Pod Networking - Service Discovery in Kubernetes - Ingress and Engress - Advanced Networking Topics in Kubernetes.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, 2017.

REFERENCES:

1. Michael Hausenblas,“Container Networking From Docker to Kubernetes”, O'Reilly Media, 2018.
2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi,”Mastering Cloud Computing'', Tata McGraw Hill”, 2013.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach ”, Tata McGraw Hill, 2009.
4. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond(Theory in Practice) ”, O'Reilly, 2009.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs64
2. https://www.edx.org/learn/cloud-computing

ONLINE RESOURCES:

1. https://www.cse.iitb.ac.in/~abhirup09/Docs/cloud_computing_final_report.pdf
2. https://www.netdevgroup.com/online/courses/virtualization/cloud-and-virtualization-concepts

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand key technologies, strengths and limitations of cloud computing (K1)
2. Explore the importance of virtualization and usage of different types of virtualization (K2)
3. Recognize the core issues in cloud resource management(K1)
4. Learn different types of cloud services and cloud storage (K1)
5. Apply the various current cloud technologies (K3)
6. Interpret concepts of Container Networking, Docker and Kubernetes (K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	2	-	-	-	-	3	1	3	1
CO2	3	3	3	2	2	2	-	-	-	-	3	1	3	1
CO3	2	3	2	2	3	2	-	-	-	-	3	1	3	1
CO4	3	3	2	3	3	2	-	-	-	-	3	1	3	1
CO5	3	3	2	3	3	2	-	-	-	-	1	1	1	1
CO6	3	3	2	3	3	2	-	-	-	-	1	1	1	1

SEMESTER - VII

20CCPC701 SDG NO. 4	MOBILE COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the basic concepts of mobile computing
- Understand Wireless LAN, Bluetooth and WiFi Technologies
- Be familiar with the network protocol stack
- Learn the basics of mobile telecommunication system

- Beexposed to Ad-Hoc networks

UNIT I INTRODUCTION **9**

Introduction to Mobile Computing — Applications of Mobile Computing-Generations of Mobile Communication Technologies-MAC Protocols — SDMA-TDMA- FDMA- CDMA

UNIT II MOBILE TELECOMMUNICATION SYSTEM

GSM — Architecture — Protocols — Connection Establishment — Frequency Allocation — Routing — Mobility Management — Security –GPRS- UMTS-Architecture

UNIT III WIRELESS NETWORKS **9**

Wireless LANs and PANs — IEEE 802.11 Standard — Architecture — Services — Blue Tooth- Wi-Fi — WiMAX

UNIT IV MOBILE NETWORK LAYER

Mobile IP — DHCP — AdHoc– Proactive and Reactive Routing Protocols — Multicast Routing- Vehicular Ad Hoc networks (VANET) –MANET Vs VANET— Security

UNIT V MOBILE TRANSPORTAND APPLICATION LAYER

Mobile TCP– WAP — Architecture — WDP — WTLS — WTP –WSP — WAE — WTA Architecture — WML

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHILearning Pvt.Ltd, New Delhi– 2012

REFERENCES:

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobilesystems",Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3. William.C.Y.Lee, "Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,Tata Mc Graw Hill Edition ,2006.
4. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
5. Android Developers : http://developer.android.com/index.html

6. Apple Developer : https://developer.apple.com/
7. Windows Phone Dev Center : http://developer.windowsphone.com
8. BlackBerry Developer : http://developer.blackberry.com

OUTCOMES:

At the end of the course, the student should be able to:

1 Understand the basics of mobile telecommunication system (K2)
2 Illustrate the generations of telecommunication systems in wireless network (K2)
3 Understand the architecture of Wireless LAN technologies (K2)
4 Determine the functionality of network layer and identify a routing protocol for a given Ad hoc networks (K2)
5 Determine the functionality of Transport Layer (K2)
6 Demonstrate the working of Application layer (K2)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	-	3	2	1	-	1	-	1	3	2	2
CO2	3	2	2	-	2	2	1	-	1	-	1	3	2	2
CO3	2	2	2	-	2	2	1	-	2	-	2	3	2	2
CO4	3	3	2	-	2	3	1	-	1	-	1	3	2	2
CO5	3	2	2	-	2	3	2	-	2	-	2	3	2	2

SEMESTER - VII

20HSMG601 SDG NO. 4	PRINCIPLES OF ENGINEERING MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Enable the students to study the evolution of Management
- Study the functions and principles of management
- Learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Management – Science or Art – Manager Vs Entrepreneur – types of managers – Engineers as Managers. Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current issues and future trends in Management; Industry 4.0 – Engineering management in modern business.

UNIT II PLANNING 9

Planning, Technology Planning - Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – MBO – process - Principles and functions of engineering management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

UNIT IV DIRECTING and CONTROLLING 9

Foundations of individual and group behaviour – Motivation – theories and techniques–Leadership – Level 5 leadership - theories – Leadership as a determinant of Engineering management - Communication – process and barriers – effective communication – Communication and IT - System and process of controlling – budgetary and non-budgetary control techniques.

UNITV INNOVATION AND TECHNOLOGY MANAGEMENT 9

Innovation management of Product and Services, Role of R & D in Entrepreneurship, Breakthrough Innovation, Disruptive Innovation – Modern approaches in Engineering management – Green management, Lean management, Managing diversity. IPR – Principles of Ethics for Engineering Managers.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Tripathy PC and Reddy PN, Principles of Management, Tata McGraw Hill, 1999.

REFERENCES:

1. Stephen P. Robbins and Mary Coulter, Management, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert Management, Pearson Education, 6th Edition, 2004.
3. Stephen A. Robbins and David A. Decenzo and Mary Coulter, Fundamentals of Management Pearson Education, 7th Edition, 2011.
4. Robert Kreitner and MamataMohapatra, Management, Biztantra, 2008.
5. Harold Koontz and Heinz Weihrich Essentials of management Tata McGraw Hill,1998.

WEB RESOURCES:

1. https://www.managementstudyguide.com/organizationmanagement.htm
2. https://nptel.ac.in/courses/110/105/110105034/
3. https://courses.lumenlearning.com/boundless-management/chapter/principles-of-management/

ONLINERESOURCES:

1. https://nptel.ac.in/courses/110/105/110105033/

OUTCOMES:

Upon completion of the course, the students should be able to

1. Understand the evolution and basic concepts of engineering management. (K2)
2. Demonstrate the planning concepts for effective decision making process. (K2)
3. Describe the basic concepts of organization and its function. (K2)

4. Describe the ability to direct, leadership and communicate effectively. (K2)
5. Apply the concepts of innovation and technology management (K3)

CO – PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	2	3	3	2	1	1	1	-	1
CO2	3	2	-	2	1	3	-	1	1	1	1	1	-	1
CO3	3	1	-	1	1	1	1	-	1	1	1	1	-	1
CO4	3	2	-	1	1	1	-	-	1	1	1	1	-	1
CO5	3	1	-	1	-	-	1	-	1	1	1	1	-	1

SEMESTER - VII

20CSPL701 SDG NO. 4	BIG DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To implement MapReduce programs for processing Big Data
- To analyze Big Data using Hive and Pig
- To realize storage of Big Data using MongoDB and Hbase
- To develop Big Data applications for streaming data using Apache Spark

LIST OF EXPERIMENTS :

1. Install, configure and run Hadoop and HDFS.
2. Implement word count / frequency programs using MapReduce.
3. Implement an MR program that processes a weather dataset.
4. Implement an application using Hive/Pig.
5. Visualize data using any plotting framework.
6. Implement an application that stores big data in Hbase / MongoDB using Hadoop/R.
7. Install, deploy and configure Apache Spark cluster. Run an application using Apache Spark.

TOTAL: 45 PERIODS

LABREQUIREMENTS :

1. Hadoop / R
2. Hive and Pig
3. Hbase
4. MongoDB
5. Apache Spark

OUTCOMES:

On completion of this laboratory course, the students should be able to

1. Demonstrate Big Data using Hadoop framework (K3)
2. Implement Map Reduce framework for processing big data (K3)
3. Perform Data Analysis using Hive/Pig (K3)
4. Use NoSQL database to Store and retrieve the data (K3)
5. Perform Graphical Data Analysis (K3)
6. Apply Apache Spark to build big data applications (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	-	3	-	-	-	-	-	-	-	3	1
CO2	3	3	3	3	3	-	-	-	-	2	-	1	2	2
CO3	1	3	3	3	3	-	-	-	-	2	-	1	1	2
CO4	1	3	3	3	3	-	-	-	-	2	-	1	3	2
CO5	1	1	1	1	3	-	-	-	-	3	-	1	3	2
CO6	3	3	3	3	3	-	-	-	-	3	-	1	3	2

SEMESTER - VII

20CCPJ701 SDG NO: 4, 6,7,8, 9,11,12,13, 17	PROJECT PHASE-I	L	T	P	C
		0	0	4	2

OBJECTIVES:

- Identify and describe the problem and scope of project
- Collect, analyze and present data into meaningful information using relevant tools
- Select, plan and execute a proper methodology in problem solving, work independently and ethically
- Present the results in written and oral format effectively and identify basic entrepreneurship skills in project management

GUIDELINES TO BE FOLLOWED:

The students may be grouped into 2 to 3 and work under a project supervisor and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor (faculty member). The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by External and Internal examiners constituted by the Head of the Department. The Project Work Phase-I will have the following sequence:

I. Problem Identification

1. A statement of system / process specifications proposed to be developed(Block Diagram / System Architecture / Process Flow)
2. Feasibility Study
3. List of possible solutions including alternatives and constraints
4. Time Line of activities

II. A report highlighting the design finalization [based on functional requirements and standards (if any)]

III. A presentation including the following:

1. Literature survey on existing system
2. Implementation Phase (Hardware &Software)
3. Testing and Validation of the developed system

IV. Consolidated report preparation

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

1. Comprehend an industrial or real life problem and identify right/ real issue with solution. (K2)
2. Analyze the necessary studies and review the literature, design a setup of equipment, complete the analysis. (K3)
3. Compose a project report based on the findings. (K6)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	2	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - VII

20CCTP701 SDG NO. 4 & 9	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE REFRESHER & APTITUDE COMPANY SPECIFIC TRAINING SKILLS – PHASE 1

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.

UNIT I PRODUCT COMPANY SPECIFIC TRAINING – I **10**

Product Specific Training for Amazon, Microsoft, IBM, Though tWorks, Juspay, Paypal, Mu Sigma, Zoho Corporation, VM Ware, Directi, Oracle, Wells Fargo, Goldman Sachs, Chargebee, Coda Global, Temenos, Freshworks, Adobe Systems.

UNIT II PRODUCT COMPANY SPECIFIC TRAINING – II **10**

Product Specific Training for Ernst and Young, BA Continuum, Standard Chartered, AON Hewitt, Soliton Technologies, Payoda Technologies, Infoview Technologies, Athena Health Technology.

UNIT III SERVICE COMPANY SPECIFIC TRAINING - I **10**

TCS, Wipro, TechMahindra, InfoView, RobertBosch, , NTT Data, Verizon, Payoda Technologies.

UNIT IV SERVICE COMPANY SPECIFIC TRAINING - II **10**

CTS, Accenture, MindTree, MPhasis, Odessa Technologies, Vuram Technologies, Hewlett Packard, HCL.

UNIT V SERVICE COMPANY SPECIFIC TRAINING - III **5**

Capgemini, Infosys, IBM, UGAM Solutions, Skava Systems, L&T Infotech, Bahwan Cybertech, Dhyan Infotech.

TOTAL : 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. AModern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

APTITUDE & TECHNICAL REFRESHER & COMPANY SPECIFIC TRAINING AND MACHINE LEARNING - PHASE II

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.
- To understand basic of Machine Learning
- To understand methods of Machine Learning.
- To understand application of Machine Learning

UNIT I PRODUCT COMPANY SPECIFIC TRAINING – I **10**

Product Specific Training for Amazon, Microsoft, IBM, ThoughtWorks, Juspay, Paypal, Mu Sigma, Zoho Corporation, VM Ware, Directi, Oracle, Wells Fargo, Goldman Sachs, Chargebee, Coda Global, Temenos, Freshworks, Adobe

Systems., Ernst and Young, BA Continuum, Standard Chartered, AON Hewitt, Soliton Technologies, Payoda Technologies, Infoview Technologies, Athena Health Technology.

UNIT II PRODUCT COMPANY SPECIFIC TRAINING – II 10

Product Specific Training for TCS,Wipro,TechMahindra, InfoView, RobertBosch, NTT Data, Verizon, Payoda Technologies. CTS, Accenture, MindTree, MPhasis, Odessa Technologies, Vuram Technologies, Hewlett Packard, HCL.

UNIT III SERVICECOMPANY SPECIFIC TRAINING - I 10

Capgemini, Infosys, IBM, UGAM Solutions, Skava Systems, L&T Infotech, Bahwan Cybertech, Dhyan Infotech.

UNIT IV INTRODUCTION TO MACHINE LEARNING 7

Overview of machine learning, real world machine learning application, Machine learning techniques- work flow of classification- importing and preprocessing data, extract features, feature selection.

UNIT V MACHINE LEARNING TECHNIQUES 8

Supervised learning- classification, regression, Unsupervised learning- clustering, association, Machine Learning (ML) Algorithms: Decision tree, SVM algorithm, Random Forest, KNN algorithm. Application of machine learning– Image Recognition, Online fraud detection.

TOTAL : 45 PERIODS

REFERENCES :

1 Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2 Quantum CAT by Sarvesh Verma
3 AModern Approach to Logical Reasoning by R. S. Agarwal
3 Verbal Ability and Reading Comprehension by Arun Sharma
5 Bishop, C., "Pattern Recognition and Machine Learning", Springer, 2006.
6 Daume, H. III, "A Course in Machine Learning", 2015 (freely available online).

ONLINERESOURCES

1 https://onlinecourses.nptel.ac.in/noc22_cs73/course
2 https://www.simplilearn.com/tutorials/machine-learning-tutorial

OUTCOMES

Upon completion of this course, the students will be able to:

1 Enhance their quantitative ability. (K3)
2 Enhance their reasoningability.(K3)
3 Enhance their verbal ability. (K3)
4 Understand basics of ML. (K2)
5 Demonstrate various methods of machine learning. (K3)
6 Explore various application of ML (K2)

CO - PO- PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	3	2	2	1	3	2	1	2	3	2
CO2	2	3	3	2	3	2	2	1	3	2	1	2	3	2
CO3	2	2	2	1	2	2	2	1	2	2	-	2	3	2
CO4	2	2	1	-	-	-	-	-	-	-	-	-	3	2
CO5	3	2	2	1	1	-	-	-	-	-	1	2	3	2
CO6	3	3	3	2	1	-	-	-	-	-	1	2	3	2

SEMESTER - VIII

20CCPJ801 SDG NO. 4,6,7, 8, 9,11,12,13,17	PROJECT PHASE-II	L	T	P	C
		0	0	8	4

OBJECTIVES:

- Identify and describe the problem and scope of project
- Collect, analyze and present data into meaningful information using relevant tools
- Select, plan and execute a proper methodology in problem solving, work independently and ethically
- Present the results in written and oral format effectively and identify basic entrepreneurship skills in project management

GUIDELINES TO BE FOLLOWED:

The students may be grouped into 2 to 3 and work under a project supervisor and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor (faculty member). The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department. The Project Work Phase-II will have the following Sequence:

I. Problem Identification

1. List of possible solutions including alternatives and constraints
2. Cost benefit analysis
3. Time Line of activities

II. A report highlighting the design finalization [based on functional, non-functional requirements and standards (if any)]

III. A presentation including the following:

1. Implementation Phase (Hardware & Software)
2. Testing and Validation of the developed system
3. Learning in the Project and Future Enhancement

IV. Consolidated report preparation **TOTAL: 60 PERIODS**

OUTCOMES :

Upon completion of the course, the students should be able to

1. Comprehend an industrial or real life problem and identify right/ real issue with solution. (K2)
2. Analyze the necessary studies and review the literature, design a setup of equipment, complete the analysis. (K3)
3. Compose a project report based on the findings. (K6)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2

PROFESSIONAL ELECTIVE I

20CSPC501 SDG NO. 9	INTERNET PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand different Internet Technologies
- Be exposed to Java specific Web services architecture
- Create Dynamic Web Pages using different Scripting
- Build tools that assist in automating data transfer over the Internet.

UNIT I WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9

Web Essentials: Clients, Servers And Communication –World Wide Web – HTML5 – Tables – Lists – Image – HTML5 Control Elements – Semantic Elements – Drag And Drop – Audio – Video Controls - CSS3 – Inline, Embedded and External Style Sheets – Rule Cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II CLIENTSIDE PROGRAMMING 9

Java Script: An Introduction to JavaScript–Javascript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-In Objects-Event Handling- DHTML with Javascript- JSON Introduction – Syntax – Function Files – HTTP Request– SQL.

UNIT III SERVER-SIDEPROGRAMMING 9

Servlets: Java Servlet Architecture - Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV PHP 9

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database.

UNIT V XML and INTRODUCTION TO AJAX 9

XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation. AJAX: Ajax Client Server Architecture-XML HTTP Request Object-Call Back Methods.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Deitel and Deitel and Nieto, "Internet and World Wide Web- How to Program", Prentice Hall India Learning Pvt.Ltd, Fifth Edition, 2011.
2. Elliotte Rusty Harold, "Java Network Programming", O'Reilly Publishers, 2013.

REFERENCES:

1. Stephen Wynkoop and John Burke, " Running a Perfect Website", QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming – "Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, — "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.
5. Uttam K.Roy, "Web Technologies", Oxford University Press, 2011.

WEB REFERENCES:

1. https://www.brainkart.com/subject/Internet-Programming_173/
2. https://nptel.ac.in/courses/106105084/

ONLINERESOURCES:

1. https://www.udemy.com/course/the-web-developer-bootcamp/
2. https://www.coursera.org/specializations/web-design

OUTCOMES:

Upon completion of the course, the student should be able to

1. Construct a basic website using HTML and Cascading Style Sheets (K2)
2. Build dynamic web pages with validation using Java script objects and byapplying different event handling mechanisms. (K3)
3. Develop server side programs using Servlets and JSP.(K2)
4. Construct simple web pages in PHP.(K3)
5. Represent web data using XML and develop dynamic web page using AJAX.(K2)
6. Use web services to develop interactive web applications(K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	-	-	-	-	1	-	-	2	-	2
CO2	1	3	3	3	2	-	-	-	2	1	-	2	2	2
CO3	1	3	-	2	2	-	-	-	1	-	-	-	1	2
CO4	1	3	-	-	2	-	-	-	1	2	-	-	-	2
CO5	1	1	-	-	1	-	-	-	1	-	-	-		2
CO6	-	3	2	1	2	-	-	-	2	1	-	-	1	2

PROFESSIONAL ELECTIVE I

20CSEL501 SDG NO. 9	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Data Warehouse concepts, Architecture, Business Analysis and Tools
- To understand Data Preprocessing and Data Visualization techniques
- To study algorithms for finding Hiddenand Interesting patterns in Data
- To understand andapply various Classification and Clustering techniques

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING 9

Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support - Concept Hierarchies - Characteristics of OLAP Systems – Typical OLAP Operations - OLAP and OLTP.

UNIT II INTRODUCTION TO DATA MINING 9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – Applications- Data Objects and Attribute Types - Statistical Description of Data - Data Preprocessing – Cleaning - Integration - Reduction - Transformation and Discretization - Data Visualization - Data Similarity and Dissimilarity Measures.

UNIT III FREQUENT PATTERN ANALYSIS **9**

Mining Frequent Patterns - Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel - Multi Dimensional Space – Constraint Based Frequent Pattern Mining - Classification Using Frequent Patterns.

UNIT IV CLASSIFICATION AND CLUSTERING **9**

Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Lazy Learners – Model Evaluation and Selection - Techniques to improve Classification Accuracy - Clustering Techniques – Cluster Analysis - Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering – Clustering High Dimensional Data - Clustering with Constraints - Outlier Analysis - Outlier Detection Methods.

UNIT V DATA ANALYSIS TOOL **9**

Datasets – Introduction, Iris plants database, Breast cancer database, Auto Imports Database - Introduction to WEKA - Explorer – Getting started, Exploring the Explorer - Learning algorithms - Clustering algorithms - Association–Rule Learners.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
2. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw– Hill Edition, 35th Reprint 2016.

REFERENCES:

1. K.P. Soman, ShyamDiwakar and V. Ajay, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H.Witten and Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Elsevier, Second Edition, 2005.
3. Parteek Bhatia, "Data Mining and Data Warehousing: Principles and Practical Techniques", Cambridge University Press, 2019.
4. Pranjali Deshpande, Soudamini Patil, "Data Warehousing and Data Mining", First Edition, Technical Publications, 2020.
5. Dr. B. Shadaksharappa,Mr. P.Ramkumar,Dr. T.N. Prabakar, " Data Warehousingand Data Mining", First Edition, Book Rivers, 2022.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/105/106105174/00
2. https://swayam.gov.in/nd1_noc20_cs12/preview
3. https://freevideolectures.com/course/3609/data-warehousing

ONLINERESOURCES:

1. https://www.tutorialspoint.com/data_mining/index.htm
2. https://www.guru99.com/online-analytical-processing.html
3. https://www.cs.waikato.ac.nz/ml/weka/courses.html
4. https://www.tutorialspoint.com/weka/what_is_weka.htm

OUTCOMES:

Upon completion of the course, the student should be able to

1. Use a Data Warehouse system and perform Business Analysis with OLAP Tools.(K3)
2. Recognize and identify suitable Pre-processing and Visualization techniques for Data Analysis. (K1)
3. Apply frequent Pattern and Association Rule Mining techniques for Data Analysis. (K3)
4. Apply appropriate Classification techniques for Data Analysis. (K3)
5. Apply appropriate Clustering techniques for Data Analysis.(K3)
6. Use WEKA tools for feature selection, classification and clustering for real time data.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	-	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	-	2	2	2	3	3	3
CO4	3	3	3	3	2	2	1	-	2	3	3	3	2	2
CO5	3	2	3	2	3	2	2	-	2	2	2	3	2	3
CO6	3	2	3	2	3	2	2	-	2	2	2	3	2	3

PROFESSIONAL ELECTIVE I

20CCEL503 SDG NO. 4,9	EMBEDDED REAL TIME SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of embedded system design and analysis.
- To learn the architecture and programming of ARM processor
- To get exposed to the basic concepts of embedded programming
- To learn the real time operating systems
- To understand processes and performance of operating systems

UNIT I INTRODUCTION TO EMBEDDED SYSTEM DESIGN 9

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques - Designing with computing platforms – consumer electronics architecture – platform-level performance analysis.

UNIT II ARM PROCESSOR AND PERIPHERALS 9

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3MCU.

UNIT III EMBEDDED PROGRAMMING 9

Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization–Program level energy and power analysis and optimization–Analysis and optimization of program size-Programvalidation and testing.

UNIT IV REAL TIME SYSTEMS 9

Structure of a Real Time System – Real time communication-Network topology protocol - Estimating program run times – Task assignment and scheduling –Fault Tolerance Techniques – Reality, Evaluation – Clock synchronization.

UNIT V PROCESSES AND OPERATING SYSTEMS 9

Introduction – Multiple tasks and multiple processes – Multirate systems-Preemptive real- time operating systems- Priority based scheduling-

Interprocess communication mechanisms - Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE. - Distributed embedded systems - MPSoCs and shared memory multiprocessors. – Design Example - Audio player, Engine control unit – Videoaccelerator.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, V)
2. Jane W.S.Liu, "Real Time Systems", Pearson Education, Third Indian Reprint, 2003.(UNIT IV)

REFERENCES:

1. Lyla B.Das, "Embedded Systems: An Integrated Approach", Pearson Education, 2013
2. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rd Edition, Cengage Learning, 2012.
3. Arnold.S.berger, "Embedded System Design: An Introduction to processes Tools, & Techniques", CRC Press, 2017
4. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison Wesley Professional, 2007.
5. Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems- From Design to Networking with C/C++", Prentice Hall, 1999.
6. C.M.Krishna, Kang G.Shin, "Real-Time Systems", International Editions, McGraw Hill, 1997
7. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dream Tech Press, 2005.
8. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw Hill, 2004.

WEB REFERENCES:

1. https://developer.arm.com/ip-products/processors/classic-processors
2. https://spin.atomicobject.com/2015/08/19/learn-embedded-systems-programming/
3. http://www.ocfreaks.com/tag/lpc2148/
4. https://www.freertos.org/about-RTOS.html

ONLINE RESOURCES:

1. https://swayam.gov.in/nd1_noc20_cs15/preview
2. https://swayam.gov.in/nd1_noc20_cs16/preview

OUTCOMES:

Upon completion of the course, the student should be able to:

1 Describe the architecture of ARM processor(K2)
2 Understand the programming of the ARM processor(K2).
3 Outline the concepts of embedded systems(K1)
4 Analyze and validate the program (K3)
5 Explain the basic concepts of real time operating system design(K2)
6 Model real-time applications using embedded-system concepts(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	3	1	3
CO2	3	3	2	-	-	-	-	-	-	-	-	3	1	3
CO3	3	2	1	-	-	-	-	-	-	-	-	2	1	3
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	-	-	-	-	-	-	-	-	-	-	1	3
CO6	2	2	1	-	-	-	-	-	-	-	-	-	1	3

PROFESSIONAL ELECTIVE I

20CCEL504 SDG NO. 4	SYSTEM ON CHIP ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- This course introduces computer system design with emphasis on fundamental ideas, analytical techniques that are applicable to a range of applications & architectures, hardware and software programmability verses performance, entire memory organization, starch pads, cache memories andobjective in cachedata how to deal the write polices

UNIT I INTRODUCTION TO THE SYSTEM APPROACH 9

System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT II PROCESSORS **9**

Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT III MEMORY DESIGN FOR SOC **9**

A: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time,

B: Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

UNIT IV: Interconnects Customization and Configuration **9**

Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT V: Application Studies / Case Studies **9**

SOC Design approach, AES algorithms, Design and Evaluation, Image compression – JPEG compression.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Michael J. Flynn and Wayne Luk, “Computer System Design System on Chip”, Wiely India Pvt. Ltd., 2012.

REFERENCE BOOKS:

1. Steve Furber, “ARM System on Chip Architecture”, Addison Wesley Professional, 2nd Edition, 2000.
2. Ricardo Reis, “Design of System on a Chip: Devices and Components”, Springer, 1st Edition, 2004.

E-RESOURCES:

1. https://ieeexplore.ieee.org/document/1652898/
2. https://ieeexplore.ieee.org/document/5196691

3. https://dl.acm.org/citation.cfm?id=557024
4. https://nptel.ac.in/courses/108102045/10
5. https://freevideolectures.com/course/2341/embedded-systems/10

OUTCOMES:

After completion of the course, students will be able to:

1. Understand the basics of System on Chip and Platform based design.(K2)
2 Understand about SoC Design Methodology,hardware and software programmability versus performance.(K2)
3. Know about entire memory organization, starch pads, cache memories and objective in cache data how to deal with the write policies (K1)
4 Know how the system forms with the lot of component and has majority about system level interconnections.(K2)
5 Describe examples of applications and systems developed using a co-design approach.(K2)
6 Investigate new techniques for future systems. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2	2	1	-	1	-	2	-	1	2	3
CO2	1	3	1	-	-	-	2	3	-	1	2	-	2	3
CO3	-	2	3	3	2	2	-	-	3	-	-	2	2	-
CO4	1	3	-	-	1		3	-	1	2	3	-	1	3
CO5	2	-	2	-	-	2	-	2	-	2	-	3	3	-

PROFESSIONAL ELECTIVE I

20MGEL703 SDG NO. 9,12	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services.
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems.

- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification.
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics.
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer.

UNIT I FUNDAMENTALS OFPRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation

UNIT IV SUSTENANCE ENGINEERINGANDEND-OF-LIFE (EOL) SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - Sustenance -Maintenance and Repair – Enhancements - Product EoL - Obsolescence Management – Configuration Management - EoL Disposal.

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product Development in Industry versus Academia –The IPD Essentials - Introduction to Vertical Specific Product Development processes -Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Book specially prepared by NASSCOM asper the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, 5th Edition, 2011.
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, 11th Edition, 2005.

REFERENCES :

1. Hiriyappa B, “Corporate Strategy – Managing the Business”, Author House, 2013.
2. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, “Enterprise Resource Planning– Concepts”, 2nd Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, 7th Edition, 2013.

WEB REFERENCES:

1. https://www.udemy.com/course/strategic-product-management-and-leadership/
2. https://www.udemy.com/course/building-insanely-great-products/
3. https://www.coursera.org/learn/customer-insights-orientation

ONLINERESOURCES:

1. https://pursuite-production.s3-ap-southeast-1.amazonaws.com/media/cms_page_media/162/FSIPD+OBF+-+2012+F0_1.pdf
2. https:// futureskillsnasscom. edcast. com/ pathways/ product-management-primer-pathway/cards/5603673#

OUTCOMES:

Upon completion of the course, the students should be able to

1. Explain thebasic essentials ofproduct development. (K2)
2. Discuss the learnings to incorporate effective design for product development.(K2)
3. Describe the various tools of innovation & product development process in the Business context. (K2)
4. Identify the various process and choose the appropriate tools for designing, development and testing. (K2)
5. Discuss disruptive models / process to manage a product development from start to finish. (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2	1	1	-	-	2	-	-
CO2	3	3	3	3	2	1	1	-	3	-	2	-
CO3	3	2	3	3	3	1	2	1	3	-	2	3
CO4	3	3	2	3	2	-	-	-	-	2	-	-
CO5	3	3	3	3	2	1	2	1	3	-	3	-

PROFESSIONAL ELECTIVE I

20CSEL607 SDG NO., 9,16	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software
- To provide a good understanding of software design and a set of software technologies and APIs
- To do a detailed examination and demonstration of Agile development and testing techniques
- To understand Agile development and testing

UNIT I AGILE METHODOLOGY **9**

Theories for Agile Management – Agile Software Development – Traditional Model Vs Agile Model – Classification of Agile Methods – Agile Manifesto and

Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design - Testing – Agile Documentations – Agile Drivers - Capabilities and Values.

UNIT II AGILEPROCESSES 9

Lean Production – SCRUM, Crystal - Feature Driven Development - Adaptive Software Development – Extreme Programming - Method Overview – Lifecycle– Work Products - Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile Information Systems – Agile Decision Making – Earl's Schools of KM – Institutional Knowledge Evolution Cycle – Development - Acquisition - Refinement - Distribution - Deployment - Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITYAND REQUIREMENTS ENGINEERING 9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment - Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE 9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

REFERENCES:

1. Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.

2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth- Heinemann, 2007.
3. Jorgen Hesselberg, "Unlocking Agility: An Insider's Guide to Agile Enterprise Transformation", Addison – Wesley Signature Series, First Edition, 2018.
4. Mike Cohn, "Agile Estimating & Planning ", Pearson Education India, First Edition, 2006.
5. Roman Pichler, "Agile Product Management with Scrum", Pearson Education India, 2011

WEB REFERENCES:

1. http://www.umsl.edu/~sauterv/analysis/6840_f09_papers/Nat/Agile.html
2. https://www.classcentral.com/help/section/edx
3. https://nptel.ac.in/courses/110/104/110104073/
4. https://www.coursera.org/learn/software-processes-and-agile-practices

ONLINERESOURCES:

1. https://www.udacity.com/course/software-development-process--ud805
2. https://www.edx.org/course/agile-software-development

OUTCOMES:

Upon completion of the course, the students should be able to

1. Realize the importance of interacting with business stakeholders in determining the requirements for a software system.(K3)
2. Perform iterative software development processes.(K2)
3. Point out the impact of social aspects on software development success.(K2)
4. Develop techniques and tools for improving team collaboration and software quality.(K3)
5. Perform Software process improvement as an ongoing task for development teams.(K3)
6. Show how agile approaches can be scaled up to the enterprise level.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	-	1	1	-	-	-	1	2	2
CO2	2	2	1	2	2	-	3	1	-	-	-	1	2	2
CO3	2	2	3	2	2	1	1	2	-	-	-	1	2	3
CO4	1	1	3	2	2	-	1	1	-	-	1	1	2	2
CO5	3	3	1	2	2	-	1	1	-	-	-	1	2	2
CO6	3	2	2	1	-	-	-	1	1	2	-	1	2	2

PROFESSIONAL ELECTIVE I

20CCEL507 SDG NO.4	COMPUTATIONAL LINGUISTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals required for computational Linguistics
- To understand the speech recognition and various Linguistic models
- To understand theconcept of Syntactic Analysis
- To understand the role of semantics and pragmatics
- To understand the discourse analysis and applications of Computational Linguistics

UNIT I INTRODUCTION 9

Computers in Linguistics-Issues-Motivation-Theory of Language-Features of Indian Language-Issues in Font-Coding Techniques -Language modeling:- Grammar - based LM- Statistical LM-Regular expressions, Finite State Automata - English Morphology, Transducers for lexicon and rules, Tokenization- Detecting and Correcting spelling Errors, Minimum edit

UNIT II SPEECHANDPROBABILISTIC MODELS 9

Speech-Phonetics-Speech Synthesis-Automatic Speech Recognition-Speech Recognition:-Advanced topics-Computational Phonology- Weighted Automata- N-grams, Evaluating N-grams- Corpus Analysis-Smoothing-Entropy-Part-of-Speech-Taggers-Issues in PoS tagging-Rule based- Hidden Markov models.

UNIT III SYNTACTIC ANALYSIS **9**

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for Grammar-Dependency Grammar-Syntactic Parsing, Ambiguity, Dynamic Programming Parsing-Shallow Parsing-Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs-Feature structures, Unification of feature Structures.

UNIT IV SEMANTICS ANDPRAMATICS **9**

Requirements for representation, First -order Logic, Description Logics-Syntax- Driven Semantic analysis, Semantic attachments - Word Senses, Relations between Senses, Thematic Roles, Selection algorithm restrictions-Word Sense Disambiguation, WSD using Supervised, Dictionary and Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS, LEXICAL RESOURCES AND APPLICATION **9**

Discourse Segmentation, Coherence-Reference Phenomena, Anaphora Resolution using Hobbs and Centring Algorithm-Coreference Resolution-Resources: Porter Stemmer ,Lemmatizer, Penn Treebanks, Brill's Tagged, WordNet, PropBank, FrameNet, Brown Corpus- Information Extraction-Question Answering and Summarization-Dialogue and Conversational Agents

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Daniel Jurafsky,James H.Martin- “Speech and Language processing:An Introduction to Natural Language Processing, Computational Linguistics and Speech”,Pearson Publication,2014.
2. Ronald Hausser “Foundations of Computational Linguistics”, Springer-Verleg,1999.
3. Steven Bird,Ewan Klein and Edward Loper “Natural Language Processing with Python”,First Edition, OReilly Media,2009.

REFERENCES:

1. Breckenridge Baldwin”Language Processing with Java and Lingpipe Cookbook”, Atlantic Publisher, 2015.
2. Richard M Reese “Natural Language Processing with Java, OReiliey Media,2015.
3. Nitin Indurkhya and Fred J.Damerau,”Handbook of Natural Language Processing”,Second Edition,Chapman and Hall/CRC Press,2010.

4. Tanveer Siddiqui,U.S.Tiwary " Natural Language Processing and Information Retrieval", Oxford University.

WEB REFERENCES:

1. http://www.cse.iitb.ac.in/-cs626-449
2. https://web.standford.edu/jurafsky/slp3/
3. http://www.linguisticsociety.org/files/languagebegin.pdf

ONLINE RESOURCES:

1. www.nlp.standford.edu

OUTCOMES:

Upon completion of the course, the student should be able to:

1 Tag a given text with basic Language features. (K2)
2 Design an innovative application. (K3)
3 Illustrate Speech and Probabilistic Models (K2)
4 Implement a rule based system to tackle syntax of a Language. (K3)
5 Design a tag set to be used for statistical processing for real-time applications. (K3)
6 Compare and contrast the use of different statistical approaches for different types of applications. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	2	2	1	2	1	1	2	2	3	3
CO2	3	3	3	3	3	2	2	2	2	2	2	2	3	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	3	3
CO4	3	3	3	3	3	2	2	2	2	2	2	2	3	3
CO5	3	3	3	3	3	2	2	2	2	3	2	2	3	3
CO6	3	3	3	3	3	2	2	2	2	3	2	2	3	3

PROFESSIONAL ELECTIVE I

20CCEL508 SDG NO.4,9	DISTRIBUTED DATABASE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the principal and foundation of distributed database.
- To learn the architecture, design issue and integrity control of distributed database.
- To learn the details of query processing and query optimization technique.
- To learn the concept of transaction management in distributed database.

UNIT I INTRODUCTORY CONCEPTS AND DESIGNOF (DDBMS) 9

Data Fragmentation; Replication; and allocation techniques for DDBMS; Methods for designing and implementing DDBMS, designing a distributed relational database; Architectures for DDBMS: cluster federated, parallel databases and client server architecture.

UNIT II QUERY PROCESSING 9

Overview of Query Processing: Query processing problem; Objectives of Query Processing; Complexity of Relational Algebra operations; characterization of Query processors; Layers of Query Processing; Translation of global queries.

UNIT III TRANSACTION MANAGEMENT 9

Introduction To Transaction Management: Definition of Transaction, Properties of Transaction, types of transaction ; Distributed Concurrency Control: Serializability theory; Taxonomy of concurrency control mechanisms; locking bases concurrency control algorithms.

UNIT IV DISTRIBUTED OBJECT DATABASE MANAGEMENT SYSTEMS 9

Fundamental Object concepts and Object models; Object distribution design; Architectural issues; Object management; Distributed object storage; Object query processing.

UNIT V CURRENT TRENDS & DEVELOPMENTS RELATED TO DISTRIBUTED DATABASE APPLICATIONS TECHNOLOGIES 9

Distributed Object/component-based DBMS; Database Interoperability including CORBA; DCOM and Java RMI;Distributed document-based systems; XML and Workflow management.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Distributed Databases - Principles and Systems; Stefano Ceri; Guiseppe Pelagatti; Tata McGraw Hill; 1985.
2. Fundamental of Database Systems; Elmasri & Navathe; Pearson Education; Asia

REFERENCE BOOKS:

1. Database System Concepts; Korth & Sudarshan; TMH
2. Principles of Distributed Database Systems; M. Tamer Ozsu; and Patrick Valduriez Prentice Hall

OUTCOMES

On completion of the course students will be able to

1. Understand and describe internal algorithms in detail. (K2)
2 Identify and be able to use recent and advanced database techniques (K2)
3 Decide on configuration issues related to database operation and performance. (K2)
4 Summarize the concepts of Transaction Management (K3)
5 Analyze and optimize transactional code, identifying causes of possible anomalies and correct them. (K3)
6 Decide on optimization issues given a known database workload, by manipulating indexes, choosing more adequate data types, and modifying queries.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	2	3	1	-	-	-	2	2	3	2	3	2
CO2	1	2	3	2		-	-	-	-	-	2	2	2	2
CO3	2	3	2	2	1	-	-	-	-	-	-	1	2	1
CO4	2	3	2	2	2	-	-	-	-	-	-	1	2	2
CO5	2	3	2	2	2	-	-	-	-	-	2	2	2	2
CO6	2	3	2	2	2	-	-	-	-	-	2	2	2	2

PROFESSIONAL ELECTIVE I

20ECEL709 SDG NO.7	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To become familiar with digital image fundamentals.
- To get exposed to image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study image segmentation and representation techniques.
- To become familiar with image compression and recognition methods.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Colorimage enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes,

Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognitionbased on matching

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson, 3rd Edition , 2010, Fifth Edition.(Unit I – V)
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Pearson, 2002. (Unit I –V)

REFERENCES:

1. Kenneth R. Castleman, "Digital Image Processing", Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB", Pearson Education, Inc., 2011.
3. D,E. Dudgeon and R. M. Mersereau, "Multidimensional Digital Signal Processing", Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, "Digital Image Processing", John Wiley, New York,4th Edition,2007.
5. Milan Sonka, Vaclav Hlavac & Roger Boyle, "Image processing, Analysis and Machine Vision", Thomson Asia Prt. Ltd, 4th Edition, 2015.
6. Sid Ahmed M.A., "Image Processing - Theory, Algorithm and Architecture", McGraw Hill, 2009

WEB REFERENCES:

1. Introduction to sensors: http://www.shortcourses.com/sensors/
2. Digital Image Fundamentals:: http://www.ph.tn.tudelft.nl/Courses/FIP/Frames/fip.html
3. DIAL-Digital Image Analysis Laboratory http://www.ece.arizona.edu/~dial/
4. JPEG image compression standard: www.jpeg.org

ONLINE RESOURCES:

1. https://www.tutorialspoint.com/dip/image_processing_introduction.htm
2. https://sisu.ut.ee/imageprocessing/book/1

OUTCOMES:

Upon completion of the course, the student should be able to:

1 Summarize the digital image acquisition concepts and color model fundamentals (K2).

2 Elaborate the image enhancement techniques in spatial and 2D

transform domain (K3).

3 Describe image degradation models and filtering techniques (K3).

4 Discuss types of image segmentation techniques and morphological operators (K2).

5 Identify image compression techniques (K2).

6 Utilize to represent image in form of boundary and regional descriptors (K2).

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	3	2	-	-	-	-	-	2	2	2	1
CO3	2	2	2	2	2	-	-	-	-	-	2	2	2	1
CO4	2	1	2	3	2	-	-	-	-	-	2	-	2	1
CO5	2	2	2	2	2	-	-	-	-	-	2	2	2	1
CO6	3	1	2	2	2	-	-	-	-	-	3	2	2	1

PROFESSIONAL ELECTIVE I

20CCEL510 SDG NO.4,9	SENSOR NETWORKS AND IOT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explore the interconnection and integration of the physical world and the cyberspace
- To understand building blocks of Internet of Things and characteristics
- To design and develop IoT Device

UNIT I WIRELESS SENSOR NETWORKS FUNDAMENTALS 9

Wireless medium access issues MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wake Up Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols (CSMA, PAMAS) Schedule based protocols (LEACH, SMACS, TRAMA) .

UNIT II ADDRESSING AND ROUTING MECHANISM 9

Address and Name Management in WSNs, Assignment of MAC Addresses

Routing Protocols- Energy-Efficient Routing,Geographic Routing, Hierarchical networks by clustering. Sensor deployment & Node discovery Data aggregation & dissemination .

UNIT III FUNDAMENTALS ON IOT **9**

Definition of IoT and Characteristics of IoT- Physical and logical design of IoT-Functional blocks of IoT Communication models &APIs: Internet connectivity, Internet-based communication,IPv4,IPv6,6LoWPAN protocol, IP Addressing in the IoT, Applicationlayerprotocols: HTTP,HTTPS,FTP,TELNET and ports.

UNIT IV M2M COMMUNICATION AND IoT **9**

M2M communication and Modified OSI Model for the IoT/M2M Systems -Data enrichment, data consolidation and device management at IoT/M2M - Gateway Web communication protocols used by connected IoT/M2M devices - Message communication protocols (CoAP-SMS, CoAP-MQ, MQTT,XMPP)for IoT/M2M devices .

UNIT V IoT PROTOTYPING AND SECURITY **9**

Introduction to Prototyping Embedded device software -Programming Embedded Device Arduino Platform using IDE -Reading data from sensors and devices, Devices-Gateways Internet and Web/Cloud services software development -Introduction to IoT privacy and security Vulnerabilities-security requirements and threat analysis- Domain specific applications of IoT

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach", Orient BlackSwan
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley

RECOMMENDED BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, Rowan Trollope, "IoT Fundamentals : Networking Technologies, Protocols and Use Cases for the Internet of Things", Pearson
2. C. Siva Ram Murthy, B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall

OUTCOMES:

Upon completion of the course, the student should be able to:

1 Understand the basic Protocols in Wireless Sensor Networks (K2)

2 Discuss the Addressing and Routing Mechanism of Wireless Sensor Networks (K2)
3 Understand the basic concepts of the Internet of Things (K2)
4 Describe the M2M Communication Protocols & IoT (K2)
5 Demonstrate the IoT applications in different domains on Embedded Platform (K3)
6 Interpret the Security Features of IoT (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	2	2	1	-	1	1	1	2
CO2	2	1	2	-	1	2	1	-	-	1	-	1	2	2
CO3	2	2	2	2	1	3	2	-	2	3	-	2	2	2
CO4	3	2	1	-	2	1	2	2	1	3	1	2	1	2
CO5	3	3	2	2	3	1	3	1	3	1	2	1	1	2
CO6	2	1	1	2	1	3	2	2	2	1	1	1	2	1

PROFESSIONAL ELECTIVE I

20CSEL504 SDG NO.4	FOUNDATION OF DATA SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Able to apply fundamental algorithmic ideas to process data.
- Learn to apply hypotheses and data into actionable predictions.
- Document and transfer the results and effectively communicate the findings using visualization techniques.

UNIT I INTRODUCTION TO DATA SCIENCE **9**

Data Science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.

UNIT II MODELING METHOD **9**

Choosing and evaluation models – mapping problems to machine learning,

evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and Logistic regression – unsupervised methods.

UNIT III INTRODUCTION TO R **9**

Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution

UNIT IV MAP REDUCE **9**

Introduction – distributed file system – algorithms using map reduce, Matrix Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture- Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution

UNIT V DELIVERING RESULTS **9**

Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters. Case studies

TOTAL: 45 PERIODS

TEXT BOOK:

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.

REFERENCES:

1. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley &Sons, Inc., 2012.
2. W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”, Network Theory Ltd, Second Edition, 2013.
3. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “Practical Data Science Cookbook”, Packet Publishing Ltd., 2014.
4. Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley, 2011.
5. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015

WEB REFERENCES

1. http://www.johndcook.com/R_language_for_programmers.html

2. http://bigdatauniversity.com/
3. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction

ONLINE RESOURCES:

1. https://freevideolectures.com/search/foundation-of-data-science/
2. https://www.simplilearn.com/big-data-and-analytics/senior-datascientist-masters-program-training

OUTCOMES:

Upon completion of the course, the student should be able to

1. Develop to obtain, clean/process and transform data. (K1)
2. Analyze and interpret data using an ethically responsible approach. (K3)
3. Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues. (K3)
4. Apply computing theory, languages and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses. (K3)
5. Formulate and use appropriate models of data analysis to solve hidden solutions to business-related challenges. (K2)
6. Employ the techniques related to the area of data science in several statistical analysis methods. (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	-	2	-	-	-	-	2	2	3	2
CO2	3	1	3	2	-	2	-	-	-	-	2	2	3	2
CO3	3	1	3	2	-	2	-	-	-	-	2	2	3	2
CO4	3	1	3	2	3	2	-	-	-	-	2	2	3	2
CO5	3	1	3	2	3	2	-	-	2	3	2	2	3	2
CO6	3	1	3	2	3	2	-	-	2	3	2	2	3	2

PROFESSIONAL ELECTIVE I

20MGEL501 SDG NO.4	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To get an introductory insight about the IPR in national and international context.
- To understand the procedures for IPR, registration and its enforcement.

UNIT I INTRODUCTION **9**

Intellectual property: Introduction, Meaning, Nature and significance types of intellectual property, importance of intellectual property rights, Protection of human innovations by IPR such as Patents, Trademarks, Copyright, Industrial Designs Geographical Indications, and Trade Secrets

UNIT II AGREEMENTS AND TREATIES **9**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, General agreement on trade and tariff (GATT), Ben convention, Rome convention, Role of WTO and WIPO

UNIT III PATENTS **9**

Concept of Patent – Historical view of Patent system in India and International Scenario, patent searching process, ownership rights and transfer, compulsory licenses, Procedure for filing of patents, Grants of patent, Benchmarks for patentability of inventions, Recent key changes and development

UNIT IV TRADEMARKS AND COPYRIGHTS **9**

Concept of Trademarks and copyrights – Rationale behind the protection Purpose, function and acquisition, ownership issues, Procedure for Registration, Industrial design and integrated circuits, protection of geographical indications and plant varieties, Recent Trends in copyrights and Trademark., Trade secrets -liability for misappropriations of trade secrets

UNIT V LEGAL ASPECTS AND NEW DEVELOPMENTS **9**

Infringements of patents– Criteria of Infringement – Modes of Infringement remedies and modification Protection against unfair competition, enforcement of intellectual property rights, Intellectual property audits, new developments of intellectual property, Impact of international instruments relating to the protection of intellectual properties Future of IPR in National and International

levels.

TOTAL: 45 PERIODS

TEXT BOOK:

1. S.V. Satarkar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
3. P.Narayanan, Intellectual property rights Eastern law house-2018 3rd Edition (revised and updated)
4. Deborah, E. Bouchoux, Intellectual property right, Cengage learning2018 5th Edition

REFERENCES:

1. Sterling, J. L. A., World copyright law, (2008) 3rd Edition, London, Sweet & Maxwell
2. GP Reddy, Intellectual property rights & other laws, Gogia law agency
3. Barrett, Margreth, Intellectual Property, (2009) 3rd Edition, New York Aspen publishers
4. Inventing the Future: An introduction to Patents for small and medium sized Enterprises; WIPO publication
5. Cornish, William Intellectual Property: Patents, Copyright, Trademarks and allied rights, (2010) 7th Edition, London Sweet & Maxwell.
6. Kankanala and Kalyan.C : Indian Patent Law and Practice (2010), India, Oxford University Press

WEB REFERENCES

1. https://www.wipo.int/edocs/lexdocs/laws/en/ws/ws020en.pdf
2. http://caaa.in/Image/34_Hb_on_IPR.pdf
3. http://www.ipindia.nic.in/patents.htm
4. http://www.ipindia.nic.in/trade-marks.htm
5.https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627956/IP-Rights-in-India.pdf
6.https://economictimes.indiatimes.com/small-biz/resources/startuphandbook/intellectual-property-rights-registration/articleshow/ 59126802.cms?from=mdr

ONLINE RESOURCES:

1. https://www.coursera.org/learn/introduction-intellectual-property
2. https://www.edx.org/course/intellectual-property-law-and-policypart-1
3. https://www.classcentral.com/tag/intellectual-property
4. https://swayam.gov.in/nd1_noc19_mg58/preview

OUTCOMES:

Upon completion of the course, the student should be able to

1 Describe the concepts of Intellectual property rights. (K2)
2 Explain the agreements and treaties of Intellectual property rights. (K2)
3 Identify the needs and avenues for patents. (K2)
4 Discuss the necessity of Trade marks and Copy rights. (K2)
5 Explain the legal context and developments of Intellectual property rights. (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	-	1	1	1	1	1	-	-	1	2	1
CO2	3	1	3	1	2	-	1	1	-	-	-	1	2	1
CO3	1	1	2	2	2	-	1	1	-	-	-	1	1	1
CO4	2	1	1	2	2	-	1	1	-	-	-	1	1	2
CO5	1	1	1	2	2	2	1	1	-	-	-	1	2	2

PROFESSIONAL ELECTIVE I

20ECEL504 SDG NO.4,9	ADVANCED COMMUNICATION SYSTEMS AND TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about modern communication systems and techniques
- To deal with Information theory and channel capacity
- To learn source and channel coding techniques
- To acquire knowledge about Television systems
- To understand Satellite systems & orbits

UNIT I MODERN COMMUNICATION SYSTEMS **9**

Introduction to modern communication system, techniques and frequency band allocation.

UNIT II INFORMATION THEORY **9**

Concept of amount of information, information units Entropy: marginal, conditional, joint and relative entropies, relation among entropies Mutual

information, information rate, channel capacity.

UNIT III SOURCE CODING AND CHANNEL CODING 9

Introduction to source coding and channel coding techniques, Shannon Fano coding, Shannon Fano Elias coding, Huffman coding, Parity check coding

UNIT IV BASIC CONCEPT OF TELEVISION SYSTEM 9

Image characteristics; Interlaced scanning, horizontal and vertical resolution, video bandwidth; Luminance and chrominance signals, composite video signal; TV camera; Transceiver architecture for TV; Smart TVs: Digital TV and video compression, HDTV, LED, LCD and Plasma TV

UNIT V BASIC CONCEPT OF SATELLITE COMMUNICATION SYSTEM 9

Introduction to satellite systems; Orbital period and velocity; Coverage angle and slant range; Satellite link design; Multiple access techniques used in satellite systems.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Haykin, S., "Communication Systems", Fourth Edition, John Wiley & Sons, 2001.
2. Tomasi W., "Advanced Electronic Communication Systems", Pearson/Prentice-Hall, Sixth Edition. 2004.

REFERENCES:

1. Kennedy G., Davis B., "Electronic Communication Systems", Tata McGrawHill, Fourth Edition 2008.
2. Proakias, J.G., and Salehi, M., "Communication Systems Engineering", Second Edition, Pearson Education. 2002
3. Roddy, D. and Coolen, V., "Electronic Communications", Fourth Edition Prentice-Hall of India 1997.
4. B.P.Lathi, "Modern Digital and Analog Communication Systems", Third Edition, Oxford University Press, 2007.
5. B.Sklar, "Digital Communications Fundamentals and Applications", Second Edition, Pearson Education, 2007.

WEB REFERENCES

1. https://nptel.ac.in/courses/108/102/108102117/
2. https://nptel.ac.in/courses/117/108/117108097/
3. https://www.udemy.com/share/102l8U/

ONLINE RESOURCES:

1. https://www.coursera.org/learn/information-theory
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer science/6-441-information-theory-spring-2016/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Discuss advanced communication systems and techniques (K2)
2. Demonstrate the measurement of Information theory and coding (K2)
3. Explain Channel capacity and Entropy of modern communication systems (K2)
4. Interpret the characteristics of television (K2)
5. Generalize the concept of satellite communication systems (K2)
6. Illustrate Smart TV systems (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	-	-	-	-	1	1	3	2
CO2	3	3	3	3	3	1	-	-	-	-	1	1	3	2
CO3	3	3	2	2	3	2	-	-	-	-	2	2	3	2
CO4	3	3	3	2	3	2	-	-	-	-	2	2	3	2
CO5	3	3	3	2	3	2	-	-	-	-	2	2	3	2
CO6	3	3	3	2	3	2	-	-	-	-	2	2	3	2

PROFESSIONAL ELECTIVE II

20CCEL601 SDG NO.4, 9, 11, 15	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Learn adhoc network and sensor network fundamentals
- To understand the wireless sensor architecture
- Have an in-depth knowledge on sensor network and design issues
- To understand the infrastructure establishment of sensor networks
- Have an exposure to mote programming platforms and tools

UNIT I OVERVIEW OF WIRELESS SENSORNETWORKS 9

Elements of adhoc Wireless Networks - Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

UNIT II ARCHITECTURES 9

Single node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING SENSORS 9

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols-Energy-Efficient Routing, Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Holger Karl, Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks - An Information Processing Approach", Elsevier, 2007.

REFERENCES:

1. Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks Technology, Protocols and Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Know the basics of Ad Hocnetworks and Wireless Sensor Networks (K2).
2. Explain the architecture and networking scenarios of Sensor Networks (K3).
3. To comprehend the functionalities of physical and data link layer with the knowledge of routing protocol (K3).
4. Illustrate the infrastructure establishment and network management (K4).
5. Demonstrate the OS used in Wireless Sensor Networks and build basic modules (K4).
6. Explain the sensor network platforms and the tools used to establish wireless connectivity (K2).

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	0	3	-	1	-	-	-	-	3	3	2	2
CO2	3	3	3	1	2	1	-	-	-	-	3	3	2	2
CO3	3	3	2	1	3	1	-	-	-	-	3	3	2	2
CO4	3	3	2	1	3	1	-	-	-	-	3	3	2	2
CO5	3	3	2	1	1	3	1	-	-	-	3	3	2	2
CO6	3	3	2	1	1	3	1	-	-	-	3	3	2	2

PROFESSIONAL ELECTIVE II

20ECEL701 SDG NO.4	COGNITIVE RADIO	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the evolving software defined radio and cognitive radio techniques and their essential functionalities.
- To study the basic architecture and standard for cognitive radio.
- To understand the physical, MAC and Network layer design of cognitive radio.
- To expose the student to evolve applications and advanced features of cognitive radio

UNIT I INTRODUCTION TO SOFTWARE-DEFINED RADIO AND COGNITIVE RADIO **9**

Evolution of Software Defined Radio and Cognitive radio: goals, benefits, definitions, architectures, relations with other radios, issues, enabling technologies, radiofrequency spectrum and regulations.

UNIT II COGNITIVE RADIO ARCHITECTURE **9**

Cognition cycle – orient, plan, decide and act phases, organization; SDR as a platform for Cognitive Radio – Hardware and Software Architectures; Overview of IEEE 802.22 standard for broadband wireless access in TV bands.

UNIT III SPECTRUM SENSING AND DYNAMIC SPECTRUM ACCESS **9**

Introduction – Primary user detection techniques – energy detection, feature detection, matched filtering, cooperative detection and other approaches; Fundamental Tradeoffs in spectrum sensing; Spectrum Sharing Models of Dynamic Spectrum Access - Unlicensed and Licensed Spectrum Sharing; Fundamental Limits of Cognitive Radio.

UNIT IV MAC AND NETWORK LAYER DESIGN FOR COGNITIVE RADIO **9**

MAC for cognitive radios – Polling, ALOHA, slotted ALOHA, CSMA, CSMA / CA; Network layer design – routing in cognitive radios, flow control and error control techniques.

UNIT V ADVANCED TOPICS IN COGNITIVE RADIO **9**

Overview of security issues in cognitive radios, auction based spectrum markets in cognitive radio networks, public safety and cognitive radio, cognitive radio for Internet of Things.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Alexander M. Wyglinski, Maziar Nekovee, Thomas Hou, "Cognitive Radio Communications and Networks", Academic Press, Elsevier, 2010. (Unit I to IV)
2. Huseyin Arslan(Ed.), "Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems", Springer, 2007.(Unit V)

REFERENCES:

1. Bruce Fette, "Cognitive Radio Technology", Newnes, 2006.
2. Kwang-Cheng Chen, Ramjee Prasad, "Cognitive Radio Networks", John Wiley and Sons, 2009.
3. Ezio Biglieri, Professor Andrea J.Goldsmith, Dr.Larry J.Greenstein, Narayan B.Mandayam, H. Vincent Poor, "Principles of Cognitive Radio", Cambridge University Press,2012.

WEB REFERENCES:

1. https://www.classcentral.com/course/swayam-basics-of-software-defined-radios-and-practical-applications-10088
2. https://nptel.ac.in/courses/108107107/
3. https://www.ofcom.org.uk/research-and-data/technology/general/emerging-tech/cognitive-radio

ONLINE RESOURCES:

1. https://link.springer.com/chapter/10.1007/978-981-10-4280-5_68
2. https://www.sciencedirect.com/topics/computer-science/cognitive-radio-network

OUTCOMES:

Upon completion of the course, the student should be able to

1. Elaborate on the architecture implications of software defined radio along with its radio frequency spectrum and regulations (K2)
2. Devise a Smart agent model in CR (K3)
3. Enumerate the Physical and Link layer parameters to improve the performance of communication link in CR (K3)
4. Discuss about the MAC schemes related to cognitive radio networks in detail (K2)

5. Make use of the concept of wireless networks to build next generation networks (K3)
6. Provide a review of security issues in cognitive network and CR- IoT framework with neat diagram (K2)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3	3	2	1	3	1	1	2	1	3	3	-
CO2	3	2	3	3	1	1	3	1	1	2	1	3	2	-
CO3	2	2	2	3	1	1	2	1	1	2	1	2	3	3
CO4	3	2	3	3	2	1	3	1	1	2	1	2	-	3
CO5	3	1	3	3	1	1	3	1	1	2	1	2	-	3
CO6	2	2	2	3	1	1	2	1	1	2	1	2	3	3

PROFESSIONAL ELECTIVE II

20CCEL602 SDG NO.4,9	NETWORKING ENGINEERING AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the need for interoperable network management
- To learn to the concepts and architecture behind standards based network management.
- To understand the concepts and terminology associated with SNMP
- To study thecurrent trends in network management technologies.

UNIT I FOUNDATIONS OFNETWORKING 9

Communication Networks – Network Elements – Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model – Datagrams and Virtual Circuits – Multiplexing – Switching - Error and Flow Control – Congestion Control – Layered Architecture – Network Externalities – Service Integration – Modern Applications.

UNIT II QUALITY OFSERVICE 9

Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best

Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping policies for BE and GS models – Traffic Shaping algorithms – End to End solutions – Laissez Faire Approach – Possible improvements in TCP– Significance of UDP in inelastic traffic

UNIT III HIGHPERFORMANCE NETWORKS 9

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behaviour – Admission Control – MPLS Networks – Scheduling Policy mechanisms–FIFO –Priority –Round Robin-Principles and Mechanisms – Label Stacking – RSVP – Protocols for Real time Interactive Application - RTP/RTCP.

UNIT IV HIGHSPEED NETWORKS 9

Optical links – WDM systems – Optical Cross Connects – Optical paths and Networks – Principles of ATM Networks – B-ISDN/ATM Reference Model – ATM Header Structure – ATM Adaptation Layer – Management and Control – Service Categories and Traffic descriptors in ATM networks-Wireless LAN –Architecture of IEEE 802.11.

UNIT V NETWORK MANAGEMENT 9

ICMP the Forerunner – Monitoring and Control – Network Management Systems – Abstract Syntax Notation – CMIP – SNMP Communication Model – SNMP MIB Group – Functional Model – Major changes in SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB-Network Management Architecture- Security and privacy architecture.

TOTAL:45 PERIODS

TEXT BOOKS

1. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fourth Edition, Morgan Kaufman Publishers, 2007. (Unit I and Unit II)
2. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002. (Unit III)
3. Mani Subramaniam, 'Network Management: Principles and Practices', Pearson Education, 2000 (Unit IVand Unit V)

REFERENCES:

1. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
2. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002

3. Kasera and Seth, 'ATM Networks: Concepts and Protocols', Tata McGraw Hill, 2002.

OUTCOME:

At the end of this course, the student will be able to

1 Learn about communication networks, switched networks and shared networks. (K1)
2 Understand the concepts of error control, flow control and congestion control in wireless networks. (K2)
3 Analyze concepts of quality of service and traffic monitoring of IP networks. (K3)
4 Evaluate the concept of TCP and UDP in inelastic traffic. (K4)
5 Understand and acquire the concepts of Differential service networks and MPLSnetworks. (K2)
6 Outline the SNMP concepts and Network monitoring in terms of security. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	-	3	-	-	3	-	3	-	3	1	1	1
CO2	-	3	-	3			3	-	3	-	3	2	1	1
CO3	-	-	-	2	2	3	2	-	2	-	2	-	2	1
CO4	3	2	-	-	-	3	3	-	3	-	3	1	2	2
CO5	3	2	-	3		2		-		-	-	1	1	1
CO6	3	2	2	1	-	-	-	-	2	2	3	1	3	3

PROFESSIONAL ELECTIVE II

20ECEL502 SDG NO. 3,4,11,15	INDUSTRIAL IoT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Introduce how IoT has become a game changer in the new economy where the customers are looking for integrated value
- Bring the IoT perspective in thinking and building solutions
- Introduce the tools and techniques that enable IoT solution and Security aspects

UNIT I INTRODUCTION 9

Introduction to IOT, What is IIOT? IOT Vs. IIOT, History of IIOT, Components of IIOT -Sensors, Interface, Networks, People &Process, Hype cycle, IOT Market, Trends& future Real life examples, Key terms – IOT Platform, Interfaces, API, clouds, Data Management Analytics, Mining &Manipulation; Role of IIOT in Manufacturing Processes Use of IIOT in plant maintenance practices, Sustainability through Business excellence tools; Challenges & Benefits in implementing IIOT.

UNIT II ARCHITECTURES 9

Overview of IOT components; Various Architectures of IOT and IIOT, Advantages & disadvantages, Industrial Internet - Reference Architecture; IIOT System components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers and its integration, WSN,WSN network design for IOT.

UNIT III SENSOR AND INTERFACING 9

Introduction to sensors, Transducers, Classification, Roles of sensors in IIOT, Various types of sensors, Design of sensors, sensor architecture, special requirements for IIOT sensors, Role of actuators, types of actuators. Hardwire the sensors with different protocols such as HART, MODBUS-Serial & Parallel, Ethernet, BACNet , Current, M2M etc.

UNIT IV PROTOCOLS AND CLOUD 9

Need of protocols; Types of Protocols, Wi-Fi, Wi-Fi direct, Zigbee, Z wave, Bacnet, BLE,Modbus, SPI , I2C, IIOT protocols –COAP, MQTT,6lowpan, lwm2m, AMPQ IIOT cloud platforms : Overview of cots cloud platforms, predix, thingworks, azure etc. Data analytics, cloud services, Business models: Saas, Paas, Iaas.

UNIT V PRIVACY, SECURITY AND GOVERNANCE 9

Introduction to web security, Conventional web technology and relationship with IIOT, Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis, Trust, IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non-repudiation and availability, Security model for IoT, Network security techniques Management aspects of cyber security.

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications

2 Bernd Scholz-Reiter, Florian 2. Michahelles, "Architecting the Internet of Things", ISBN 978-3- 642- 19156-5 e-ISBN 978-3-642-19157-2, Springer

REFERENCES:

1. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2 nd Edition, Willy Publications
3. Inside the Internet of Things (IoT), Deloitte University Press
4. Internet of Things- From Research and Innovation to Market Deployment;By Ovidiu & Peter; River Publishers Series
5. Five thoughts from the Father of the Internet of Things; by By Phil Wainewright – Kevin Ashton
6. How Protocol Conversion Addresses IIoT Challenges: White Paper By RedLion.

WEB REFERENCES:

1 https://nptel.ac.in/courses/106/105/106105195/
2 https://freevideolectures.com/course/4231/nptel-introduction-industry-industrial-internet-things

ONLINERESOURCES:

1 https://www.coursera.org/lecture/digital-thread-implementation/the-industrial-internet-of-things-iiot-za9wH
2 https://swayam.gov.in/nd1_noc20_cs24/preview

OUTCOMES:

Upon completion of the course, the student should be able to

1. Review the components and key terms in IOT (K1)
2. Describe the architectures of IOT, IIOT (K1)
3. Understand, design and develop the real life IoT applications using off the shelf hardware and software (K1)
4. Understand various IoT layers and their relative importance (K1)
5. Study various IoT platforms and Security (K1)
6. Realize the importance of Data Analytics in IoT (K1)

CO – PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	1	1	1	1
CO2	3	1	2	2	-	2	-	-	-	-	2	2	3	2
CO3	3	1	3	2	-	2	-	-	-	-	2	2	3	2
CO4	3	1	3	2	-	2	-	-	-	-	2	2	3	2
CO5	3	1	3	2	2	2	-	-	-	-	2	2	3	2
CO6	3	1	3	2	2	2	-	-	2	3	2	2	3	2

PROFESSIONAL ELECTIVE II

20CSEL704 SDG NO.4	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the techniques in natural language processing
- To be familiar with the natural language generation
- To be exposed to machine translation
- To understand the information retrieval techniques

UNIT I OVERVIEW AND LANGUAGE MODELING 9

Overview: Origins and Challenges of NLP-Language and Grammar - Processing Indian Languages - NLP Applications - Information Retrieval - Language Modeling - Various Grammar - Based Language Models-Statistical Language Model.

UNIT II WORD LEVEL AND SYNTACTIC ANALYSIS 9

Word Level Analysis - Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and Correction-Words and Word Classes-Part-of Speech Tagging - Syntactic Analysis - Context-Free Grammar-Constituency- Parsing-Probabilistic Parsing.

UNIT III SEMANTIC ANALYSIS AND DISCOURSE PROCESSING 9

Semantic Analysis: Meaning Representation-Lexical Semantics - Ambiguity-Word Sense Disambiguation - Discourse Processing - Cohesion-Reference Resolution- Discourse Coherenceand Structure.

UNIT IV NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION 10

Natural Language Generation - Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG - Machine Translation - Problems in Machine Translation - Characteristics of Indian Languages - Machine Translation Approaches - Translation Involving Indian Languages.

UNIT V INFORMATION RETRIEVAL AND LEXICAL RESOURCES 8

Information Retrieval - Design features of Information Retrieval Systems-Classical - Non-classical - Alternative Models of Information Retrieval – Valuation Lexical Resources - World Net-Frame Net- Stemmers - POS Tagger-Research Corpora.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, O_Reilly Media, 2009.

REFERENCES:

1. DanielJurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2008.
2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin / Cummings publishing company, 1995.
3. Hobson lane, Cole Howard, Hannes Hapke, "Natural language processing in action" MANNING Publications, 2019.
4. Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, 2012.
5. Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer-Verlag London Limited, 2007.

WEB REFERENCES:

1. https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_information_retrieval.htm
2. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1

3. https://machinelearningmastery.com/natural-language-processing/
4. https://becominghuman.ai/a-simple-introduction-to-natural-language-processing-ea66a1747b32

ONLINERESOURCES:

1. https://www.coursera.org/learn/language-processing
2. https:// www.youtube.com/playlist?list=PLoROMvodv4rOhcuXMZkNm7j3fVwBBY42z

OUT COMES:

Upon completion of the course, the student should be able to

1. Learn the approaches of syntax and semantics in NLP.(K1)
2. Understand approaches to discourse, generation, dialogue and summarization within NLP. (K1)
3. Implement current methods for statistical approaches to machine translation. (K3)
4. Analyse machine learning techniques used in NLP.(K3)
5. Apply information retrieval techniques. (K2)
6. Develop a Statistical Methods for Real World Applications and explore deep learning based NLP. (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	1	2	-	1	2	2
CO2	2	3	3	2	3	2	-	1	3	1	2	2	3	2
CO3	3	3	2	2	-	-	-	1	2	1	3	2	1	1
CO4	3	3	1	-	3	-	-	2	1	1	-	1	2	1
CO5	3	3	3	3	3	-	-	1	1	1	2	1	1	1
CO6	2	2	1	-	1	1	-	-	-	-	1	1	2	2

PROFESSIONAL ELECTIVE II

20MGEL601 SDG NO.4	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts and philosophies of Quality Management
- To know the impact and significance of TQM principles on organizations in recent times.

UNIT 1 INTRODUCTION 8

Need and Evolution of Quality, Quality-Definitions, statements and dimensions of product and service quality TQM-concepts, Elements and Framework, Benefits & Obstacles of TQM , TQM-Culture, Stategic Quality Management, Costs of Quality.

UNIT II CONTRIBUTIONS AND APPROACHES TO QUALITY MANAGEMENT 9

Renowned quality gurus- Deming, Juran, Crosby and Ishikawa, Contributions of Taguchi – Loss Function, Signal to Noise Ratio and design of experiments, Kaizen -principles and practices-5 S tools, Poka Yoke-8Discipline Methodology, Just in time, Continous process improvement-PDCA cycle and 5 why analysis

UNIT III CUSTOMER FOCUS AND TEAMWORK 8

Identifying Customer Needs, QFD - Process, Building HoQ, Customer Satisfaction Measurement Techniques. Employee Involvement Practices. Individual Participation - Suggestion Systems & Empowerment, Motivation , Leadership, Partnerships - Cross- Functional Teams, Supplier/Customer Partnerships, Problem-Solving Teams - Quality Circles.

UNIT IV STATISTICAL TOOLS & TECHNIQUES 11

SQC - Tools For Data Collection And Analysis – Seven tools(old and new),Statistical Process Control (SPC) – Construction of Control Chart – Variables and Attributes. Process Capability – concepts and measurement. Six Sigma models ,Lean six sigma, BPR, TPM, FMEA and Benchmarking.

UNIT V QUALITYSYSTEMS AND STANDARDS 9

Need for ISO 9000- ISO 9001: 2015 quality system-guidelines and clausewise requirements, Quality audits-types and responsibilities, ISO 14001:2004 EMS,

ISO / TS 16949:2002, ISO 27001:2005 ISMS, SEI – CMMIand Awards - Demings Prize, MBNQA andcriteria.

TOTAL:45PERIODS

TEXT BOOKS:

1. Besterfield, Total Quality Management, 3rd Edition, Pearson India
2 Shridhara K Bhat, Total Quality Management. Himalaya Publishing House, 2010.

REFERENCE BOOKS:

1. Bedi Kanishka, Quality Management, Oxford University Press
2. Kiran D.R., Total Quality Management - Key Concepts and Case Studies, Butterworth-Heinemann, 2016.
3. Poornima M Charantimath, Total Quality Management. Pearson India, 2017
4. Sharma DD, Total Quality Management, Principles, Practice and Cases, Sultan Chandand Sons.
5. Douglas C. Montgomory, Introduction to Statistical Quality Control, Wiley Student Edition, 4 th Edition, Wiley India Pvt Limited, 2008

MOOC REFERENCES:

1. https://www.coursera.org/lecture/supply-chain-management/total-quality-management-wLrvy
2. https://swayam.gov.in/nd1_noc20_mg34/preview
3. https://www.openlearning.com/courses/total-quality-management/
4. https://www.udemy.com/course/tqm-in-academics/

MOOC REFERENCES:

1. https://www.unido.org/sites/default/files/2009-04/A_roadmap_to_quality_volume_1_0.pdf
2. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
3. https://www.researchgate.net/publication/237006071_Total_Quality_Management_in_Academic_Libraries_A_Study
4. https://www.isixsigma.com/methodology/total-quality-management-tqm/introduction-and-implementation-total-quality-management-tqm/
5. https://study.com/academy/lesson/five-principles-of-total-quality-management-tqm.html

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand quality concepts and philosophies of TQM. (K2)
2. Apply TQM principles and concepts of continuous improvement. (K3)
3. Explain the quality tools, management tools and statistical fundamentals to improve quality. (K2)
4. Demonstrate the various TQM tools as a means to improve quality. (K2)
5. Illustrate quality tools and procedures for better quality output. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	-	1	-	1	1	-	-	-	1
CO2	3	3	3	2	2	-	1	1	-	-	-	1
CO3	3	3	2	2	2	-	1	1	-	-	-	1
CO4	2	2	3	2	2	-	1	1	-	-	-	1
CO5	3	3	3	2	2	2	1	1	-	-	-	1

PROFESSIONAL ELECTIVE II

20CCEL603 SDG NO.4,9	ADVANCED DATASTRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To solve problems using different data structures and design techniques and to compare their performance, tradeoffs.
- To learn appropriate use and choice of standard data structures.
- To develop recursive algorithms for various applications.

UNIT I FUNDAMENTALS **9**

Mathematical Induction - Asymptotic Notations – Properties of Big-oh Notation – Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – NP-Completeness – NP-Hard – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoff.

UNIT II HEAP STRUCTURES 9

Min/Max heaps – Array-Based Heaps - Heap-Ordered Trees and Half-Ordered Trees -Deaps – Leftist Heaps – Binomial Heaps: Structure –Operations- Changing Keys in Heaps – Fibonacci Heaps – Skew Heaps – Lazy- Binomial Heaps.

UNIT III SEARCH STRUCTURES 9

Binary Search Trees – Self balancing Binary Search Trees – Applications – The concept of balancing and its advantages – AVL Trees : Single and Double rotations – Red-Black trees – Multi-way Search Trees –B-Trees: Operations: Insert and Delete– Splay Trees : Rotation – Tries.

UNIT IV MULTIMEDIA STRUCTURES 9

Segment Trees – k-d Trees: Node structure – 2-D trees – insertion - deletion – Point Quad Trees:insertion – deletion - Expanded Node Type– Range Searches – MX-Quad Trees: Range Queries – R-Trees – TV-Trees: Node Structure –Search - Insertion – Deletion - Extending andcontracting.

UNIT V ALGORITHMS 9

Huffman Coding – Convex Hull – Topological Sort – Tree Vertex Splitting – Activity Networks – Flow Shop Scheduling – Counting Binary Trees – Introduction to Randomized Algorithms.

TOTAL:45 PERIODS

TEXT BOOKS

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, Uiversity Press, 2007.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
3. V.S. Subramanian, Principles of Multimedia Database systems, Morgan Kaufman, 1998.

REFERENCES

1. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Prentice –Hall, 1988.

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the properties of of Big-oh Notation and Conditional Asymptotic Notation (K2)
2. Solve NP-Completeness and NP-Hard problem(K3)

3. Analyze different types of Heaps and its structure.(K3)
4. Able to create Heap Structure for different types of Heaps(K3)
5. Learn about different types of trees like AVL Trees, Red-Black trees and B-Trees(K3)
6. Summarize different algorithm implementations (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	0	3	0	1	0	0	0	0	3	3	2	2
CO2	3	3	3	1	2	1	0	0	0	0	3	3	2	2
CO3	3	3	2	1	3	1	0	0	0	0	3	3	2	2
CO4	3	3	2	1	3	1	0	0	0	0	3	3	2	2
CO5	3	3	2	1	1	3	1	0	0	0	3	3	2	2
CO6	3	3	3	2	2	1	1	0	0	0	3	3	2	1

PROFESSIONAL ELECTIVE II

20ITEL601 SDG NO.4,9	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the criteria and design of Test Cases
- To learn the design of Test Cases
- To understand Test Management and Test Automation Techniques
- To apply Test Metrics and Measurements

UNIT I INTRODUCTION **9**

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model - Basic Definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Cost of Defects – Defect Classes – The Defect Repository and Test Design – Defect Examples- Developer/Tester Support of Developinga Defect Repository.

UNIT II TEST CASE DESIGNSTRATEGIES **9**

Test Case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State Based

Testing – Cause-Effect Graphing – Compatibility Testing – User Documentation Testing – Domain Testing - Random Testing – Requirements Based Testing – Using White Box Approach to Test design – Test Adequacy Criteria – Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Code Complexity Testing – Additional White Box Testing Approaches.

UNIT III LEVELS OF TESTING **9**

The Need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit Tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination System Testing – Acceptance Testing – Performance Testing – Regression Testing – Internationalization Testing – Ad Hoc Testing – Alpha, Beta Tests – Testing Object Oriented Systems – Usability and Accessibility Testing – Configuration Testing – Compatibility Testing – Testing the Documentation – Website Testing.

UNIT IV TEST MANAGEMENT **9**

People and Organizational Issues in Testing – Organization Structures for Testing Teams – Testing Services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – Test Management – Test Process – Reporting Test Results – Introducing the Test Specialist – Skills Needed by a Test Specialist – Building a Testing Group- The Structure of Testing Group - The Technical Training Program.

UNIT V TESTAUTOMATION **9**

Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Test Metrics and Measurements – Project, Progress and Productivity Metrics.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
2. Ron Patton, "Software Testing Second Edition", Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2. Edward Kit, "Software Testing in the Real World – Improving the Process", Pearson Education, 1995.

3. Boris Beizer, "Software Testing Techniques" 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur "Foundations of Software Testing - Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.
5. Naresh chauhan-software testing principles and practices,2nd edition,oxford University Press, 2017.

WEB REFERENCES :

1. https://nptel.ac.in/courses/106/105/106105150/

ONLINERESOURCES:

1. https://www.javatpoint.com/software-testing-tutorial
2. https://www.toolsqa.com/software-testing-tutorial/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand about the Software Testing Principles and Defect Classes (K2)
2. Apply test cases suitable for software development for different domains(K3)
3. Discuss the various Levels of Testing (K2)
4. Identify suitable tests to be carried out (K2)
5. Discuss the concepts of Test plan and its skill set (K2)
6. Apply automatic testing tools and discuss the various test metrics and measurements (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	2	-	2	3
CO2	2	3	3	-	-	-	-	-	2	-	1	-	3	3
CO3	2	3	3	-	-	-	-	-	3	-	1	2	3	3
CO4	2	3	3	-	-	-	-	-	3	-	3	3	3	3
CO5	-	2	1	-	-	-	-	-	2	-	2	-	3	3
CO6	3	2	2	-	-	-	-	-	1	2	2	2	3	3

PROFESSIONAL ELECTIVE II

20CCEL604 SDG NO.4,9	INFOMETRICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the information properties of scientific and technical data.
- To learn how to measure and evaluate aspects of research data set usability.
- To have hands-on experience with data science and infomatics tools

UNIT I IT ORGANIZATION 9

Metrics that matter - Interpreting the metrics – Collecting the data – Managing the data – Obstacles to acquiring IT metrics information – Old data versus new graphical analysis – Core of software planning – Measuring the core metrics (Product, Quality, Process, Productivity, Time, Effort) – Estimating and controlling with the core metrics – Work output measurements.

UNIT II MEASUREMENT PROGRAMAPPROACHES 9

EDS Brazil metrics program – Measurement program implementation approaches : Assessing measurement frame work and guidelines– Bench marking: conceptual model for bench marking, semantics annotations – Data definition framework for defining software measurements.

UNIT III SOFTWARE METRICS 9

Functional points as part of measurement program :mean time ,detect density, customer problem ,customer satisfaction– Estimation of software reliability – Establishing central support for software sizing activities – Using metrics to manage projects – Tracking software progress – Effectively utilizing software metrics.

UNIT IV SOFTWARE ESTIMATION 9

Problems with measurements – Avoiding obstacles and common pitfalls – Unreported and unpaid overtime – Using software metrics for effective estimating – Estimating software development projects – Enhanced estimation on time within budget – Metrics in outsourcing – Lifigaton – The product of non practicing function point metrics – Applying statistical process central to software – Metrics in E-Commerce.

UNIT V SOFTWARE DEFECT MANAGEMENT **9**

Literature review – Defect removal effectiveness and quality planning : early detection of software errors, phase based defect removal model, characteristics of special case phase 2 model – Quality planning – Cost effectiveness of phase defect removal – Process maturity:

TOTAL:45 PERIODS

TEXT BOOK

1. Stephen H. Kan, " Metrics and Models In Software Quality Engineering", First Edition, Pearson Education, 2003.

REFERENCES

1. N. Fenton, S. L. Pfleeger, "Software Metrics: A Rigorous and Practical Approach", Thomson Learning, 1997.
2. IT Measurement – A Practical Advice from the Experts", International Function Point Users Group, Pearson Education, 2002.

OUTCOME:

At the end of this course, the student will be able to

1 Understand the concept of Obstacles to acquiring IT metrics information (K2)
2 Learn the concept of Estimating and controlling with the core metrics (K1)
3 Determine EDS Brazil metrics program. (K2)
4 Analyze Tracking software progress (K3)
5 Discuss the topic Functional points as part of measurement program. (K2)
6 Interpret the software defect management process using various metrics. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	0	0	0	0	0	0	0	0	2	2	2
CO2	1	3	3	0	0	0	0	0	0	0	0	2	2	2
CO3	2	3	0	2	0	0	0	0	0	0	0	2	1	1
CO4	0	3	0	3	2	0	0	0	0	0	0	2	2	1
CO5	1	0	3	0	0	0	0	0	0	0	0	2	2	-
CO6	1	2	2	2	1	0	0	0	0	0	2	2	1	2

PROFESSIONAL ELECTIVES - II

20CSEL702 SDG NO. 4	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To appreciate the need for Software Defined Networks
- To learn working of Software Defined Networking
- To know the Open Flow Specifications
- To know the applications of Software Defined Networking in Data Centers

UNIT I INTRODUCTION **9**

Basic Packet Switching Terminology - The Modern Data Center - Traditional Switch Architecture - Autonomous and Dynamic Forwarding Tables - Open Source and Technological Shifts - SDN - Evolution of Switches - Control Planes - Cost - SDN Implications for Research and Innovation - Data Center Innovation - Data Center Needs.

UNIT II THE GENESIS OF SDN **9**

The Evolution of Networking Technology - Sustaining SDN Interoperability - Open Source Contributions - Legacy Mechanisms Evolve Toward SDN - Network Virtualization - Fundamental Characteristics of SDN - SDN Operation - SDN Devices- SDN Controller - SDN Applications - Alternate SDN Methods.

UNIT III THE OPENFLOW SPECIFICATION **9**

OpenFlow Overview - OpenFlow 1.0-1.1-1.2-1.3 - OpenFlow - Limitations - Alternative Definitions of SDN - Potential Drawbacks of Open SDN - SDN via APIs - SDN via Hypervisor - Based Overlays - SDN via Opening Up the Device - Network Functions Virtualization - Alternatives Overlap and Ranking.

UNIT IV SDN IN THE DATACENTER **9**

Data Center Definition - Data Center Demands - Tunneling Technologies for the Data Center, Path Technologies in the Data Center - Ethernet Fabrics in the Data Center - SDN Use Cases in the Data Center - Open SDN versus Overlays in the Data Center - Real-World Data Center Implementations.

SDN IN OTHER ENVIRONMENTS: Consistent Policy Configuration - Global Network View - Wide Area Networks - Service Provider and Carrier Networks - Campus Networks - Hospitality Networks - Mobile Networks - In-Line Network Functions - Optical Networks - SDN vs P2P/Overlay Networks.

UNIT V SDN APPLICATIONS **9**

Reactive versus Proactive Applications - Reactive SDN Applications - Proactive SDN Applications - Analyzing Simple SDN Applications - Creating Network Virtualization Tunnels - Offloading Flows in the Data Center - Access Control for the Campus - Traffic Engineeringfor Service Providers.

SDN FUTURES: Potential Novel Applications of Open SDN - Applying Programming Techniques to Networks - Security Applications - Hiding IP Addresses - Segregating IPSec Traffic in Mobile Networks - Roaming in Mobile

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Paul Goransson, Chuck Black, "Software Defined Networks - A Comprehensive Approach", Elsevier, 2014.
2. Siamak Azodolmolky, "Software Defined Networking with Open Flow", Second Edition, Packt Publishing, 2013.

REFERENCES:

1. Thomas D.Nadeau & Ken Gray, "SDN Software Defined Networks", O'Reilly publishers, First edition, 2013.
2. Sreenivas Voruganti, Sriram Subramanian, "Software Defined Networking (SDN) with Open Stack", First Edition, Packt Publishing, 2016.
3. William Stallings, "Foundations of Modern Networking", First Edition, Pearson education limited, 2016.
4. Vivek Tiwari, "SDN and Open Flow for Beginners", Amazon Digital Services, Inc., 2013.
5. Fei Hu, Editor, "Network Innovation through Open Flow and SDN: Principles and Design", Chemical Rubber Company Press, 2014.

WEB REFERENCES:

1. https:// users. cs. fiu. edu/ ~fortega/ storage/ tcn 6430 /SDN_ 9780124166844.pdf
2. https://www.cs.rutgers.edu/~sn624/552-F18/papers/p4.pdf
3. https://www.cs.rutgers.edu/~sn624/552-F18/papers/road.pdf

ONLINERESOURCES:

1. https://sdn.ieee.org/outreach/resources
2. https://www.coursera.org/learn/sdn

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the key benefits of SDN by the separation of data and control planes (K1)
2. Interpret the SDN data plane devices and Openflow Protocols.(K2)
3. Implement the operation of SDN control plane with different controllers.(K2)
4. Apply techniques that enable applications to control the underlying network using SDN.(K3)
5. Appreciate the applications of Software Defined Networking in Data Centers (K2)
6. Describe Network Functions Virtualization components and their roles in SDN(K3)

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	2	-	2	2	2	3	3	3	3	3	-
CO2	1	3	1	2	-	1	-	3	1	-	1	1	1	3
CO3	3	3	3	3	1	-	-	-	3	1	3	3	3	3
CO4	3	3	3	3	3	2	-	2	2	1	3	2	3	3
CO5	3	3	3	3	3	1	-	-	1	1	3	2	3	3
CO6	3	3	3	2	3	2	-	2	2	1	3	2	3	3

PROFESSIONAL ELECTIVE II

20CSPC702 SDG NO.4 & 11	MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem

solving

UNIT I INTRODUCTION **9**

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS **9**

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING **9**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naıve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING **9**

K - Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT V ADVANCED LEARNING **9**

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TOTAL: 45 PERIODS

TEXT BOOK:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (India) Private Limited, 2017.
2. Marco Gori , “Machine Learning: A Constraint-Based Approach”, Morgan Kaufmann. 2017

REFERENCES:

1. Ethem Alpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press 2004.
2. Stephen Marsland, “Machine Learning: An Algorithmic Perspective”, CRC Press, 2009 Richard O. Duda, Peter E. Hart, David G. Stork, “Pattern Classification”, Wiley, Second Edition.
3. Christopher Bishop, “Pattern Recognition and Machine Learning”, illustrated Edition, Springer, 2006.

4. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.

WEB REFERENCES

1. https://towardsdatascience.com/best-resources-for-ai-machinelearning-data-science-d72625d4689d
2. https://www.analyticsvidhya.com/resources-machine-learning-deeplearning-neural-networks/
3. https://www.ritchieng.com/machine-learning-resources/
4. https://www.guru99.com/machine-learning-tutorial.html

OUTCOMES:

Upon completion of the course, the student should be able to

1. Gain knowledge about basic concepts of Machine Learning and differentiate between supervised, unsupervised, semi-supervised machine learning approaches. (K2)
2. Discuss and apply the back propagation algorithm and genetic algorithms to various problems. (K2)
3. Discuss the Decision Tree algorithm, identity and overcome the problem of over fitting and apply the Bayesian concepts to Machine Learning. (K2)
4. Solve the problems using various Machine Learning techniques and apply instant based learning techniques. (K3)
5. Analyze and suggest appropriate Machine Learning approaches for various types of problems. (K4)
6. Demonstrate various machine learning algorithms in a range of real-world applications (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO2	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO3	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO4	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO5	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO6	2	2	2	1	2	1	-	-	-	-	1	2	2	2

PROFESSIONAL ELECTIVE II

20ITEL707 SDG NO.4,9,11 & 12	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the RPA Basics and the underlying logic and architecture.
- To learn about the data manipulation and the control flow structures in RPA Tools.
- To gain knowledge on using the various plugins and user interaction modules.
- To understand the exception handling and the deploying techniques in the context of RPA
- To develop RPA system for the popular applications

UNIT I PROGRAMMING BASICS & RPA CONCEPTS 9

Processes-Software Design-SDLC Programming Concepts -Scripting- HTML – .Net Framework-.Net Fundamentals-CSS-XML-RPA Basics - History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA - What Processes can be Automated - Types of Bots - Workloads which can be automated

UNIT II RPA TOOL BASICS & CONTROL FLOW 9

Sequence, Flowchart & Control Flow: Sequencing the Work flow – Activities – Flowchart - Control Flow for Decision making.

Data Manipulation: Variables-Collection-Arguments-Data Table-Clipboard management-File operations-Controls-Finding the control-waiting for a control-Act on a control-UiExplorer.

UNIT III PLUGINS & USER INTERACTION 9

Plugins and Extensions:Terminal plugin-Java plugin -Java plugin with UiPath Studio-Citrix automation-Citrix environment-Mail plugin-PDF plugin-Web integration-Excel and Word plugins-Credential management. Extensions Handling User Events and Assistant Bots: What are assistant bots-Monitoring system event triggers-Hotkey trigger-Mouse trigger-System trigger Monitoring image and element triggers- Launching an assistant bot on a keyboard event

UNIT IV EXCEPTION HANDLING & PROJECT BUILDING 9

Exception handling-Common exceptions and ways to handle them-Logging and taking screenshots Debugging techniques-Setting breakpoints-Slow step Highlighting- Break-Collecting crash dumps- Enabling crash dumps- Disabling crash dumps-Error reporting: Enterprise Edition customers- Community

Edition users. Managing and Maintaining the Code: Project organization Picking an appropriate layout for each workflow- Breaking the process into smaller parts-Using exception handling- Making your workflow readable Keeping it clean- Nesting workflows- Reusability of workflows- Templates Commenting techniques- State Machine- When to use Flowcharts State Machines or Sequences.

UNIT V DEPLOYING AND MAINTAINING THE BOT 9

Publishing using publish utility-Overview of Orchestration Server- Using Orchestration Server to control bots- Using Orchestration Server to deploy bots-License management- Activating and uploading a license to Orchestrator-Publishing and managing updates-Packages-Managing packages.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: OReilly Publishing, 2018.
2. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Paciic Holdings Private Limited, 2018

REFERENCES:

1. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Paciic Holdings Private Limited, 2018.
2. SrikanthMerianda, Robotic Process Automation Tools, Process Automation and their beneits: Understanding RPA and Intelligent Automation, 1st Edition, Consulting Opportunity Holdings LLC, 2018.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols||, Wiley, 201.

WEB REFERENCES

1. https://www.edx.org/learn/robotic-process-automation.
2. https://www.nice.com/rpa/rpa-guide/.

ONLINE RESOURCES:

1. https://www.uipath.com/rpa/robotic-process-automation.
2. https://www.udemy.com/robotic-process-automation/
3. https://www.uipath.com/landing/academic-studio-download

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand Basic Programming concepts and to describe the various components of RPA development. (K2)
2. Understand the user interface and to manage the interaction modules and activities. (K2)
3. Demonstrate the various plugins for Image, Text and Data Tables Automation. (K3)
4. Describe automation process to Email and various types of Exceptions and strategies to handle. (K2)
5. Analyze various case studies and application of RPA in real time scenarios. (K4)
6. Explain and deploy the applications based on the orchestration concepts. (K4)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-				-	-	-	-	3	2
CO2	2	3	3	3	3				2	2	2	2	3	2
CO3	1	3	-	-	-				-	-	-	-	3	2
CO4	2	3	3	3	3				2	2	2	2	3	2
CO5	1	2	3	3	3				2	2	2	3	3	2
CO6	2	-	-	-	-				-	-	-	1	3	2

PROFESSIONAL ELECTIVE II

20ECEL504 SDG NO.4,9	PROGRAMMABLE LOGIC CONTROLLERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on the principle and working of Programmable Logic Controllers
- To learn PLC Programming
- To study Ladder Logic Diagrams
- To implement Counter and Timer Logic
- To understand PLC Functions.

UNIT I PLC BASICS AND PROGRAMMING **9**

PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules. Input instructions, outputs, operational procedures, programming examples using contacts and coils

UNIT II LADDER DIAGRAMS AND REGISTERS **9**

Digital logic gates, programming in the Boolean algebra system, conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system. PLC Registers: Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.

UNIT III PLC FUNCTIONS **9**

Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions. Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications

UNIT IV ANALOG PLC OPERATION **9**

Analog modules & systems, Analog signal processing, Multi bit Data Processing, Analog output Application Examples, PID principles, position indicator with PID control, PID Modules, PID tuning, PID functions

UNIT V TIMERS AND COUNTERS **9**

Timer Instructions: ON Delay timer instruction, Retentive Timer, Cascading Timers, Example: Industrial Applications, Industrial Process Timing Applications. Counter Instructions: Up counter, Down Counter and Up/Down Counter instructions, Cascading Counters, Combining counter and Timer Functions.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, PHI, 2009.
2. Programmable Logic Controllers- Programming Method and Applications JR. Hackworth &F.D Hackworth Jr. Pearson, 2004.

REFERENCES:

1. Programmable logic controller by Frank D. Petruzella, Tata McGraw-Hill publication,2007
2. Introduction to programmable logic controller by Gary dunning,Thomson Asia Pte Ltd.Publication, Singapore
3. Sinha, Priyabrata," Speech Processing in Embedded Systems",Springer 2010
4. Programmable Logic Controllers: Principles and Applications by John W.

Webb and Ronald A.Reis,Prentice – Hall India publication,Fifth edition,2009
5. Programmable Logic Controllers by W. Bolton, Elsevier Newnes publication, Fourth edition,2007.
6. Programmable Controllers An engineer's guide by E.A.Parr, Elsevier Newnes publication Third edition 2008.

WEB REFERENCES:

1. https ://elect r ical-engineer ing-por tal.com/resources/plcprogramming-training
2. https://udemy.com/plc
3. https://www.solisplc.com/tutorials/how-to-read-ladder-logic

ONLINE RESOURCES:

1. https://www.intechopen.com/books/programmable-logic-controller
2. https://www.intechopen.com/books/programmable-logiccontroller/new - applications -using-plcs-in-access-netWorks

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the working of PLCs. (K2)
2. Develop programs for simple applications(K3)
3. Design Ladder Diagrams for the process. (K3)
4. Write PLC programs using Functions (K3)
5. Create Analog PLC systems. (K4)
6. Define the Timer and Counter Functions. (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	1	-	-	-	-	-	2	3	2
CO2	3	3	3	3	3	1	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	1	-	-	-	-	-	2	2	2
CO4	3	3	3	2	1	2	-	-	-	-	-	2	2	2
CO5	3	3	3	3	3	2	-	-	-	-	-	2	3	2
CO6	3	3	3	3	1	2	-	-	-	-	-	2	3	2

PROFESSIONAL ELECTIVE III

20CCEL701 SDG NO.4	ADHOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the design issues in ad hoc and sensor networks. Learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

UNIT I INTRODUCTION 9

Characteristics of wireless channel - Wireless local loop - IEEE 802.16 standard – HIPERACCESS -Ad hoc wireless networks: Introduction and issues - MAC protocols: Design issues - Goals and classification - MACAW: A media access protocol for wireless LANsDistributed packet reservation multiple access protocol-Distributed priority scheduling and Medium access in Ad hoc networks- MAC protocol using directional antennas.

UNIT II ROUTING PROTOCOLS 9

Design issues – Classification – Wireless routing protocol - Location aided routing- Zone routing protocol - Hierarchical state routing protocol - Power aware routing protocol – Operation of multicast routing protocols - Classification of multicast routing protocols – Application-Dependent multicast routing.

UNIT III SECURITY IN AD HOC NETWORKS 9

Security in ad hoc wireless networks – Network security requirements - Issues and challenges in security provisioning – Network security attacks – key management – secure routing in Ad hoc Networks

UNIT IV WIRELESS SENSOR NETWORKS 9

Architecture - Data dissemination - Date gathering - MAC protocols - Location discovery - Quality of sensor networks – Case study

UNIT V SENSOR NETWORK DATABASE 9

Sensor database challenges – Querying the physical environment – Query interfaces - High level database organization – In-Network aggregation – Temporal data – Emerging Applications.

TOTAL: 45 PERIODS

TEXT BOOK:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ",Prentice Hall Professional Technical Reference, 2008.
2. Toh C.K., "Ad hoc Mobile Wireless Networks: Protocols And Systems", Prentice Hall PTR, First edition 2002

REFERENCES:

1. Mohammad Ilyas, —The Handbook Of Ad hoc Wireless Networks||, CRC press, 2002
2. Charles E. Perkins,—Adhoc Networking||, Addison–Wesley,2000
3. Stefano Basagni , et al — Mobile Ad hoc Networking||, Wiley –IEEE press,2004
4. Zhao, Guibas ||Wireless Sensor Networks|| ,Morgan Kaufmann Publications,2004

OUTCOMES:

Upon completion of the course, the student should be able to:

1 Explain the concept of ad hoc and sensor networks, their applications and typical node and network architectures. (K2)
2 Summarize the Concepts of MAC Protocol (K2)
3 Compare wireless routing protocol's function and their implications on network performance. (K3)
4 Explain various security threats to ad hoc networks and describe proposed solutions. (K2)
5 Explain the sensor network characteristics, sensor databases and query processing. (K2)
6 Analyze the protocol design issues of adhoc and sensor networks (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-		-	-	-	-	-	-	-	-
CO3	3	2	-	-	-		-	-	-	-	-	-	-	-
CO4	3	2	-	2	-		-	-	-	-	-	-	-	-
CO5	3	2	-	2	-		-	-	-	-	-	-	-	2
CO6	3	2	-	-	-	-	-	-	-	-	-	-	-	-

PROFESSIONAL ELECTIVE III

20CCEL702 SDG NO.4,8,9	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Learn the foundations of Human Computer Interaction
- To Learn the technology for designing interactive systems
- To Be aware of mobile HCI
- Learn the guidelines for user interface.
- To understand the Web Interface Design

UNIT I FOUNDATIONS OF HCI **9**

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms- Case Studies

UNIT II INTERACTIVE STYLES AND DESIGN PROCESS **9**

Interactive Design: Basics– process–SDLC-scenarios–navigation–screen design– Iteration and prototyping. HCI in software process – software engineering life cycle –usability engineering: NFR -requirements. Prototyping in practice–design rationale. Design Process: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT III MODELS AND THEORIES **9**

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia

UNIT IV INTERACTION TECHNIQUES FOR MOBILE **9**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT V INTERACTION TECHNIQUES FOR WEB INTERFACE **9**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (Unit I,II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (Unit IV)
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009. (Unit V)
4. Samit Bhattacharya. (2019). Human-Computer Interaction: User-Centric Computing for Design, McGraw Hill Education (1st ed).

REFERENCES:

1. Julie A. Jacko and Andrew Sears, "The human-computer interaction handbook: fundamentals,evolving Technologies, and emerging applications", Lawrence Erlbaum Associates, Inc.,Publishers, 2003
2. Lloyd P. Rieber, "Computers, Graphics, & Learning", Brown & Benchmark publishers, 2005.
3. Yvonne Rogers, Helen Sharp, Jenny Preece, "Interaction Design: beyond human- computer interaction", Second Edition, John-Wiley and Sons Inc., 2009
4. DovTe-eni, Jane Carey, Ping Zhang, "Human-Computer Interaction: Developing Effective Organizational Information Systems", John-Wiley and Sons Inc., 2007
5. H. Alexander. "Formally-based Tools and Techniques for Human-Computer Dialogues". Ellis Horwood, Chichester, 1987.

WEB REFRENCES:

1. https://nptel.ac.in/courses/106103115
2. https://nptel.ac.in/courses/106106177
3. https://onlinecourses.nptel.ac.in/noc23_cs116

ONLINE COURSES:

1. https://freevideolectures.com/course/4491/nptel-introduction-human-computer-interaction
2. https://www.iare.ac.in/sites/default/files/lecture_notes/HCI%20LECTURE%20NOTES.pdf
3. https://mrcet.com/pdf/Lab%20Manuals/IT/R15A0562%20HCI.pdf

OUTCOMES:

Upon completion of the course, the student should be able to:

1 Summarize the Foundation of HCI (K2)
2 Interpret the Interactive Design Process (K2)
3 Infer Prototyping HCI in Software Process. (K2)
4 Summarize the Different Models and Theories in Software Design. (K2)
5 Interpret the Concepts of Mobile HCI (K2)
6 Understand the HCI implications for designing multimedia/ e commerce/ e-learning Websites. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-		-	-	-	-	-	-	-	-
CO3	3	2	-	-	-		-	-	-	-	-	-	-	-
CO4	3	2	-	2	-		-	-	-	-	-	-	-	-
CO5	3	2	-	2	-		-	-	-	-	-	-	-	2
CO6	3	2	-	-	-	-	-	-	-	-	-	-	-	-

PROFESSIONAL ELECTIVE III

20CCEL703 SDG NO.8,9	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduction to quantum computing
- To know the various quantum systems
- To know the Relationship between quantum and classical complexity classes
- To know the Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search
- To find the evaluation of the Noiseanderror correction

UNIT I INTRODUCTION TO QUANTUM COMPUTING 9

Overview of traditional computing – Church-Turing thesis – circuit model of

computation – reversible computation – quantum physics – quantum physics and computation – Dirac notation and Hilbert Spaces – dual vectors – operators – the spectral theorem – functions of operators – tensor products – Schmidt decomposition theorem.

UNIT II QUBITS AND QUANTUM MODEL OF COMPUTATION 9

State of a quantum system – time evolution of a closed system – composite systems – measurement – mixed states and general quantum operations – quantum circuit model – quantum gates – universal sets of quantum gates – unitary transformations – quantum circuits.

UNITIII QUANTUM STANDARD ALGORITHMS - I 9

Superdense coding – quantum teleportation – applications of teleportation – probabilistic versus quantum algorithms – phase kick-back – the Deutsch algorithm – the Deutsch- Jozsa algorithm – Simon's algorithm – Quantum phase estimation and quantum Fourier Transform – eigenvalue estimation.

UNIT IV QUANTUM STANDARD ALGORITHMS - II 9

Order-finding problem – eigenvalue estimation approach to order finding – Shor's algorithm for order finding – finding discrete logarithms – hidden subgroups – Grover's quantum search algorithm – amplitude amplification – quantum amplitude estimation – quantum counting – searching without knowing the success probability

UNIT V QUANTUM COMPUTATIONAL COMPLEXITY AND ERROR CORRECTION 9

Computational complexity – black-box model – lower bounds for searching – general black-box lower bounds – polynomial method – block sensitivity – adversary methods – classical error correction – classical three-bit code – fault tolerance – quantum error correction – three- and nine-qubit quantum codes – fault-tolerant quantum computation

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999.

REFERENCES:

1. Nielsen M. A., Quantum Computation and Quantum Information Cambridge University Press.
2. V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.
3. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and

Information, Vol. I: Basic Concepts, Vol II: Basic Tools and SpeciaTopics,WorldScientific.

WEB REFERENCES

1. https://www.udemy.com/course/quantumcomputingquantumphysics/?utm_source=adwords&utm_medium=udemyads&utm.

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=Z1uoz_8dLH0&list=PL74Rel4IAsETUwZS_Se_P-fSEyEVQwni7
2. https://www.youtube.com/playlist?list=PLq-Gm0yRYwThGmlypvSFQ-kT2rPaXKAZ5

OUTCOMES:

1. Describe about quantum computing basics (K1)
2. Design the model for quantum computing systems (K3)
3. Design the algorithm for the model for quantum computing system (K3)
4. Develop the advanced algorithm for the progressed model (K3)
5. Compare Different Quantum Standard Algorithms (K3)
5. Compute the computational complexity and correct the errors (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	1	1	_	1	3	2	1	2	3
CO2	3	3	3	2	3	1	1	_	1	3	2	1	2	3
CO3	3	3	3	2	3	1	1	_	1	3	2	1	2	3
CO4	3	3	3	2	3	1	1	_	1	3	2	1	2	3
CO5	3	3	3	2	3	1	1	_	1	3	2	1	2	3
CO6	3	3	3	2	3	1	1	_	1	3	2	1	2	3

PROFESSIONAL ELECTIVE III

20ECPC702 SDG NO. 9, 11	OPTICAL COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study about the various optical fiber modes, configuration and transmission characteristics of optical fibers
- To learn about the transmission characteristics associated with dispersion and polarization techniques
- To learn about the various optical sources, detectors and transmission techniques
- To explore various idea about optical fiber measurements and various couplingtechniques
- To enrich the knowledge about optical communication systems and networks

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Introduction, need for optical communication, salient features of optical fibers, Ray theory of light guidance, Basic optical laws and definitions, Total internal reflection, Acceptance angle, Numerical aperture, Modes of a fiber, single and multimode fibers, Step-index and graded-index fibers, Fiber fabrication techniques. Electromagnetic nature of light, Boundary Conditions, Reflection and transmission of waves at a boundary, Modal analysis of optical fibers, Linearly polarized modes.

UNIT II SIGNALDEGRADATION IN OPTICAL FIBER 9

Attenuation, Absorption, Scattering losses, Bending losses, Core and Cladding losses, Signal dispersion, Inter symbol interference and bandwidth, Intra model dispersion, Material dispersion, Waveguide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening In GI fibers, Mode Coupling, Design optimization of single mode fiber, Characteristics of single mode fiber, RI Profile cutoff wave length, Dispersion calculations, Mode field diameter.

UNIT III OPTICAL SOURCES AND DETECTORS 9

Sources and Deectors: Intrinsic and extrinsic materials, Direct and indirect band gaps, LED structures, Surface emitting LED, Edge emitting LED, Quantum efficiency and LED power, Light source materials, Modulation of LED, LASER diodes, Modes and threshold conditions, Rate equations, External quantum efficiency. PIN photo detector, Avalanche photo diodes, Photo detector noise,

Noisesources, SNR, Detector response time, Avalanche multiplication noise.

UNIT IV OPTICALRECEIVER, MEASUREMENTS AND COUPLING 9

Fundamental receiver operation, preamplifiers, error sources, Front end amplifiers, Digital receiver performance, Probability of error, Receiver sensitivity, Quantum limit. Optical power measurement, Attenuation measurement (Cut back & Insertion loss Methods), Dispersion measurement, Fiber Numerical Aperture Measurements, Fiber cut-off Wave length Measurements, Fiber diameter measurements, OTDR Field Applications: OTDR Trace-Attenuation Measurements and Fiber fault location.

Coupling: Source to Fiber Power Launching, Lensing Schemes for coupling improvement, Fiber-to-Fiber Joints, LED Coupling to Single mode Fibers-Fiber Splicing, Optical Connectors.

UNIT V OPTICAL COMMUNICATION SYSTEMS AND NETWORKS 9

Digital Transmission Systems, System design consideration, Point–to–Point links, Link power budget, Rise time budget, WDM Concepts and Components, Elements of optical networks, SONET/SDH, Optical Interfaces, SONET/SDHRings and Networks, Broadcast and select WDM Networks, Wavelength Routed Networks, Optical ETHERNET, Solitons, All-Optical Networking, Evolution, Benefits, Challenges, and Future Vision.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Gred Keiser, "Optical Fiber Communication", McGraw Hill Education (India) Private Limited, Fifth Edition, Reprint 2013.
2. John M. Senior, "Optical Fiber Communication", Pearson Education, Second Edition, 2007.

REFERENCES:

1. Rajiv Ramaswami, "Optical Networks", Second Edition, Elsevier, 2004.
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.
3. Govind P. Agrawal, "Fiber Optic Communication Systems", Third Edition, John Wiley & sons, 2004.

WEB REFERENCES:

1. https://ieeexplore.ieee.org/abstract/document/6166843

ONLINE REFERENCES

1. https://onlinecourses.nptel.ac.in/noc18_ph06

OUTCOMES:

Upon completion of the course, the student should be able to

1. Realize basic elements in optical fibers, different modes and configurations. (K2)
2. Analyze the transmission characteristics associated with dispersion and polarization techniques. (K2)
3. Discuss optical sources, detectors, with their use in optical communication system. (K2)
4. Construct fiber optic receiver systems, and coupling techniques. (K3)
5. Measure Optical fiber parameters and performance (K2)
6. Design optical communication systems and its networks. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	-	-	-	-	2	2	1
CO2	3	3	2	2	3	1	-	-	-	-	-	2	2	1
CO3	3	3	3	1	2	-	1	-	-	-	-	-	2	1
CO4	3	3	3	1	2	-	-	-	1	1	-	-	2	1
CO5	3	2	2	1	1	1	-	-	-	-	-	-	2	1
CO6	2	1	-	-	-	-	2	1	-	-	-	-	2	1

PROFESSIONAL ELECTIVE III

20CCEL704 SDG NO.4	DATABASE SECURITY AND PRIVACY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of security, and how it relates to information systems.
- To identify risks and vulnerabilities in operating systems from a database perspective.
- To learn good password policies, and techniques to secure passwords in an organization.
- To learnand implement administration policies for users.
- To understand the various database security models and their advantages or disadvantages.
- To learn to implement privacy preserving data mining algorithms.

UNIT I OPERATING SYSTEM SECURITY FUNDAMENTALS 9

Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods. Introduction-Operating System Overview-Security . Environment – Components- Authentication Methods-User Administration-Password Policies-Vulnerabilities-E- mail Security.

UNIT II ADMINISTRATION OF USERS ,POLICIES, PRIVILEGES AND ROLES 9

Introduction-Authentication-Creating Users, SQL Server User-Removing,

Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies, Introduction-Defining and Using Profiles-Designing and Implementing Password . Policies-Granting and Revoking User Privileges-Creating, Assigningand Revoking User Roles-Best Practices.

UNIT III DATABASE APPLICATION SECURITY MODELS AND PRIVATE DATABASES 9

Introduction- Types of Users-Security Models- Application Types- Application Security Models-Data Encryption. Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server.

UNIT IV- AUDITING DATABASE ACTIVITIES 9

Using Oracle Database Activities-Creating DLL Triggers with Oracle- Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study.

UNITV- PRIVACYPRESERVING DATA MINING TECHNIQUES 9

Privacy Preserving Data Mining Techniques: Introduction- Privacy Preserving Data Mining Algorithms- General Survey-Randomization Methods-Group Based Anonymization-Distributed Privacy Preserving Data Mining-Curse of Dimensionality-Application of Privacy Preserving Data Mining

TOTAL : 45 PERIODS

TEXT BOOK

1. Hassan A. Afyouni, “Database Security and Auditing”, Third Edition, Cengage Learning, 2009.(UNIT 1 to IV)
2. Charu C. Aggarwal, Philip S Yu, “Privacy Preserving Data Mining”: Models

and Algorithms, Kluwer Academic Publishers, 2008.(UNIT V).

REFERENCE

1. Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier Digital Press, 2005.

ONLINERESOURCES:

1. http://charuaggarwal.net/toc.pdf
2. http://adrem.ua.ac.be/sites/adrem.ua.ac.be/file s/securitybook.pdf

OUTCOMES:

1. Describe Operating System Security Fundamentals (K1)
2 Illustrate Administration of Users and Different Policies (K2)
3 Illustrate the use of Database Security Models (K3)
4 Interpret the Concepts of VPD (K3)
5 Auditing Database Activities (K2)
6 Apply privacy preserving data mining algorithms.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	2	-	-	-	-	1	2	3	2
CO2	3	2	3	2	1	2	-	-	-	-	1	2	3	2
CO3	3	2	3	2	1	2	-	-	-	-	1	2	3	2
CO4	3	2	3	2	1	2	-	-	-	-	1	2	3	2
CO5	3	2	3	2	1	2	-	-	2	3	1	2	3	2
CO6	3	2	3	2	1	2	-	-	2	3	1	2	3	2

PROFESSIONAL ELECTIVE III

20CCEL705 SDG NO.4	PARALLEL ARCHITECTURE AND ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand different parallel architectures and models of computation.
- To introduce the various classes of parallel algorithms.
- To study parallel algorithms for basic problems.

UNIT I INTRODUCTION **9**

Need for Parallel Processing - Data and Temporal Parallelism - Models of Computation - RAM and PRAM Model – Shared Memory and Message Passing Models- Processor Organisations - PRAM Algorithm – Analysis of PRAM Algorithms- Parallel Programming Languages.

UNIT II PRAM ALGORITHMS **9**

Parallel Algorithms for Reduction – Prefix Sum – List Ranking –Preorder Tree Traversal – Searching -Sorting - Merging Two Sorted Lists – Matrix Multiplication - Graph Coloring – Graph Searching.

UNIT III SIMD ALGORITHMS - I **9**

2D Mesh SIMD Model - Parallel Algorithms for Reduction - Prefix Computation - Selection - Odd-Even Merge Sorting - Matrix Multiplication.

UNIT IV SIMD ALGORITHMS - II **9**

Hypercube SIMD Model - Parallel Algorithms for Selection- Odd-Even Merge Sort- Bitonic Sort- Matrix Multiplication Shuffle Exchange SIMD Model - Parallel Algorithms for Reduction -Bitonic Merge Sort - Matrix Multiplication - Minimum Cost Spanning Tree.

UNIT V MIMD ALGORITHMS **9**

UMA Multiprocessor Model -Parallel Summing on Multiprocessor- Matrix Multiplication on Multiprocessors and Multicomputer - Parallel Quick Sort - Mapping Data to Processors.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Michael J. Quinn, "Parallel Computing : Theory & Practice", Tata McGraw Hill Edition, Second edition, 2017.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", University press, Second edition , 2011.
3. V Rajaraman, C Siva Ram Murthy, " Parallel computers- Architecture and Programming ", PHI learning, 2016.

REFERENCES:

1. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", 2nd Edition, Addison Wesley, 2003.
2. M Sasikumar, Dinesh Shikhare and P Ravi Prakash , " Introduction to Parallel Processing", PHI learning , 2013.
3. S.G.Akl, "The Designand Analysis of Parallel Algorithms", PHI, 1989.

WEB REFERENCES:

1. https://web.cs.ucdavis.edu/~amenta/s13/parallel.html
2. https://www.sciencedirect.com/topics/computer-science/parallel-architectures.

ONLINERESOURCES:

1. https://freevideolectures.com/course/3361/parallel-algorithm
2. https://www.classcentral.com/course/swayam-parallel-algorithms-12934
3. https://nptel.ac.in/courses/106106112/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Introduce to parallel algorithms
2. Introduction of various classes of parallel Algorithms
3. Develop Parallel algorithms for standard problems
4. Understandingand applications of Parallel Algorithm
5. Analyzeefficiency of different parallel algorithms.

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	1	-	-	-	-	-	1	3	2
CO2	3	3	3	1	-	2	-	-	-	-	-	2	3	2
CO3	3	3	3	-	-	1	-	-	-	-	-	1	3	2
CO4	3	3	3	-	-	2	-	-	-	-	-	1	3	2
CO5	3	3	3	1	-	2	-	-	2	-	2	1	3	2
CO6	3	3	3	-	-	2	-	-	-	-	-	1	3	2

PROFESSIONAL ELECTIVE III

20CSPC602 SDG NO.4	COMPILER DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about the various phases of the Compiler
- To learn various Parsing techniques
- To understand Intermediate code generation & run time environment

- To analyze Code optimization techniques & Code generation algorithm

UNIT I INTRODUCTION TO COMPILERS 9

Translators-Compilation and Interpretation-Language processors – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens– Recognition of Tokens – LEX tool–Regular Expressions to Automata Direct method.

UNIT II SYNTAX ANALYSIS 12

Role of the parser –Writing a Grammar –Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive LL(1) Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedence Parsing – LR Parsers – SLR Parser– Introduction to LALR & CLR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT III INTERMEDIATE CODEGENERATION 8

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements –BackPatching – Procedure calls. Type Systems-Specification of a simple type checker- Equivalence of Type Expressions-Type Conversions.

UNIT IV RUN-TIME ENVIRONMENT AND CODEGENERATION 8

Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables- Dynamic Storage Allocation. Issues in the design of code generator – The target machine - Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG Representation of Basic Blocks.

UNIT V CODE OPTIMIZATION 8

Principal Sources of Optimization – Peep-hole optimization - DAG-Optimization of Basic Blocks- Global Data Flow Analysis - Efficient Data Flow Algorithm.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education, 2009.
2. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.

REFERENCES:

1. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003
3. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Allen I. Holub, "Compiler Design in C", Prentice-Hall Software Series, 1993.
5. Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", 2008.

WEB REFERENCES:

1. http://www.holub.com/software/compiler.design.in.c.docs.pdf
2. http://www.cs.usfca.edu/~galles/compilerdesign/x86.pdf

ONLINERESOURCES:

1. https://www.javatpoint.com/compiler-tutorial

OUTCOMES:

Upon completion of the course, the students should be able to:

1. Explain the role of each phase of a compiler with its construction tools.(K2)
2. Illustrate the role of a Lexical Analyzer for recognizing the tokens of a given language with the knowledge of symbol table management and error-handling(K3)
3. Construct parsers like top-down, bottom-up for a given grammar (K3)
4. Develop semantic analyzers for type-checking and intermediate code generators to translate the source program into an intermediate code (K3)
5. Outline Runtime environment and a simple Code Generator using the code generation Algorithm (K2)
6. Implement code optimizers to optimize the target code generated (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	2
CO2	3	2	-	1	2	-	-	-	-	-	-	1	2	2
CO3	2	3	-	2	-	-	-	-	-	-	-	1	2	2
CO4	2	3	1	2	-	-	-	-	-	-	-	1	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO6	1	-	3	-	1	-	-	-	-	-	-	1	2	2

PROFESSIONAL ELECTIVES - III

20ITEL710 SDG NO. 4 & 9	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic principles of Service Oriented Architecture
- To learn the fundamentals of XML
- To implement API using XML, JSON and REST
- To study about web services technology elements of SOA

UNIT I INTRODUCTION TO XML ANDXML BASED APPICATIONS 9

XML Document Structure – Well Formed and Valid documents – Name Spaces – DTD – XML Schema – X-Files - Parsing XML using DOM - SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML.

UNIT II DESIGN OF API USING JSON AND REST 9

Introduction to JSON - REST- Comparison of XML , JSON and REST - HTTP Methods using RESTful Services - REST Architectural Constraints - Richardson Maturity Model - JSON and REST Based Service Provider and Requestor API Examples.

UNIT III SERVICEORIENTED ARCHITECTURE 9

Characteristics of SOA - Comparing SOA with Client/Server and Distributed Architectures – Benefits of SOA - Principles of Service Orientation – Service Layers.

UNIT IV WEB SERVICES **9**

Service Descriptions – WSDL – Messaging with SOAP – Service Discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography –WS Transactions.

UNIT V BUILDING SOA- BASEDAPPLICATIONS **9**

Service Oriented Analysis and Design – Service Modeling – Design Standards and Guidelines - Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ron Schmelzer et al. " XML and Web Services", Pearson Education,2002
2. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

REFERENCES:

1. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education,2002.
2. Eric Newcomer, GregLomow, "Understanding SOA with Web Services", Pearson Education, 2005.
3. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 20044.
4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web. Services Architecture", Morgan Kaufmann Publishers,2003.
5. Thomas Erl,"Service-oriented Architecture: Concepts, Technology, and Design",2016

WEB REFERENCES:

1. https://www.coursera.org/learn/service-oriented-arhitecture
2. https://restfulapi.net/json-schema/
3. https://www.w3schools.com/js/js_json_intro.asp

ONLINERESOURCES:

1. https://nptel.ac.in/conten/storage2/nptel_data3/html/mhrd/ict/text/106105167/lec10.pdf

OUTCOMES:

Upon completion of the course, the student should be able to

1. Demonstrate the basic concepts of XML and XML based applications. (K3)
2. Construct the design of API using JSON & REST. (K3)
3. Discuss the basics concepts of SOA, its Principles and Benefits. (K2)
4. Interpret the Web services using technology elements. (K2)

5. Analyse the SOA based applications for intra-enterprise and inter-enterprise applications. (K4)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	1	-	-	-	-	1	-	1	1	1	2
CO2	3	3	-	1	1	-	-	-	1	1	1	2	1	2
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	1
CO4	3	3	1	-	-	-	-	-	-	1	1	1	1	1
CO5	3	3	1	1	1	-	-	-	1	1	1	2	1	2

PROFESSIONAL ELECTIVE III

20CCEL706 SDG NO.4	ADVANCED WIRELESS COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the latest concepts of wireless communication.
- To understand propagation models and its design parameters.
- To learn various modulation techniques and fading concepts
- To enable understanding of channel impairment mitigation using space time block and Trellis codes
- To practice and implement possible techniques to improve the performance of wireless systems.

UNIT I INTRODUCTION 9

Introduction about wireless communication - technical challenges of wireless communication- applications; Cellular architecture - frequency reuse - channel assignment - handoff - coverage and capacity improvement; Multiple access - FDMA/CDMA/TDMA/SDMA

UNIT II PROPAGATION PRINCIPLES 9

Propagation Principles: Propagation mechanisms - channel modeling methods - radio channels- indoor channels - outdoor channels - fading channels ; Mobile Radio Propagation : Large scale path loss – path loss and propagation models - small scale fading - types of small scale fading- parameters of mobile multipath channels - statistical models for multipath

fadingchannel.

UNIT III MODULATION AND DETECTION 9

Digital modulation: Structure of a wireless communication link - linear and constant envelope modulation techniques for wireless communication - error performance in fading channel; Transmission System; combined fast and slow fading - Equalization - different detection techniques used in wireless communication.

UNIT IV MIMO SYSTEMS 9

Types of MIMO Systems: Beam forming - spatial multiplexing - basic space time code design principles- Alamouti scheme - orthogonal and quasi orthogonal space time block codes- space time trellis codes - representation of space - performance analysis for space-time trellis codes - comparison of space-time block and trellis codes.

UNIT V INSTRUCTIONAL ACTIVITIES 9

Simulation of minimum of (2) modulation and multiple access techniques for wireless communication using related simulation tools.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Andreas Molisch F, "Wireless Communications", John Wiley and Sons Ltd., 2011.
2. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005

REFERENCES:

1. David Tse and PramodViswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Theodore S. Rappaport, "Wireless Communications: Principles and Practice", 2nd Edition, Prentice Hall of India, 2005.
3. Guillaume De La Roche, Andres Alayon Glazunov and Ben Allen, "LTE – Advanced and Next Generation Wireless Networks: Channel Modelling and Propagation", John Wileyand Sons Ltd., 2013
4. S.G. Glisic, "Advanced Wireless Communications", 4G Technologies, Wiley, 2004
5. Michel DaoudYacoub, "Wireless Technology: Protocols, Standards, and Techniques", CRC Press, 2002.
6. Jafarkhani H, "Space-Time Coding: Theory & Practice", Cambridge University Press, 2005.

WEB REFERENCES :

1. http://ee.sharif.edu/~wireless.comm.net/references/Tse,%20Fundamentals%20of%20Wireles s%20Communication.pdf
2. http://ee.sharif.edu/~pr.wireless.comm/references/Goldsmith.pdf

ONLINERESOURCES:

1. https://saravanyablog.files.wordpress.com/2017/04/andreas -f-molisch-wireless-comm.pdf
2. http://freevideolectures.com/Course/2329/Wireless-Communication
3. https://videoken.com/search-results

OUTCOMES:

At the end of this course, students will be able to:

1 Discuss cellular system design and technical challenges. (K1)

2 Analyze the Mobile radio propagation, fading, path loss and the channel modelling.(K3)

3 Evaluate the performance of digital modulation techniques over wireless channels using software andhardware techniques. (K3)

4 Analyze the design parameters, link design, smart antenna, beam forming and MIMO systems.(K3)

5 Suggest the possible techniques to improve the performance of wireless systems using modern tools. (K2)

6 Describe the various Instructional Activities (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	3	3	3	3	2	2	2	2	2	2
CO2	3	2	3	3	3	2	2	3	2	1	3	2	2	2
CO3	3	3	3	3	3	3	2	1	1	2	2	2	3	2
CO4	3	2	3	3	3	2	2	3	1	2	2	2	3	3
CO5	3	3	3	3	3	2	3	3	2	1	3	2	2	3
CO6	3	2	3	3	3	2	2	3	1	2	2	2	3	3

PROFESSIONAL ELECTIVE III

20CCEL707 SDG NO.4	PRINCIPLES OF MULTIMEDIA	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide sound knowledge in scripting languages, user interface design, and efficient program development
- To create exciting, compelling interactive user experiences.

UNIT I INTRODUCTION **9**

Introduction to Multimedia – Characteristics – Utilities – Creation -Uses – Promotion – Digital Representation – Media and Data streams – Multimedia Architecture – Multimedia Documents

UNIT II ELEMENTS OF MULTIMEDIA **9**

Text: types – font - Unicode standard - text compression - file formats. – Image: types - image processing – standards - specification - device independent color models - gamma correction - file formats – Video :video signal transmission - signal formats - broadcasting standards - digital video standards - PC video - video file formats – Audio : acoustics - characteristics of sound - elements of audio system – microphone – amplifier – loudspeaker - audio mixer - digital audio - MIDI – Graphics – components of graphics system, co-ordinate system – plotter - Intro to 2D & 3D Graphics -surface characteristics and texture - lights – Animation :key frames & Tweening, techniques, principles of animation, 3D animation, file formats.

UNITIII MULTIMEDIASYSTEMS **9**

Visual Display Systems – CRT - video adapter card - video adapter cable – LCD – PDP - optical storage media - CD technology - DVD Technology - Compression Types and Techniques – CODEC - GIF coding standards - lossy and lossless – JPEG - MPEG-1 - MPEG-2 - MP3 - Fractals – MMDBS

UNIT IV MULTIMEDIA TOOLS **9**

Authoring tools – features and types - card and page based tools - icon and object based tools - time based tools - cross platform authoring tools - Editing tools - text editing and word processing tools - OCR software - painting and drawing tools - 3D modeling and animation tools - image editing tools -sound editing tools - digital movie tools – plug -ins and delivery vehicles for www

UNITV MULTIMEDIA APPLICATIONDEVELOPMENT 9

Software life cycle – ADDIE Model – conceptualization – content collection and processing – story – flowline – script - storyboard - implementation - multiplatform issues – authoring – metaphors – testing – report writing - documentation - case study: -Web Application – Console Application – Distributed Application – Mobile Application - games consoles – iTV – kiosks – education

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Parekh R "Principles Of Multimedia" Tata McGraw-Hill, 2006.
2. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications" Prentice Hall, 1995.

REFERENCES:

1. Tay Vaughan, "Multimedia: Making It Work" McGraw-Hill Professional, 2006
2. Deitel & Deitel "Internet & World Wide Web How to Program", Fourth Edition– Prentice Hall, 2008.

OUTCOME:

At the end of this course, the student will be able to

1. Understand the basic concepts of multimedia characteristics, media and data streams (K2)
2 Implement the concepts of multimedia architecture and multimedia documents (K3)
3 Learn the concepts of text, image and video types (K2)
4 Analyzesignal formats and digital video standards (K3)
5 Acquire the concepts of visual display systems such as CRT, LCD, and PDP (K2)
6 Summarize the Various Multimedia application Development (K2

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	1	1	-	-	-	-	-	2	2	1
CO2	3	2	2	2	2	1	-	-	-	-	-	1	2	1
CO3	3	2	3	3	3	2	-	-	-	-	-	1	2	2
CO4	3	2	3	3	3	2	-	-	-	-	-	1	2	2
CO5	3	3	3	3	3	2	-	-	-	-	-	1	2	1
CO6	3	3	3	3	3	1	-	-	-	-	-	1	2	2

PROFESSIONAL ELECTIVE III

20CSEL802 SDG NO.4 & 9	DEEP LEARNING PRINCIPLES AND PRACTICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the concepts of Deep Learning
- To introduce Dimensionality Reduction techniques.
- To illustrate Deep Learning techniques to support Real-time applications
- To examine the case studies of Deep Learning techniques

UNIT I INTRODUCTION 9

Introduction to Machine Learning-Linear Models - SVMs – Perceptrons - Logistic Regression -Introduction to Neural Networks - Shallow Network - Training a Network - Loss Functions - Back Propagation and Stochastic Gradient Descent-Neural Networks as Universal Function.

UNIT II CONCEPTS OF DEEP LEARNING 9

History of Deep Learning - Probabilistic Theory of Deep Learning - Back Propagation –Regularization –Batch Normalization-VC Dimension - Neural Networks-Deep Vs Shallow Networks- Convolutional Networks-Generative Adversarial Networks (GAN) - Semi-supervised Learning.

UNITIII METRIC LEARNING 9

Principle Component Analysis – Linear Discriminant Analysis- Manifolds - Metric Learning -Auto Encoders -Dimensionality Reduction in Networks - Introduction to Convolution Network - Architectures –AlexNet – Visual

Geometry Group –Inception– Residual Network

UNIT IV OPTIMIZATION **9**

Optimization in Deep Learning–Non-Convex Optimization for Deep Networks Stochastic optimization-Generalization in Neural Networks-Spatial Transformer Networks-Recurrent networks – Long Short Term Memory - Recurrent Neural Network Language Models-Word Level

UNIT V ADVANCED TECHNIQUES **9**

ImageNet - Object Detection - Audio WaveNet - Natural Language Processing - Word2Vec Model -Joint Detection-Bio Informatics-Face Recognition-Scene Understanding-Gathering Image Captions.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Cosma Rohilla Shalizi, "Advanced Data Analysis from an Elementary Point of View", Carnegie Mellon University, Cambridge University Press (March 21, 2021); eBook.
2. Deng and Yu, "Deep Learning: Methods and Applications", Now Publishers, 2013.

REFERENCES:

1. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press 2004
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press, 2009.
3. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", Wiley, Second Edition
4. Christopher Bishop, "Pattern Recognition and Machine Learning", illustrated Edition, Springer, 2006
5. Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series)", An MIT Press book, 2016

WEB REFERENCES:

1.https://nptel.ac.in/courses/106105215/
2.https://nptel.ac.in/courses/106106201/
3. https://www.coursera.org/specializations/deep-learning

ONLINE RESOURCES:

1.https://www.simplilearn.com/deep-learning-tutorial
2.https://www.tutorialspoint.com/machine_learning/deep_machine_learning.htm

OUTCOME:

At the end of this course, the student will be able to

1 Differentiate various learning approaches and to interpret the concepts of Machine Learning. (K2)

2 Understand the history of Deep Learning and theory behind Deep Learning techniques and analyze it.(K2)

3 Compare the different Dimensionality Reduction techniques and study about Convolution network technique.(K2)

4 Illustrate the working of Optimization techniques in Deep Learning.(K3)

5 Identify the case studies in Deep Learning and identify its applicability in real life problems.(K3)

6 Examine advanced techniques in Deep Learning like image detection, Bio Informatics-Face Recognition.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	1	-	2	-	-	-	2	1	-	3	3	1
CO2	2	-	1	-	3	-	-	-	2	1	-	2	3	1
CO3	3	-	1	-	2	-	-	-	2	1	-	3	3	1
CO4	3	-	1	-	2	-	-	-	2	1	-	2	3	1
CO5	3	-	1	-	3	-	-	-	2	1	-	2	3	1
CO6	3	-	1	-	2	-	-	-	2	1	-	2	2	1

PROFESSIONAL ELECTIVE III

20ITEL708 SDG NO.4 & 9	FULL STACK SOFTWARE DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain knowledge on front-end and back-end technologies
- To become proficient in JQuery and Bootstrap
- To build strong expertise on Typescript, React and Node.js
- To implement MVC and responsive design to provide uniied and intuitive user experience
- To Use Docker and Kubernetes platform for building, running, managing and

distributing applications

UNIT I INTRODUCTION TO FULL STACK DEVELOPMENT 9

Introduction – Full Stack Development – Front-end – Back-end, Technologies essential for Full Stack Development – Introduction to Web Application Development – Front-end Technologies – Back-end Technologies – Introduction to MVC – Introduction to Web Services – Communication between front-end and back-end – Build responsive websites with HTML5 and CSS3 – Javascript basic building blocks – Object oriented JS – Functional JS

UNIT II JQUERY AND BOOTSTRAP 9

Overview of Bootstrap – Structure of a Bootstrap – enabled Webpage – Grids – Typography – Colors – Images – Jumbotron – Alerts – Buttons – Button Groups - Progress Bars – Pagination – Navigation menu and bar – Forms – Media Objects – Overview of JQuery – Configuration of JQuery – Selectors – Events – Effects – Working with HTML – JQuery with CSS – Traversing.

UNITIII TYPE SCRIPT, REACT, NODEJS 9

Node and NPM – NPM commands – Standard modules - React – Components – JSX – TypeScript – Configuring Typescript Compilation – Types – Block scope – Functions – Spread and Rest – Destructuring – Classes – Interfaces – Namespaces and Modules.

UNIT IV SPRING, SPRING MVC AND HIBERNATE 9

Spring Framework – Spring Architecture – Spring MVC – Interception – Chain of resolvers – Multiple view page and controllers – Model Interface – Forms – CRUD – File Upload – Validation – Hibernate Introduction – Architecture – Java objects in Hibernate – Inheritance Mapping – Collection Mapping – HCQL – Caching – Spring Integration.

UNIT V CONTAINERS 9

Kubernetes and Container Operations – Overview – Microservices and orchestration – Kubernetes Architecture – Core constructs – Health checks – Application Scheduling - Docker – Introduction to Containers and Containerization – Building Docker Images – Deploying to Docker hub

TOTAL : 45 PERIODS

TEXT BOOKS:

1. MayuirRamgir, “Full Stack Java Development with Spring MVC, Hibernate, jQuery and Bootstrap”, Wiley India Pvt. Ltd., 2020.
2. Frank Zammetti, “Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack and Docker”, Apress, 2020.

REFERENCES:

1. Chris Northwood, "The Full Stack Developer", Apress, 2018
2. Adam Bretz, Colin J. Ihrig, "Full Stack Javascript Development with MEAN", SitePoint Pty. Ltd., 2014
3. Dinesh Rajput, "Designing Applications with Spring Boot 2.2 and React JS", BPB Publications, 2019
4. Juha Hinkula, Hands-on Full Stack Development with Spring Boot 2 and React, Packt Publishing, 2019
5. Jonathan Baier, "Getting Started with Kubernetes", Packt Publishing, 2015

WEB REFERENCES:

1.https://docs.spring.io/spring-framework/docs/3.2.x/springframework-reference/html/index.html
2.https://www.w3spoint.com/hibernate-tutorial
3.https://www.w3schools.com/
4.https://docs.docker.com/get-started/
5. https://kubernetes.io/docs/tutorials/

OUTCOME:

At the end of this course, the student will be able to

1. Understand the basic principles of full stack software development. (K2)

2. Classify the libraries, user interfaces and runtime environments for data communication. (K2)

3. Architect solutions to real time problems by combining visual components and classes. (K3)

4. Use the frameworks for developing enterprise class applications. (K3) 5. Design and develop interactive and responsive web pages. (K3)

6. Build and manage container orchestration for elastic web server framework. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	3	-	-	-	-	-	-	2	2	2
CO2	1	2	1	1	3	-	-	-	-	-	-	2	2	2
CO3	1	2	1	1	3	-	-	-	-	-	-	2	2	2
CO4	1	2	2	2	3	-	-	1	-	-	-	2	2	2
CO5	1	2	2	2	3	-	-	1	-	-	-	2	2	2
CO6	1	2	2	2	3	-	-	1	-	-	-	2	2	2

PROFESSIONAL ELECTIVE III

20ECEL706 SDG NO.9 &12	MICROWAVE AND MILLIMETER WAVE CIRCUITS AND SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study trend in the designing and modeling of Microwave and mm wave circuits.
- To Summarize the applications of Microwave and mm wave circuits and systems.
- To analyze modeling of noise for UWB systems.
- To illustrate concept of MIOS and SIW technologies.
- To outline the design of RF circuits and RF Mems

UNIT I DESIGN AND MODELING TRENDS 9

Introduction to Low Coefficient Accurate Nonlinear Microwave and Millimeter Wave Nonlinear Transmitter Power Amplifier Behavioural Models, Artificial Neural Network in Microwave Cavity Filter Tuning, Wideband Directive Antennas with High Impedance Surfaces - AMC Characterization, 2 Antenna over AMC, Wideband Directive Antenna Using AMC with a Lumped Element Wideband Directive Antenna Using a Hybrid AMC

UNIT II MODELLING OF SUBSTRATE NOISE AND MITIGATION SCHEMES FOR UWB SYSTEMS 9

Ultra Wideband Systems – Developments and Challenges, Impact Evaluation of Substrate Noise, Analytical Modelling of Switching Noise in Lightly Doped Substrate, Substrate Noise Suppression and Isolation for UWB Systems.

UNIT III APPLICATIONS **9**

Short-Range Tracking of Moving Targets by a Handheld UWB Radar System - Handheld UWB Radar System, UWB Radar Signal Processing, Advances in the Theory and Implementation of GNSS Antenna Array Receivers - GNSS: Satellite-Based Navigation Systems, Challenges in the Acquisition and Tracking of GNSS Signals, Design of Antenna Arrays for GNSS, Multiband RF Front-Ends for Radar and Communications Applications- Minimum SubNyquist Sampling , Design of Signal-Interference Multiband Bandpass Filters, Building and Testing of Direct-Sampling RF Front-Ends

UNIT IV RECONFIGURABLE RF CIRCUITS AND RF-MEMS **9**

Reconfigurable RF Circuits – Transistor-Based Solutions, Design Example: Tunable Band Pass filter, Beamforming Network, LNA and VCO, Reconfigurable RF Circuits Using RF-MEMS

UNIT V MIOS and SIW TECHNOLOGIES **9**

Quiet-Sun Spectral Flux Density, Radiation Mechanism in Flares, Solar Flares Flux Density, Solar Flares Peak Flux Distribution, Atmospheric Variability, Ionospheric Variability, Antenna Design - Antenna e (SIW) Technology - Substrate Integrated Waveguide Technology, Passive SIW Cavity-Backed Antennas, Design of Coupled Oscillator Systems for Power Combining, Coupled Oscillator Array with Beam-Scanning Capabilities

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Apostolos Georgiadis, Hendrik Rogier, Luca Roselli, Paolo Arcioni Microwave and Millimeter Wave Circuits and Systems: Emerging Design, Technologies and Applications, 2012, Wiley

REFERENCES:

1. Joy Laskar, Babak Matinpour, Sudipto Chakraborty, “Modern Receiver Front- Ends Systems, Circuits, and Integration”, Wiley- Interscience, 2004.

WEB REFERENCES:

1. https://www.everythingrf.com/
2. https://nptel.ac.in/courses/117/105/117105139/#

ONLINE REOURCES:

1.https://www.youtube.com/watch?v=kYp0ipC-wtE
2.https://mtt.org/webinar-library/microwave-and-millimeter-wavepower-amplifiers-technology-applications-and-future-trends/

OUTCOME:

At the end of this course, the student will be able to

1. Summarize the trend in the designing and modeling of Microwave and mm wave circuits (K1)

2. Apply the Microwave and mm wave circuits and systems to various communication technologies (K2)

3. Model and suppress various noise sources in communication systems. (K2)

4. Illustrate concept of MIOS and SIW technologies (K1)

5. Design RF circuits and RF Mems (K3)

6. Illustrate the design and applications of Microwave and mm wave circuits and systems (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	1	1	-	1	1	1	1	3	2
CO2	3	3	3	1	1	1	1	-	1	1	1	1	3	2
CO3	3	3	3	1	1	2	2	1	1	1	1	1	3	3
CO4	3	2	3	1	1	2	2	1	1	1	1	1	2	2
CO5	3	3	3	1	1	1	2	-	1	1	1	1	3	2
CO6	3	3	3	1	1	1	2	-	1	1	1	1	3	2

PROFESSIONAL ELECTIVE IV

20CCEL801 SDG NO.4	HARDWARE SOFTWARE CODESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Transform software programs into cycle-based hardware descriptions.
- Partition and implement software programs into hardware and software components and design interfaces to communicate between them.
- Explain the control-flow and data-flow of a software program and cycle accurate hardware components.

UNIT I INTRODUCTION TO HARDWARE SOFTWARE CODESIGN 9

Levels of Abstraction, Driving factors in codesign. Data flow modeling and implementation, Synchronous Data Flow Graphs, Scheduling of Data Flow, dynamic and static schedule. Pipelining, multi-rate expansion.

UNIT II TRANSFORMATION OF SOFTWAREINTO HARDWARE 9

Data and control flow of programs, construction of control flow graph. Design of data path and controller. Finite State Machine with Data path, FSMD modeling and implementation, Simulation and Synthesis of FSMD.

UNIT III DESIGNOF CUSTOM ARCHITECTURES 9

Programming in Gezel. FSMD examples in Gezel, Verilog, VHDL. Limitations of Finite state machines, Microprogrammed architecture control, encoding, datapath. Microprogrammed Interpreters and pipelining. Picoblaze: Acontemporary microprogram controller. Embedded Cores for Codesign: Processors, RISCpipeline, Control, data and structural hazards.

UNIT IV PROGRAM ORGANIZATION 9

Data types, memory hierarchy, program layout, object code, compiled code. System On Chip: Design principles of So C architecture. Data processing, Communications, Storage and Control of Heterogeneous and Distributed systems. Interfacing for Hardware Software Codesign: on-chip bus systems, bus transfers, bus priority and locking.

UNIT V SYNCHRONIZATION SCHEMES 9

semaphore, handshake, blocking and non-blocking data transfer. Memory-Mapped Interfaces: Register, Mailbox, FIFO, Shared memory. Coprocessor Interfacing: tight and loose coupling, Fast Simplex Link, Custom

instruction interfaces, ASIP Design flow. Coprocessor design for Advanced Encryption Standard (AES): functions of coprocessor, Data and Control design, Programmers model, software design.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Patrick Schaumont, “A Practical Introduction to Hardware/Software Codesign", Springer, 2nd Edition, 2012.
2. D. D. Gajski, S. Abdi, A. Gerstlauer, G. Schirner, “Embedded System Design: Modeling, Synthesis and Verification”, Springer, 2009.
3. P. Marwedel, “Embedded System Design: Embedded systems foundations of CyberPhysical Systems, Springer, 2011.
4. Frank Vahid, Tony Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", John Wiley & Sons, 2002.

REFERENCE BOOKS

1. G. De Micheli, R. Ernst, W. Wolf, "Readings in Hardware/Software Codesign", Morgan Kaufman, 2002.
2. J. Staunstrup and Wayne Wolf, “Hardware/Software Co-design: Principles andpractice”, Springer, 1997.
3. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Elsevier Publication, 2nd Edition, 2008.

OUTCOMES

Upon completing the course, the student should be able to

1 Understand various models of computation for embedded systems (K2)
2 Understand the architectural selection, partitioning, scheduling and communication for embedded systems(K2)
3 Apply the simulation, synthesis and verification for FPGA implementation (K2)
4 Realize the retargetable code generation through hardware implementation(K2)
5 Understand the Coprocessor Interfacing and ASIP Design flow(K2)
6 Understand the Concepts of various Synchronization Schemes (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	3	3	3	3	2	2	2	2	2	2
CO2	3	2	3	3	3	2	2	3	2	1	3	2	2	2
CO3	3	3	3	3	3	3	2	1	1	2	2	2	3	2
CO4	3	2	3	3	3	2	2	3	1	2	2	2	3	3
CO5	3	3	3	3	3	2	3	3	2	1	3	2	2	3
CO6	3	2	3	3	3	2	2	3	1	2	2	2	3	3

PROFESSIONAL ELECTIVE IV

20CCEL802 SDG NO.3,4,9	FUZZY LOGIC AND NEURAL NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Impact knowledge on fuzzy logic and Artificial Neural Networks
- To Understand models of ANN
- To Use the fuzzy logic and neural network for application related to design and manufacture

UNIT I INTRODUCTION TO FUZZY LOGIC PRINCIPLES 9

Basic concepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relations – Fuzzy relational equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference – Predicate Logic – Inference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference – fuzzy rule based systems – fuzzification and defuzzification – types.

UNIT II ADVANCEDFUZZY LOGIC APPLICATIONS 9

Fuzzy logic controllers – principles – review of control systems theory – various industrial applications of FLC adaptive fuzzy systems – fuzzy decision making – Multi objective decision making – fuzzy classification – means clustering – fuzzy pattern recognition – image processing applications – syntactic recognition – fuzzy optimization.

UNIT III INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 9

Fundamentals of neural networks – model of an artificial neuron – neural network architectures – Learning methods – Taxonomy of Neural network architectures – Standard back propagation algorithms – selection of various parameters – variations Applications of back propagation algorithms.

UNIT IV OTHER ANN ARCHITECTURES 9

Associative memory–exponential BAM–Associative memory for real coded pattern pairs–Applications adaptive resonance theory – introduction – ART 1 – ART2 – Applications – neural networks based on competition – Kohonen self organizing maps – learning vector quantization – counter propagation networks – applications.

UNIT V RECENT ADVANCES 9

Fundamentals of genetic algorithms – genetic modeling – hybrid systems – integration of fuzzy logic, neural networks and genetic algorithms – non-traditional optimization techniques like ant colony optimization – Particle swarm optimization and artificial immune systems – applications in health sector, design and manufacturing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rajasekaran. S.. Vijayalakshmi Pai. G.A. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice Hall of India Private Limited, 2003
2. Timothy J.Ross, "Fuzzy logic with Engineering Applications", McGraw Hill, 2017 .
3. Zurada J.M. "Introduction to Artificial Neural Systems", Jaico publishing house, 2016.

REFERENCES:

1. Klir.G, Yuan B B "Fuzzy sets and Fuzzy Logic Prentice Hall of India private limited, 1997.
2. Laurene Fausett, "Fundamentals of Neural Networks", Prentice hall, 1992

WEB REFERENCES:

1. https://swayam.gov.in › nd1_noc20_ge09
2. https://www.slideshare.net/sajidqaxi/fuzzy-logic-and-neural-networks
3. https://nptel.ac.in/courses/127105006/

ONLINE RESOURCES:

1. https://youtu.be/IZWTduVCrf8
2. https://www.slideshare.net/ehamzei/fuzzy-set

OUTCOMES:

Upon completion of the course, the student should be able to:

1 Understand the principles behind Fuzzy logic and artificial neural network.(K2)
2 Understand various fuzzy logic controllers, optimization techniques and Genetic algorithm(K2)
3 Apply ANN models and Fuzzy logic principles to industrial application (K3)
4 Apply optimization techniques in design and manufacturing field (K3)
5 Analyze the fuzzy logic techniques using image processing and pattern recognition field (K3)
6 Describe the fundamentals of Genetic Algorithms (K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	1	2	2	-	-	-	2	2	3	2
CO2	3	2	3	2	1	2	1	-	-	-	2	2	3	2
CO3	3	3	3	3	2	3	-	-	-	-	2	2	3	3
CO4	3	3	3	2	3	2	1	-	-	-	2	2	3	3
CO5	3	3	3	2	3	2	2	-	2	3	2	2	3	3
CO6	3	3	3	2	3	2	2	-	2	3	2	2	3	3

PROFESSIONAL ELECTIVE IV

20CCEL803 SDG NO.4	SATELLITE COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Analyze the various methods of satellite access
- Understand the applications of satellites

- Understand the basics of satellite Networks

UNIT I SATELLITEORBITS 9

Kepler‟s Laws, Newton‟s law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility – eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II SPACESEGMENT 9

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The Antenna Subsystem.

UNIT III SATELLITE LINK DESIGN 9

Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV SATELLITE ACCESS ANDCODING METHODS 9

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes.

UNIT V SATELLITE APPLICATIONS 9

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broad cast satellites (DBS/DTH).

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Dennis Roddy, "Satellite Communication", 4th Edition, Mc Graw Hill International, 2006.
2. Timothy, Pratt, Charles, W.Bostain, Jeremy E.Allnutt, "Satellite Communication", 2nd Edition, Wiley Publications,2002

REFERENCES

1. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.
2. N.Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
3. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.

4. Tri T. Ha, "Digital Satellite Communication", II nd edition, 1990.
5. Emanuel Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.
6. Robert G. Winch, "Telecommunication Trans Mission Systems", Mc Graw-Hill Book Co., 1983.
7. Brian Ackroyd, "World Satellite Communication and earth station Design", BSP professional Books, 1990.
8. G.B.Bleazard, "Introducing Satellite communications", NCC Publication, 1985.
9. M.Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003.

OUTCOMES:

Upon completion of the course, the students should be able to

1 Analyze the orbital mechanics (K2)
2 Classify different launch vehicles and describe the working of the space segment subsystems. (K2)
3 Evaluate the satellite link budget and estimate the performance impairments. (K2)
4 Understand different earth station parameters and its measures. (K2)
5 Illustrate the different applications of satellites. (K2)
6 Illustrate the concepts of Satellite access and coding methods (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO2	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO3	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO4	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO5	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO6	2	2	2	1	2	1	-	-	-	-	1	2	2	2

PROFESSIONAL ELECTIVE IV

20CCEL804 SDG NO.4	ETHICAL HACKING AND DIGITAL FORENSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn how illegal computer attacks are performed and how to counteract them
- To explore the nature of digital evidence and to focus on the law issues surrounding computer crime.

UNIT I INTRODUCTION **9**

Definition of hacking: Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks –SQL injection attacks – Buffer overflow attacks – Privacy attacks.

UNIT II NETWORK FORENSICS **9**

TCP / IP – Check sums – IP Spoofing port scanning, DNS Spoofing. Dos attacks– SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls.

Batch File Programming.

UNITIII FUNDAMENTALS OF COMPUTER FRAUD **9**

Fundamentals of Computer Fraud:the use of computers in occupational fraud, Asset Misappropriation Cash Schemes Skimming, Cash larceny, Fraudulent disbursements– Threat concepts – Framework for predicting inside attacks–Managing the threat –Strategic Planning Process.

UNIT IV PREVENTIONSTRATAGIES **9**

Architecture strategies for computer fraud prevention: Service oriented architecture, distributed system architecture, client server architecture – Protection of Web sites – Intrusion detection system: Active IDS, passive IDS – NIDS, HIDS: comparison of NIDS AND HIDS – Penetrating testing process – Web Services – Reducing transaction risks.

UNIT V FRAUDTAXONOMY **9**

Key Fraud Indicator selection process customized taxonomies – Key fraud signature selection process – Accounting Forensics – Computer Forensics – Journaling and it requirements – Standardized logging criteria – Journal risk and control matrix–Neural networks – Misuse detection and Novelty detection.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Kenneth C. Brancik "Insider Computer Fraud" Auerbach Publications Taylor& Francis Group – 2008.

REFERENCES

1. Ankit Fadia "Ethical Hacking" second edition Macmillan India Ltd, 2006

OUTCOME:

At the end of this course, the student will be able to

1. Evaluate penetration testing and ethical hacking of computer systems (K3)
2 Understand the role of the entire penetration testing process (K2)
3 Analyze and mitigate threats to internal computer systems (K3)
4 Process and analyze computer forensic evidence (K2)
5 Analyze Asset Misappropriation and Fraudulent disbursements (K3)
6 Compare and contrast different Prevention Methods (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	2	-	1	-	-	2	2	3	2
CO2	3	2	3	2	2	2	-	1	-	-	2	2	3	2
CO3	3	2	3	2	1	2	-	1	-	-	2	2	3	2
CO4	3	2	3	2	3	2	-	1	-	-	2	2	3	2
CO5	3	2	3	2	3	2	-	1	2	3	2	2	3	2
CO6	3	2	3	2	3	2	-	1	2	3	2	2	3	2

PROFESSIONAL ELECTIVES - IV

20MGEL801 SDG NO. 3,4,5,8,10, 13,14,15,16	PROFESSIONAL ETHICS AND VALUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- An understanding of their duties and responsibilities as professionals through gaining knowledge of the philosophies of ethics, professional practice, and world culture.
- Basic knowledge to make informed ethical decisions when confronted

with problems in the working environment.

- Improved awareness of potential ethical issues within an engineering context.
- Team skills through working in teams on assignments and in-class assignments.
- Subjective analytical skills through investigation and evaluation of ethical problems in engineering settings using accepted tests for moral problem solving.
- An understanding of how societal morals vary with culture and its influence on ethical thought and action.
- Improved communications skills with regard to ethical and professional issues in engineering.
- Know some of the classic cases as well as contemporary issues in engineering ethics.

UNITI HUMAN VALUES

Morals, Values, and Ethics – Integrity –Trustworthiness – Work Ethics – Service-Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II PRINCIPLES FOR HARMONY

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties – Aspirations and Harmony (I, We & Nature) – Gender Bias – Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III ENGINEERING ETHICS AND SOCIAL EXPERIMENTATION

History of Ethics – Need of Engineering Ethics – Senses of Engineering Ethics- Profession and Professionalism ––Self Interest – Moral Autonomy – Utilitarianism – Virtue Theory – Uses of Ethical Theories – Deontology- Types of Inquiry –Kohlberg's Theory – Gilligan's Argument – Heinz's Dilemma – Comparison with Standard Experiments –– Learning from the Past – Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law – Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV ENGINEERS' RESPONSIBILITIES TOWARDS SAFETY AND RISK

The concept of Safety – Safety and Risk – Types of Risks – Voluntary v/s Involuntary Risk – Consequences – Risk Assessment –Accountability – Liability – Reversible Effects – Threshold Levels of Risk – Delayed v/s Immediate Risk – Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V ENGINEERS' DUTIES AND RIGHTS

Concept of Duty – Professional Duties – Collegiality – Techniques for Achieving Collegiality – Senses of Loyalty – Consensus and Controversy – Professional and Individual Rights – Confidential and Proprietary Information – Conflict of Interest-Ethical egoism – Collective Bargaining – Confidentiality – Gifts and Bribes – Problem solving-Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI GLOBAL ISSUES

Globalization and MNCs –Cross Culture Issues – Business Ethics – Media Ethics – Environmental Ethics – Endangering Lives – Bio Ethics – Computer Ethics – War Ethics – Research Ethics -Intellectual Property Rights.

TEXT BOOKS:

1. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009

REFERENCE BOOKS:

1. Ethical Choices in Business Response Books, Sekhar, R.C: 1997, New Delhi,Sage Publications.
2. The Ethical Organisation, Kitson, Alan and Campebell, Robert: 1996. Great Britain Macmillan Press Ltd.
3. Engineering Ethics, Pinkus, Rosa Lyun B., Larry J Shulman, Norman Phummon, Harvey Wolfe:1997, New York, Cambridge Uty., Press
4. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
5. Ethics in Engineering by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.
6. Professional Ethics and Morals by Prof.A.R.Aryasri, Dharanikota Suyodhana – Maruthi Publications.
7. Engineering Ethics by Harris, Pritchard, and Rabins, Cengage Learning, New Delhi.
8. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
9. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
10. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill – 2013
11. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications

WEB RESOURCES

1 Ethos Education provides a concise guide on developing a code of ethics for primary and secondary schools.
2 The Ethics Resource Center has a toolkit available for use. When used for commercial purposes, a nominal license fee is required.
3 Creating A Code Of Ethics for Your Organization, with many suggested books, by Chris MacDonald
4 The Deloitte Center for Corporate Governance offers a variety of resources for those who are active in governance, including a variety of resources and a set of suggested guidelines for writing a code of ethics or a code of conduct.

MOOC REFERENCES:

1 https://www.udemy.com/course/worlplace-ethics-and-attitude/
2 https://www.udemy.com/course/business-ethics-how-to-create-an-ethical-organization/
3 https://nptel.ac.in/courses/110/105/110105097/Ethics in Engineering Practice
4 https://nptel.ac.in/courses/109/104/109104068/Human Values
5 https://www.coursera.org/learn/ethics-technology-engineering
6 https://www.classcentral.com/course/ethics-technology-engineering-10485

OUTCOMES:

Upon completion of the corse, the students will be able to

1 Classify between ethical and non-ethical situations. (K2)
2 Discuss and practice moral judgment in conditions of dilemma. (K2)
3 Explain and relate the code of ethics to social experimentation and real world scenarios. (K2)
4 Describe risk and safety measures in various engineering fields. (K2)
5 Explain the impact of engineering solutions in a global/societal / professional context. (K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	2	2	3	3	3	3	3	1	3
CO2	2	3	2	2	2	3	3	3	3	3	2	3
CO3	3	2	3	2	2	3	3	3	3	3	1	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	2	2	2	2	2	3	3	3	3	3	1	3

PROFESSIONAL ELECTIVE IV

20CCEL805 SDG NO.4	DATABASE TUNING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of relational databases, algebra and tuning.
- To learn the Normalization, denormalization, query optimization techniques, layouts, triggers and the methods of accessing multiple databases.
- To troubleshoot and analyze query access plan.

UNIT I FUNDAMENTALS OF TUNING 8

Review of Relational Databases – Relational Algebra - Locking and Concurrency Control – Correctness Consideration – Lock Tuning – Logging and the Recovery Subsystem – Principles of Recovery – Tuning the Recovery Subsystem – Operating Systems Considerations – Hardware Tuning.

UNIT II INDEX TUNING 8

Types of Queries – Data Structures – B tree – B+ Tree - Hash Structures – Bit Map Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Comparison of Indexing and Hashing Techniques.

UNIT III QUERY OPTIMIZATION 10

Techniques - Tuning Relational Systems – Normalization – Tuning Denormalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers – Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases.

UNIT IV TROUBLESHOOTING **10**

Query Plan Explainers – Performance Monitors – Event Monitors – Finding "Suspicious" Queries – Analyzing a Query's Access Plan – Profiling a Query Execution – DBMS Subsystems.

UNIT V CASE STUDIES **9**

Transaction Chopping – Time Series Databases – Understanding Access Plans – Configuration Parameters: Oracle; SQL Server; DB2UDB – Distributed Database - Implementation.

TOTAL : 45 PERIODS

REFERENCES

1. Dennis Shasha and Philippe Bonnet "Database Tuning, Principles, Experiments, and Troubleshooting Techniques", Elsevier Reprint 2005.
2. Thomas Connoly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education 2003.
3. M.Tamer Ozsu, Patrick Valduriez and S.Sridhar "Principles of Distributed Database Systems", Pearson Education 2007.

OUTCOMES:

At the end of this course, the student will be able to

1 Understand the concept of Relational Algebra (K2)
2 Denormalize Tuning to optimize multiple database access (K2)
3 Determine Types of Queries and Data Structures. (K2)
4 Analyze B tree, B+ Tree and Hash Structures (K3)
5 Discuss Tuning Relational Systems.(K2)
6 Compareandcontrast Different Databases (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	1	2	2	-	-	-	2	2	3	2
CO2	3	2	3	2	1	2	1	-	-	-	2	2	3	2
CO3	3	3	3	3	2	3	-	-	-	-	2	2	3	3
CO4	3	3	3	2	3	2	1	-	-	-	2	2	3	3
CO5	3	3	3	2	3	2	2	-	2	3	2	2	3	3
CO6	3	3	3	2	3	2	2	-	2	3	2	2	3	3

PROFESSIONAL ELECTIVE IV

20CCEL806 SDG NO.4	ANDROID APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the essentials of mobile apps development,
- To aid in developing simple android applications
- To identify the essentials of android design, file settings
- To study about user interface design and develop android APIs.

UNIT I MOBILE AND INFORMATION ARCHITECTURE 9

Introduction to Mobile: A brief history of Mobile, The Mobile Eco system, Why Mobile? Types of Mobile Applications.Mobile Design, Mobile 2.0, Mobile Web development, Small Computing Device Requirements.

UNIT II INTRODUCTION TOANDROID 9

History of Mobile Software Development, The Open Handset Alliance-Android platform differences. The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building a Sample Android application.

UNIT III ANDROIDAPPLICATIONDESIGN ESSENTIALS 9

Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents. Android Manifest File and its common settings, Using Intent Filter, Permissions, Managing Application resources in a hierarchy, working with different types of resources.

UNIT IV ANDROID USER INTERFACE DESIGN 9

Essentials User Interface Screen elements, Designing User Interfaces with Layouts. Drawing and Working with Animation- Drawing on the screen –Working with Text-Working with Bitmaps-Working with shapes-Working with animation.

UNIT V: ANDROID APPLICATIONS 9

Using Common Android APIs Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers.Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. James Keogh, "J2ME: The Complete Reference", Tata McGrawHill.
2. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nded. (2011).

REFERENCE BOOKS:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd.
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd.
3. Barry Burd, "Android Application Development All in one" Edition: I, Wiley India Pvt Ltd.

E-RESOURCES

1. http://onlinevideolecture.com/ebooks/?subject=Android-Development
2. https://developer.android.com/training/basics/firstapp/index.html
3. IEEE Transactions on Mobile Computing
4. International Journal of Interactive Mobile Technologies
5. http://nptel.ac.in/courses/106106147/

OUTCOMES:

At the end of the course, students will be able to

1. Classify different types of Platforms.(K2)
2 Appreciate the Mobility landscape (K2)
3 Familiarize with Mobile apps development aspects. (K2)
4 Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications. (K3)
5 Perform testing, signing, packaging and distribution of mobile apps (K3)
6 Understand recent trends in Android.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		-		-	-	-		-	-	-	-	-
CO2	-	-	3	-	3	-	-	-		-	-	-	-	-
CO3	-	-	3	-	3	-		-		-	-	-	-	-
CO4	-	-	-	2		-	1	-		-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	3	-	-	3	-	-
CO6	2	1	2	2	-	-	-	2	-	1	-	-	-	-

PROFESSIONAL ELECTIVES - IV

20CSEL706 SDG NO. 4 & 9	MULTI-CORE ARCHITECTURES AND PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the need for Multi-core processors and their architectures
- To understand the challenges in Parallel and Multi-threaded programming
- To learn about the various Parallel Programming paradigms
- To develop Multi-core programs and design parallel solutions

UNIT I MULTI-CORE PROCESSORS 9

Single core to Multi-core Architectures - SIMD and MIMD Systems- Interconnection Networks-Symmetric and Distributed Shared Memory Architectures- Cache Coherence - Performance Issues - Parallel Program Design.

UNIT II PARALLEL PROGRAM CHALLENGES 9

Performance - Scalability - Synchronization and Data Sharing – Data Races - Synchronization Primitives (Mutexes, Locks, Semaphores, Barriers) - Deadlocks and LiveLocks - Communication between Threads (Condition Variables - Signals - Message Queues and Pipes).

UNIT III SHARED MEMORY PROGRAMMING WITH OpenMP 9

OpenMP Execution Model - Memory Model - OpenMP Directives - Work-sharing Constructs - Library functions - Handling Data and Functional Parallelism- Handling Loops - Performance Considerations

UNIT IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI 9

MPI Program Execution - MPI Constructs - Libraries - MPI Send and Receive - Point-to-Point and Collective Communication - MPI Derived Data Types - Performance Evaluation.

UNIT V PARALLEL PROGRAM DEVELOPMENT 9

Case studies - n-body Solvers - Tree Search - OpenMP and MPI Implementations and Comparison.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan-Kauffman/Elsevier, 2011.
2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris", Pearson, 2011 (Unit 2).

REFERENCES:

1. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
2. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.
3. Yan Solihin, "Fundamentals of Parallel Multicore Architecture" CRC press, 2015.
4. John L. Hennessey and David A. Patterson, " Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.
5. Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", Prentice Hall, 2011.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs45/preview

ONLINE RESOURCES:

1. https:// youtube.be/FauseE2FtUsY
2. https://slideplayer.com/slide/7106313/&9784375

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the basics of Multi-core Architectures. (K2)
2. Understand the challenges in Parallel and Multithreaded programming. (K2)

3. Explain about the various Parallel Programming paradigms and solutions.(K2)
4. Identify the issues in programming Parallel Processors.(K2)
5. Write programs using Open MP and MPI. (K3)
6. Compare and contrast programming for Serial Processors and programming for Parallel Processors.(K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	2	1	2	-	1	2	-	1	3	1
CO2	2	3	1	2	2	1	2	-	1	2	-	1	3	1
CO3	2	1	2	2	2	1	1	1	1	1	2	2	3	1
CO4	3	2	1	1	2	1	-	-	1	2	2	3	3	1
CO5	2	2	1	2	2	1	-	-	1	2	2	3	3	1
CO6	2	2	-	1	2	1	-	-	1	2	2	3	3	1

PROFESSIONAL ELECTIVES - IV

20CSEL806 SDG NO. 4	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about theories, methods and discoveries in cognitive science, the historical context and the philosophical roots that allowed the rising of this multidisciplinary field of studies.
- To help students develop general scientific thinking and study skills that will be an important requirement for all the master courses
- To help students understand cognitive science application to real world artefacts.
- To help students to develop a critical approach to scientific research and literature

UNIT I INTRODUCTION TO COGNITIVE SCIENCE, PSYCHOLOGY, NERVOUS SYSTEM AND BRAIN 9

Introduction to the study of cognitive sciences. A brief history of cognitive science. Methodological concerns in philosophy, artificial intelligence and

psychology. Structure and constituents of the brain; Brief history of neuroscience; Mathematical models; Looking at brainsignals.

UNIT II BRAIN AND SENSORY MOTOR INFORMATION, REPRESENTATION OF SENSORY INFORMATION FROM SENSATION TO COGNITION AND ROOTS OF COGNITIVE SCIENCE 9

Processing of sensory information in the brain; Neural Network Models; Processing of sensory information in the brain; motor and sensory areas; Brain Imaging, fMRI, MEG, PET, EEG, Multisensory integration in cortex; information fusion; from sensation to cognition, cybernetics; From physics to meaning; Analogvs. Digital: Code duality

UNIT III LANGUAGE AND EMBODIMENT 9

What is language?; Linguistic knowledge: Syntax, semantics, (and pragmatics); Generative linguistics;Brain and language; Language disorders; Lateralization; The great past tense debate. Cognitivist and emergent standpoints; A robotic perspective

UNIT IV AFFORDANCE IN BIOLOGICAL AND ARTIFICIAL SYSTEM AND COGNITIVE DEVELOPMENT, ATTENTION 9

Affordances, direct perception, Ecological Psychology, affordance learning in robotics, Development, child and robotic development, Attention and related concepts; Human visual attention; Computational models of attention; Applications of computational models of attention.

UNIT V LEARNING –MEMORY AND REASONING 9

Categories and concepts; Concept learning; Logic ; Machine learning, Constructing memories; Explicit vs. implicit memory; Information processing (three-boxes) model of memory; Sensory memory; Short term memory; Long term memory, Rationality; Bounded rationality; Prospect theory ; Heuristics andbiases; Reasoning in computers

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Gardner, The Mind's New Science, Gardner, Howard E, "The mind's new science: Ahistory of the cognitiverevolution", Basic books, 2008.
2. Jose Luis Bermu dez, "Cognitive Science: An Introduction to the Science ofthe Mind", Cambridge University Press, New York, 2014.

REFERENCES:

1. Michael I Posner, "The Foundations of Cognitive Science", MIT Press, Prentice October 1993
2. Jose Luis Bermu dez, "Cognitive Science: An Introduction to the Science of the Mind", Cambridge University Press, August 2010.
3. Gilbert Ryle, "The Concept of Mind", Cambridge University Press, 2003.
4. Pranjali Deshpande, Soudamini Patil, "Evolution of the Brain and Intelligence", Cambridge University Press, 2003.
5. Miller, Earl K., and Jonathan D. Cohen. "An Integrative Theory of Prefrontal Cortex Function." Annu Rev Neurosci 24 (2001): 167-202.
6. Bermudez Wallace, Mark T., and Barry E. Stein. "Sensory organization of the superior colliculus in cat and monkey." Progress in brain research 112 (1996): 301-311.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_hs105/preview
2. https://onlinecourses.nptel.ac.in/noc20_hs29/preview

ONLINERESOURCES:

1. https://en.wikipedia.org/wiki/Cognitive_science
2. https://plato.stanford.edu/entries/cognitive-science/
3. https://cognitivesciencesociety.org/
4. https://www.forcepoint.com/cyber-edu/cognitive-science

OUTCOMES:

On Successful completion of the course, students will be able to:

1. Compare and contrast different philosophical views on the nature of mind. (K3)
2. Apply basic Artificial Intelligence techniques to solve some simple problems. (K3)
3. Interpret findings from cognitive psychology and cognitive neuroscience. (K3)
4. Discuss social, evolutionary, and other ecological aspects of cognition. (K2)
5. Promote cognitive science. (K1)
6. Understand the concept of memory. (K1)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	1	2	1	1	-	2	1	2	2	2
CO2	3	1	1	2	-	1	2	-	1	-	2	2	2	1
CO3	2	1	3	1	-	2	1	2	-	2	2	2	2	1
CO4	3	1	2	2	2	1	-	1	1	-	2	1	3	2
CO5	2	1	3	1	2	2	1	-	2	3	2	2	3	2
CO6	3	1	3	1	2	2	1	-	2	3	2	2	3	2

PROFESSIONAL ELECTIVES - IV

20ITEL802 SDG NO. 4 & 9	VIRTUAL AND AUGMENTED REALITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce Virtual Reality, Input and Output devices
- To acquire knowledge on Computing architectures and modelling
- To explore VR programming and human factors
- To learn various application of Virtual and Augmented reality

UNIT I INTRODUCTION TO VIRTUAL REALITY AND INPUT AND OUTPUT DEVICES 9

Introduction - The Three I's of Virtual Reality - A Short History of Early Virtual Reality - Early Commercial VR Technology - VR becomes an Industry - The Five Classic Components of a VR System. Input Devices - Three-Dimensional Position Trackers - Tracker Performance Parameters - Ultrasonic Trackers - Optical Trackers - Navigation and Manipulation Interfaces - Gesture Interfaces - Output Devices - Graphics Displays - Large - Volume Displays - Sound Displays

UNIT II COMPUTING ARCHITECTURES AND MODELING OF VR SYSTEM 9

Computing Architectures for VR - The Rendering Pipeline - The Graphics Rendering Pipeline - The Haptics Rendering Pipeline - PC Graphics Architecture - PC Graphics Accelerators - Graphics Benchmarks - Distributed

VR Architectures - Multipipeline Synchronization - Colocated Rendering Pipelines - Modeling - Geometric Modeling - Kinematics Modeling - Physical and Behavior Modeling.

UNIT III VR PROGRAMMING AND HUMAN FACTORS 9

Toolkits and Scene Graphs - World Tool Kit - Model Geometry and Appearance - The WTK Scene Graph - Sensors and Action Functions - WTK Networking - Java 3D - Model Geometry and Appearance - Java 3D Scene Graph - Sensors and Behaviors - Java 3D Networking - WTK and Java 3D Performance Comparison Methodology and Terminology - User Performance Studies - VR Health and Safety Issues - VR and Society.

UNIT IV APPLICATIONS OF VR 9

Medical Applications of VR - Virtual Anatomy - Triage and Diagnostic - Surgery - VR in Education - VR and the Arts - Entertainment Applications of VR - Military VR Applications - Army Use of VR - VR Applications in the Navy - Air Force use of VR - Applications of VR in Robotics - Robot programming - Robot Teleoperation

UNIT V AUGMENTED REALITY 9

Augmented Reality - An overview - Introduction - History - Augmented Reality Technologies – Computer Vision Methods in AR - AR Devices - AR Interfaces - AR Systems - Visualization Techniques for Augmented Reality - Data Integration - Depth Perception - Augmenting Pictorial Depth Cues - Occlusion Handling - Image Based X-ray Visualization - Scene Manipulation - Rearranging Real World Objects - Space - Distorting Visualization - AR in Healthcare

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology”, Wiley, Second Edition, 2006
2. BorkoFurht, “Handbook of Augmented Reality”, Springer, 2011.

REFERENCES:

1. C. Burdea & Philippe Coiffet, “Virtual Reality Technology”, Second Edition, Gregory, John Wiley & Sons, Inc.,2008
2. Jason Jerald. 2015. The VR Book: Human-Centred Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York, NY, USA.
3. Augmented Reality: Principles and Practice (Usability) by Dieter Schmalstieg & Tobias Hollerer, Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016. ISBN:

9780321883575

4. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability),Steve Aukstakalnis, Addison-Wesley Professional; 1 edition, 2016.
5. The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything, Robert Scoble & Shel Israel, Patrick Brewster Press; 1 edition, 2016.

WEB REFERENCES:

1. http://www.cs.upc.edu/~virtual/RVA/CourseSlides/03.%20VR%20Input%20H

OUTCOMES:

On Successful completion of the course, students will be able to:

1. Summarize the basics of virtual reality and IO devices. (K2)
2. Associate the computing architectures and rendering pipelines used. (K2)
3. Demonstrate the virtual reality system using various toolkits and scene graphs. (K3)
4. Infer various applications of virtual reality systems. (K2)
5. Summarize the basics of augmented reality, IO devices and visualization techniques. (K2)
6. Construct augmented reality applications for various real time problems. (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1										1		1
CO2	2	1										1		1
CO3	3	2	1		1			1		1	1	1	2	1
CO4	2	1										1		1
CO5	2	1										1		1
CO6	2	2	1		1			1		1	1	1	2	1

PROFESSIONAL ELECTIVES - IV

20CSEL803 SDG NO. 4 & 9	BLOCK CHAIN AND CRYPTO CURRENCY TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand how Block Chain systems (Bitcoin and Ethereum) work
- To securely interact with them
- Design, build, deploy Smart Contracts and Distributed applications
- Integrate ideas from Block Chain technology into their own projects

UNIT I BASICS **9**

Distributed Database - Two General Problem - Byzantine General Problem and Fault Tolerance - Hadoop Distributed File System - Distributed Hash Table - ASIC Resistance - Turing Complete - Cryptography - Hash Function - Digital Signature - ECDSA – Memory Hard Algorithm-Zero Knowledge Proof

UNIT II BLOCKCHAIN **9**

Introduction, Advantage Over Conventional Distributed Database - Block Chain Network – Mining Mechanism – Distributed Consensus Merkle Patricia Tree - Gas Limit - Transactions and Fee - Anonymity - Reward - Chain Policy - Life of Block Chain Application - Soft & Hard Fork - Private and Public Block Chain

UNIT III DISTRIBUTED CONSENSUS **9**

Nakamoto Consensus - Proof of Work - Proof of Stake - Proof of Burn - Difficulty Level- Sybil Attack - Energy Utilization and Alternate.

UNIT IV CRYPTOCURRENCY **9**

Crypto Currency: History - Distributed Ledger - Bit coin Protocols - Mining Strategy and Rewards - Ethereum - Construction, - DAO - Smart Contract - GHOST - Vulnerability - Attacks - Side Chain, Name coin

UNIT V CRYPTO CURRENCY REGULATION AND BLOCK CHAIN APPLICATIONS **9**

Crypto Currency Regulation: Stakeholders - Roots of Bit coin- Legal Aspects - Crypto Currency Exchange-Black Market and Global Economy-Block chain Applications: Internet of Things-Medical Record Management System Domain Name Service - Future of Block Chain.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Crypto Currency Technologies: A Comprehensive Introduction", Princeton University Press(July 19,2016). 2. Narayanan et al., "Bit coin and Crypto currency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.

.

REFERENCES:

1. Antonopoulos, "Mastering Bit coin: Unlocking Digital Crypto currencies", O'Reilly Media Inc., 2015.

2. Dr. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellowpaper, 2014.

3. Mastering Bitcoin: Unlocking Digital Crypto currencies, by Andreas M Antonopoulos 2018.

4. Henning Diedrich, Ethereum: Block chains, Digital Assets, Smart Contracts, and Decentralized Autonomous Organizations-2016.

5. Don and Alex Tapscott, "Block chain Revolution". Portfolio Penguin 2016

WEB REFERENCES:

1. https://www.blockchain.com/

ONLINE RESOURCES:

1. https://www.pwc.com/us/en/industries/inancial-services/ intech/ bitcoin-blockchain-cryptocurrency.html
2. https://www.investopedia.com/terms/b/blockchain.asp

OUTCOMES:

On Successful completion of the course, students will be able to:

1 Understand Design principles of Bit coin and Ethereum. (K2)

2 Ability to extract the knowledge of Nakamoto consensus. (K2)

3 List and describe differences between proof-of-work and proof-of-stake consensus. (K1)

4 Design, build and deploy a Distributed application. (K3)

5 Ability to analyze the algorithms developed for bit coin mining. (K2)

6 Identify the security, privacy and efficiency of a given Block Chain system. (K1**)**

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2			1		2	3	3	2
CO2	3	2	3	2		2					3	2	3	2
CO3	3	1	3	2	1	2					2	3	3	2
CO4	3	2	2	2	3	2			1		2	2	3	2
CO5	3	1	2	2	3	2			2	3	2	2	3	2
CO6	3	2	2	1	2	2			1		2	3	3	2

PROFESSIONAL ELECTIVES - IV

20CSEL703 SDG NO. 4 & 9	INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of Information Retrieval
- To apply Machine Learning techniques for Text Classification and Clustering
- To implement various Search engine system operations
- To learn different techniques of Recommender system

UNIT I INTRODUCTION **9**

Information Retrieval – Early Developments – The IR Problem – The Users Task – Information Vs Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the Web Changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces

UNIT II MODELING AND RETRIEVAL EVALUATION **9**

Basic IR Models - Boolean Model - TF / IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-Based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT III TEXT CLASSIFICATION AND CLUSTERING 9

A Characterization of Text Classification – Unsupervised Algorithms - Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – KNN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation Metrics – Accuracy and Error – Organizing the Classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi Dimensional Indexing

UNIT IV WEB RETRIEVAL AND WEB CRAWLING 9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations - Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation

UNIT V RECOMMENDER SYSTEM 9

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-Based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content Based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", First Edition, 2011.

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REFERENCES:

1. C. Manning, P. Raghavan, and H. Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.

2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2010.

3. ChengXiang Zhai, "Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies)", Morgan & Claypool Publishers, 2008.

4. Gerald J. Kowalski, Mark T. Maybury, "Information Storage and Retrieval Systems – Theory and Implementation", Second Edition, Springer 2013

5. Frakes, W.B., Ricardo Baeza-Yates, "Information Retrieval Data Structures and Algorithms", Prentice Hall, 2007.

WEB REFERENCES:

1. https://libguides.lamk.i/informationretrieval/techniques

ONLINE RESOURCES:

1. www.informationretrieval.org
2. https://nlp.stanford.edu/IR-book/html/htmledition/irbook.html

OUTCOMES:

On Successful completion of the course, students will be able to:

1. Identify and design the various components of an Information Retrieval system. (K1)
2. Use an open source Search engine framework and explore its capabilities. (K3)
3. Apply appropriate method of Classification or Clustering. (K3)
4. Design and implement innovative features in a Search engine. (K2)
5. Design and implement a Recommender system. (K2)
6. Demonstrate Information visualization technologies like Cognition and perception in the Internet or Web search engine.(K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	1	2	1	1	2	1	2
CO2	3	3	3	3	3	1	2	2	3	2	1	2	1	2
CO3	3	3	3	3	3	1	1	1	1	2	1	2	1	2
CO4	3	3	3	2	3	1	2	2	2	2	1	2	2	2
CO5	3	3	3	3	3	1	2	2	3	3	2	2	2	2
CO6	3	3			2	2					1	1	2	2

PROFESSIONAL ELECTIVES - IV

20ECEL801 SDG NO. 4,8,9, 11,15	5G AND 6G WIRELESS COMMUNICATION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the Basics of 5G and Beyond Wireless communication
- Bring a basic understanding of the key technologies and enablers of 5G and beyond communication systems.
- Study 5G Radio Access Technology
- Learn massive MIMO and mmWave (mmW) communication
- Understand 6G Technology
- Learn 6G concepts

UNIT I DRIVERS FOR 5G **9**

Evolution of LTE Technology to Beyond 4G – Pillars of 5G – Standardization Activities -Use cases and Requirements – System Concept – Spectrum and Regulations: Spectrum for 4G – Spectrum Challenges in 5G – Spectrum Landscape and Requirements – Spectrum Access Modes and Sharing Scenarios

UNIT II 5G ARCHITECTURE AND MILLIMETER WAVE COMMUNICATION **9**

5G Architecture: Software Defined Networking – Network Function Virtualization – Basics about RAN Architecture –High-Level Requirements for 5G Architecture – Functional Architecture and 5G Flexibility – Physical Architecture and 5G Deployment Millimeter Wave Communication: Channel Propagation – Hardware Technologies for mmW Systems

UNIT III 5G RADIO ACCESS TECHNOLOGIES **9**

Access Design Principles for Multi-user Communications – Multi-carrier with Filtering – Non-orthogonal Schemes for Efficient Multiple Access – Radio Access for Dense Deployments – Radio Access for V2X Communication

UNIT IV MASSIVE MULTIPLE-INPUT MULTIPLE –OUTPUT SYSTEMS **9**

MIMO in LTE – Single-user MIMO – Multi-user MIMO – Capacity of Massive MIMO – Pilot Design of Massive MIMO – Resource Allocation and Transceiver Algorithms for Massive MIMO

UNIT V 6G OVERVIEW **9**

Introduction to 6G Key Enablers: Wireless energy harvesting, machine learning, visible light communication - IRS.

TOTAL: 45 PERIODS

REFERENCES:

1. Asif Oseiran, Jose F.Monserrat and Patrick Marsch, "5G Mobile and Wireless Communications Technology", Cambridge University Press, 2016.

2. Jonathan Rodriquez, "Fundamentals of 5G Mobile Networks", Wiley, 2015

3. Patrick Marsch, Omer Bulakci, Olav Queseth and Mauro Boldi, "5G System Design – Architectural and Functional Considerations and Long Term Research", Wiley, 2018

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee56/preview
2. http://www.iitkgp.ac.in

ONLINE RESOURCES:

1. https://hcis-journal.springeropen.com/articles/10.1186/s13673- 020-00258-2
2. https://www.qualcomm.com
3. www.electronics-notes.com › technology-basics
4. https://www.researchgate.net

OUTCOMES:

On Successful completion of the course, students will be able to:

1. Explain 4G-LTE and 5G cellular communication networks and Spectrum standards (K2)
2. Describe 5G architectures and millimeter-wave communication (K2)
3. Illustrate the 5G techniques for the design of communication systems (K2).
4. Describe various modulation and multiplexing techniques for 5G (K2)
5. Discuss the machine learning algorithms for resource allocation in 5G MIMO systems(K2)
6. Explain the 6G technology (K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3		1					3	3	2	2
CO2	3	3	3	1	2	1					3	3	2	2
CO3	3	3	2	1	3	1					3	3	2	2
CO4	3	3	2	1	3	1					3	3	2	2
CO5	3	3	2	1	1	3	1				3	3	2	2
CO6	3	3	2	1	1	3	1				3	3	2	2

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Make it happen!

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We have GOOD HEALTH AND WELL BEING QUALITY EDUCATION and full GENDER EQUALITY everywhere.

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which will help to create DECENT WORK AND ECONOMIC GROWTH Our prosperity shall be fuelled by investments in INDUSTRY, INNOVATION AND INFRASTRUCTURE that will help us to REDUCE INEQUALITIES by all means. We will live in SUSTAINABLE CITIES AND COMMUNITIES. RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.

CLIMATE ACTION will reduce global warming and we will have abundant, flourishing LIFE BELOW WATER , rich and diverse LIFE ON LAND.

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DEPARTMENT OF

COMPUTER SCIENCE & ENGINEERING (CYBER SECURITY)

REGULATIONS
2020

Academic Year 2022-23 onwards

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SEMESTERS

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VISION

To be identified as a "Centre of Excellence" with high standards of knowledge dissemination and research opportunities and to transform the students to imbibe qualities of technical expertise, international standards, and high levels of ethical values, who in turn shall contribute to the advancement of society and humankind.

MISSION

We shall dedicate and commit ourselves to attaining and maintaining excellence in technical education through commitment and continuous improvement of infrastructure and equipment and providing an inspiring environment for learning, research, and innovation for our students so they become complete human beings with ethical and social values.

QUALITY POLICY

We at the Sri Sai Ram Institute of Technology are committed to building a beer nation through quality education with team spirit. Our students are enabled to excel in all areas of life and become good citizens. We continuously improve the system, infrastructure, and services to satisfy the students, parents, industry, and society.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (CYBER SECURITY)

VISION

To be a centre of excellence in educating and graduating Computer Engineers by providing unique environment that foster research, technological, and social enrichment with intellectual knowledge to acquire international standards.

MISSION

To deliver qualified computer professionals having innovative research capabilities. To inculcate the spirit of moral values that contributes to societal ethics. To provide training programs that bridges the gap between academia and industry. To enhance research quality and productivity through state of the art facilities.

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Regulations 2020

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA101	Engineering Mathematics-I	3	1	0	4	4
2	20HSEN101	Technical English-I	3	0	0	3	3
3	20BSPH101	Engineering Physics	3	0	0	3	3
4	20BSCY101	Engineering Chemistry	3	0	0	3	3
5	20ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	20ESGE101	Engineering Graphics	1	2	0	3	3
PRACTICALS							
7	20BSPL101	Physics and Chemistry Laboratory	0	0	3	3	1.5
8	20ESPL101	Programming in C Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - I							
9	20TPHS101	Skill Enhancement	0	0	2	2	1
10	20HSMG101	Personal Values	2	0	0	2	0
TOTAL						**29**	**23**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA204	Discrete Structures	3	1	0	4	4
2	20HSEN201	Technical English – II	3	0	0	3	3
3	20BSPH203	Physics for Information Science	3	0	0	3	3
4	20BSCY201	Environmental Science and Engineering	3	0	0	3	3
5	20ESIT202	Python Programming	3	0	0	3	3
6	20ESIT203	Digital Principles and System Design	2	1	0	3	3
PRACTICALS							
7	20ESPL201	Python Programming Laboratory	0	0	3	3	1.5
8	20ESPL202	Digital Laboratory	0	0	3	3	1.5
9	20ESGE201	Engineering Practices Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - II							
10	20HSTA101	Heritage of Tamils	1	0	0	1	1
11	20TPHS201	Skill Enhancement	0	0	2	2	0
12	20HSMG201	Interpersonal Values	2	0	0	2	0
TOTAL						**33**	**24.5**

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA309	Number Theory	3	1	0	4	4
2	20ITPC301	Data Structures	3	0	0	3	3
3	20CSPC301	Object Oriented Programming	3	0	0	3	3
4	20SCPC301	Software Architecture And Project Management	3	0	0	3	3
5	20SCPC302	Cyber Security Essentials	3	0	0	3	3
6	20SCPC303	Machine Learning in Cyber Security	3	0	0	3	3
PRACTICALS							
7	20CSPL301	Object Oriented Programming Laboratory	0	0	3	3	1.5
8	20SCPL301	Software Engineering Laboratory	0	0	3	3	1.5
9	20ITPL301	Data Structures Laboratory	0	0	3	3	1.5
10	20SCTE301	Live in Lab – I	0	0	2	2	1
VALUE ADDITIONS - III							
11	20HSTA201	Tamils And Technology	1	0	0	1	1
12	20SCTP301	Skill Enhancement	0	0	2	2	0
13	20MGMC301	Constitution of India	2	0	0	2	0
TOTAL						**35**	**25.5**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA402	Probability and Queuing Theory	3	0	0	5	4
2	20CSPW401	Computer Networks (with lab)	3	0	2	5	4
3	20CSPC401	Operating Systems	3	0	0	3	3
4	20CSPC402	Database Management System	3	0	0	3	3
5	20SCPC401	Cryptography & Cyber Security	3	0	0	3	3
6	20ITPC401	Design and Analysis of Algorithms	2	1	0	3	3
PRACTICALS							
7	20SCPL401	Cryptography & Cyber Security Laboratory	0	0	3	3	1.5
8	20CSPL401	Operating Systems Laboratory	0	0	3	3	1.5
9	20CSPL402	Database Management Systems Laboratory	0	0	3	3	1.5
10	20SCTE401	Live in Lab – II	0	0	2	2	1
VALUE ADDITIONS - III							
11	20SCTP401	Skill Enhancement	0	0	2	2	1
		TOTAL				**35**	**26.5**

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20SCPC502	Offensive Security & Dark Web Analysis	3	0	0	3	3
2	20SCPC503	Secure Coding	3	0	0	3	3
3	20SCPC503	Deep Learning with Artificial Intelligence	3	0	0	3	3
4	20XXELXXX	Professional Elective – I	3	0	0	5	3
5	20XXOEXXX	Open Elective – I	2	1	0	3	3
PRACTICALS							
6	20SCPL501	Deep Learning Laboratory	0	0	3	3	1.5
7	20SCPL502	Secure Coding Laboratory	0	0	3	3	1.5
8	20SCTE501	Live In Lab – III	0	0	3	3	1
9	20HSPL501	Communication and Soft Skills Laboratory	0	0	2	2	1
VALUE ADDITIONS - V							
10	20SCTP501	Skill Enhancement	0	0	2	2	1
		TOTAL				**31**	**21**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20SCPC601	Network Security Devices & Hardening	3	1	0	3	3
2	20SCPC602	Application Security	3	0	0	3	3
3	20SCPC603	Distributed and Cloud Security	3	0	0	3	3
4	20SCPC604	Security Operation Centre	3	0	0	3	3
5	20XXELXXX	Professional Elective – II	2	1	0	3	3
PRACTICALS							
6	20SCPL601	Network Security Devices & Hardening lab	0	0	3	3	1.5
7	20SCPL602	Application Security lab	0	0	3	3	1.5
8	20SCPJ601	Innovative Design Projects	0	0	2	2	1
VALUE ADDITIONS - VI							
9	20SCTP601	Skill Enhancement	0	0	2	2	1
		TOTAL				**31**	**20**

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20SCPC701	Vulnerability Assessment & Penetration Testing	3	1	0	3	3
2	20SCPC703	Cyber Forensics	3	0	0	3	3
3	20SCPC704	Software Testing & automation	3	0	0	3	3
4	20XXELXXX	Professional Elective – III	3	0	0	3	3
5	20XXOEXXX	Open Elective – II	3	0	0	5	3
PRACTICALS							
6	20SCPJ701	Project phase –I	0	0	3	3	2
7	20SCPL701	Vulnerability Assessment & PenetrationTesting Laboratory	0	0	3	3	1.5
8	20SCPL702	Digital Forensics Laboratory	0	0	3	3	1.5
9	20SCPL703	DevSecOps Laboratory Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - VII							
10	20SCTP701	Skill Enhancement	0	0	2	2	1
		TOTAL				**31**	**22.5**

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20XXELXXX	Professional Elective – IV	3	1	0	3	3
PRACTICAL							
2	20SCPJ801	Project Phase - II	0	0	3	4	6
		TOTAL				**7**	**9**

CREDIT DISTRIBUTION

Category	BS	ES	HS	EL	PC+PL	PW	OE	TE	PJ	TP	IS	MC	TOTAL
Credit	29.5	25.5	10	12	62	04	06	04	7	7	3	Y	**170**
Percentage	17.4	15.0	5.9	7.1	36.5	2.4	3.5	2.4	4.1	4.1	1.8	-	

*IS-Internship

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20SCEL501	Applied Cryptography	3	0	0	3	3	Cyber Security
2	20SCEL502	Web and Mobile Application security	3	0	0	3	3	Cyber Security
3	20SCEL503	Identity and Access Management	3	0	0	3	3	Cyber Security
4	20SCEL504	Cyber Security Standards & Framework	3	0	0	3	3	Cyber Security
5	20CSEL807	Computer Vision	3	0	0	3	3	Artificial Intelligence
6	20SCEL506	Scripting Languages	3	0	0	3	3	Cyber Security
7	20SCEL507	Multimedia security	3	0	0	3	3	Cyber Security
8	20SCEL508	Network Troubleshooting Tools	3	0	0	3	3	Cyber Security
9	20SCEL509	IT Security Engineering	3	0	0	3	3	Cyber Security
10	20SCEL510	Ethical Hacking and Brute Force Attack	3	0	0	3	3	Cyber Security

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20SCEL701	Software Reliability	3	0	0	3	3	Cyber Security
2	20SCEL702	Digital Forensics & Malware Analysis	3	0	0	3	3	Cyber Security
3	20SCEL703	Distributed System Security	3	0	0	3	3	Cyber Security
4	20SCEL704	System Integration	3	0	0	3	3	Cyber Security
5	20SCEL705	Smart Devices Security	3	0	0	3	3	Cyber Security
6	20SCEL706	Secure Interconnecting systems	3	0	0	3	3	Cyber Security
7	20SCEL707	Biometric Security	3	0	0	3	3	Cyber Security
8	20SCEL707	Software Maintenance	3	0	0	3	3	Cloud Computing & Security
9	20SCEL709	Database Security	3	0	0	3	3	Computing
10	20SCEL710	Information Visualization	3	0	0	3	3	Management

PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20SCEL601	Communication Security and Encryption	3	0	0	3	3	Software Engineering
2	20SCEL602	Security Audit 3	0	0	3	3		Cyber Security
3	20SCEL603	Information Retrieval	3	0	0	3	3	Cyber Security
4	20SCEL604	Software Risk Management	3	0	0	3	3	Software Engineering
5	20SCEL605	Social Media Security	3	0	0	3	3	Cyber Security
6	20SCEL606	Software design and architecture	3	0	0	3	3	Security
7	20SCEL607	Identity & Access Management	3	0	0	3	3	Software Engineering
8	20CSEL801	Green Computing	3	0	0	3	3	Cyber Security
9	20SCEL609	Micro services architecture	3	0	0	3	3	Cyber Security
10	20SCEL609	Business Process Management	3	0	0	3	3	Information Security

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20SCEL801	Information System Analysis and Design	3	0	0	3	3	Security
2	20SCEL802	Block-chain Technology	3	0	0	3	3	Security
3	20SCEL803	IT Security Assessment and Testing	3	0	0	3	3	IT Security
4	20SCEL804	Software architecture for the Internet of Things	3	0	0	3	3	Internet of Things
5	20SCEL805	Statistics and analytics using R Programming	3	0	0	3	3	Programming
6	20SCEL806	Cyber Access Control	3	0	0	3	3	Cyber Security
7	20SCEL807	IT Security Operations	3	0	0	3	3	Cyber Security
8	20SCEL808	Foundation Skills in Integrated Product Development	3	0	0	3	3	Cyber Security
9	20SCEL809	Robotics and Applications	3	0	0	3	3	Cyber Security
10	20SCEL810	Information Visualization	3	0	0	3	3	Artificial Intelligence

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Formulate, analyze and solve Engineering problems with strong foundation in Mathematical, Scientific and Engineering fundamentals

PEO2: Analyze the requirements, realize the technical specification and design the Engineering solutions by applying computer science theory and principles.

PEO3: Promote collaborative learning and team work spirit through multi -disciplinary projects and diverse professional activities.

PEO 4 : Equip the graduates with strong knowledge, competence and soft skills that allow them to contribute ethically to the needs of society.

PEO 5 : Accomplish sustainable progress in the emerging areas of Engineering through life-long learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 Demonstrate basic knowledge of computer applications and apply standard practices in software project development.

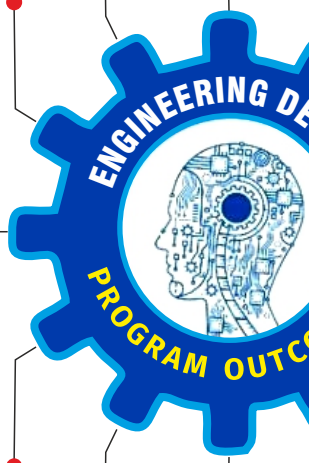
PSO2 Understand, Analyze and Develop computer programs for efficient design of computer-based systems of varying complexity.

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences(BS)	17.4	31	29.5
Engineering Sciences(ES)	15.0	33	25.5
Humanities and Social Sciences (HS)	5.9	12	10
Professional Electives(EL)	7.1	12	12
Program Core+Program Lab (PC+PL)	36.5	76	62
Program theory with Lab (PW)	2.4	05	04
Open Electives (OE)	3.5	06	06
Talent Enhancement (TE)	2.4	08	04
Project (PJ)	4.1	14	07
Training & Placement (TP)	4.1	14	07
Internships/Seminars (IS)	1.8	-	03
Mandatory Courses (MC)	NA	06	NA
Total number of Credits		**217**	**170**

PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM



01 Engineering knowledge

Apply the basic principle and knowledge of mathematics, science and engineering principles to solve technical problems.

02 Problem Analysis

Identify and analyze complex engineering problems reaching logical conclusions using the basic principles of mathematics, science and engineering.

03 Development of solutions

Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

04 Investigate complex problems

Perform investigations, use research based knowledge and conduct experiments, analyze and interpret the results to provide valid conclusions.

05 Modern tool usage

Create, select and apply the latest techniques, resources and modern engineering / IT tools to develop appropriate solutions with an understanding of the limitations.

06 The Engineer and Society

Apply reasoning based on contextual knowledge to assess societal, legal and cultural issues with competency in professional engineering practices.

07 Environment & Sustainability

Demonstrate professional skills, knowledge and contextual reasoning to assess / environmental / societal issues for sustainable development.

08 Apply ethical principles

Apply ethical principles and commit to professional ethics and responsibilities based on the norms of professional engineering pratices.

09 Individual & Teamwork

Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary professional settings.

10 Communicate effectively

Communicate effectively amongst the engineering community, being able to comprehend & write effective reports, make presentations & give/receive clear instructions.

11 Project management

Demonstrate knowledge and apply the principles of engineering & management in their own / team projects in multidisciplinary environments.

12 Life-long learning

Recognize the need for, and have the preparation, ability to engage in independent and life-long learning in the context of technological change.

SEMESTER - I

20BSMA101 SDG NO. 4	ENGINEERING MATHEMATICS-I	L	T	P	C
		3	1	0	4

OBJECTIVES:

The intent of the course is

- To understand and gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives and maxima and Minima
- To acquaint the concept of improper integrals and the properties of definite integrals.
- To provide understanding of double integration, triple integration and their application.
- To introduce the concept of sequence and series and impart the knowledge of Fourier series.

UNIT I MATRICES **12**

Symmetric, skew symmetric and orthogonal matrices; Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (excluding proof) – Diagonalization of a Quadratic form using orthogonal transformation - Nature of Quadratic forms.

UNIT II DIFFERENTIAL CALCULUS **12**

Limits, continuity, Differentiation rules - Maxima and Minima of functions of one variable, partial derivatives (first and second order – basic problems), Taylor's series for functions of two variables, Jacobian, Maxima & Minima of functions of several variables, saddle points; Method of Lagrange multipliers.

UNIT III INTEGRAL CALCULUS **12**

Evaluation of definite integrals - Techniques of Integration-Substitution rule - Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions. Applications of definite integrals to evaluate surface area of revolution and volume of revolution. Evaluation of improper integrals.

UNIT IV MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V SEQUENCES AND SERIES **12**

Introduction to sequences and series – power series – Taylor's series – series for exponential, trigonometric, logarithmic, hyperbolic functions – Fourier series – Half range Sine and Cosine series – Parseval's theorem.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

REFERENCES:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
3. T. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
4. N.P. Bali and Manish Goyal, "A text-book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2014.

WEB REFERENCES:

1. https://math.mit.edu/~gs/linearalgebra/ila0601.pdf
2. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter30/
3. https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/2.-partial-derivatives/
4. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter31/

ONLINE RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
2. https://www.khanacademy.org/math/differential-calculus

OUTCOMES:

Upon completion of the course, the student should be able to

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)
2. Evaluate the limit, examine the continuity and use derivatives to find extreme values of a function. (K3)
3. Evaluate definite and improper integrals using techniques of integration. (K3)
4. Apply double and triple integrals to find the area of a region and the volume of a surface. (K3)
5. Compute infinite series expansion of a function. (K3)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	-	-	-	-	-	-	1
CO2	3	3	2	1	1	-	-	-	-	-	-	1
CO3	3	3	2	1	1	-	-	-	-	-	-	1
CO4	3	3	2	1	1	-	-	-	-	-	-	1
CO5	3	3	2	1	1	-	-	-	-	-	-	1

SEMESTER - I

20HSEN101 SDG NO. 4	TECHNICAL ENGLISH - I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop the basic LSRW skills of the students
- To encourage the learners to adapt to listening techniques
- To help learners develop their communication skills and converse fluently in real contexts
- To help learners develop general and technical vocabulary through reading and writing tasks
- To improve the language proficiency for better understanding of core subjects

UNIT I INTRODUCTION 9

Listening – short texts – formal and informal conversations - **Speaking** – basics in speaking – speaking on given topics & situations – recording speeches and strategies to improve - **Reading –** critical reading – finding key information in a given text – shifting facts from opinions - **Writing –** free writing on any given topic – autobiographical writing - **Language Development** – tenses – voices- word formation: prefixes and suffixes – parts of speech – developing hints

UNIT II READING AND LANGUAGE DEVELOPMENT 9

Listening - long texts - TED talks - extensive speech on current affairs and discussions -Speaking – describing a simple process – asking and answering questions - **Reading** comprehension – skimming / scanning / predicting & analytical reading – question & answers – objective and descriptive answers –identifying synonyms and antonyms - process description - **Writing** instructions – **Language Development** – writing definitions – compound words.

UNIT III SPEAKING AND INTERPRETATION SKILLS 9

Listening - dialogues & conversations - **Speaking** – role plays – asking about routine actions and expressing opinions - **Reading** longer texts & making a critical analysis of the given text - **Writing** – types of paragraph and writing essays – rearrangement of jumbled sentences - writing recommendations - **Language Development** – use of sequence words - cause & effect expressions - sentences expressing purpose - picture based and newspaper based activities – single word substitutes

UNIT IV VOCABULARY BUILDING AND WRITING SKILLS 9

Listening - debates and discussions – practicing multiple tasks – self introduction – **Speaking** about friends/places/hobbies - **Reading** -Making inference from the reading passage – Predicting the content of the reading passage - **Writing** – informal letters/e-mails - **Language Development** - synonyms & antonyms - conditionals – if, unless, in case, when and others – framing questions.

UNIT V LANGUAGE DEVELOPMENT AND TECHNICAL WRITING 9

Listening - popular speeches and presentations - **Speaking** - impromptu speeches & debates - **Reading** - articles – magazines/newspapers **Writing** – essay writing on technical topics - channel conversion – bar diagram/ graph – picture interpretation - process description - **Language Development** – modal verbs - fixed / semi-fixed expressions – collocations

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al.Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. http://engineeringvideolectures.com/course/696

ONLINE RESOURCES:

1. https://www.pearson.com/english/catalogue/business-english/technical-english.html
2. https://www.cambridgeenglish.org/learning-english/free-resources/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Express and explain short texts on different topics with key information applying suitable vocabulary (K2)
2 Interpret and dramatize fluently in informal and formal contexts(K2)
3 Choose and apply the right syntax in comprehending diversified general and technical articles (K3)
4 Analyze and write technical concepts in simple and lucid style (K3)
5 Construct informal letters and e-mails thoughtfully (K2)
6 Demonstrate technical concepts and summaries in correct grammar and vocabulary (K2)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	1	-	2	3	1	1
CO2	-	-	-	-	-	-	-	1	2	3	2	1
CO3	-	-	-	-	-	-	-	-	1	3	3	2
CO4	-	2	-	-	-	-	-	1	2	3	1	1
CO5	-	-	-	-	-	-	-	2	-	3	2	1
CO6	-	-	-	-	-	-	3	-	-	3	2	1

SEMESTER - I

20BSPH101 SDG NO. 4	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To educate and enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology

UNIT I CRYSTAL PHYSICS 9

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - Powder diffraction method - Debye Scherer formula - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - packing factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy - Diamond and Graphite structure (qualitative) - Growth of single crystals: Solution and Melt growth Techniques.

UNIT II PROPERTIES OF MATTER 9

Elasticity - Stress - strain diagram and its uses - Poisson's ratio - Relationship between three moduli of elasticity (qualitative) - Factors affecting elastic modulus and tensile strength - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III QUANTUM PHYSICS 9

Black body radiation - Planck's theory (derivation) - Compton effect: theory -

wave particle duality - electron diffraction - progressive waves - wave equation - concept of wave function and its physical significance - Schrödinger's wave equation - Time independent and Time dependent equations - particle in a box (one dimensional motion) - Tunneling (qualitative) - scanning tunneling microscope.

UNIT IV LASERS AND FIBER OPTICS 9

Lasers: population of energy levels, Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - three level and four level laser - CO_2 laser - Semiconductor lasers: Homojunction and Heterojunction.

Fiber optics: Principle, Numerical aperture and Acceptance angle - Types of optical fibers (material, refractive index, mode) - Losses associated with optical fibers - Fiber Optical Communication system (Block diagram) - Fiber optic sensors: pressure and displacement.

UNIT V THERMAL PHYSICS 9

Transfer of heat energy - thermal expansion of solids and liquids - bimetallic strips - thermal conduction, convection and radiation - heat conduction in solids (qualitative) - thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - thermal insulation - applications: heat exchangers, refrigerators and solar water heaters.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. D.K. Bhattachary & T.Poonam, "Engineering Physics". Oxford University Press, 2015.
2. R.K. Gaur& S.L. Gupta, "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S.Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
4. V. Rajendran, "Engineering Physics", Mc Graw Hill Publications Ltd. New Delhi, 2014.
5. M.N. Avadhanulu& P.G. Kshirshagar, "A textbook of Engineering Physics", S. Chand & Co Ltd. 2016.

REFERENCES:

1. D. Halliday, . Resnick & J. Walker, "Principles of Physics", Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. N.K. Verma," Physics for Engineers", PHI Learning Private Limited, 2014.

4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H.Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.

OUTCOMES :

Upon completion of the course, the student should be able to

1. To understand the crystal systems and elastic properties of Materials (K2)
2. To distinguish different crystal structures and heat conduction in conductor and insulators (K4)
3. To explain powder diffractionmethod-deformation of materials in response to action load,quantum mechanics to understand wave particle dualism (K2)
4. To apply quantum theory to set up one dimensional Schrodinger's wave equation and applications to a matter wave system and principle of laser action (K3)
5. To analyze bending of beams,types of optical fiber and modes of heat transfer (K4)
6. To discuss light propagation in optical fibers and transfer of heat energy in different measures and its applications (K2)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	-	-	-	-	-	-	-	1
CO2	3	2	3	3	-	-	2	-	-	-	-	3
CO3	3	3	3	2	-	-	3	-	-	-	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	3	3	3	-	-	3	-	-	-	-	3
CO6	3	3	3	3	-	-	3	-	-	-	-	3

SEMESTER - I

20BSCY101 SDG NO. 4,6&7	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques
- To illustrate the principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials
- To categorize types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels
- To demonstrate the principles and generation of energy in batteries, nuclear reactors, solar cells, windmills and fuel cells
- To recognize the applications of polymers, composites and nano-materials in various fields

UNIT I WATER TECHNOLOGY AND SURFACE CHEMISTRY 9

Water Technology : Introduction – Hard water and Soft water. Hardness of water – types – expression of hardness (numerical problems). Boiler troubles – scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion. Treatment of boiler feed water – Internal treatment (carbonate, phosphate, calgon, colloidal and sodium aluminate conditioning). External treatment – Ion exchange process, Zeolite process –Domestic water treatment (break point chlorination) –Desalination of brackish water – Reverse Osmosis.

Surface Chemistry: Adsorption – types – adsorption of gases on solids – adsorption of solutes from solution – applications of adsorption –role of adsorbents in catalysis and pollution abatement.

UNIT II ELECTROCHEMISTRY AND CORROSION 9

Electrochemistry: Cells – types (electrochemical and electrolytic cell) Redox reaction – single electrode potential (oxidation potential and reduction potential) – measurement and applications –Nernst equation (derivation and problems) – electrochemical series and its significance.

Corrosion: Causes, factors and types – chemical and electrochemical corrosion (galvanic, differential aeration). Corrosion control – material selection and design aspects, cathodic protection methods (sacrificial anodic and impressed current cathodic method) and corrosion inhibitors. Paints: Constituents and its functions. Electroplating of Copper and electroless plating of Nickel.

UNIT III FUELS AND COMBUSTION 9

Fuels: Introduction – classification of fuels – Coal – analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – octane number and cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gases (LPG). Biofuels – Gobar gas and Biodiesel.

Combustion of Fuels: Introduction – calorific value – higher and lower calorific values- theoretical calculation of calorific value – flue gas analysis (ORSAT Method).

UNIT IV ENERGY SOURCES AND STORAGE DEVICES 9

Energy sources: Nuclear fission – nuclear fusion – differences between nuclear fission and fusion – nuclear chain reactions – nuclear energy – light water nuclear power plant – breeder reactor – solar energy conversion – solar cells – wind energy.

Storage devices: Batteries – types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium–ion–battery), fuel cells – H_2 -O_2 fuel cell and super capacitors.

UNIT V POLYMERS AND NANOMATERIALS 9

Polymers: Classification – types of polymerization – mechanism (Free radical polymerization) –Engineering polymers: Nylon–6, Nylon–6,6, Teflon, Kevlar and PEEK – preparation, properties and uses – Plastic and its types – Conducting polymers – types and applications. Composites – definition, types, polymer matrix composites – FRP.

Nanomaterials: Introduction – Nanoparticles, Nanoclusters, Nanorods, Nanotubes (CNT: SWNT and MWNT) and Nanowires – Properties (surface to volume ratio, melting point, optical and electrical), Synthesis (precipitation, thermolysis, hydrothermal, electrodeposition, chemical vapour deposition, laser ablation, sol-gel process) and Applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" DhanpatRai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.
4. Ravikrishnan A, 'Engineering Chemistry', Sri Krishna Hitech Publishing Company Pvt. Ltd, New Edition 2021.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

OUTCOMES

Upon completion of the course, the student should be able to

1. Identify the origin of water resources and develop innovative methods to produce soft water for industrial use and potable water at cheaper cost and recognize the basic design of adsorption systems and its industrial applications. (K2)
2. Recognize the basic concepts of electrochemistry and apply the principles of electrochemistry to corrosion process and the applications of protective coatings to overcome the corrosion. (K2)
3. Disseminating the importance of chemistry of fuels and combustion to enhance the fuel efficiency. (K2)
4. Acquire the basics of non-conventional sources of energy and illustrate the principles and the reaction mechanism of batteries and fuel cells. (K2)
5. Explain the synthesis and applications of polymers, composites and nano-materials. (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	1	2	-	-	-	-	1
CO2	3	2	3	2	2	1	2	-	-	-	-	3
CO3	3	2	3	2	-	1	2	-	-	-	-	1
CO4	3	2	3	2	-	1	2	-	-	-	1	3
CO5	3	2	3	1	2	1	1	-	-	-	1	3

SEMESTER - I

20ESCS101 SDG NO. 4&9	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand about the programming language
- To develop C Programs using basic Programming Constructs, Loops Arrays and Strings
- To develop applications in C using Functions , Pointers and Structures
- To perform I/O operations and File Handling in C

UNIT I INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING 10

The Basic Model of Computation, Programming Paradigms- Program Development Life Cycle - Algorithm –Pseudo Code – Flow Chart - Programming Languages - Compilation - Linking and Loading - Testing and Debugging - Documentation - Control Structures – Algorithmic Problem Solving- Problems Based on Sequential, Decision Making - Branching and Iteration.

UNIT II BASICS OF C PROGRAMMING 8

Structure of C program - C programming: Data Types – Storage Classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions – Input / Output Statements - Assignment Statements – Decision making Statements - Switch Statement - Looping Statements – Pre-Processor Directives - Compilation Process

UNIT III ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One Dimensional Array – Example Program: Computing Mean, Median and Mode - Two Dimensional Arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String Operations: Length, Compare, Concatenate - Copy – Selection Sort - Linear and Binary Search.

UNIT IV FUNCTIONS AND POINTERS 9

Introduction to Functions: Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) – Recursion – Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions – Pointers – Pointer Operators – Pointer Arithmetic – Arrays and Pointers –

Array of Pointers – Example Program: Sorting of Names – Parameter Passing: Pass by Value - Pass by Reference – Example Program: Swapping of Two Numbers using Pass by Reference.

UNIT V STRUCTURES and FILE PROCESSING 9

Structure - Nested Structures – Pointer and Structures – Array of Structures – Example Program using Structures and Pointers – Self Referential Structures – Dynamic Memory Allocation - Singly Linked List – Typedef.

Files – Types of File Processing: Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files – Command Line Arguments.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2012.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication, 2015.
2. Jeri R. Hanly & Elliot B. Koffman, "Problem Solving and Program Design in C", Pearson Education, 2013.
3. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
6. Kanetkar Y, "Let us C", BPB Publications, 2007.
7. Hanly J R & Koffman E.B, "Problem Solving and Programme design in C", Pearson Education, 2009.

WEB REFERENCES:

1. https://www.learn-c.org/
2. https://codeforwin.org/
3. https://www.cprogramming.com/

ONLINE RESOURCES:

1. https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial
2. https://nptel.ac.in/courses/106105171
3. https://swayam.gov.in/nd1_noc19_cs42/preview

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the concepts of algorithms for solving a problem. (K2)
2. Illustrate the various constructs in C to develop simple applications. (K3)
3. Understand the concepts of Array & Strings. (K2)
4. Demonstrate the usage of Functions and Pointers. (K3)
5. Explain the Structure and union concepts. (K2)
6. Describe the file manipulation and its organisation.(K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	-	2	2	-	3	2	3
CO2	3	3	3	3	2	-	1	1	2	2	3	3	2	3
CO3	3	3	3	3	2	1	1	1	2	-	3	-	3	2
CO4	3	3	3	3	2	1	-	1	2	2	3	3	1	2
CO5	3	3	3	3	2	1	1	1	2	2	3	3	2	1
CO6	3	3	3	3	2	1	1	1	2	2	3	3	3	2

SEMESTER - I

20ESGE101 SDG NO. 4,6,7, 9, 12,14 &15	ENGINEERING GRAPHICS	L	T	P	C
		1	2	0	3

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To visualize the job in three dimensions
- To have a clear conception and appreciation of the shape, size, proportion and design
- To expose the student community to existing national standards related to technical drawings

CONCEPTS AND CONVENTIONS (Not for Examination) 3

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning- Projection of Points

UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+9

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid on Horizontal Surfaces – construction of involutes of circle for one complete revolution – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF LINES AND PLANE SURFACE 6+9

Orthographic projection- principles-Principal planes- Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method- Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 6+9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+9

Sectioning of prisms, pyramids, cylinder and cone in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and truncated solids in vertical position – Prisms, pyramids cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+9

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinder, cone- Perspective projection of simple solids-Prisms, pyramids and cylinder by visual ray method.

TOTAL: 78 PERIODS

TEXT BOOKS:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
3. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
5. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
6. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
7. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

WEB REFERENCES:

1. https://nptel.ac.in/courses/112/103/112103019/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/104/105104148/

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

OUTCOMES:

Upon completion of the course, the student should be able to

1. Relate thoughts and ideas graphically in a neat fashion and ability to perform sketching of engineering curves used in engineering practices, multiple views of objects. (K1)
2. Understand the concepts of orthographic projections for basic geometrical constructions. (K2)
3. Acquire the knowledge of orthographic projection in three dimensional object. (K2)
4. Develop knowledge about Sectioning and apply interior shapes of solids. (K3)
5. Analyze the concepts of design in developing various 3 dimensional projections. (K4)
6. Build a strong foundation to analyze the design in various dimensions. (K4)

CO - PO , PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO2	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO3	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO4	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO5	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO6	3	2	2	-	-	-	-	-	2	2	-	2	2	2

SEMESTER - I

20BSPL101 SDG NO. 4	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	3	1.5

PHYSICS LABORATORY

OBJECTIVES:

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis

LIST OF EXPERIMENTS (Any 5 Experiments)

1. Determination of Young's modulus by non-uniform bending method.
2. Determination of rigidity modulus –Torsion pendulum.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4. (a) Determination of wavelength and particle size using Laser.
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's bridge.
7. Determination of wavelength of mercury spectrum – spectrometer grating.
8. Determination of band gap of a semiconductor.
9. Determination of Hall coefficient by Hall Effect experiment.
10. Determination of solar cell characteristics.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 6 (max.) STUDENTS PER EXPERIMENT

1. Young's modulus by non-uniform bending method-experimental set-up – 12 sets
2. Rigidity modulus - Torsion pendulum experimental set-up – 12 sets
3. Ultrasonic Interferometer to determine velocity of sound and compressibility of liquid – 6 sets
4. (a) Experimental set-up to find the wavelength of light, and to find particle size using Laser – 6 sets
   (b) Experimental set-up to find acceptance angle in an optical fiber – 6 sets
5. Lee's disc method- experimental set up to find thermal conductivity of a bad conductor – 6 sets
6. Experimental set-up to find specific resistance of a coil of wire-Carey Foster's Bridge – 6 sets
7. Experimental set-up to find the wavelength of mercury spectrum-spectrometer grating – 6 sets
8. Experimental set-up to find the band gap of a semiconductor – 12 sets
9. Experimental set-up to find the Hall coefficient by Hall Effect Experiment – 6 sets

10. Experimental set-up to study characteristics of solar cells – 6 sets

TEXTBOOKS:

1. J.D. Wilson& C.A. Hernandez Hall "Physics Laboratory Experiments" Houghton Mifflin Company, New York, 2010.
2. M.N. Srinivasan, S. Balasubramanian &R. Ranganathan, "Practical Physics", S. Chand & Sons educational publications, New Delhi, 2011.
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

CHEMISTRY LABORATORY

(Any five experiments to be conducted)

OBJECTIVES:

- To acquaint the students with practical knowledge of the basic concepts of chemistry, the student faces during the course of their study in the industry and engineering field
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis
- To understand and develop experimental skills for building technical competence

LIST OF EXPERIMENTS (Any five experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water samples.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Conductometric titration of strong acid vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
9. Estimation of sodium and potassium present in water using flame photometers.
10. Determination of molecular weights of polymers using Ostwald's Viscometer.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 6 (MAX.) STUDENTS PER EXPERIMENT.

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample - 6 sets
2. Determination of total, temporary & permanent hardness of water by EDTA method - 6 sets
3. Determination of DO content of water sample by Winkler's method - 6sets
4. Determination of chloride content of water sample by argentometric method – 6 sets
5. Determination of strength of given hydrochloric acid using pH meter - 6 sets
6. Conductometric titration of strong acid vs strong base - 6 sets
7. Estimation of iron content of the given solution using potentiometer - 6 sets
8. Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method) - 2 sets
9. Estimation of sodium and potassium present in water using flame photometer - 2 sets
10. Determination of molecular weights of polymer using Ostwald's Viscometer. - 6 sets

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply the principles of thermal physics and properties of matter to evaluate the properties of materials and to determine the physical properties of liquid using ultrasonic interferometer. (K1)
2. Understand measurement technique and usage of new instruments in optics for real time application in engineering. (K2)
3. Apply the knowledge of semiconductor materials to evaluate the band gap and Hall coefficient of materials and to study the characteristics of solar cell for engineering solutions. (K3)
4. Interpret quantitative chemical analysis to generate experimental skills in building technical competence. (K3)

5. Analyze the quality of water for domestic and industrial purpose. (K3)
6. Standardize the solutions using volumetric titrations, conductivity, pH, redox potential and optical density measurements. (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	3	3	2	2	1	1	3
CO2	3	3	3	3	3	3	3	2	2	2	2	3
CO3	3	3	3	3	3	3	3	2	1	1	2	3
CO4	3	2	3	3	1	1	2	2	2	2	3	2
CO5	3	2	3	3	1	1	2	2	2	2	3	2
CO6	3	2	3	3	1	1	2	2	2	2	3	2

SEMESTER - I

20ESPL101 SDG NO. 4&9	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop programs in C using basic Programming Constructs
- To develop applications in C using Arrays and Strings
- To design and implement applications in C using Functions, Structures
- To develop applications in C using Files

LIST OF EXPERIMENTS

1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is Armstrong number or not?

6. Write a program tocheck whether a given number is odd or even?
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to display array elements using two dimensional arrays.
10. Write a program to perform swapping using function.
11. Write a program to display all prime numbers between two intervals using functions.
12. Write a program to reverse a sentence using recursion.
13. Write a program to get the largest element of an array using the function.
14. Write a program to concatenate two string.
15. Write a program to find the length of String.
16. Write a program to find the frequency of a character in a string.
17. Write a program to store Student Information in Structure and Display it.
18. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
    (a) Total marks obtained by each student.
    (b) The highest marks in each subject and the marks of the student who secured it.
    (c) The student who obtained the highest total marks.
19. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
20. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Solve some simple problems leading to specific applications. (K3)
2. Demonstrate C programming development environment, compiling, debugging, linking and executing a program. (K3)
3. Illustrate C programs for simple applications making use of basic constructs, arrays and strings. (K3)
4. Construct C programs involving functions and recursion. (K3)

5. Demonstrate C programs involving pointers, and structures. (K3)
6. Interpret applications using sequential and random access file. (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	-	2	2	-	3	2	3
CO2	3	3	3	3	2	-	1	1	2	2	3	3	2	3
CO3	3	3	3	3	2	1	1	1	2	-	3	-	3	2
CO4	3	3	3	3	2	1	-	1	2	2	3	3	1	2
CO5	3	3	3	3	2	1	1	1	2	2	3	3	2	1
CO6	3	3	3	3	2	1	1	1	2	2	3	3	3	2

SEMESTER - I

20TPHS101 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To enrich social network ethics
- To develop and enhance browsing culture
- To understand the concepts of networking
- To promote self professionalism
- To acquire knowledge about various digital identification procedures

UNIT I SOCIAL NETWORK ETIQUETTES **6**

Introduction to social network – Social Networking Etiquettes - Pros and Cons - Usage of Facebook, Instagram, WhatsApp , Telegram, Youtube, Evolution of Android and IOS, Introduction to Linkedin & Benefits. (Practicals – Official Mail id- Linkedin Id Creation, Linkedin Profile Bulilding , Facebook Id and Creation and Modifying the existing FB ID)

UNIT II BROWSING CULTURE **6**

Introduction to browsing – Search Engines-Google - Bing -Yahoo!-AOL -MSN –DuckDuckGo ,browsers, phishing – Cookies - URL – https:// extensions , browsing history, Incognito mode- VPN – Pros and Cons – Book mark.

UNIT III NETWORKING **6**

Basics of networking - LAN, MAN, WAN, Introduction to network topologies, Protocols , IP Commands (Command line prompt), Define online complier and editor (Practicals – Find Your System IP,Ping Command, Firewall Fortinet, Basic DOS Commands)

UNIT IV PROFESSIONALISM **6**

Dress Code, Body Language, Appropriate Attire ,Communication Skills, Interview preparation – Introducing yourself - How to greet Superiors, Importance of Eye Contact During conversation.

UNIT V DIGITAL IDENTIFICATION **6**

Introduction to NAD - Importance of Aadhar, PAN Card, Passport, Bank Account, Bar Code, QR scan, Payment Gateway (Gpay, Phone Pe, UPI, BHIM, Paytm), Mobile Banking (Practicals - NAD registration Step by Step, Linking bank account with netbanking , Register for payment gateway).

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Social Network Etiquettes:

1. https://sproutsocial.com/glossary/social-media-etiquette/
2. https://www.shrm.org/resourcesandtools/tools-and-samples/hr-qa/pages/socialnetworkingsitespolicy.aspx
3. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02711/full
4. https://medium.com/@sirajea/11-reasons-why-you-should-use-telegram-instead-of-whatsapp-ab0f80fbfa79
5. https://buffer.com/library/how-to-use-instagram/
6. https://www.webwise.ie/parents/what-is-youtube/
7. https://www.androidauthority.com/history-android-os-name-789433/
8. https://www.mindtools.com/pages/article/linkedin.htm

Unit II: Browsing Culture:

1. https://sites.google.com/site/bethanycollegeofteacheredn/unit--ict-connecting-with-world/national-policy-on-information-and-communication-technology-ict/accessing-the-web-introduction-to-the-browser-browsing-web
2. https://www.wordstream.com/articles/internet-search-engines-history
3. https://www.malwarebytes.com/phishing/
4. https://www.adpushup.com/blog/types-of-cookies/

5. https://www.eff.org/https-everywhere
6. https://www.sciencedirect.com/topics/computer-science/browsing-history\
7. https://www.vpnmentor.com/blog/pros-cons-vpn/
8. https://www.tech-wonders.com/2016/10/use-hush-private-bookmarking-extension-chrome.html

Unit III:Networking

1. https://www.guru99.com/types-of-computer-network.html
2. https://www.studytonight.com/computer-networks/network-topology-types
3. https://www.cloudflare.com/learning/network-layer/what-is-a-protocol/
4. https://www.howtogeek.com/168896/10-useful-windows-commands-you-should-know/
5. https://paiza.io/en

Unit IV : Professionalism

1. https://career.vt.edu/develop/professionalism.html
2. https://englishlabs.in/importance-dress-code/
3. https://www.proschoolonline.com/blog/importance-of-body-language-in-day-to-day-life
4. https://www.thespruce.com/etiquette-of-proper-attire-1216800
5. https://shirleytaylor.com/why-are-communication-skills-important/
6. https://www.triad-eng.com/interview-tips-for-engineers/
7. https://www.indeed.co.in/career-advice/interviewing/interview-question-tell-me-about-yourself
8. https://toggl.com/track/business-etiquette-rules/

Unit V: Digital Identification

1. https://nad.ndml.in/nad-presentation.html
2. https://www.turtlemint.com/aadhaar-card-benefits/
3. https://www.bankbazaar.com/pan-card/uses-of-pan-card.html
4. https://www.passportindex.org/passport.php
5. https://consumer.westchestergov.com/financial-education/money-management/benefits-of-a-bank-account
6. https://en.wikipedia.org/wiki/QR_code

7. https://www.investopedia.com/terms/p/payment-gateway.asp
8. https://www.paisabazaar.com/banking/mobile-banking/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Learn and apply social network ethics. (K3)
2. Understand the browsing culture. (K2)
3. Analyze the networking concepts . (K4)
4. Develop self professionalism. (K3)
5. Gain hands-on experience in various digital identification procedures. (K2)
6. Analyse and apply the different digital payment gateway methods. (K4)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

SEMESTER - I

20HSMG101 SDG NO. 4&5	PERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I SELF CONCEPT **6**

Understanding self Concept – Identify Yourself – Who am I – an individual, engineer, citizen – Attitude – Measuring Behaviour – Change of Behaviour – Personality – Characteristics in personal, professional life.

UNIT II INDIVIDUAL VALUES **6**

Personal Values – Attributes –Courage – Creativity, Honesty, Perfection, Simplicity, Responsibility – Measuring personal values

UNIT III MORAL VALUES **6**

Moral – Understanding right and wrong – Positive thoughts – Respect to others – Doing good to society.

UNIT IV PHYSICAL AND MENTAL WELL-BEING **6**

Health – Physical fitness –Mental vigour – Diet management – Yoga – Meditation – Peaceful life – Happiness in life

UNIT V DECISION MAKING **6**

Goal Setting – Decision making skill – Overcome of Barriers – Success – Mental strength and weakness

TOTAL: 30 PERIODS

Note:

Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development" McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Become an individual in knowing the self. (K4)
2. Acquire and express Personal Values, Spiritual values and fitness. (K4)
3. Practice simple physical exercise and breathing techniques. (K2)
4. Practice Yoga asana which will enhance the quality of life. (K1)
5. Practice Meditation and get benefitted. (K1)
6. Understanding moral values and need of physical fitness. (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	3	3	1	1	1
CO2	-	-	-	-	-	2	2	3	3	1	1	1
CO3	-	-	-	-	-	2	2	3	3	1	1	1
CO4	-	-	-	-	-	2	2	3	3	1	1	1
CO5	-	-	-	-	-	2	2	3	3	1	1	1
CO6	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - II

20BSMA204 SDG NO. 4	DISCRETE STRUCTURES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To learn the basic concepts of Relations and Functions
- To learn the concepts of Mathematical induction, Permutation and Combination
- To understand the concepts of Logic, Rules of inference and Quantifiers
- To impart the knowledge on Groups, Normal subgroups, Rings and Fields
- To develop Graph Algorithms by using the concepts of Graphs and Trees

UNIT I RELATION AND FUNCTION 12

Binary Relation, Partial Ordering Relation, Equivalence Relation – Sum and Product of functions – Bijective functions – Inverse and composite functions.

UNIT II COMBINATORICS 12

The Principles of Mathematical Induction-The Well-Ordering Principle – Recursive definition – Basic counting techniques – Inclusion and exclusion , Pigeonhole principle – Permutation – Combination.

UNIT III LOGICS AND PROOFS 12

Basic Connectives – Truth Tables – Logical Equivalence: The Laws of Logic, Logical Implication – Rules of Inference – The use of Quantifiers – Proof Techniques: Some Terminology – Proof Methods and Strategies – Forward Proof – Proof by Contradiction – Proof by Contraposition.

UNIT IV ALGEBRAIC STRUCTURES 12

Algebraic Structures with One Binary Operation – Semi Groups, Monoids, Groups, Permutation Groups – Subgroups – Normal subgroups – Algebraic Structures with two Binary Operations - Definition and Examples of Rings and Fields – Boolean Algebra – Identities of Boolean Algebra.

UNIT V GRAPHS AND TREES 12

Graphs and their properties – Degree, Connectivity, Path, Cycle – Sub Graph – Isomorphism – Eulerian and Hamiltonian Walks –Rooted Trees, Trees and Sorting.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications: with Combinatorics and Graph Theory", 7th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2015.
2. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science", Tata Mc Graw Hill Education (India) Edition 1997.
3. Narsingh Deo, "Graph theory with applications to Engineering and Computer Science", Prentice Hall Inc., Englewood Cliffs,N.J., 1974.

REFERENCES:

1. Susanna S. Epp, "Discrete Mathematics with Applications", 4th edition, Brooks/Cole, Cengage Learning, 2010.
2. Norman L. Biggs, "Discrete Mathematics", 2nd Edition, Oxford University Press, 2002.
3. Seymour Lipschutz, MarcLipson, "Discrete Mathematics, Schaum's Outlines Series", 3rd edition, McGraw-Hill Education, 2009.
4. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", 4th Edition, Tata McGraw–Hill Education Pvt. Ltd, 2012.

WEB REFERENCES :

1. https://web.stanford.edu/class/cs103x/cs103x-notes.pdf
2. https://www.cs.cornell.edu/~rafael/discmath.pdf
3. http://home.iitk.ac.in/~arlal/book/mth202.pdf

ONLINE RESOURCES:

1 https://www.youtube.com/watch?v=h_9WjWENWV8&list=PL3o9D 4Dl2FJ9q0_gtFXPh_H4POI5dK0yG
2 https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862 D1A947252D203.
3 https://www.youtube.com/watch?v=4LlTmsfDS4Y&list=PLEAYk Sg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13
4 https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzl V3ogoVxVxCTlI45pDVM1aoYoMHf
5. https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ9O QGMqxersk8fUxiUMSIx0DBqsKZS

OUTCOMES:

Upon completion of the course, the student should be able to

1. Classify the relations and functions defined on a set. (K2)
2. Apply counting principle and mathematical induction to solve combinatorial problems. (K3)
3. Construct mathematical arguments using logical connectives, quantifiers and verify the correctness of an argument using symbolic logic, truth tables and proof strategies. (K3)
4. Explain the fundamental concepts of algebraic structures such as groups, rings, fields and Boolean algebra. (K3)
5. Illustrate the concepts of graphs and sorting in trees. (K3)

CO- PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	1	2	-	-	-	-	-	-	-	1
CO3	3	3	1	2	-	-	-	-	-	-	-	1
CO4	3	3	1	2	-	-	-	-	-	-	-	1
CO5	3	3	1	2	-	-	-	-	-	-	-	1

SEMESTER - II

20HSEN201 SDG NO. 4	TECHNICAL ENGLISH - II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To strengthen the listening skills for comprehending and critically analyzing passages
- To enhance students' ability with multiple strategies and skills for making technical presentations
- To participate in group discussions for developing group attitude
- To develop skills for preparing effective job application
- To write effective technical reports

UNIT I LANGUAGE DEVELOPMENT 9

Listening – Listening conversations involving two participants – multiple participants – **Speaking** – conversation methods in real life occurrences using expressions of different emotions and imperative usages – **Reading** passages and short stories - **Writing** – preparation of checklist – extended definition – **Language Development** – tenses - subject - verb agreement

UNIT II VOCABULARY BUILDING 9

Listening – listening formal and informal conversation and participative exercises – **Speaking** - creating greetings/wishes/excuses and thanks – **Reading** – articles/novels-**Writing** summary of articles and concise writing identifying new words – homonyms, homophones, homographs – one-word substitutions – easily confused words - creating SMS and using emoticons - sharing information in social media. **Language Development** - reported speeches – regular and irregular verbs - idioms & phrases

UNIT III WRITING TECHNICAL REPORTS 9

Listening – listening conversation – effective use of words and their sound aspects, stress, intonation & pronunciation – **Speaking** - practicing telephonic conversations – observing and responding. **Reading** – regular columns of newspapers/magazines - **Writing** – reports – feasibility, accident, survey and progress - preparation of agenda and minutes – **Language Development** - using connectives – discourse markers

UNIT IV TECHNICAL WRITING 9

Listening – Model debates & documentaries - **Speaking** – expressing agreement/disagreement, assertiveness in expressing opinions – **Reading** biographies/autobiographies – **Writing** – note-making – formal letters – inviting guests – acceptance/declining letters - **Language Development** – degrees of comparison - numerical adjectives – embedded sentences

UNIT V GROUP DISCUSSION AND JOB APPLICATION 9

Listening – Listening - classroom lectures – recommending suggestions & solutions – **Speaking** – participating in group discussion – learning GD strategies – **Reading** – journal articles - Writing – Job application – cover letter - résumé preparation – **Language Development** – purpose statement – editing – verbal analogies.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.

2. Ashraf Rizvi. M, Effective Technical Communication. 2nd ed. McGraw Hill, New Delhi, 2018.

REFERENCES

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York,2011.
2. Raman, Meenakshi and Sharma, Sangeetha. Technical Communication Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan& Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamilnadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Suresh Kumar, E. Engineering English. Orient Blackswan, Hyderabad, 2015
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

WEB REFERENCES :

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://freevideolectures.com/course/3250/introduction-to-film-studies/10

ONLINE RESOURCES

1. https://www.ef.com/wwen/english-resources/
2. https://www.smilesforlearning.org/gclid=EAIaIQobChMI49DF9bnd6AIVSY6PCh1d_gV9EAAYASAAEgIBPvD_BwE.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Define technical terms with the correct use of grammar (K1)
2 Identify new words, phrases, idioms and summarize articles/ write ups effectively (K2)
3 Pronounce words correctly, speak fluently and share opinions and suggestions effectively in conversations, debates and discussions (K3)
4 Construct reports convincingly and write official letters emphatically (K3)
5 Communicate confidently while speaking and writing by employing language strategies (K2)

6 Adapt group behavior, execute their role as a contributing team member and prepare winning job applications (K3)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	1	2
CO2	-	2	-	-	-	-	-	-	2	3	1	1
CO3	-	-	-	1	-	-	-	2	2	3	1	1
CO4	-	-	-	-	-	2	-	3	2	3	2	2
CO5	-	-	-	-	-	-	-	-	2	3	2	2
CO6	-	-	-	-	-	-	-	2	2	3	1	2

SEMESTER - II

20BSPH203 SDG NO. 4	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the essential principles of physics of conducting materials, superconducting and optical properties of materials
- To educate the basic principles of semiconductor device and electron transport properties
- To become proficient in magnetic materials
- To acquire the basic working of nanoelectronic devices

UNIT I CONDUCTING MATERIALS **9**

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity expression - Wiedemann-Franz law - Success and failures - Electrons in metals - Motion of a particle in a three dimensional box (Quantum Mechanical Approach) - degenerate states - Fermi- Dirac statistics - Density of energy states - Electron in periodic potential - Energy bands in solids - Tight binding approximation - Electron effective mass - Concept of hole.

UNIT II SEMICONDUCTOR MATERIALS **9**

Intrinsic Semiconductors - Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors - extrinsic semiconductors -

Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - Variation of Fermi level with temperature and impurity concentration - Carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and devices - Ohmic contacts - Schottky diode.

UNIT III MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic dipole moment - atomic magnetic moments - magnetic permeability and susceptibility - Magnetic material classification: diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism - ferrimagnetism - Ferromagnetism: origin and exchange interaction - Domain Theory - M versus H behaviour - Hard and soft magnetic materials - applications - Magnetic principle in computer data storage - Magnetic hard disc - GMR sensor.

UNIT IV SUPERCONDUCTING & OPTICAL PROPERTIES OF MATERIALS 9

Super conductivity - Type-I and Type-II superconductors - Properties and applications - Classification of optical materials - Carrier generation and recombination processes - Photo current in a P-N diode - Solar cell - LED - Organic LED - Optical data storage techniques and devices.

UNIT V NANO DEVICES 9

Introduction - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials - Tunneling: single electron phenomena and single electron transistor - Quantum dot laser - Carbon nanotubes: Properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley 2012.
2. Kasap, S.O., "Principles of Electronic Materials and Devices", McGraw-HillEducation, 2017.
3. Kittel, C., "Introduction to Solid State Physics", Wiley, 2018.
4. S.O.Pillai, "Solid State Physics, New Academic Science", 2017.
5. D.K.Bhattacharya & PoonamTandon., "Physics for Information Science and Electronics Engineering", Oxford Higher Education",2017.

REFERENCES:

1. Garcia, N. & Damask, A., "Physics for Computer Science Students", Springer-Verlag, 2012.
2. Hanson, G.W., "Fundamentals of Nanoelectronics", Pearson Education, 2009.

3. Rogers, B., Adams, J. &Pennathur, S., "Nanotechnology: Understanding Small Systems", CRC Press, 2014.

OUTCOMES:

At the end of the course, the students should able to

1. Understand the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K2)
2. Illustrate the various types of semiconductors based on band gap energy and doping, expression for carrier concentration, Fermi energy and their variations (K2)
3. Apply the suitable semiconducting materials for Hall device, Schottky and tunnel diode fabrication and acquire the basic knowledge of magnetic materials and its classification (K3)
4. Gain the knowledge on the types of superconducting and optical materials, properties of superconductors, mechanism of carrier generation and recombination in optical data storage devices (K2)
5. Apply the semiconducting, ferrimagnetic and superconducting materials in optical devices, data storage devices and magnetic levitation (K3)
6. Understand the basics of 1D, 2D, 3D quantum structures, single electron transport, carbon nanotubes and its applications (K3)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	3	-	-	-	-	-	-	1
CO2	3	3	-	-	3	-	2	-	-	-	-	3
CO3	3	3	-	2	3	-	3	-	-	-	-	2
CO4	3	3	3	2	3	-	3	-	-	-	-	3
CO5	3	3	3	3	3	-	3	-	-	-	-	3
CO6	3	3	3	2	3	-	-	-	-	-	-	1

SEMESTER - II

20BSCY201 SDG NO. 4,17	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the nature and facts about environment
- To find and implement scientific, technological, economic and political solutions to environmental problems
- To study the interrelationship between living organism and environment
- To provide the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness – Ecosystem: concept of an ecosystem – structure and functions of an ecosystem – Biotic and abiotic components – Biogeochemical cycle (C, N & P) – energy flow in the ecosystem – food chains, food webs and ecological pyramids – ecological succession - keystone species. Introduction to biodiversity definition: genetic, species and ecosystem diversity – values of biodiversity – IUCN Red list species classification - endemic, endangered, rare, vulnerable, extinct and exotic species – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – man-wildlife conflicts. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of Terrestrial (Forest, Grassland, Desert) and Aquatic ecosystem (Pond, Lake, River, Estuary and Marine)

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: Air pollution, Water pollution, Soil pollution Marine pollution, Noise pollution, Thermal pollution and Nuclear pollution – solid waste management: causes, effects and control measures of municipal solid wastes (MSW) – role of an individual in prevention of pollution – Case studies related to environmental pollution.

Disaster management: floods, earthquake, cyclone and landslides – nuclear holocaust – Case studies.

UNIT III NATURAL RESOURCES 9

Forest resources: Use and over – exploitation, deforestation – Land resources: land degradation, man induced landslides, soil erosion and desertification – Water resources: Use and over- utilization of surface and groundwater – dams-benefits and problems, conflicts over water – Mineral resources: Environmental effects of extracting and using mineral resources – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – fertilizer – pesticide problems, water logging and salinity. Energy resources: Renewable energy (Solar energy, Wind energy, Tidal energy, Geothermal energy, OTE, Biomass energy) and non renewable energy (Coal, Petroleum, Nuclear energy) sources. – role of an individual in conservation of natural resources. Case studies – timber extraction, mining, dams and their effects on forests and tribal people.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 10

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect- role of greenhouse gases on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures). environmental ethics: Issues and possible solutions – Green chemistry - 12 principles of green chemistry.

Urbanisation - Urban problems related to energy - Water conservation: rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns - case studies. Environment Legislations and Laws : Environment (protection) act – 1986. Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. Biomedical Waste(Management and Handling rules):1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark) - Issues involved in enforcement of environmental legislation - central and state pollution control boards, role of non-governmental organization – Public awareness - Environmental Impact Assessment (EIA).

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 8

Population growth, variation among nations – population explosion – family welfare programme – women and child welfare environment and human health – HIV / AIDS – Role of Information Technology in environment and Human health – Case studies – human rights – value education – Sustainable Development – Need for sustainable development – concept – 17 SDG goals – 8 Millennium Development Goals(MDG).

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.

REFERENCES :

1. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt Ltd., Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt. Ltd., Delhi, 2014.
4. Rajagopalan. R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

OUTCOMES:

Upon successful completion of this course, student should be able to

1. Explain the different components of environment, structure and function of an ecosystem, importance of biodiversity and its conservation. (K1)
2. Aware about problems of environmental pollution, its impact on human and ecosystem, control measures and basic concepts in Disaster Management. (K2)
3. Disseminate the need for the natural resources and its application to meet the modern requirements and the necessity of its conservation. (K2)
4. Illustrate the various aspects of atmospheric chemistry with a focus on climate change and recognize the principles of green chemistry. Describe suitable scientific, technological solutions and Protection Acts to eradicate social and environmental issues. (K2)
5. Recognize the need for population control measures and the environmental based value education concepts to achieve the Sustainable Development Goals. (K2)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	1	2	-	1	1	-	2
CO2	2	2	2	-	2	2	3	1	2	2	-	2
CO3	1	1	1	1	-	1	1	-	1	2	-	1
CO4	2	2	2	1	2	1	1	-	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1

SEMESTER - II

20ESIT202 SDG NO. 4&9	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop simple Python programs with conditionals and loops
- To define Python functions and to implement lists, tuples, dictionaries and sets
- To perform file operations and understand OO concepts in Python
- To understand NumPy, Pandas and Matplotlib

UNIT I BASICS OF PYTHON PROGRAMMING **9**

Introduction to Python – Literals – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved words – Indentation – Operators and Expressions - Conditionals: Boolean values and operators - conditional if - alternative if - chained conditional - Iteration - Illustrative programs: Evaluation of expressions - String Operations - Circulate the values of n variables - Square root (Newton's method) - GCD - Sum an Array of Numbers.

UNIT II STRING, LISTS, TUPLES, DICTIONARIES, SETS **9**

Strings: String slices - Immutability - String functions and methods - String module - Lists: List operations - List slices - List methods - List loop - Mutability - Aliasing - Cloning lists - List parameters - Tuples: Tuple assignment - Tuple as return value.

Dictionaries: Operations and Methods - Advanced list processing - List comprehension - Sets: Creating Sets – Operations and methods – Set comprehension - Illustrative programs: Linear search - Binary search - Selection sort - Insertion sort - Merge sort.

UNIT III FUNCTIONS, MODULES, PACKAGES 9

Functions - definition and use - Flow of execution - Parameters and arguments - Fruitful functions: Return values - Parameters - Local and global scope - Function composition - Recursion - Modules – from import statement – Name of Module – Making your own modules - Packages - Packages in Python – Standard Library Modules – Globals(), Locals() and Reload(); Illustrative programs: Fibonacci series using functions - Arithmetic operations using module - Area of different shapes using packages.

UNIT IV FILES, EXCEPTIONS, CLASSES AND OBJECTS 9

Files and exception: Text files - Reading and writing files - Format operator - Command line arguments - Errors and exceptions - Handling exceptions - Classes and Objects: Defining classes - Creating Objects – Data abstraction – Class constructor – Class variables and Object variables – Public and Private data members – Private Methods; Illustrative programs: Word count - Copy file - Creating user defined exception - Creating student class and object.

UNIT V NUMPY, PANDAS, MATPLOTLIB 9

Introduction - Basics of NumPy - N-dimensional Array in NumPy - Methods and Properties - Basics of SciPy - Broadcasting in NumPy Array Operations - Array Indexing in NumPy, Pandas - Introduction - Series - DataFrame - Matplotlib - Basics - Figures and Axes - Method subplot() - Axis container Illustrative Programs: Multiplying a Matrix by a Vector, Solving Linear System of Equations - Using Pandas to Open CSV files - Creating a Single plot.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press 2018.
2. Anurag Gupta, G.P. Biswas, "Python Programming: Problem Solving, Packages and Libraries", McGrawHill, 2020.

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.
3. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.

5. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
6. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
7. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
8. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

WEB REFERENCES:

1. http://greenteapress.com/wp/think-python/
2. www.docs.python.org
3. https://nptel.ac.in/courses/106/106/106106182/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the syntax and semantics, string operations of python programming language (K2)
2. Develop python programs using control flow statements.(K3)
3. Construct various Data structures to develop python programs. (K3)
4. Illustrate the concepts of Functions, Modules and Packages in Python.(K3)
5. Understand the concepts of Object Oriented Programming, files and Exception handling.(K2)
6. Examine various problem solving concepts in python to develop real time applications.(K4)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	0	0	1	0	1	2	2
CO2	3	3	3	3	3	1	0	0	0	0	0	1	2	2
CO3	3	3	3	3	3	2	1	0	0	0	0	1	2	2
CO4	3	3	3	3	3	2	1	0	0	0	0	1	2	2
CO5	3	3	3	3	3	2	2	1	0	2	0	2	3	3
CO6	3	3	3	3	3	3	3	2	3	2	3	2	3	3

SEMESTER - II

20ESIT203 SDG NO. 4 & 9	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems – Arithmetic Operations – Binary Codes- Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits – Storage Elements: Latches , Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure – Registers and Counters – HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

RAM – Memory Decoding – Error Detection and Correction – ROM – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", 6th Edition, Pearson Education, 2017.

REFERENCES:

1. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010
2. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design", Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, "Digital Principles and Design", Tata Mc Graw Hill, 2003.

ONLINE RESOURCES:

1. https://ocw.mit.edu/courses/online-textbooks/
2. https://nptel.ac.in/courses/117105080/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understanding Boolean algebra, number systems and simplify Boolean functions using Kmap. (K2)
2. Understand the Combinational and sequential Circuits. (K2)
3. Demonstrate the use of Combinational Circuits and Sequential circuits (K3)
4. Interpret the designs using Programmable Logic Devices. (K3)
5. Apply HDL code for combinational and Sequential Circuits. (K3)
6. Interpret and troubleshoot logic circuits. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	2	-	-	-	-	-	-	-	-	3	1	-	-
CO3	-	2	3	-	-	-	-	-	-	-	3	1	-	-
CO4	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	1	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	3	-	-	-

SEMESTER - II

20ESPL201 SDG NO. 4	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries

LIST OF EXPERIMENTS :

1 Compute the GCD of two numbers
2 Find the maximum and minimum of a list of numbers
3 Linear search and Binary search
4 Selection sort, Insertion sort
5 Merge sort, Quick Sort
6 First n prime numbers
7 Multiply matrices
8 Programs that take command line arguments (word count)
9 Find the most frequent words in a text read from a file
10 Exception Handling – License Process
11 Classes and Objects – Student class
12 Solving Linear System of Equations
13 Using Pandas to Open csv files
14 Creating a Single plot
15 Creating Scatter plot, Histogram

TOTAL: 45 PERIODS

LAB REQUIREMENTS

Python 3

OUTCOMES

On completion of the laboratory course, the student should be able to

1. Illustrate simple programs for describing the syntax, semantics and control flow statements. [K3]
2. Describe the core data structures like String, lists, dictionaries, tuples and sets in Python to store, process and sort the data. [K2]
3. Interpret the concepts of functions, modules and packages in Python. [K3]
4. Illustrate the applications of python libraries. [K3]

5. Describe the file manipulation and its operations. [K2]
6. Demonstrate exceptions and classes and objects for any real time applications. [K3]

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	1	2	1	2	-	-	-	1	-	3	3	-	1
CO2	1	2	3	3	3	2	1	1	1	1	1	3	1	2
CO3	-	1	3	3	2	1	-	-	-	-	1	3	-	1
CO4	1	2	3	3	2	-	-	-	-	-	1	3	1	2
CO5	-	-	3	3	2	-	-	1	-	-	2	3	-	-
CO6	-	-	3	3	2	-	-	1	-	-	2	3	-	-

SEMESTER - II

20ESPL202 SDG NO. 4 & 9	DIGITAL LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To design and implement the various combinational circuits
- To design and implement combinational circuits using MSI devices
- To design and implement sequential circuits
- To understand and code with HDL programming

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters
3. Design and implement Half/Full Adder and Subtractor
4. Design and implement combinational circuits using MSI devices:
   a) 4 bit binary adder/subractor
   b) Parity generator/checker
   c) Magnitude comparator
5. Application using multiplexers
6. Design and implement shift-registers

7. Design and implement synchronous counters
8. Design and implement asynchronous counter
9. Coding combinational circuits using HDL
10. Coding sequential circuits using HDL
11. Design and implementation of a simple digital system (Mini Project)

LAB REQUIREMENTS:

HARDWARE:

DIGITAL TRAINER KITS

DIGITAL IC's required for the experiments in sufficient numbers

SOFTWARE:

HDL, Verilog simulator

TOTAL: 45 PERIODS

OUTCOMES

On completion of the laboratory course, the student should be able to

1. Implement simplified combinational circuits using basic logic gates. (K6)
2. Implement combinational circuits using MSI devices. (K6)
3. Implement sequential circuits like registers and counters.(K6)
4. Simulate combinational and sequential circuits using HDL.(K4)
5. Implement designs using Programmable Logic Devices. (K6)
6. Design and implementation of a simple digital system.(K6)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	-	2	1	1
CO2	3	3	3	2	3	2	1	1	2	2	2	3	1	1
CO3	2	3	3	3	3	2	2	1	2	2	2	3	1	1
CO4	3	3	3	3	3	2	2	1	3	3	3	3	1	1
CO5	2	3	3	2	2	-	-	2	-	2	2	2	1	1
CO6	2	3	3	2	2	1	-	-	2	2	3	2	1	1

SEMESTER - II

20ESGE201 SDG NO. 4,9,12	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Electrical and Electronics Engineering, Civil and Mechanical Engineering

ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

CIVIL ENGINEERING PRACTICE

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings, safety aspects.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.

3. Preparation of plumbing line sketches for water supply and sewage works.
4. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE

Welding:

1. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
2. Gas welding practice.

Basic Machining:

1. Simple Turning and Taper turning.
2. Drilling Practice.

Sheet Metal Work:

1. Forming & Bending.
2. Model making – Trays and funnels.
3. Different type of joints.

Machine assembly practice:

1. Study of centrifugal pump.
2. Study of air conditioner.

Demonstration on:

1. Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
2. Foundry operations like mould preparation for gear and step cone pulley.
3. Fitting – Exercises – Preparation of square fitting and V – fitting models.

Total : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. Electrical

1	Assorted electrical components for house wiring	15 Sets
2	Electrical measuring instruments	10 Sets

3	Study purpose items: Iron box, fan and regulator, emergency lamp	 1 Each
4	Megger (250V/500V)	1 No
5	Power Tools: Range Finder Digital Live-wire detector	 2 Nos 2 Nos

2. Electronics

1	Soldering guns	10 Nos
2	Assorted electronic components for making circuits	50 Nos
3	Small PCBs	10 Nos
4	Multimeters	10 Nos

3. Civil

1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2	Carpentry vice (fitted to work bench)	15 Nos
3	Standard woodworking tools	15 Sets
4	Models of industrial trusses, door joints, furniture joints	5 each
5	Power Tools: Rotary Hammer Demolition Hammer Circular Saw Planer Hand Drilling Machine Jigsaw	 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos

4. Mechanical

1	Arc welding transformer with cables and holders	5 Nos
2	Welding booth with exhaust facility	5 Nos
3	Welding accessories like welding shield, chipping hammer, wire brush, etc	5 Sets
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5	Centre lathe	2 Nos
6	Hearth furnace, anvil and smithy tools	2 Sets
7	Moulding table, foundry tools	2 Sets
8	Power Tool: Angle Grinder	2 Nos
9	Study-purpose items: centrifugal pump, air-conditioner	1 each

OUTCOMES:

Upon completion of the course, the students should be able to

1. Elaborate on the components, gates, soldering practices. Calculate electrical parameters such as voltage, current, resistance and power. (K1)
2. Design and implement Rectifier and Timer circuits (K2)
3. Measure the electrical energy by single phase and three phase energy meters. (K2)
4. Prepare the carpentry and plumbing joints. (K2)
5. Perform different types of welding joints and sheet metal works (K2)
6. Perform different machining operations in lathe and drilling. (K2)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	-	-	1	1	1	1
CO2	3	2	1	1	2	1	-	-	1	1	1	1
CO3	2	2	1	1	1	1	-	-	1	1	1	1
CO4	1	1	1	-	-	2	-	-	1	1	1	2
CO5	2	1	1	-	-	1	1	1	1	1	1	2
CO6	2	1	1	-	-	1	-	1	1	1	1	2

SEMESTER - II

20HSTA101 SDG NO. 4	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE **3**

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2 கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3 கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

தமிழர் மரபு

அலகு I மொழி மற்றும் இலக்கியம்: 3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை: 3

நடுகல் முதல் நவீன சிற்பங்கள் வளர - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - கதர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலொட்டம், தொல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திறைக் கோட்பாடுகள்: 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்கொப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்ப்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு ___ மக்களும் பண்பாடும் ___ கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல்

பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

SEMESTER - II

20TPHS201 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the nuances in resume building
- To explore various virtual meeting tools
- To gain knowledge about online certification courses
- To develop knowledge in Google Suite products
- To enhance presentation skills

UNIT I RESUME BUILDING **6**

Your Strength, Projects, Internship, Paper Presentation, uploading your coding in github, Introduction to HackerRank, HackerEarth virtual online assessment (Auto Proctored) (Practicals - Construct a resume, Register for a online Mock Assessment / Contest)

UNIT II VIRTUAL MEETINGS **6**

Basic Etiquette of virtual meeting – Introduction to Skype - Zoom - Webex - Google Meet - Gotowebinar - Jio meet – Screen Share - Jamboard - Feedback polling - Chatbox

(Practicals - Accept and Register for a mock class to attend - How to host a meeting).

UNIT III ONLINE LEARNING **6**

Online Certification - Coursera – Udemy – Edx – Cisco – Online Practice Platforms - SkillRack – Myslate - FACEprep - BYTS - aptimithra - Contest Registrations - TCS Campus Commune - HackwithInfy, InfyTQ - Virtusa NurualHack - Mindtree Osmosis – Online assessment - AMCAT-PGPA.

(Practicals - Campus Commune Registration , Coursera registration - Mock Registration (KAAR Technologies as sample).

UNIT IV GOOGLE SUITE **8**

Define google suite - Benefits of google suite - Google Search - Sheet - Docs - Forms - Calender - Drive - Slide - Translate - Duo - Earch - Maps - Hangouts- Sites - Books - Blogger

(Practicals – Create google sheets and share - Create google Forms and share, Create Google Slide and share , Google drive creation and share (Knowledge of Rights), Create poll and share.

UNIT V PRESENTATION SKILLS **4**

Email Writing – Group Discussion - Power Point Presentation

(Practicals- Create a self SWOT Analysis report. A PowerPoint Slide Preparation)

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Resume Building:

1. https://zety.com/blog/resume-tips
2. https://resumegenius.com/blog/resume-help/how-to-write-a-resume
3. https://www.hackerearth.com/recruit/
4. https://www.hackerrank.com/about-us

Unit – II:Virtual Meetings

1. https://www.claphamschool.org/our-community/blog/online-learning-etiquette-guide-14-principles-to-guide-students
2. https://online.hbs.edu/blog/post/virtual-interview-tips?c1=GAW_SE_NW&source=IN_GEN_DSA&cr2=search__-__nw__-__in__-

__dsa__-__general&kw=dsa__-__general& cr5=459341920955&cr7=c&gclid=Cj0KCQjw8fr7BRDSARIsAK0Qqr4dRRbboL3kltrwDsr7hm8oIHtN5dfjD3NIFZULuzNwEXxhjpNFQ2caApn5EALw_wcB

3. https://hygger.io/blog/top-10-best-group-meeting-apps-business/
4. https://www.zdnet.com/article/best-video-conferencing-software-and-services-for-business/

Unit – III:Online Learning

1. https://www.coursera.org/browse
2. https://support.udemy.com/hc/en-us/articles/229603868-Certificate-of-Completion
3. https://www.edx.org/course/how-to-learn-online
4. https://www.cisco.com/c/en/us/training-events/training-certifications/certifications.html
5. https://campuscommune.tcs.com/en-in/intro
6. https://www.freshersnow.com/tcs-campus-commune-registration/
7. https://www.infosys.com/careers/hackwithinfy.html
8. https://www.mindtree.com/blog/osmosis-2013-my-experiences
9. https://www.myamcat.com/knowing-amcat
10. https://www.admitkard.com/blog/2020/02/06/amcat/

Unit IV: Google Suite

1. https://www.inmotionhosting.com/blog/what-is-g-suite-and-why-should-i-consider-using-it/
2. https://en.wikipedia.org/wiki/G_Suite
3. https://blog.hubspot.com/marketing/google-suite
4. https://kinsta.com/blog/g-suite/

Unit V: Presentation Skills

1. https://www.mindtools.com/CommSkll/EmailCommunication.htm
2. https://www.grammarly.com/blog/email-writing-tips/
3. https://business.tutsplus.com/articles/how-to-write-a-formal-email--cms-29793
4. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
5. https://www.mbauniverse.com/group-discussion/tips
6. https://slidemodel.com/23-powerpoint-presentation-tips-creating-engaging-interactive-presentations/
7. https://business.tutsplus.com/articles/37-effective-powerpoint-presentation-tips--cms-25421

8 https://blog.prezi.com/9-tips-on-how-to-make-a-presentation-a-success/
9. http://www.garrreynolds.com/preso-tips/design/

OUTCOMES:

On completion of this course, the student should be able to

1. Construct a suitable resume and registration procedure for online mock assessments. (K1)
2. Handle various virtual meeting tools. (K3)
3. Acquire exposure about online certification courses. (K4)
4. Get involved and work in a collaborative manner. (K2)
5. Gain knowledge in various presentation methodologies. (K1)
6. Apply knowledge to practice Google suite features and SWOT analysis. (K3)

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

SEMESTER - II

20HSMG201 SDG NO. 4 & 5	INTERPERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I INTERPERSONAL VALUES **6**

Interpersonal Relationships and Values – Importance and Barriers – Building and maintain relationships – Mutual understanding – Respect to others.

UNIT II EFFECTIVE COMMUNICATION **6**

Communication skills –Importance and Barriers - Impressive formation and management – Public speaking

UNIT III GROUP DYNAMICS **6**

Group formation –Teamwork – Identify others attitude and behaviour – Formation of relationship – Personal and professional.

UNIT IV MUTUAL RELATIONSHIP **6**

Building mutual understanding and cooperation – Enhancing decision making skills – Problem solving skills – Comparative Appraisal – Interpersonal needs.

UNIT V POSITIVE ATTITUDE **6**

Fostering trust and cooperation – Developing and maintain positive attitude – Improving socialization – Development of security and comfort.

TOTAL: 30 PERIODS

Note: Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development", McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Develop a healthy relationship & harmony with others. (K1)
2. Practice respecting every human being. (K3)
3. Practice to eradicate negative temperaments. (K3)
4. Acquire Respect, Honesty, Empathy, Forgiveness and Equality. (K4)
5. Manage the cognitive abilities of an Individual. (K5)
6. Understanding the importance of public speaking and teamwork. (K2)

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	3	3	1	1	1
CO2	-	-	-	-	-	2	2	3	3	1	1	1
CO3	-	-	-	-	-	2	2	3	3	1	1	1
CO4	-	-	-	-	-	2	2	3	3	1	1	1
CO5	-	-	-	-	-	2	2	3	3	1	1	1
CO6	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - III

20BSMA309 SDG NO. 4	NUMBER THEORY	L	T	P	C
		3	0	0	4

OBJECTIVES:

- The aim of this course is to impart knowledge in the concepts of linear algebra as a prerequisite for the recent thrust areas of technological advancement.
- To understand the basic concepts in number theory
- To examine the key questions in the Theory of Numbers.
- To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

UNIT I DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS 12

Division algorithm — Base — b representations — Number patterns — Prime and composite numbers — GCD — Euclidean algorithm — Fundamental theorem of arithmetic — LCM.

UNIT II CONGRUENCES 12

Congruences, Solutions of congruences, congruences of deg 1, The function 0(n) - Congruences of higher degree, Prime power moduli, Prime modulus, congruences of degree 2, Prime modulus, Power residues.

UNIT III QUADRATIC RESIDUES 12

Quadratic residues, Quadratic reciprocity, The Jacobi symbol, greatest integer function, arithmetic function, The Mobius Inversion formula, The multiplication of arithmetic functions.

UNIT IV DIOPHANTINE EQUATIONS 12

Diophantine equations, The equation ax + by = c, Positive solutions, Other linear Equations, Sums of four and five squares, Waring's problem, sum of fourth powers, sum of two Squares.

UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS 12

Wilson's theorem — Fermat's little theorem — Euler's theorem — Euler's Phi functions — Tau and Sigma functions.

TOTAL: 60 PERIODS

REFERENCES:

1. Bressoud D., Wagon S., "A Course in Computational Number Theory", Key College Publishing, New York, 2000.
2. Graham R.L., Knuth D.E. and Patachink O., "Concrete Mathematics", Pearson education, Second Edition, London, 2002.
3. Niven I., Zuckerman H.S., and Montgomery H.L., "An introduction to the theory of numbers", John Wiley & Sons, Fifth Edition, Singapore, 2004.
4. Kenneth Ireland & Michael Rosen, "A Classical Introduction to Modern Number Theory", Springer International Edition, Second Edition, New York, 2010
3. Koblitz, N., "A course in number theory and Cryptography", Springer Verlag , New York, 1994
5. Rose H.E., "A Course in Number Theory", Clarendon Press, Second Edition, Oxford, 1995

OUTCOMES:

Upon completion of the course, the student should be able to

1. The student would have learnt to solve divisibility problems some techniques of numerical calculations using congruences
2. Students would have learnt application of congruences.
3. Students will be able to apply the Gaussian reciprocity law in public-key cryptography
4. The students will be able to solve some diophantine equations .

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	-	-	-	-	-	-	1
CO2	3	3	2	1	1	-	-	-	-	-	-	1
CO3	3	3	2	1	1	-	-	-	-	-	-	1
CO4	3	3	2	1	1	-	-	-	-	-	-	1
CO5	3	3	2	1	1	-	-	-	-	-	-	1
CO6	3	3	2	1	1	-	-	-	-	-	-	1

SEMESTER - III

20ITPC301 SDG NO. 4	DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of ADT's
- To learn Linear Data Structures – Lists, Stacks, and Queues
- To understand Sorting, Searching and Hashing Algorithms
- To learn Dynamic Data Structures - Tree and Graph

UNIT I LINEAR DATA STRUCTURES – I 9

Stacks and Queues : Abstract Data Types (ADTs) – Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to Postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue –Dequeue – Applications of Queues.

UNIT II LINEAR DATA STRUCTURES – II 9

Linked List: List ADT – Array-Based Implementation – Linked List Implementation –– Singly Linked Lists- Circularly Linked Lists- Doubly-Linked Lists – Applications of Lists –Polynomial Manipulation – All Operations (Insertion, Deletion, Merge, Traversal).

UNIT III NON LINEAR DATA STRUCTURES – I 9

Trees : Tree ADT – Tree Traversals - Binary Tree ADT – Expression Trees – Applications of Trees – Binary Search Tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree -Heap – Applications of Heap.

UNIT IV NON LINEAR DATA STRUCTURES – II 9

Graphs : Definition – Representation of Graph – Types of Graph – Breadth First Traversal –Depth First Traversal – Topological Sort – Bi-Connectivity – Cut Vertex – Euler Circuits – Dijkstra‟s algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms – Applications of Graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search - Sorting - Bubble Sort - Selection Sort - Insertion Sort - Shell Sort – Radix Sort – Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2002.
2. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2011.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
3. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.

WEB REFERENCES :

1. https://www.programiz.com/dsa
2. http://masterraghu.com/subjects/Datastructures/ebooks/rematharej a.pdf

OUTCOMES:

Upon completion of the course, the student should be able to

1. Implement abstract data types for linear data structures. (K3)
2. Implement abstract data types for non-linear data structure. (K3)
3. Apply the different linear and non-linear data structures to problem solutions. (K3)
4. Implement the various sorting and searching algorithms. (K3)
5. Solve Problem involving Graph, Trees and Heap. (K3)
6. Choose appropriate data structures to solve real world problems efficiently. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	1	1	1	0	2	2	3	3	1	1
CO2	2	2	1	2	1	1	1	0	2	2	3	3	1	1
CO3	3	3	2	3	3	1	1	1	2	2	3	3	1	1
CO4	2	2	1	2	3	2	1	0	1	1	2	1	1	2
CO5	2	2	1	2	3	0	0	1	2	1	2	2	1	2
CO6	3	3	3	3	1	0	0	0	1	1	2	1	2	2

SEMESTER - III

20CSPC301 SDG NO. 4 & 9	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To understand Object Oriented Programming concepts and principles of Packages, Inheritance and Interfaces
- To define Exceptions and use I/O streams
- To develop a Java application with threads and generic classes
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming – Abstraction – Objects and Classes – Encapsulation– Inheritance – Polymorphism– OOP in Java – Characteristics of Java – The Java Environment – Java Source File – Compilation - Fundamental Programming Structures in Java – Defining Classes in Java – Constructors - Methods - Access Specifiers – Static Members - Comments - Data Types- Variables - Operators- Control Flow- Arrays- Packages – Javadoc Comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super Classes– Sub Classes –Protected Members – Constructors in Sub Classes– The Object Class – Abstract Classes and Methods – Final Methods and Classes – Interfaces – Defining an Interface - Implementing Interface - Differences between Classes and Interfaces and Extending Interfaces – Object Cloning -Inner Classes -Array Lists -Strings.

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions – Exception Hierarchy – Throwing and Catching Exceptions – Built-in Exceptions-Creating own Exceptions - Stack Trace Elements - Input / Output Basics – Streams – Byte Streams and Character Streams – Reading and Writing Console – Reading and Writing Files.

UNIT IV MULTI-THREADING AND GENERIC PROGRAMMING 8

Differences between Multi-Threading and Multitasking - Thread Life Cycle - Creating Threads - Synchronizing Threads - Inter-Thread Communication - Daemon Threads - Thread Groups - Java Concurrency Packages - Generic Programming – Generic Classes – Generic Methods – Bounded Types – Restrictions and Limitations.

UNIT V LAMBDAS STREAMS AND REACTIVE PROGRAMMING 9

Lambda Expressions – Library Enhancements to Support Lambdas – No Parameter-Single Parameter - Multiple Parameters – With or Without Return Keyword-Comparator– Filter Collection Data-Streams-Generating Streams-Java Stream Interface Methods – For each-Map-Filter-Limit-Sorted - Parallel Processing - Reactive Programming– ReactiveX– ReactiveX Classes– Creating Operator– Reactive Subjects.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Herbert Schildt, "Java - The Complete Reference", 8th Edition, McGrawHill Education, 2011.
2. E.Balagursamy- "Programming with Java", 6th Edition, McGrawHill Education, 2019.

REFERENCES:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson, 2015.
2. Steven Holzner, "Java 2 Blackbook", Dream Tech Press, 2011.
3. Timothy Budd, "Understanding Object-Oriented Programming with Java", Updated Edition, Pearson Education, 2000.
4. Kathy Sierra, Bert Bates, Trisha Gee, "Head First Java", 3rd Edition, O'Reilly, 2022.
5. Joshua Bloch, " Effective Java", Third Edition, Addison Wesley, 2018.

WEB REFERENCES:

1. https://www.w3schools.com/java/java_oop.asp
2. https://www.edureka.co/blog/object-oriented-programming/
3. https://www.ntu.edu.sg/home/ehchua/programming/java/J3a_OOPBasics.html

ONLINE RESOURCES :

1. https://www.ntu.edu.sg/home/ehchua/programming/java/J3a_OOPBasics.html
2. https://introcs.cs.princeton.edu/java/lectures/

OUTCOMES:

Upon completion of the course, students should be able to

1. Comprehend Object Oriented Programming Concepts in Java. (K2)
2. Illustrate the purpose of packages, Java documents and Analyze the various types of Inheritance. (K4)

3. Apply the Object Oriented Programming Concepts to develop the reusable Applications. (K3)
4. Illustrate the java applications using Java Exceptions and I/O Streams.(K4)
5. Understand the concept of Multithreading and Generic Classes in Java. (K2)
6. Design and implement Lambda expressions, streams and reactive programming. (K6)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	-	2	-	-	-	-	-	2	3	2
CO2	3	1	3	2	-	2	-	-	2	-	-	2	3	2
CO3	3	1	3	2	-	2	-	-	-	-	-	2	3	3
CO4	3	1	3	2	-	2	-	-	-	-	-	2	3	2
CO5	3	1	3	2	3	2	-	-	-	-	-	2	3	2
CO6	3	1	3	2	3	2	-	-	1	-	-	2	3	2

SEMESTER - III

20SCPC301 SDG NO. 4	SOFTWARE ARCHITECTURE AND PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the phases in a software project.
- To recognize the Cost estimation, risk and mitigation of Software project
- To understand fundamental concepts of requirements engineering and Analysis Modelling.
- To analyze the various software design methodologies, testing and maintenance measures.
- To Study the quality and Reliability of software products.

UNIT I INTRODUCTION **6**

Programming in the small vs. programming in the large, software project failures and importance of software quality and timely availability, engineering approach to software development, role of software engineering towards successful execution of large software projects, emergence of software engineering as a discipline; Basic concepts of life cycle models – different models - Agile and milestones;

UNIT II SOFTWARE REQUIREMENTS & OBJECT ORIENTED ANALYSIS, DESIGN AND CONSTRUCTION 10

Software Requirements Analysis, Design and Construction: Introduction to SRS and requirement elicitation techniques, requirement modeling techniques – decision tables, event tables, state transition tables, Petri nets OOAD and Construction:Introduction to UML,Use cases, -Concepts - the principles of abstraction, modularity, specification, encapsulation and information hiding, concepts of abstract data type, Class Responsibility Collaborator (CRC) model, quality of design, design measurements, design patterns, Refactoring, object-oriented construction principles, object-oriented metrics. Secure development and build environment.

UNIT III SOFTWARE PROJECT MANAGEMENT AND ESTIMATION TECHNIQUES 11

Software Project Management: Software project planning –identification of activities and resources, concepts of feasibility study, techniques for estimation of schedule and effort,introduction to the concepts of risk and its mitigation, configuration management. Estimation Techniques:Software cost estimation models and concepts of software engineering economics, techniques of software project control and reporting,Introduction to measurement of software size, software metrics and metrics-based control methods, measures of code and design quality.

UNIT IV SOFTWARE TESTING 9

Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables, testing use cases, transaction-based testing, testing for non-functional requirements – volume, performance and efficiency, concepts of inspection. Security testing of software: Unit testing, integration testing, validation and system testing, fuzzing.

UNIT V SOFTWARE QUALITY AND RELIABILITY 9

Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI), introduction to software reliability, reliability models and estimation.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning PrivateLimited, 2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.

ONLINE RESOURCES:

1. http://nptel.ac.in/.
2. http://infolab.stanford.edu/~burback/watersluice/watersluice.html.

WEB REFERENCES:

1. https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf.
2. http://www.darshan.ac.in/Upload/DIET/Documents/CE/2160701_Software%20Engineering%20Study%20Material%20GTU_23042016_032444AM.pdf.
3. https://jnec.org/lab-manuals/cse/te/se.pdf.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Define the key approaches of engineering that yield the importance of software project quality.(K1)
2. Understand the different activities in software project plan , activities , management and cost estimation techniques.(K2)
3. Understand the software requirement specifications and the principles of unified modelling language to model the business requirements.(K2)
4. Select and apply the various testing concepts in software projects to maintain stable software products.(K3)
5. Compare and contrast the reliability and quality metrics of a software product.(K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	-	-	-	1	-	3	2	1	2
CO2	-	3	2	1	2	-	-	-	2	1	-	1	1	2
CO3	2	2	2	1	2	-	-	-	-	-	-	-	2	-
CO4	-	3	3	-	-	-	-	-	-	1	-	-	3	2
CO5	2	2	2	1	2	-	-	-	-	-	-	-	2	2

SEMESTER - III

20SCPC302 SDG NO. 4 & 9	CYBER SECURITY ESSENTIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Students should be able to understand.
- The difference between threat, risk, attack and vulnerability.
- How threats materialize into attacks.
- Where to find information about threats, vulnerabilities and attacks.
- Typical threats, attacks and exploits and the motivations behind them.

UNIT I INTRODUCTION TO CYBER SECURITY 9

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication -Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

UNIT II SECURITY IN OPERATING SYSTEM & NETWORKS 9

Security in Operating Systems - Security in the Design of Operating Systems - Rootkit - Networking basics (home network and large-scale business networks), Networking protocols, Security of protocols, sample application hosted on-premises.

UNIT III DIGITAL SECURITY 9

Basics of digital security, protecting personal computers and devices, protecting devices from Virus and Malware, Identity, Authentication and

Authorization, need for strong credentials, keeping credentials secure, protecting servers using physical and logical security, World Wide Web (www), the Internet and the HTTP protocol, security of browser to web server interaction,

UNIT IV PRIVACY IN CYBERSPACE 9

Introduction to cyber-attacks, application security (design, development and testing), operations security, monitoring, identifying threats and remediating them, Principles of data security - Confidentiality, Integrity and Availability, Data Privacy, Data breaches, preventing attacks and breaches with security controls, Compliance standards, Computer Ethics.

UNIT V MANAGEMENT AND INCIDENTS 9

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015

REFERENCES:

1. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
2. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
3. Nelson Phillips and Enfinger Steuart, —Computer Forensics and Investigations||, Cengage Learning, New Delhi, 2009.

OUTCOMES:

Upon completion of the course, the student should be able to

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	1	1	-	2	2	-	2	1	1
CO2	2	3	3	3	2	1	1	-	2	2	-	2	1	1
CO3	3	3	3	3	3	2	1	-	2	2	2	3	1	2
CO4	2	3	3	3	3	2	2	-	2	2	2	3	1	2
CO5	3	3	3	3	3	2	2	-	3	3	3	3	1	2

SEMESTER - III

20SCPC303 SDG NO. 4	MACHINE LEARNING IN CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty
- Introduce Machine Learning and supervised learning algorithms
- Study about ensembling and unsupervised learning algorithms
- The students will learn to implement, train and validate the machine learning models and understand the recent algorithms in machine learning through case studies

UNIT I PROBLEM SOLVING 9

Problem solving – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP).

UNIT II SUPERVISED LEARNING 9

Foundations of supervised learning - Decision trees and inductive bias, Regression Vs Classification, Supervised: Linear Regression, Logistic Regression, Generalisation, Training, Validation and Testing, Problem of Overfitting, Bias vs Variance, Performance metrics, Decision Tree, Random Forest, Perceptron, Beyond binary classification. Case study: Anomaly detection

UNIT III ADVANCED SUPERVISED LEARNING 9

Advanced supervised learning - Naive Bayes, Bayesian Belief Network, K-

Nearest Neighbour, Support vector machines, Markov model, Hidden Markov Model, Parameter Estimation: MLE and Bayesian Estimate, Expectation Maximisation, Neural Networks.

UNIT IV UNSUPERVISED LEARNING 9

Unsupervised Learning: Curse of Dimensionality, Dimensionality Reduction Techniques, Principal component analysis, Linear Discriminant Analysis Clustering: K-means, Hierarchical, Spectral, subspace clustering, association rule mining. Case Study: Spam filtering /machine learning for end point protection/network protection/ Application security

UNIT V PROBABILISTIC REASONING 9

Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. Tom Mitchell. Machine Learning. First Edition McGraw Hill Education; 2017

REFERENCES:

1. Christopher M Bishop. Pattern Recognition and Machine Learning. Springer 2010
2. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern Classification. Wiley, Second Edition;2007
3. Kevin P. Murphey. Machine Learning, a probabilistic perspective. The MIT Press Cambridge, Massachusetts, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Use appropriate search algorithms for problem solving
2. Apply reasoning under uncertainty
3. Understand issues and challenges of machine learning: data, model selection, model complexity, various machine learning algorithms in a range of real-world applications.
4. Understand strengths and weaknesses of many popular machine learning approaches.

5. Analyse the underlying mathematical relationships within and across Machine Learning algorithms.
6. Apply the paradigms of supervised and un-supervised learning on use cases of security.

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	1	-	1	-	-	-	2	1	2	2	1	2
CO2	-	-	-	-	1	-	-	-	2	1	2	2	1	2
CO3	-	-	1	-	-	-	2	-	1	-	3	3	2	2
CO4	1	-	-	-	1	-	-	-	2	-	3	2	1	2
CO5	1	-	1	-	1	-	-	-	2	-	2	2	2	2
CO6	3	2	-	2	3	3	2	3	3	3	3	-	-	3

SEMESTER - III

20CSPL301 SDG NO. 4 & 9	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of Packages, Inheritance and Interfaces
- To develop a Java application with Threads and Generic classes
- To make the students understand life cycle of the Applets and its functionality

LIST OF EXPERIMENTS :

1. Basic JAVA Programs
   a. Write a program to find the sum of individual digits of a positive integer.
   b. Write a program to generate the first n terms of the sequence.
   c. Write a program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
   d. Write a program to find both the largest and smallest number in a list of integers.

e. Write a program to find factorial of list of number reading input as command.

2. Write a program to calculate bonus for different departments using method overriding.
3. Write a program to sort list of elements in ascending and descending order and show the exception handling.
4. Write a program to implement the concept of importing classes from user defined package and creating packages.
5. Write programs that illustrate how the following forms of inheritance are supported:
   a) Single inheritance
   b) Multiple inheritance
   c) Multi level inheritance
   d) Hierarchical inheritance
6. Write a program to demonstrate use of implementing interfaces.
7. Write a program to implement interfaces all string operations.
8. Write a program to create student report using applet, read the input using text boxes and display the output using buttons.
9. Write a program to implement thread priorities.
10. Write a program to implement thread, applets and graphics to animate ball movement.
11. JAVA Applet program
    a) Write a Applet program using paint brush
    b) Write a program to display analog clock using Applet
    c) Write a program to create different shapes and fill colors using Applet
12. JAVA Event Handling program
    a) Write a program that display the x and y position of the cursor movement using Mouse
    b) Write a program that identifies key-up key-down event user entering text in a Applet
13. JAVA programs on Swings
    a) Write a program to build a Calculator in Swings
    b) Write a program to display the digital watch in swing
    c) Write a program that to create a single ball bouncing inside a Jpanel.
    d) Write a program JTree as displaying a real tree upside down

TOTAL : 45 PERIODS

LAB REQUIREMENTS :

Hardware :

Desktop Systems - Pentium IV with 2 GB RAM
160 GB HARD Disk
Monitor 1024 x 768 colour

Software :

Windows operating system
JDK 1.8

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Write Java programs in accordance with the object oriented programming concepts. (K6)
2. Design user defined java packages. (K6)
3. Create Java programs using Inheritance and Polymorphism. (K6)
4. Implement Error-handling techniques using Exception handling and Multithreading. (K6)
5. Develop Applet program and GUI using Swing components. (K6)
6. Enumerate the event handling techniques in Java Programming. (K5)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	2	-	-	-	-	2	2	3	2
CO2	2	2	3	2	-	2	-	-	-	-	2	2	3	2
CO3	2	2	3	2	-	2	-	-	2	2	2	2	3	2
CO4	3	3	2	2	-	2	-	-	-	-	2	2	3	2
CO5	3	3	3	2	-	2	-	-	-	-	2	2	3	2
CO6	2	3	3	2	-	2	-	-	2	2	2	2	3	2

SEMESTER - III

20SCPL301 SDG NO. 4	SOFTWARE ENGINEERING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand the concepts of software engineering
- To understand the effectiveness of software project management
- To understand the metrics and models of software quality and reliability
- To implement software requirement analysis, design and construction
- To know the various software testing methods

LIST OF EXPERIMENTS :

1. 1. Preparation of required document for standard Application program in standard format(SRS).
2. DFD of standard application problem.
3. To prepare time line chart/Gantt Chart for selected software project.
4. Implement requirements modeling techniques and methods.
5. To perform the user's view analysis, Structural, behavioral diagram for the suggested system: Use case diagrams.
6. Implement of CRC model
7. Implement metrics of code and design quality
8. Implement verification and validation procedure
9. Implement Test plan /Test script
10. Implement Software Testing - Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and site monitor

TOTAL: 30 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT

EQUIPMENTS:

Argo UML/Star UML/UML Graph/Selenium or Equivalent

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. To utilize engineering approach to software development. (K3)
2. To practice various software life cycle models. (K3)
3. To implement software quality models. (K6)

4. To analyze the techniques of requirements gathering and modeling. (K4)
5. To implement class responsibility collaborator model. (K6)
6. To execute both white box and black box testing. (K6)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	1	-	3	2	1	-
CO2	2	3	1	1	-	1	-	-	-	-	-	-	-	-
CO3	2	2	2	1	2	-	-	-	-	-	-	-	1	1
CO4	-	3	2	1	2	-	-	-	2	1	-	1	2	1
CO5	2	3	-	1	-	1	-	-	-	-	-	-	2	-
CO6	-	3	3	-	-	-	-	-	-	1	-	-	2	-

SEMESTER - III

20ITPL301 SDG NO. 4	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To implement Linear and Non-linear Data Structures
- To understand the different operations of Search Trees
- To implement Graph Traversal algorithms
- To get familiarized to Sorting and Searching algorithm

LIST OF EXPERIMENTS :

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues

9. Graph representation and Traversal algorithms
10. Applications of Graphs- Implementation of searching and sorting algorithms
11. Implementation of any two Collision Techniques in Hashing

TOTAL: 45 PERIODS

LAB REQUIREMENTS :

Turbo C/Dev C++, Borland C

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Write functions to implement linear and non-linear data structure operations. [K1]
2. Suggest appropriate linear / non-linear data structure operations for solving a given problem. [K2]
3. Design and analyze the time and space efficiency of data structure.[K2]
4. Apply sorting and searching techniques. [K3]
5. Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval. [K3]
6. Choose and implement efficient data structures and apply them to solve problems. [K3]

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	1	1	-	-	-	-	2	2	2	2
CO2	2	3	2	2	2	1	-	-	-	-	2	3	2	2
CO3	3	3	2	2	1	1	-	-	-	-	2	2	2	2
CO4	3	3	2	2	1	1	-	-	-	-	2	3	2	2
CO5	1	2	2	1	2	1	-	-	-	-	1	1	2	2
CO6	1	2	2	1	1	-	-	-	-	-	1	1	2	2

SEMESTER - III

20CSTE301 SDG NO. 4,11&15	LIVE-IN-LAB - I	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products
- To develop design that add value to products and solve technical problems.
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used

COURSE PLAN :

Study: Take minimum three simple products, processes or techniques in the area of specialization, study, analyze and present them. The analysis shall be focused on functionality, construction, quality, reliability, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

Design: The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality; design for strength is not expected.

Note: *The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.*

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 20 marks
3. Final evaluation (Last week of the semester) : 60 marks

Note: *All the three evaluations are mandatory for course completion and for awarding the final grade.*

OUTCOMES:

Upon completion of the course, the student should be able to

1. List the problems and conduct literature survey to identify the gap and come up with an application oriented research problem in the specific domain.(K1)
2. Understand the project characteristics and explore necessary tools and components needed at various stages of the project(K2)
3. Design and validate the proposed system using simulation.(K3)
4. Develop the Prototype of the proposed system by adapting Industrial safety standards and best financial management practices(K5)
5. Analyze the obtained results and prepare a technical report.(K4)
6. Evaluate the project and go for journals and patents publication.(K5)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - III

20HSTA201 SDG NO. 4	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2 கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3 கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

தமிழர் மரபு

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்: 3
சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க கொலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் ___ சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் கொலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III உற்பத்தித் தொழில் நுட்பம்: 3
கப்பல் கட்டும் கலை -உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணொடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3
அணை, ஏரி, குளங்கள், மதகு -சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் ___ பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூ லகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு ___ மக்களும் பண்பாடும் ___ கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

SEMESTER - III

20CSTP301 SDG NO. 4	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVE:

- To educate and enrich the students on quantitative ability, reasoning ability, and verbal ability.
- Improve their quantitative ability.
- Improve the ability of arithmetic reasoning
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVE ABILITY – I **10**

Problems on Trains - Time and Distance - Height and Distance - Time and Work

UNIT II QUANTITATIVE ABILITY – II **10**

Problems on Ages - Alligation or Mixture - Chain Rule - Simple Interest - Simple Equation - Theory Of Equation.

UNIT III REASONING ABILITY – I **8**

Analytical Reasoning - Pipes and Cistern - Logical Problems - Logical Games - Logical Deduction - Data Sufficiency - Arithmetic Reasoning

UNIT IV VERBAL ABILITY – I **10**

Idioms & Phrases - Synonyms - Antonyms - Classification

UNIT V CREATIVITY ABILITY – I **7**

Venn Diagrams -Cube and Cuboids - Dice - Cubes and Dice - Figure Matrix.

TOTAL : 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

PROBLEM SOLVING USING C PROGRAMMING - PHASE 2

OBJECTIVES:

- To provide exposure to problem-solving through programming.
- To train the student to the basic concepts of the C-programming language.
- To provide exposure to problem-solving through programming.
- To give the student hands-on experience with the concepts

UNIT I INTRODUCTION TO PRINCIPLES OF PROGRAMMING **9**

Introduction to Programming , Programming Domain : Scientific Application , Business Applications, Artificial Intelligence, Systems Programming , Web Software Categories of Programming Languages: Machine Level Languages, Assembly Level Languages , High Level Languages Programming Design Methodologies : Top Down and Bottom UP Program Development Cycle with case study, Program Execution and Translation Process ,Problem solving using Algorithms and Flowcharts, Performance Analysis and Measurements: Time and Space complexity.

UNIT II INTRODUCTION TO C PROGRAMMING **9**

Features of C and its Basic Structure, Simple C programs, Constants, Integer Constants, Real Constants, Character Constants, String Constants, Backslash

Character Constants, Concept of an Integer and Variable, Rules for naming Variables and assigning values to variables, Floating-point Numbers, Converting Integers to Floating-point and vice-versa, Mixed-mode Expressions, The type cast Operator, The type char, Keywords, Character Input and Output, Formatted input and output, The gets() and puts() functions, Interactive Programming.

UNIT III OPERATORS, EXPRESSIONS AND CONTROL STATEMENTS 9

Arithmetic Operators, Unary Operators, Relational and Logical Operators, The Conditional Operator, Library Functions, Bitwise Operators, The Increment and Decrement Operators, The Size of Operator, Precedence of operators, The goto statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do…while loop, The for loop, The nesting of for loops, The break statement and continue statement.

UNIT IV ARRAYS, STRINGS AND POINTERS 9

One Dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers, Pointers and One-dimensional Arrays, Pointer Arithmetic, Pointer Subtraction and Comparison, Similarities between Pointers and One-dimensional Arrays, Null pointers, Pointers and Strings, Pointers and two-dimensional arrays, Arrays of Pointers.

UNIT V STRUCTURES, UNIONS AND FUNCTIONS 9

Basics of Structures, Arrays of Structures, Pointers to Structures, Self-referential Structures, Unions, Function Philosophy, Function Basics, Function Prototypes, and Passing Parameters: Passing Parameter by value and Passing Parameter by reference, passing string to function, Passing array to function, Structures and Functions Recursion.

TOTAL : 45 PERIODS

REFERENCES:

1. Programming in ANSI C - Balagurusamy - Tata McGraw-Hill Education, 2008
2. Programming in C (3rd Edition), by Stephen G. Kochan, Sams, 2004
3. Programming in C - Stephen G. Kochan, III Edition, Pearson Education.

COURSE OUTCOMES :

Upon completion of this course, the students should be able to:

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)

3. Create their verbal ability through vocabulary building and grammar. (K6)
4. Evaluate the situations to analyze the computational methods in order to identify and abstract the programming task involved. (K5)
5. Analyze tasks in which the numerical techniques are applicable in order to apply them to write, edit, compile, debug, correct, recompile and run programs. (K4)
6. Analyze and Design applications using Arrays, Strings,Pointers,Structures and Unions. (K4)

CO- PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO2	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO3	-	-	-	-	3	2	-	-	1	3	-	2	-	-
CO4	-	-	-	-	3	2	-	3	3	3	-	2	2	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2	2	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2	2	2

SEMESTER - III

20MGMC301 SDG NO. 4	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

OBJECTIVES:

At the end of the course, the student is expected to

- To know about Indian constitution
- To know about central government functionalities in India
- To know about state government functionalities in India
- To know about Constitution function
- To Know about Constitutional remedies

UNIT I INTRODUCTION **6**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT 6

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT 6

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS 6

Indian Federal System – Centre – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries.

UNIT V CONSTITUTIONAL REMEDIES 6

Enforcement of fundamental rights - Power of parliament to modify the rights the conferred by this part in their application to forces.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
3. M.V. Pyle (2019) , "An Introduction to The Constitution of India, 5/e", Vikas Publishing, New Delhi.
4 P.M. Bakshi, (2018) , "Constitution of India", Universal Law Publishing, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalandhar.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the Constitution and Fundamental rights of citizens (K2)
2. Discuss the structure, hierarchy and functions of Central Government (K2)

3. Explain the functions of Supreme Court and Judiciary Systems in the state (K2)
4. Discuss the structure, hierarchy and functions of State Government (K2)
5. Recall the Centre-State relationship, constitutional amendments and functionaries (K1)
6. Discuss the remedies and rights available to India Citizens (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	1	-	-	-	-	-
CO2	-	-	-	-	-	1	1	-	-	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	-
CO4	-	-	-	-	-	1	1	-	-	-	-	-
CO5	-	-	-	-	-	2	1	3	-	-	-	-
CO6	-	-	-	-	-	2	1	2	3	-	-	-

SEMESTER - IV

20BSMA402 SDG NO. 4	PROBABILITY AND QUEUEING THEORY	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To impart necessary basic knowledge in Probability theory, Random Processes and Queueing models which are invariably used in Computer science courses

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Baye's theorem - Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Erlang and Normal distributions.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear Regression – Transformation of Random Variables – Central Limit Theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 12

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNIT IV QUEUEING MODELS 12

Markovian queues – Birth and Death processes – Single and multiple server Queueing models – Little's formula - Queues with finite waiting rooms –Self-service model.

UNIT V ADVANCED QUEUEING MODELS 12

Finite source models - M/G/1 queue – Pollaczek-Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

TOTAL: 60 PERIODS

TEXT BOOKS:

1 Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007. (1.1-1.3, 1.6, 1.7 - 1.7.1, 1.8, 1.13 - Exercise problems in the above sections ; 2.1 – 2.8, 3.1 – 3.5, 3.9 , 4.1 - 4.3, 4.4 - 4.4.2, 4.7 – 4.11, 5.1 - 5.7, 6.1 – 6.3, 6.8, 6.10, 8.1 - 8.5, 10.5 (10.5.1 - 10.5.6), 10.6, 10.7 – 10.7.1-10.7. 5) (Units I, II & III).

2. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014. (1.1 – 1.5, 1.7, 2.1 - 2.7, 4.1, 4.2, 5.1 – 5.1.1) (Units IV and V)

REFERENCES:

1. Hwei Hsu, "Schaum's Outline Theory and Problems of Probability, Random variables and Random Processes", Tata Mcgraw Hill Edition, New Delhi, 2004.
2. Taha, H.A., " Operations Research", 9th Edition , Pearson India Education Services, Delhi,2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
4. Yates, R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
5. Veerarajan T., "Probability and Statistics, Random Processes and Queueing Theory", TataMc-Graw Hill Education Pvt. Ltd., New Delhi

WEB REFERENCES:

1. https://nptel.ac.in/courses/117103017/
2. https://nptel.ac.in/courses/111105041/
3. http://home.iitk.ac.in/~skb/ee679/ee679.html

ONLINE RESOURCES:

1. https://freevideolectures.com/course/3066/performance-evaluation-of-computer-systems/5
2. https://freevideolectures.com/course/3066/performance-evaluation-of-computer-systems/6

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply the knowledge of basic concepts of probability, one dimensional random variables and standard distributions in real life situations. (K3)
2. Study the relationship between two random variables and transformation by applying its basic concepts. (K3)
3. Apply the concepts of random processes in engineering disciplines. (K3)
4. Acquire the skills in analyzing Markovian queuing models. (K3)
5. Analyze the behavior of Non-Markovian queuing models, series queues and open networks. (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	1
CO2	3	3	2	-	-	-	-	-	-	-	-	1
CO3	3	3	2	-	-	-	-	-	-	-	-	1
CO4	3	3	2	-	-	-	-	-	-	-	-	1
CO5	3	3	2	-	-	-	-	-	-	-	-	1

SEMESTER - IV

20CSPW401 SDG NO. 4 & 9	COMPUTER NETWORKS WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the protocol layering and physical level communication
- To understand the various components required to build different networks and analyze the performance of a network
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer

UNIT I INTRODUCTION AND PHYSICAL LAYER 9

Networks – Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II DATA LINK LAYER & MEDIA ACCESS 9

Introduction – Data Link Layer - Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III NETWORK LAYER 9

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV TRANSPORT LAYER **9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram protocol – Transmission Control Protocol – SCTP.

UNIT V APPLICATION LAYER **9**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

LIST OF EXPERIMENTS : **15**

1. Simple client server program.
2. Socket program for echo/ping commands.
3. Implementing Link state routing algorithm.
4. Implementing distance vector routing algorithm.
5. Study of Network Simulator (NS2 or NS3) and Simulation of Congestion Control Algorithms using NS.
6. Study of TCP/UDP performance using Simulation tool.
7. Simulation of error correction code (like CRC).
8. Traffic Analysis using Wireshark.

TOTAL: 60 PERIODS

LAB REQUIREMENTS:

1. C/C++/JAVA/Equivalent compiler
2. Network Simulator like NS2/OPNET/Wireshark

TEXT BOOKS:

1. Behrouz A. Forouzan, “Data communications and networking with TCP/IP protocol suite", Sixth Edition, McGraw Hill, cop. 2022.
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

REFERENCES:

1. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2014.
2. Nader F. Mir, "Computer and Communication Networks", Second Edition Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

5. Andrew S. Tanenbaum, David J. Wetherall,"Computer Networks ", 5th edition, Pearson Education,2011

WEB REFERENCES:

1. https://swayam.gov.in/nd2_cec19_cs07/preview
2. https://nptel.ac.in/courses/106105081/
3. https://www.isi.edu/nsnam/ns/

ONLINE RESOURCES:

1. https://ptgmedia.pearsoncmg.com/images/9780789749048/samplepages/0789749041.pdf
2. https://www.cse.iitb.ac.in/~sri/cs348/cs378-lab00-overview.pdf
3. https://freevideolectures.com/course/2276/computer-networks
4. https://www.youtube.com/watch?v=g8iY36onLeM&list=PLWPirh4EWFpHJrW1D9UB24wsbM3zx7QMx

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the basic layers and its functions in computer networks. (K2)
2. Demonstrate the performance of a network. (K2)
3. Explain the basics of how data lows from one node to another. (K2)
4. Understand IEEE standards, analyze and design routing algorithms. (K2)
5. Describe the working of various transport and application layer protocols.(K2)
6. Apply the protocols for various functions in the network.(K3)

CO-PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2	2	-	2	1	-	1	3	2
CO2	3	3	2	-	-	-	1	-	-	-	-	-	2	1
CO3	3	3	3	-	1	-	1	-	-	1	-	1	3	1
CO4	3	3	3	-	-	-	1	-	-	1	-	-	2	2
CO5	3	3	3	-	1	-	2	-	-	1	-	1	3	2
CO6	3	3	3	-	1	-	1	-	-	1	-	-	3	2

SEMESTER - IV

20CSPC401 SDG NO. 4&9	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts, functions of Operating Systems, Processes and Threads
- To analyze Scheduling algorithm and understand the concept of Deadlock
- To analyse various Memory Management schemes and understand I/O management and File Systems
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android

UNIT I OPERATING SYSTEM OVERVIEW 7

Computer System Overview-Basic Elements - Instruction Execution - Interrupts - Memory Hierarchy - Cache Memory - Direct Memory Access - Multiprocessor and Multicore Organization - Operating System Overview-Objectives and Functions - Evolution of Operating System - Computer System Organization Operating System Structure and Operations - System Calls - System Programs - OS Generation and System Boot.

UNIT II PROCESS MANAGEMENT 11

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication - CPU Scheduling - Scheduling Criteria - Scheduling Algorithms- Multiple - Processor Scheduling - Real Time Scheduling - Threads - Overview - Multithreading Models - Threading Issues - Process Synchronization - The Critical - Section Problem - Synchronization Hardware - Mutex Locks - Semaphores - Classic Problems of Synchronization - Critical Regions - Monitors - Deadlock – System Model - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.

UNIT III STORAGE MANAGEMENT 9

Main Memory – Background, Swapping, Contiguous Memory Allocation - Paging - Segmentation - Segmentation with Paging - 32 and 64 Bit Architecture Examples - Virtual Memory – Background - Demand Paging - Page Replacement - Allocation - Thrashing - Allocating Kernel Memory - OS Examples.

UNIT IV FILE SYSTEMS AND I/O SYSTEMS 9

Mass Storage System – Overview of Mass Storage Structure - Disk Structure - Disk Scheduling and Management - Swap Space Management - File-System Interface - File Concept - Access Methods - Directory Structure - Directory Organization - File System Mounting - File Sharing and Protection - File System Implementation- File System Structure - Directory Implementation - Allocation Methods - Free Space Management - Efficiency and Performance - Recovery - I/O Systems – I/O Hardware - Application I/O Interface - Kernel I/O Subsystem - Streams - Performance.

UNIT V CASE STUDY 9

Linux System - Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management - Input-Output Management - File System - Inter-Process Communication - Mobile OS - iOS and Android - Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TOTAL : 45 PERIODS

TEXT BOOK :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2 William Stallings, "Operating Systems – Internals and Design Principles",7th Edition, Prentice Hall, 2011

REFERENCES :

1. Ramez Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. AchyutS.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.
4. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.

WEB REFERENCES :

1. https://nptel.ac.in/courses/106/106/106106144/
2. https://www.coursera.org/courses?query=operating%20system
3. https://www.computerhope.com/jargon/o/os.html
4. https://www.os-book.com/OS9/slide-dir/
5. http://web.iitd.ac.in/~minati/MTL458.html

ONLINE RESOURCES:

1. https://www.udacity.com/course/introduction-to-operating-systems--ud923
2. https://freevideolectures.com/course/3670/introduction-to-operating-systems

OUTCOMES:

Upon the completion of the course, the students should be able to

1. Understand the basic concepts and functions of the operating system. (K2)
2. Analyze various scheduling algorithms. (K4)
3. Understand deadlock, prevention and avoidance algorithms. (K2)
4. Compare and contrast various memory management schemes. (K4)
5. Understand the functionality of file systems (K2)
6. Understand the performance of administrative tasks on Linux servers. (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	1	1	-	-	-	1	2	2
CO2	3	3	3	2	2	-	1	1	-	-	-	1	2	2
CO3	3	3	2	2	2	-	1	1	-	-	-	1	2	2
CO4	2	2	3	2	2	-	1	1	-	-	-	1	2	2
CO5	3	3	3	2	2	-	1	1	-	-	-	1	2	2
CO6	3	3	2	2	2	-	1	1	-	-	-	1	2	2

SEMESTER - IV

20CSPC402 SDG NO. 4&9	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To design a database using ER diagrams, convert them to Relational Databases and to write SQL Queries
- To understand the fundamental concepts of Transaction Processing, Concurrency Control techniques and Recovery procedures
- To understand the Internal Storage structures and about the Query Processing Techniques
- To have an introductory knowledge about the Object Databases, XML Databases and NoSQL Databases

UNIT I DATABASE DESIGN **7**

Purpose of Database System – Views of Data –Database System Architecture-Data Models– Entity Relationship Model – ER Diagrams – Enhanced ER Model.

UNIT II RELATIONAL DATABASES **11**

Introduction to Relational Databases – Relational Model-ER-to-Relational Mapping– Keys –Relational Algebra – SQL Fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL-Functional Dependencies – Non-loss Decomposition – First – Second - Third Normal Forms - Dependency Preservation – Boyce/CoddNormal Form – Multi Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTIONS **9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV IMPLEMENTATION TECHNIQUES **9**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ Tree Index Files – B Tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics - Cost Estimation.

UNIT V ADVANCED TOPICS **9**

Distributed Databases – Architecture - Data Storage - Transaction Processing –

Object Based Databases - Object Database Concepts – Object Relational Features - ODMG Object Model – ODL - OQL – XML Databases - XML Hierarchical Model – DTD - XML Schema –Xquery.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2020.
2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill Education, 2015.
3. G.K.Gupta,"Database Management Systems", Tata McGraw Hill, 2011.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs46/
2. http://www.nptelvideos.in/2012/11/database-management-system.html
3. https://www.classcentral.com/course/swayam-database-management-system-9914
4. http://learnsql.com
5. https://www.w3schools.com/sql/default.asp
6. https://www.khanacademy.org/computing/computer-programming/sql

OUTCOMES:

Upon completion of the course, the student should be able to

1. Discuss the concepts of database to apply the Relational, ER model for design and SQL for implementation of the database. (K2)
2. Recognize and identify the use of normalization and functional dependencies to reine the database system. (K1)
3. Demonstrate various SQL queries for the Transaction Processing & Locking using concept of Concurrency control. (K2)
4. Build the query processing techniques for the optimization of SQL queries. (K3)
5. Implement the indexing and hashing techniques for the organisation of database records. (K3)

6. Illustrate how the advanced databases differ from the traditional databases. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	2	1	0	0	0	0	0	0	2	2
CO2	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO3	2	1	2	1	2	1	0	0	0	0	0	0	2	2
CO4	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO5	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO6	2	2	2	1	2	1	0	0	0	0	0	0	2	2

SEMESTER - IV

20SCPC401 SDG NO. 4	CRYPTOGRAPHY & CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Learn to analyze the security of in-built cryptosystems.
- Know the fundamental mathematical concepts related to security.
- Develop cryptographic algorithms for information security.
- Comprehend the various types of data integrity and authentication schemes
- Understand cyber crimes and cyber security.

UNIT I INTRODUCTION TO SECURITY **9**

Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services and Mechanisms – A Model for Network Security – Classical encryption techniques: Substitution techniques, Transposition techniques, Steganography – Foundations of modern cryptography: Perfect security – Information Theory – Product Cryptosystem – Cryptanalysis.

UNIT II SYMMETRIC CIPHERS **9**

Number theory – Algebraic Structures – Modular Arithmetic - Euclid's algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields SYMMETRIC KEY CIPHERS: SDES – Block Ciphers – DES, Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block

cipher mode of operation – Evaluation criteria for AES – Pseudorandom Number Generators – RC4 – Key distribution.

UNIT III ASYMMETRIC CRYPTOGRAPHY 9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem – Chinese Remainder Theorem – Exponentiation and logarithm ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange -– Elliptic curve arithmetic – Elliptic curve cryptography.

UNIT IVINTEGRITY AND AUTHENTICATION ALGORITHMS 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function: HMAC, CMAC – SHA – Digital signature and authentication protocols – DSS – Schnorr Digital Signature Scheme – ElGamal cryptosystem – Entity Authentication: Biometrics, Passwords, Challenge Response protocols – Authentication applications – Kerberos MUTUAL TRUST: Key management and distribution – Symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates.

UNIT V CYBER CRIMES AND CYBER SECURITY 9

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security - Principles and Practice", Seventh Edition, Pearson Education, 2017.
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber crimes, Computer Forensics and Legal Perspectives", First Edition, Wiley India, 2011.

REFERENCES:

1. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
2. Apply the different cryptographic operations of symmetric cryptographic algorithms
3. Apply the different cryptographic operations of public key cryptography
4. Apply the various Authentication schemes to simulate different applications.
5. Understand various cyber crimes and cyber security.

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	0	0	0	0	0	0	0	0	0	0	1
CO2	3	3	1	0	0	0	0	0	0	0	0	0	0	1
CO3	2	3	0	1	0	0	0	0	0	0	0	0	0	1
CO4	2	3	0	2	0	0	0	0	0	0	0	0	0	1
CO5	1	2	0	1	0	0	0	0	0	0	0	0	0	1
CO6	1	2	1	2	0	0	0	0	0	0	0	0	0	1

SEMESTER - IV

20ITPC401 SDG NO. 4	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To understand and apply the algorithm analysis techniques
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To understand different algorithm design techniques
- To understand the limitations of Algorithmic power

UNIT I INTRODUCTION **10**

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic

Efficiency –Asymptotic Notations and their properties - Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization.

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

Brute Force – Computing an – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment Problem.

Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUES 9

Dynamic programming – Principle of optimality - Coin Changing Problem - Computing a Binomial Coefficient – Floyd's Algorithm – Multi Stage Graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions - Greedy Technique – Container Loading Problem - Prim's Algorithm and Kruskal's Algorithm – 0/1 Knapsack Problem - Optimal Merge pattern - Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 8

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs - Stable Marriage problem.

UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9

Lower - Bound Arguments - P, NP, NP - Complete and NP-Hard Problems- Backtracking – n-Queen Problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO Search - Assignment Problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman Problem – Knapsack Problem.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2007.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2. Alfred V.Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.
4. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106101060
2. https://www.cse.iitm.ac.in/course_details.php?arg=OTI
3. https://swayam.gov.in/nd1_noc19_cs47/previ

ONLINE RESOURCES:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/
2. http://www.learnalgorithms.in/
3. https://courses.cs.vt.edu/ csonline/Algorithms/Lessons/
4. http://openclassroom.stanford.edu/MainFolder/Course Page.php?course=IntroToAlgorithms.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Review the fundamentals of algorithmic problem solving and analyzing efficiency of algorithms [K2]
2. Apply mathematical formulation,complexity analysis and methodologies to solve recurrence relations for algorithms [K3]
3. Compare the time complexities of various algorithms [K3]
4. Critically analyze the different algorithm design techniques for a given problem [K3]
5. Illustrate NP class problems and formulate solutions using standard approach [K2]
6. Articulate solutions for real life problems using algorithm design principles [K3]

CO-PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	0	0	0	0	0	0	0	0	0	0	1
CO2	3	3	1	0	0	0	0	0	0	0	0	0	0	1
CO3	2	3	0	1	0	0	0	0	0	0	0	0	0	1
CO4	2	3	0	2	0	0	0	0	0	0	0	0	0	1
CO5	1	2	0	1	0	0	0	0	0	0	0	0	0	1
CO6	1	2	1	2	0	0	0	0	0	0	0	0	0	1

SEMESTER - IV

20SCPL401 SDG NO. 4 & 9	CRYPTOGRAPHY & CYBER SECURITY LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Learn different cipher techniques.
- Implement the algorithms DES, AES, RSA and Diffie-Hellman.
- Implement hashing techniques such as SHA-1, MD-5.
- Develop a digital signature scheme.

PRACTICAL EXERCISES:

1. Write a program to implement the following cipher techniques to perform encryption and decryption
2. Caesar Cipher
3. Playfair Cipher
4. Hill Cipher
5. Write a program to implement the following transposition techniques
6. Rail fence technique –Row major transformation
7. Rail fence technique - Column major transformation
8. Write a program to implement DES algorithm
9. Write a program to implement AES algorithm
10. Write a program to implement RSA Encryption algorithm
11. Write a program to implement the Diffie-Hellman Key Exchange mechanism. Consider one of the parties as Alice and the other party as bob.
12. Write a program to calculate the message digest of a text using the SHA-1 algorithm.
13. Write a program to calculate the message digest of a text using the MD-5 algorithm.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Develop a code for classical encryption techniques.
2. Build a symmetric and asymmetric algorithms.
3. Construct a code for various Authentication schemes.
4. Apply the principles of digital signature.

CO-PO,PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	1	1	1	2	2	2	1	2	2	2
CO3	3	3	3	3	1	2	1	2	2	2	2	2	2	2
CO4	3	3	3	2	1	-	-	1	1	1	1	2	2	2
CO5	3	3	3	2	1	-	-	1	1	1	1	1	2	2
CO6	3	3	2	2	1	-	-	1	1	1	1	1	2	2

SEMESTER - IV

20CSPL401 SDG NO. 4 & 9	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn Unix commands and Shell programming
- To implement various CPU scheduling algorithm, Process Creation and Interprocess Communication
- To implement Deadlock avoidance and Deadlock Detection algorithms
- To implement Page Replacement algorithms and File strategies

LIST OF EXPERIMENTS :

1. Basics of UNIX commands & Administrator commands (man, uptime, users, service, pkill, pmap, wget, free, Shutdown commands, ping, su, who, env).
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
3. Write programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming.
5. Write programs to implement the various CPU Scheduling Algorithms.
6. Implementation of Semaphores.
7. Implementation of Shared memory and IPC.
8. Implementation of Bankers Algorithm for Deadlock Avoidance.
9. Implementation of Deadlock Detection Algorithm.
10. Write program to implement Threading & Synchronization Applications.
11. Implementation of the following Memory Allocation Methods for fixed partition

a) First Fit b) Worst Fit c) Best Fit

12. Implementation of Paging Technique of Memory Management.
13. Implementation of the following Page Replacement Algorithms
    a) FIFO b) LRU c) LFU
14. Implementation of the various File Organization Techniques.
15. Implementation of the following File Allocation Strategies
    a) Sequential b) Indexed c) Linked

TOTAL: 45 PERIODS

LAB REQUIREMENTS

1. Standalone desktops with C / C++ / Java / Equivalent compiler 30 Nos. with Linux OS

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Compare the performance of various CPU Scheduling Algorithms (K4)
2. Implement Deadlock avoidance and Detection Algorithms (K2)
3. Implement Semaphores. Create processes and implement IPC (K2)
4. Analyze the performance of the various Page Replacement Algorithms (K4)
5. Implement File Organization and File Allocation Strategies (K2)
6. Implement File Allocation Strategies (K2)

CO-PO,PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	1	1	1	2	2	2	1	2	2	2
CO3	3	3	3	3	1	2	1	2	2	2	2	2	2	2
CO4	3	3	3	2	1	-	-	1	1	1	1	2	2	2
CO5	3	3	3	2	1	-	-	1	1	1	1	1	2	2
CO6	3	3	2	2	1	-	-	1	1	1	1	1	2	2

SEMESTER - IV

20CSPL402 SDG NO. 4&9	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn the use of Data Definition, Data Manipulation Commands, Nested and Join queries
- To understand Functions, Procedures and Procedural extensions of databases
- To be familiar with the use of a Front End tool
- To understand design and implementation of typical Database applications

LIST OF EXPERIMENTS :

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Implementation of Views, Sequences and Synonyms.
4. Database Programming: Implicit and Explicit Cursors.
5. Procedures and Functions.
6. Triggers.
7. Exception Handling.
8. Database Design using ER Modeling, Normalization and Implementation for any application.
9. Database Connectivity with Front End Tools.
10. Case Study using Real Life Database applications.

TOTAL: 45 PERIODS

LAB REQUIREMENTS

SOFTWARE

Front end: VB/VC ++/JAVA or Equivalent

Back end: Oracle / SQL / MySQL/ Postgres / DB2 or Equivalent

OUTCOMES :

On completion of this laboratory course, the student should be able to

1. Use typical data definitions and manipulation commands. (K1)
2. Design applications to test Nested and Join Queries. (K3)

3. Implement simple applications that use Views. (K3)
4. Critically analyze the use of Tables, Views, Functions and Procedures. (K4)
5. Make use of ER modeling and normalization to design and implement database. (K3)
6. Implement real life applications that require a Front-end Tool as a Team. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	2	1	0	0	0	0	0	0	2	2
CO2	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO3	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO4	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO5	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO6	2	2	2	1	2	1	0	0	0	0	0	0	2	2

SEMESTER - IV

20CSTE401 SDG NO. 4,11&15	LIVE-IN-LAB - II	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To offer students a glimpse into real world problems and challenges that need IT based solutions
- To improve the team building, communication and management skills of the students
- To introduce students to the vast array of literature available of the various research challenges in the field of CSE

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
2. The course must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering

standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development.

3. Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project.
4. On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 30marks
3. Final evaluation (Last week of the semester) : 50marks

Note: *All the three evaluations are mandatory for course completion and for awarding the final grade*

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

1. Conduct literature survey to identify the gap and an application oriented research problem in the specific domain(K4)
2. Design and validate the proposed system using simulation(K6)
3. Prototype the proposed system(K5)
4. Analyze the obtained results and prepare a technical report(K4)
5. Publish the work in journals and apply for the patents.(K3)
6. Prepare for industrial environment and real time work(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	2	3	2	2	2	2	2	3	3	3	3

SEMESTER - IV

20CSTP401 SDG NO. 4	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE AND COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Improve their quantitative ability.
- Improve their reasoning ability.
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVE ABILITY – III **10**

Compound Interest - Profit and Loss- Partnership - Percentage- Set Theory

UNIT II QUANTITATIVE ABILITY – IV **10**

True Discount-Ratio and Proportion - Simplification - Problems On H.C.F and L.C.M

UNIT III REASONING ABILITY – II **8**

Course of Action - Cause and Effect - Statement and Conclusion - Statement and Argument - Data Sufficiency (DS) - Statement and Assumption - Making Assumptions.

UNIT IV VERBAL ABILITY – II **10**

Change of Voice - Change of Speech - Letter and Symbol Series - Essential Part-Verbal Reasoning - Analyzing Arguments.

UNIT V CREATIVITY ABILITY – II **7**

Seating Arrangement - Direction Sense Test - Character Puzzles - Missing Letters Puzzles - Mirror &Water Images.

TOTAL : 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

ADVANCED C PROGRAMMING - PHASE 2

COURSE OBJECTIVE:

- To improve C programming skills with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To understand procedural programming methods using Dynamic memory Allocation.

UNIT I INTRODUCTION TO RECURSION **9**

Introduction to Recursion, Types of Recursion - Head Recursion , Tail Recursion, Tree Recursion, Indirect Recursion and Nested Recursion . Recursion vs Looping - Analysis on efficiency of looping and recursion, Working of recursive code in main memory. Recurrence Relation , Different types of recurrence relation. Deriving time complexity and space complexity using recurrence relation.

UNIT II GROWTH FUNCTIONS AND RECURSION **9**

Polynomial Equations, Compare growth functions - order growth functions, omega growth functions, theta growth functions - Constant time, Linear time, Logarithmic time, Quadratic time and exponential time. Problems on Recursions - Factorial Number, Sum of first N Natural Numbers, Nth Fibonacci Number, Exponent Function, Taylor Series, Tower of Hanoi.

UNIT III STORAGE CLASSES, THE PREPROCESSOR AND DYNAMIC MEMORY ALLOCATION **9**

Storage Classes and Visibility, Automatic or local variables, Global variables, Static variables, External variables, File Inclusion, Macro Definition and Substitution, Macros with Arguments, Nesting of Macros, Conditional Compilation, Dynamic Memory Allocation, Allocating Memory with malloc, Allocating Memory with calloc, Freeing Memory, Reallocating Memory Blocks, Pointer Safety, The Concept of linked list, Inserting a node by using Recursive Programs, Sorting and Reversing a Linked List, Deleting the Specified Node in a Singly Linked List.

UNIT IV FILE MANAGEMENT **9**

Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Random Access to Files, Command Line Arguments.

UNIT V BIT MANIPULATION **9**

The hexadecimal number system, C bitwise operators, Working with individual bits, How to check if a given number is a power of 2, Count the number of ones in the binary representation of the given number, Check if the ith bit is set in the binary form of the given number, How to generate all the possible subsets of a set, Find the largest power of 2 (most significant bit in binary form), which is less than or equal to the given number N, Tricks with Bits, Applications of bit operations.

TOTAL : 45 PERIODS

REFERENCES:

1. R. G. Dromey, "How to Solve It By Computer", Pearson, 1982
2. A.R. Bradley, "Programming for Engineers", Springer, 2011
3. Kernighan and Ritchie, "The C Programming Language", (2nd ed.) Prentice Hall, 1988

COURSE OUTCOMES :

Upon completion of this course, the students should be able to:

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K6)
4. Evaluate code organization and functional hierarchical decomposition with complex data types. (K5)
5. Understand C programming skills to apply advanced structured and procedural programming. (K2)
6. Apply Various File and Bit Manipulation algorithms in Problem Solving. (K3)

CO- PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO2	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO3	-	-	-	-	3	2	-	-	1	3	-	2	-	-
CO4	-	-	-	-	3	2	-	3	3	3	-	2	2	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2	2	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2	2	2

Imagine the Future and

Make it happen!

Together let's build a better world where there is NO POVERTY and ZERO HUNGER.

We have GOOD HEALTH AND WELL BEING QUALITY EDUCATION and full GENDER EQUALITY everywhere.

There is CLEAN WATER AND SANITATION for everyone. AFFORDABLE AND CLEAN ENERGY

which will help to create DECENT WORK AND ECONOMIC GROWTH. Our prosperity shall be fuelled

by investments in INDUSTRY, INNOVATION AND INFRASTRUCTURE that will help us to

REDUCE INEQUALITIES by all means. We will live in SUSTAINABLE CITIES AND COMMUNITIES.

RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.

CLIMATE ACTION will reduce global warming and we will have abundant,

flourishing LIFE BELOW WATER, rich and diverse LIFE ON LAND.

We will enjoy PEACE AND JUSTICE through STRONG INSTITUTIONS

and will build long term PARTNERSHIPS FOR THE GOALS.

For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **People like you.**

Together we can...

Sai Prakash Leo Muthu

Chairman & CEO – Sairam Institutions

We build a Better nation through Quality education.

Sairam INSTITUTIONS

Sri SAIRAM INSTITUTE OF TECHNOLOGY

An Autonomous Institution

Affiliated to Anna University & Approved by AICTE, New Delhi

*Accredited by **NBA** and **NAAC** "**A+**"*
***ISO** 9001:2015 Certified and MHRD **NIRF** ranked institutions*

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DEPARTMENT OF
COMPUTER SCIENCE ENGINEERING
M.E BIG DATA ANALYTICS

REGULATIONS
2020

Academic Year 2020-21 onwards

AUTONOMOUS
CURRICULUM AND
SYLLABUS
I - IV
SEMESTERS

SRI SAIRAM INSTITUTE OF TECHNOLOGY

VISION

To be identified as a "Centre of Excellence" with high standards of Knowledge Dissemination and Research opportunities and to transform the students to imbibe qualities of technical expertise of international standards and high levels of ethical values, who in turn shall contribute to the advancement of society and human kind.

MISSION

We shall dedicate and commit ourselves to attain and maintain excellence in Technical Education through commitment and continuous improvement of infrastructure and equipment and provide an inspiring environment for Learning, Research and Innovation for our students to transform them into complete human beings with ethical and social values.

QUALITY POLICY

We at Sri Sai Ram Institute of Technology are committed to build a better nation through Quality Education with team spirit. Our students are enabled to excel in all values of Life and become Good Citizens. We continually improve the System, Infrastructure and Services to satisfy the Students, Parents, Industry and Society.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

To be a centre of excellence in educating and graduating Computer Engineers by providing unique environment that foster research, technological, and social enrichment with intellectual knowledge to acquire international standards.

MISSION

M1: Develop high quality Computer Science and Engineering graduates with technical and Professional skills by providing modern infrastructure to acquire international standards.

M2: Foster research to solve real world problems with emerging Technologies

M3: Establish center of excellences in collaboration with industries, to meet the changing needs of society

M4: Inculcate spirit of moral values that contributes to societal ethics

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20PBDMA101	Applied Probability And Statistics	3	1	0	4	4
2	20PBDPC101	Advanced Data Structures And Algorithms	3	0	0	3	3
3	20PBDPC102	Big Data Mining And Analytics	3	0	0	3	3
4	20PBDPC103	Multi Core Architecture	3	0	0	3	3
5	20PBDMC101	Research Methodology and IPR	2	0	0	2	2
6	20PBDMC102	Audit Course – I *	2	0	0	2	0
PRACTICALS							
7	20PBDPL101	Advanced Data Structures Lab	0	0	3	3	1.5
8	20PBDPL102	Big Data Computing Laboratory	0	0	3	3	1.5
		TOTAL				**23**	**18**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20PBDPC201	Foundations Of Data Science	3	1	0	4	4
2	20PBDPC202	Big Data Security	3	0	0	3	3
3	20PBDPC203	Machine Learning Techniques	3	0	0	3	3
4	20PBDPC204	NOSQL Database	3	0	0	3	3
5	20PXXELXXX	Professional Elective I	3	0	0	3	3
6	20PBDMC201	Audit Course – II*	2	0	0	2	0
PRACTICALS							
7	20PBDPL201	Big Data Query Languages Laboratory	0	0	3	3	1.5
8	20PBDPL202	Machine Learning Techniques Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - V							
9	20PBDTE201	Innovative Design Project	0	0	2	2	1
		TOTAL				**26**	**20**

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20PXXOEXXX	OPEN ELECTIVE	3	0	0	3	3
2	20PXXPEXXX	ELECTIVE II	3	0	2	5	4
3	20PXXELXXX	ELECTIVE III	3	0	0	3	3
4	20PXXELXXX	ELECTIVE IV	3	0	0	3	3
PRACTICAL							
5	20PBDPJ301	PROJECT WORK PHASE I	0	0	12	12	6
					TOTAL	**26**	**19**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
PRACTICAL							
1	20PBDPJ401	Project Work Phase II	0	0	24	24	12
					TOTAL	**24**	**12**

CREDIT DISTRIBUTION

Category	BS	PC	PL	TP	TE	EL	PJ
Credit	03	30	01	03	05	12	16

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20PBDEL201	High Performance Computing	3	0	0	3	3	Cloud Computing
2	20PBDEL202	Service Oriented Architecture	3	0	0	3	3	Cloud Computing
3	20PBDEL203	Information Retrieval Techniques	3	0	0	3	3	Data Science
4	20PBDEL204	Distributed Systems	3	0	0	3	3	Cloud Computing
5	20PBDEL205	Internet of Things	3	0	0	3	3	IoT

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20PBDEL301	Soft Computing	3	0	0	3	3	Cloud Computing
2	20PBDEL302	Multimedia Communication Networks	3	0	0	3	3	Cloud Computing
3	20PBDEL303	Parallel and Distributing Computing	3	0	0	3	3	Cloud Computing
4	20PBDEL304	Predictive Modelling	3	0	0	3	3	Data Science
5	20PBDEL305	Image Processing and Analysis	3	0	0	3	3	Data Science

PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20PBDEL306	Deep Learning	3	0	0	3	3	Data Science
2	20PBDEL307	Cognitive Computing	3	0	0	3	3	Cloud Computing
3	20PBDEL308	Social Network Analysis	3	0	0	3	3	Cyber Security
4	20PBDEL309	Virtualization Techniques & Applications	3	0	0	3	3	Cloud Computing
5	20PBDEL310	Natural Language Processing	3	0	0	3	3	Data Science

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20PBDEL311	Data Intensive Computing		3	0	0	3 3	Data Science
2	20PBDEL312	R Language for Mining	3	0	0	3	3	Cloud Computing
3	20PBDEL313	Web Analytics	3	0	0	3	3	Cyber Security
4	20PBDEL314	Bioinformatics	3	0	0	3	3	Cloud Computing
5	20XXXELXXX	Statistics for Business Analytics	3	0	0	3	3	Data Science

AUDIT COURSES (AC)

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20PBDMC102	English for Research Paper Writing	2	0	0	0	0
2	20PBDMC103	Sanskrit for Technical Knowledge	2	0	0	0	0
3	20PBDMC104	Value Education	2	0	0	0	0
4	20PBDMC105	Pedagogy Studies	2	0	0	0	0
5	20PBDMC201	Disaster Management	2	0	0	0	0
6	20PBDMC202	Constitution of India	2	0	0	0	0
7	20PBDMC203	Stress Management by Yoga	2	0	0	0	0
8	20PBDMC204	Personality Development Through Life Enlightenment Skills	2	0	0	0	0
9	20PBDMC205	Unnat Bharat Abhiyan	2	0	0	0	0
					TOTAL	**0**	**0**

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Possess a mastery of Health safety and environment knowledge and safety management skills, to reach higher levels in their profession.

PEO 2 Knowledgeable safety Engineer rendering professional expertise to the industrial and societal needs at national and global level subject to legal requirements.

PEO 3 Well communicate the information on Health safety and environment facilitating collaboration with experts across various disciplines so as to create and execute safe methodology in complex engineering activities.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 An ability to become a knowledgeable safety Engineer rendering professional expertise to the industrial and societal needs subject to legal requirements.

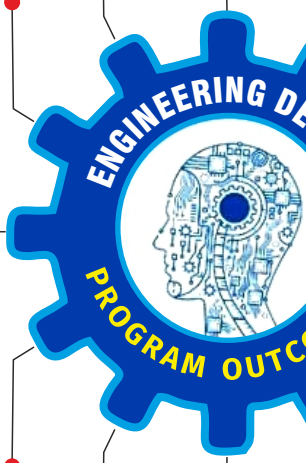
PSO2 An Ability to create a Health safety and environment facilitating collaboration with experts across various discipline.

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences(BS)	17.4	31	29.5
Engineering Sciences(ES)	15.0	33	25.5
Humanities and Social Sciences (HS)	5.9	12	10
Professional Electives(EL)	7.1	12	12
Program Core+Program Lab (PC+PL)	36.5	76	62
Program theory with Lab (PW)	2.4	05	04
Open Electives (OE)	3.5	06	06
Talent Enhancement (TE)	2.4	08	04
Project (PJ)	4.1	14	07
Training & Placement (TP)	4.1	14	07
Internships/Seminars (IS)	1.8	-	03
Mandatory Courses (MC)	NA	06	NA
Total number of Credits		**217**	**170**

PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM



01 Engineering knowledge

Apply the basic principle and knowledge of mathematics, science and engineering principles to solve technical problems.

02 Problem Analysis

Identify and analyze complex engineering problems reaching logical conclusions using the basic principles of mathematics, science and engineering.

03 Development of solutions

Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

04 Investigate complex problems

Perform investigations, use research based knowledge and conduct experiments, analyze and interpret the results to provide valid conclusions.

05 Modern tool usage

Create, select and apply the latest techniques, resources and modern engineering / IT tools to develop appropriate solutions with an understanding of the limitations.

06 The Engineer and Society

Apply reasoning based on contextual knowledge to assess societal, legal and cultural issues with competency in professional engineering practices.

07 Environment & Sustainability

Demonstrate professional skills, knowledge and contextual reasoning to assess / environmental / societal issues for sustainable development.

08 Apply ethical principles

Apply ethical principles and commit to professional ethics and responsibilities based on the norms of professional engineering pratices.

09 Individual & Teamwork

Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary professional settings.

10 Communicate effectively

Communicate effectively amongst the engineering community, being able to comprehend & write effective reports, make presentations & give/receive clear instructions.

11 Project management

Demonstrate knowledge and apply the principles of engineering & management in their own / team projects in multidisciplinary environments.

12 Life-long learning

Recognize the need for, and have the preparation, ability to engage in independent and life-long learning in the context of technological change.

SEMESTER - I

20PBDMA101 SDG NO. 4	APPLIED PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To provide the solid foundation on topics in applied probability and various statistical methods which form the basis for many other areas in the mathematical sciences including statistics, modern optimization methods and risk modeling.
- To introduce the basic concepts of Two dimensional random variables.
- To provide information about estimation theory.
- To learn the concepts of Correlation, Regression and Testing of testing of hypothesis.
- To address the issues and the principles of multivariate normal distribution and principle of components analysis.

UNIT I PROBABILITY AND RANDOM VARIABLES 9

Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

UNIT III ESTIMATION THEORY 9

Unbiased estimators – Method of moments – Maximum likelihood estimation - Curve fitting by principle of least squares – Regression lines.

UNIT IV TESTING OF HYPOTHESIS 9

Sampling distributions - Type I and Type II errors - Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 9

Random Vectors and Matrices - Mean vectors and Covariance matrices - Multivariate Normal density and its properties - Principal Components

Population principal components - Principal components from standardized variables.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Devore, J. L., —Probability and Statistics for Engineering and the Sciences‖, 8th Edition, Cengage Learning, 2014.
2. Dallas E. Johnson, —Applied Multivariate Methods for Data Analysis‖, Thomson and Duxbury press, 1998.
3. Gupta S.C. and Kapoor V.K.,‖ Fundamentals of Mathematical Statistics‖, Sultan and Sons, New Delhi, 2001.
4. Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers ", Pearson Education, Asia, 8th Edition, 2015.
5. Richard A. Johnson and Dean W. Wichern, —Applied Multivariate Statistical Analysis‖, 5th Edition, Pearson Education, Asia, 2002.

REFERENCES:

1. Milton. J. S. and Arnold. J.C., “Introduction to Probability and Statistics”, Tata McGraw Hill, 4 th Edition, 2007.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers ", Pearson Education, Asia, 8th Edition, 2015.
3. Papoulis. A and Unnikrishnapillai. S., “Probability, Random Variables and Stochastic Processes ” McGraw Hill Education India , 4th Edition, New Delhi , 2010.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Basic probability axioms and rules and the moments of discrete and Continuous random variables.
2. Consistency, efficiency and unbiasedness of estimators, method of Maximum likelihood estimation and Central Limit Theorem.
3. Use statistical tests in testing hypotheses on data.
4. Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.
5. The students should have the ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	-	-	2	-	-	-	-	-	-	-	3	2
CO3	3	3	-	3	2	-	-	-	2	3	2	-	3	2
CO4	3	3	3	3	-	-	-	-	2	3	2	-	3	2
CO5	3	3	3	3	-	-	-	-	2	3	2	-	3	2

SEMESTER - I

20PBDPC101 SDG NO. 4,8,9	ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of analysis of algorithm
- To understand the various Heap data structures
- To learn a variety of useful data structures and algorithms for Searching
- To understand the geometric algorithms and parallel algorithms
- To apply the algorithms and techniques to solve various problems

UNIT I FUNDAMENTALS **9**

Mathematical Proof Techniques: Induction, proof by contradiction, direct proofs – Asymptotic Notations – Properties of Big-oh Notation –Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – Introduction to NP-Completeness/NP-Hard – Recurrence Equations – Solving Recurrence Equations – Time-Space Tradeoff.

UNIT II HEAP STRUCTURES **9**

Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy-Binomial Heaps.

UNIT III SEARCH STRUCTURES **9**

Binary Search Trees – AVL Trees – Red-Black trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries.

UNIT IV GEOMETRIC ALGORITHMS **9**

Segment Trees – 1-Dimensional Range Searching – k-d Trees – Line Segment Intersection – Convex Hulls – Computing the Overlay of Two Subdivisions – Range Trees – Voronoi Diagram

UNIT V PARALLEL ALGORITHMS **9**

Flynn's Classifications – List Ranking – Prefix computation – Array Max – Sorting on EREW ,PRAM – Sorting on Mesh and Butterfly – Prefix sum on Mesh and Butterfly – Sum on mesh and butterfly – Matrix Multiplication – Data Distribution on EREW, Mesh and Butterfly

TOTAL: 45 PERIODS

REFERENCES:

1. Ellis Horowitz, SartajSahni, Dinesh Mehta, "Fundamentals of Data Structures in C", Silicon Pr, 2007.
2. Gilles Brassard, Paul Bratley, "Algorithmics: Theory and Practice", Prentice Hall, 1988. 3. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, "Computational Geometry Algorithms and Applications", Third Edition, 2008.
3. J.A. Storer, "An Introduction to Data Structures and Algorithms", Birkhäuser Boston, 2002.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, 2009. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
5. Jeremy Howard, Margit Zwemer, Mike Loukides, "Designing Great Data Products- Inside the Drivetrain Approach, a Four-Step Process for Building Data Products – Ebook", 1st Edition, O'Reilly Media, March 2012.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/advanced-data-structures
2. https://courses.csail.mit.edu/6.851/

ONLINE RESOURCES:

1. https://www.freebookcentre.net/ComputerScience-Books-Download/Advanced-Data-Structures.html
2. http://pages.cs.wisc.edu/~shuchi/courses/787-F07/ scribe-notes/ All-in-one.pdf

OUTCOMES:

Upon completion of the course, the student should be able to

1. Analyze the algorithmic efficiency of an algorithm
2. Implement the various Heap and Search Data Structure
3. Use geometric algorithm to solve computational problems
4. Describe the parallel algorithm for parallel processing
5. Apply the various data structures and algorithms to solve problems

CO-PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2	-	-	-	1	-	1	3	2	2
CO2	3	2	3	3	2	-	-	-	1	-	1	3	2	2
CO3	3	2	3	3	2	-	-	-	1	-	1	3	2	2
CO4	3	2	3	3	2	-	-	-	1	-	1	3	2	2
CO5	3	2	3	3	2	-	-	-	1	-	1	3	2	2

SEMESTER - I

20PBDPC102 SDG NO. 4	BIG DATA MINING AND ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the computational approaches to Modelling, Feature Extraction
- To understand the need and application of Map Reduce
- To understand the various search algorithms applicable to Big Data
- To analyse and interpret streaming data
- To learn how to handle large data sets in main memory and learn the various clustering techniques applicable to Big Data

UNIT I DATA MINING AND LARGE SCALE FILES 9

Introduction to Statistical modeling – Machine Learning – Computational approaches to modeling – Summarization – Feature Extraction – Statistical Limits on Data Mining - Distributed File Systems – Map-reduce – Algorithms using Map Reduce – Efficiency of Cluster Computing Techniques.

UNIT II SIMILAR ITEMS **9**

Nearest Neighbor Search – Shingling of Documents – Similarity preserving summaries – Locality sensitive hashing for documents – Distance Measures – Theory of Locality Sensitive Functions – LSH Families – Methods for High Degree of Similarities.

UNIT III MINING DATA STREAMS **9**

Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distance Elements in a Stream – Estimating Moments – Counting Ones in Window – Decaying Windows

UNIT IV LINK ANALYSIS AND FREQUENT ITEMSETS **9**

Page Rank –Efficient Computation - Topic Sensitive Page Rank – Link Spam – Market Basket Model – A-priori algorithm – Handling Larger Datasets in Main Memory – Limited Pass Algorithm – Counting Frequent Item sets.

UNIT V CLUSTERING **9**

Introduction to Clustering Techniques – Hierarchical Clustering –Algorithms – K-Means – CURE – Clustering in Non – Euclidean Spaces – Streams and Parallelism – Case Study: Advertising on the Web – Recommendation Systems

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.
2. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufman Publications, Third Edition, 2011.

REFERENCES:

1. Ian H.Witten, Eibe Frank "Data Mining – Practical Machine Learning Tools and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
2. David Hand, HeikkiMannila and Padhraic Smyth, "Principles of Data Mining", MIT PRESS, 2001

WEB REFERENCES:

1. https://swayam.gov.in/nd2_arp19_ap60/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/106104189/lec1.pdf

ONLINE RESOURCES:

1. https://examupdates.in/big-data-analytics/
2. https://www.tutorialspoint.com/big_data_analytics/index.htm
3. https://www.tutorialspoint.com/data_mining/index.htm

OUTCOMES :

Upon completion of the course, the student should be able to

1. Design algorithms by employing Map Reduce technique for solving Big Data problems.
2. Design algorithms for Big Data by deciding on the apt Features set .
3. Design algorithms for handling petabytes of datasets
4. Design algorithms and propose solutions for Big Data by optimizing main memory consumption
5. Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	1	-	-	-	-	1	1	2	2
CO2	3	2	2	2	-	2	-	-	-	-	2	2	2	2
CO3	3	2	2	2	-	2	-	-	-	-	2	2	2	2
CO4	3	3	2	2	3	2	-	-	-	-	2	2	3	2
CO5	3	3	3	2	3	2	-	-	2	3	2	2	3	2

SEMESTER - I

PBDPC103 SDG NO. 4,9	MULTI CORE ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters
- To understand the different multiprocessor issues
- To expose the different types of multicore architectures
- To understand the design of the memory hierarchy

UNIT I FUNDAMENTALS OF COMPUTER DESIGN AND ILP 9

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges – Limitations of ILP – Multithreading – SMT and CMP Architectures – The Multicore era.

UNIT II MEMORY HIERARCHY DESIGN 9

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

UNIT III MULTIPROCESSOR ISSUES 9

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

UNIT IV MULTICORE ARCHITECTURES 9

Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-scale computers, Cloud Computing – Architectures and Issues – Case Studies.

UNIT V VECTOR, SIMD AND GPU ARCHITECTURES 9

Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.

REFERENCES:

1. Darryl Gove, "Multicore Application Programming: For Windows, Linux, and Oracle Solaris", Pearson, 2011.
2. David B. Kirk, Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kauffman, 2010.
3. Wen– mei W. Hwu, "GPU Computing Gems", Morgan Kaufmann / Elsevier, 2011.

WEB REFERENCES

1. https://www.youtube.com/watch?v=nF3kr5KvUno
2. https://www.globalspec.com/reference/71417/203279/chapter-1-introduction-to-multi-core-architecture

OUTCOMES:

Upon completion of the course, the student should be able to

1. Identify the limitations of ILP and the need for multicore architectures
2. Discuss the issues related to multiprocessing and suggest solutions
3. Critically analyze the different types of inter connection networks
4. Point out the salient features of different multicore architectures and how they exploit parallelism
5. Design a memory hierarchy and optimize it

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	-	-	-	-	-	-	1	-	2	1
CO2	2	2	2	1	-	-	-	-	-	-	-	-	1	2
CO3	1	3	3	2	-	-	-	-	-	-	1	2	3	2
CO4	2	1	3	2	-	-	-	-	-	2	-	2	1	1
CO5	3	3	3	3	-	-	-	-	-	1	-	3	2	3

SEMESTER - I

20PBDMC101 SDG NO. 4&9	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To impart knowledge and skills required for research and IPR
- Problem formulation, analysis and solutions.
- Technical paper writing / presentation without violating professional ethics
- Patent drafting and filing patents.

UNIT I RESEARCH PROBLEM FORMULATION 6

Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations

UNIT II LITERATURE REVIEW 6

Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III TECHNICALWRITING /PRESENTATION 6

Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR) 6

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR) 6

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TOTAL: 30 PERIODS

REFERENCES:

1. Asimov, "Introduction to Design", Prentice Hall, 1962.
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners" 2010

OUTCOMES:

Upon completion of the course, the student should be able to

1. Ability to formulate research problem
2. Ability to carry out research analysis
3. Ability to follow research ethics
4. Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
5. Ability to understand about IPR and filing patents in R & D

CO- PO, PSO MAPPING:

SEMESTER - I

20PBDPL101 SDG NO. 4,6,7, 9, 12,14 &15	ADVANCED DATA STRUCTURES LAB	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand heap and various tree structures like AVL, Red-black, B and Segment trees
- To understand the problems such as line segment intersection, convex shell and Voronoi diagram

LIST OF EXPERIMENTS:

1. Min/Max Heap
2. Leftist Heap
3. AVL Trees
4. Red-Black Trees
5. B-Trees

6. Segment Trees
7. Line segment intersection
8. Convex Hull
9. Voronoi Diagram

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 18 STUDENTS:

Standalone desktops with C compiler, C++ compiler 18 Nos.

(Or)

Server with C compiler, C++ supporting 18 terminals or more.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Implement heap and various tree structure like AVL, Red-black, B and Segment trees
2. Implement List ADTs and their operations.
3. Solve the problems such as line segment intersection, convex shell and Voronoi diagram
4. Develop programs for sorting, implementing trees and their traversal operations.
5. Apply algorithm design techniques

CO, PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	3	2	-	-	1	3	2	2	3	2
CO2	3	1	3	2	1	2	1	-	-	2	2	1	2	1
CO3	2	-	3	2	1	2	-	1	-	2	2	2	1	2
CO4	3	1	3	2	3	2	-	2	-	2	2	2	2	2
CO5	1	1	3	2	3	2	-	-	-	2	2	2	3	2

SEMESTER - I

20PBDPL102 SDG NO. 4	BIG DATA COMPUTING LAB	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To set up single and multi-node Hadoop Clusters.
- To solve Big Data problems using Map Reduce Technique.
- To learn NoSQL query.
- To design algorithms that uses Map Reduce Technique to apply on Unstructured and structured data.
- To learn Scalable machine learning using Mahout

LIST OF EXERCISES:

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
2. MapReduce application for word counting on Hadoop cluster
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
4. K-means clustering using map reduce
5. Page Rank Computation
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
7. Application of Recommendation Systems using Hadoop/mahout libraries

TOTAL: 60 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

Each of the 21 servers in the VMWARE ESXi Cluster consists of:
IBM X3650 M4 Big Data model
Hadoop software
Installation of PIG,HIVE

OUTCOMES:

Upon completion of the course, the student should be able to

1. Set up single and multi-node Hadoop Clusters.
2. Apply Map Reduce technique for various algorithms.

3. Design new algorithms that uses Map Reduce to apply on Unstructured and structured data.
4. Develop Scalable machine learning algorithms for various Big data applications using Mahout.
5. Represent NoSQL data.

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	-	-	1	1	2	2	3	3	2
CO2	3	3	3	3	1	-	-	2	1	2	2	3	3	2
CO3	3	3	3	3	1	-	-	1	1	2	2	3	3	2
CO4	3	3	3	3	1	-	-	1	1	3	2	3	3	2
CO5	3	3	3	3	1	-	-	1	1	3	2	3	3	2

SEMESTER - II

20PBDPC201 SDG NO. 4	FOUNDATION OF DATA SCIENCE	L	T	P	C
		3	1	0	4

OBJECTIVES:

- Able to apply fundamental algorithmic ideas to process data.
- Learn to apply hypotheses and data into actionable predictions.
- Document and transfer the results and effectively communicate the findings using visualization techniques.

UNIT I INTRODUCTION TO DATA SCIENCE **9**

Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.

UNIT II MODELING METHOD **9**

Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods.

UNIT III INTRODUCTION TO R **9**

Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution.

UNIT IV MAP REDUCE **9**

Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop MapReduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution.

UNIT V DELIVERING RESULTS **9**

Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate

data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters. Case studies

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.

REFERENCES:

1. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.
2. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley &Sons, Inc., 2012.
3. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013
4. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical DataScience Cookbook", Packet Publishing Ltd., 2014.
5. Nathan Yau, "Visualize This: The FlowingData Guide to Design, Visualization, andStatistics", Wiley, 2011.
6. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",Wiley, ISBN: 9788126551071, 2015.

WEB REFERENCES:

1. http://www.johndcook.com/R_language_for_programmers.html
2. http://bigdatauniversity.com/
3. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction

ONLINE RESOURCES:

1. https://freevideolectures.com/search/foundation-of-data-science/
2. https://www.simplilearn.com/big-data-and-analytics/senior-data-scientist-masters-program-training

OUTCOMES:

Upon completion of the course, the student should be able to

1. Obtain, clean/process and transform data.
2. Analyze and interpret data using an ethically responsible approach.
3. Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues.

4. Apply computing theory, languages and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses.
5. Formulate and use appropriate models of data analysis to solve hidden solutions to business-related challenges.

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	-	2	-	-	-	-	2	2	3	2
CO2	3	1	3	2	-	2	-	-	-	-	2	2	3	2
CO3	3	1	3	2	-	2	-	-	-	-	2	2	3	2
CO4	3	1	3	2	3	2	-	-	-	-	2	2	3	2
CO5	3	1	3	2	3	2	-	-	2	3	2	2	3	2

SEMESTER - II

20PBDPC202 SDG NO. 4 & 9	BIG DATA SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the mathematical foundations of security principles
- To appreciate the different aspects of encryption techniques
- To understand the role played by authentication in security
- To understand the security concerns of big-data.

UNIT I SYMMETRIC TECHNIQUES 9

Probability and Information Theory - Algebraic foundations – Number theory - Substitution Ciphers – Transposition Ciphers – Classical Ciphers – DES – AES – Confidentiality Modes of Operation

UNIT II ASYMMETRIC TECHNIQUES 9

Diffie-Hellman Key Exchange protocol – Discrete logarithm problem – RSA cryptosystems & cryptanalysis – ElGamal cryptosystem – Elliptic curve architecture and cryptography - Data Integrity techniques.

UNIT III AUTHENTICATION 9

Authentication requirements – Authentication functions – Message authentication codes – Hash functions – Security of hash functions and MACS – MD5 Message Digest algorithm – Secure hash algorithm.

UNIT IV SECURITY ANALYTICS I 9

Introduction to Security Analytics – Techniques in Analytics – Analysis in everyday life –Challenges in Intrusion and Incident Identification – Analysis of Log file – Simulation and Security Process.

UNIT V SECURITY ANALYTICS II 9

Access Analytics – Security Analysis with Text Mining – Security Intelligence – Security Breaches

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008. (Unit 1 and 3)
2. Thomas Erl, " Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005 (Unit 2, 3, 4, and 5)
3. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002 (Unit 5)

REFERENCES:

1. William Stallings, "Crpyptography and Network security: Principles and Practices",Pearson/PHI, 5th Edition, 2010.
2. Behrouz A. Forouzan, "Cryptography and Network Security", Tata McGraw Hill Education,2nd Edition, 2010.
3. Douglas R. Stinson ,"Cryptography Theory and Practice ", Chapman & Hall/CRC, 3rd Edition, 2006.
4. Mark Talabis, Robert McPherson, I Miyamoto and Jason Martin, "Information Security Analytics: Finding Security Insights, Patterns, and Anomalies in Big Data",Syngress Media, U.S., 2014

WEB REFERENCES:

1. http://www.smartercomputingblog.com/category/big-data/
2. https://www.rd-alliance.org/group/big-data-ig-data-security-and-trust-wg/wiki/big-data-security-issues-challenges-tech-concerns

ONLINE RESOURCES:

1. https://www.tutorialspoint.com/big_data_tutorials.htm
2. https://www.simplilearn.com/tutorials/big-data-tutorial

OUTCOMES:

Upon completion of the course, the student should be able to

1. Design algorithms in a secure manner for Big data applications
2. Use available security practices in big-data analytics.
3. Mathematical foundations of security principles and different aspects of encryption techniques
4. To Study the Role played by authentication in security
5. Security concerns of big-data

CO - PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	3	3	-	3	3	3	-	-	-	-	3	2
CO2	3	-	3	3	-	3	3	3	-	-	-	-	3	2
CO3	1	-	3	3	-	3	3	3	-	-	-	-	3	2
CO4	3	-	3	3	-	3	3	3	-	-	-	-	3	2
CO5	3	-	3	3	-	3	3	3	-	-	-	-	3	2

SEMESTER - II

20PBDPC203 SDG NO. 4 & 9	MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of machine learning
- To appreciate supervised and unsupervised learning and their applications
- To understand the theoretical and practical aspects of Probabilistic Graphical Models
- To appreciate the concepts and algorithms of reinforcement learning
- To learn aspects of computational learning theory

UNIT I INTRODUCTION **8**

Machine Learning - Machine Learning Foundations –Overview – Design of a Learning system - Types of machine learning –Applications Mathematical foundations of machine learning - random variables and probabilities - Probability Theory – Probability distributions -Decision Theory- Bayes Decision Theory - Information Theory

UNIT II SUPERVISED LEARNING **10**

Linear Models for Regression - Linear Models for Classification – Naïve Bayes - Discriminant Functions -Probabilistic Generative Models -Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees - Classification Trees- egression Trees - Pruning. Neural Networks -Feed-forward Network Functions - Back- propagation. Support vector machines - Ensemble methods- Bagging- Boosting.

UNIT III UNSUPERVISED LEARNING **8**

Clustering- K-means - EM Algorithm- Mixtures of Gaussians. The Curse of Dimensionality Dimensionality Reduction - Factor analysis - Principal Component Analysis - Probabilistic PCA- Independent components analysis

UNIT IVPROBABILISTIC GRAPHICAL MODELS **10**

Graphical Models - Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning- Generalization - Hidden Markov Models - Conditional random fields (CRFs)

UNIT V ADVANCED LEARNING **9**

Sampling –Basic sampling methods – Monte Carlo. Reinforcement Learning- K-Armed Bandit- Elements - Model-Based Learning- Value Iteration- Policy Iteration. Temporal Difference Learning- Exploration Strategies- Deterministic and Non-deterministic Rewards and Actions Computational Learning Theory - Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting

TOTAL: 45 PERIODS

REFERENCES:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.

4. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
6. Stephen Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall/CRC Press, Second Edition, 2014.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106106139/
2. https://nptel.ac.in/courses/106106202/
3. https://www.udemy.com/course/machinelearning/
4. https://www.edx.org/learn/machine-learning

ONLINE RESOURCES:

1. https://deepakdvallur.weebly.com/machine-learning.html
2. https://www.tutorialsduniya.com/notes/
3. https://ai.stanford.edu/~nilsson/MLBOOK.pdf

OUTCOMES:

At the end of the course, the students should able to

1. Design a neural network for an application of your choice
2. Implement probabilistic discriminative and generative algorithms for an application of your choice and analyze the results
3. Use a tool to implement typical clustering algorithms for different types of applications
4. Design and implement an HMM for a sequence model type of application
5. Identify applications suitable for different types of machine learning with suitable justification

CO - PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	2	2	3	3	2
CO2	3	3	2	3	2	2	-	-	-	2	2	3	3	2
CO3	3	3	2	3	2	2	2	-	-	2	2	3	3	2
CO4	3	3	3	2	3	2	2	2	2	2	2	3	3	3
CO5	3	3	2	3	2	2	2	2	3	2	2	3	3	2

SEMESTER - II

20PBDPC204 SDG NO. 4, 9	NoSQL DATABASE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To define, compare and use the four types of NoSQL Databases
- To demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- To Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

UNIT I INTRODUCTION TO NoSQL DATABASES 9

Overview of NoSQL Databases -Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Aggregate-Oriented Databases.

UNIT II `DATABASE FOR MODERN WEB 9

Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication Document Databases ,Scaling, Suitable Use Cases,Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

UNIT III COLUMN- ORIENTED NOSQL DATABASES 9

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platfo rms, Counters, Expiring Usage.

UNIT IV KEYVALUE DATABASE DESIGNS 9

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets.

UNIT V GRAPH DATABASE DESIGN **9**

Graph NoSQL databases using Neo4,NoSQL database development tools and programming languages, Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Sadalage", P. & Fowler , Pearson Education

REFERENCE BOOKS:

1. "A Guide to Modern Databases and the NoSQL Movement Edition," Redmond, E. &Wilson,1st Edition. Chodorow, K. (2013).
2. "MongoDB: The Definitive Guide (2nd ed.). Upper Saddle River", NJ: Pearson Education, Inc. ISBN-13: 978-1449344689 ISBN-10: 1449344682.

WEB REFERENCES:

1. https://www.mongodb.com/nosql-explained
2. https://en.wikipedia.org/wiki/NoSQL
3. https://docs.microsoft.com/en-us/dotnet/architecture/microservices/microservice-ddd-cqrs-patterns/nosql-database-persistence infrastructure

ONLINE RESOURCES:

1. https://www.w3resource.com/mongodb/nosql.php
2. https://www.couchbase.com/resources/why-nosql

OUTCOMES:

Upon successful completion of this course, student should be able to

1. Demonstrate an understanding of installing MongoDB.
2. Explain the techniques used to create, insert, update and delete data/documents.
3. Demonstrate the various techniques used to query the database.
4. Explain the techniques to optimize querying using indexing.
5. Explain the technique of splitting data across machines via sharding.

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1	3	2	-	-	-	2	1	1	2
CO2	2	2	1	1	1	2	2	-	-	-	2	1	2	1
CO3	1	1	-	-	-	2	-	-	-	-	-	1	2	1
CO4	1	1	-	-	-	1	-	-	-	-	-	1	1	2
CO5	2	2	1	1	1	1	1	-	-	-	-	1	1	1

SEMESTER - II

20PBDPL201 SDG NO. 4&9	BIG DATA QUERY LANGUAGES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand the basic programming constructs of R and understand the use of R in Big Data analytics.
- To solve Big data problems using Map Reduce Technique in R, HADOOP.
- To develop Pig scripts for analyzing large un-structured and semi-structured data.
- To develop program for Query processing using Hive.
- To perform analytics on Big data streams using Hadoop Streaming API.To learn to work on Sqoop

LIST OF EXPERIMENTS:

1. Perform descriptive and predictive analytics using "R programming"
2. MapReduce application for word counting on R HADOOP after successful installation of three R packages(rhdfs, rmr, and rhbase)
3. Understand data pipeline using Pig Interactive Shell Commands after successful "Pig" installation
4. Develop Pig Scripts and call UDF's to accomplish functionalities to meet the problem objectives
5. Embedding PIG Latin in Python
6. Log analysis using "Pig" on semi structured data

7. Perform query processing on data warehousing after successful installation of "Hive"
8. Perform adhoc query on HDFS data using Hive Query Language (HQL)
9. Accomplish MapReduce Job by using Hadoop Streaming API
10. Perform various HDFS commands
11. Loading data into HDFS using Sqoop

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to

1. Set up R packages and develop a program using R Programming constructs.
2. Solve Big Data problems using RHADOOP.
3. Understand setting up of Pig and solve Big Data problems.
4. Understand setting up of Hive and perform query processing.
5. Apply Hadoop Streaming API for Big Data problems.

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	3	3	-	3	3	3	-	-	2	-	3	2
CO2	3	-	3	3	2	3	3	3	2	-	-	-	3	2
CO3	1	-	3	3	-	3	3	3	1	-	-	-	3	2
CO4	3	-	3	3	2	3	3	3	-	-	1	-	3	2
CO5	3	-	3	3	-	3	3	3	-	-	-	-	3	2

SEMESTER - II

20PBDPL202 SDG NO. 4 & 9	MACHINE LEARNING TECHNIQUES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To apply the concepts of Machine Learning to solve real-world problems
- To implement basic algorithms in clustering & classification applied to text & numeric data
- To implement algorithms emphasizing the importance of bagging & boosting in classification & regression

- To implement algorithms related to dimensionality reduction
- To apply machine learning algorithms for Natural Language Processing applications

EXERCISES RECOMMENDED:

1. Solving Regression & Classification using Decision Trees
2. Root Node Attribute Selection for Decision Trees using Information Gain
3. Bayesian Inference in Gene Expression Analysis
4. Pattern Recognition Application using Bayesian Inference
5. Bagging in Classification
6. Bagging, Boosting applications using Regression Trees
7. Data & Text Classification using Neural Networks
8. Using Weka tool for SVM classification for chosen domain application
9. Data & Text Clustering using K-means algorithm
10. Data & Text Clustering using Gaussian Mixture Models
11. Dimensionality Reduction Algorithms in Image Processing applications
12. Application of CRFs in Natural Language Processing

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to

1. To learn to use Weka tool for implementing machine learning algorithms related to numeric data
2. To learn the application of machine learning algorithms for text data
3. To use dimensionality reduction algorithms for image processing applications
4. To apply CRFs in text processing applications
5. To use fundamental and advanced neural network algorithms for solving real-world data

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	2	2	-	-	-	-	2	2	3	3	2
CO2	3	3	2	3	2	2	-	-	-	2	2	3	2	2
CO3	3	-	2	3	2	2	2	-	-	2	2	3	3	2
CO4	3	3	3	2	3	2	2	2	2	2	2	3	2	3
CO5	3	3	2	3	2	3	2	2	3	2	2	3	3	2

PROFESSIONAL ELECTIVES I

20PBDEL201 SDG NO. 4 & 9	HIGH PERFORMANCE COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamental concepts of High Performance Computing.
- To learn the network & software infrastructure for high performance computing.
- To understand the real time analytics using high performance computing.
- To learn the different ways of security perspectives and technologies used in HPC.
- To understand the emerging big data applications.

UNIT I INTRODUCTION 9

The Emerging IT Trends- IOT/IOE-Apache Hadoop for big data analytics-Big data into big insights and actions – Emergence of BDA discipline – strategic implications of big data – BDA Challenges – HPC paradigms – Cluster computing – Grid Computing – Cloud computing – Heterogeneous computing – Mainframes for HPC - Supercomputing for BDA – Appliances for BDA.

UNIT II NETWORK & SOFTWARE INFRASTRUCTURE FOR HIGH PERFORMANCE BDA 9

Design of Network Infrastructure for high performance BDA – Network Virtualization – Software Defined Networking – Network Functions Virtualization – WAN optimization for transfer of big data – started with SANs-storage infrastructure requirements for storing big data – FC SAN – IP SAN – NAS – GFS – Panasas – Luster file system – Introduction to cloud storage.

UNIT III REAL TIME ANALYTICS USING HIGH PERFORMANCE COMPUTING 9

Technologies that support Real time analytics – MOA: Massive online analysis – GPFS: General parallel file system – Client case studies – Key distinctions – Machine data analytics – operational analytics – HPC Architecture models – In Database analytics – In memory analytics

UNIT IV SECURITY AND TECHNOLOGIES 9

Security, Privacy and Trust for user – generated content: The challenges and solutions – Role of real time big data processing in the IOT's – End to End Security Framework for big sensing data streams – Clustering in big data.

UNIT V EMERGING BIG DATA APPLICATIONS 9

Deep learning Accelerators – Accelerators for clustering applications in machine learning - Accelerators for classification algorithms in machine learning – Accelerators for Big data Genome Sequencing

TOTAL: 45 PERIODS

TEXT BOOKS:

1. "High-Performance Big-Data Analytics: Computing Systems and Approaches", 2015 Edition, Springer
2. "Big Data Management and Processing", Kuan-Ching Li , Hai Jiang, Albert Y. Zomaya, CRC Press.
3. "High Performance Computing for Big Data: Methodologies and Applications", Chao wang ,CRC Press

REFERENCES:

1. "High-Performance Data Mining And Big Data Analytics" , Khosrow Hassibi, Create Space Independent Publishing Platform
2. "High performance computing: Modern systems and practices", Thomas Sterling, Matthew Anderson, Morgan Kaufmann publishers.

WEB REFERENCES:

1. https://www.hpcwire.com/

ONLINE RESOURCES:

1. http://hpc.fs.uni-lj.si/sites/default/files/HPC_for_dummies.pdf
2. https://www.nics.tennessee.edu/computing-resources/what-is-hpc

OUTCOMES

On completion of the laboratory course, the student should be able to

1. Understand the basics concepts of High Performance computing systems.
2. Apply the concepts of network and software infrastructure for high performance computing
3. Use the real time analytics using high performance computing.
4. Apply the security models and big data applications in high performance computing
5. Understand the emerging big data applications.

CO- PO,PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	-	-	2	2	2	3	3	2
CO2	3	2	3	2	1	2	-	-	1	-	3	2	3	2
CO3	3	2	3	2	1	2	-	-	-	-	2	3	3	2
CO4	3	2	1	2	3	2	-	-	1	3	2	1	3	2
CO5	3	2	2	2	3	2	1	-	2	3	2	2	3	2

PROFESSIONAL ELECTIVES I

20PBDEL202 SDG NO. 4, 9, 11	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide an overview of XML Technology and modeling databases in XML
- Understand the key principles behind SOA.
- Be familiar with the web services technology elements for realizing SOA.
- To introduce Security Standards and Solutions in XML and Web Services

UNIT I XML Technology **9**

XML – XML and Web - Name Spaces – XML Document Structure - Structuring with Schemas and DTD - Modeling Databases in XML – XQuery

UNIT II SOA Basics **9**

Service Oriented Architecture (SOA) – Comparing SOA with Client-Server and Distributed architectures - Characteristics of SOA – Benefits of SOA -- Principles of Service orientation –Service layers - Business Process management

UNIT III Web Services (WS) **9**

SOA and Web Services – Web Services Protocol Stack – Service descriptions – WSDL –Messaging with SOAP – Service discovery – UDDI. Service-Level Interaction patterns – XML and Web Services - Enterprise Service Bus - .NET and J2EE Interoperability.

UNIT IV WS Technologies and Standards 9

Web Services Technologies - JAX-RPC, JAX-WS. Web Service Standards – WS-RM, WS-Addressing, WS-Policy. Service Orchestration and Choreography – Composition Standards -BPEL. Service Oriented Analysis and Design.

UNIT V XML and WS Security 9

XML Security Overview – Canonicalization – XML Security Framework – XML Encryption –XML Signature – XKMS Structure. Web Services Security - XACML - WS-Security.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008. (Unit 1 and 3)
2. Thomas Erl, " Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005 (Unit 2, 3, 4, and 5)
3. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002(Unit 5)

REFERENCES:

1. "High-Performance Data Mining And Big Data Analytics" , Khosrow Hassibi, Create Space Independent Publishing Platform
2. "High performance computing: Modern systems and practices", Thomas Sterling, Matthew Anderson, Morgan Kaufmann publishers.

REFERENCE BOOKS:

1. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", AddisonWesley, 2005.
2. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture", Elsevier, 2011.
3. Mark O' Neill, et al., "Web Services Security", Tata McGraw-Hill Edition, 2003.
4. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004

WEB REFERENCES:

1. https://books.google.co.in/books/about/Understanding_SOA_with_Web_Services.html?id=WupSAAAAMAAJ
2. https://www.elsevier.com/books/java-web-services-architecture/mcgovern/978-1-55860-900-6
3. https://books.google.co.in/books/about/Developing_Enterprise_Web_Services.html?id=LEpPzQ5mRDoC

ONLINE RESOURCES:

1. https://www.opengroup.org/soa/source-book/soa_refarch/index.htm
2. https://www.javatpoint.com/service-oriented-architecture

OUTCOMES

On completion of the laboratory course, the student should be able to

1. Understand the basics of XML technology
2. Learn the Basic concepts of SOA and understand the applicability of SOA design patterns
3. Design, develop and test Web services
4. Evaluate emerging and proposed standards for the main components of Web services architectures.
5. Learn the approaches for providing security for XML documents as well as messages exchanged among Web Services.

CO- PO,PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	-	3	3	3	3	2	-	3	-	-	3	2
CO2	2	3	-	3	3	3	3	2	-	3	-	-	3	2
CO3	2	3	-	3	3	3	3	2	-	3	-	-	3	2
CO4	2	3	-	3	3	3	3	2	-	3	-	-	3	2
CO5	2	3	-	3	3	3	3	2	-	3	-	-	3	2

PROFESSIONAL ELECTIVES I

20PBDEL203 SDG NO. 4	INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I INTRODUCTION 9

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR ––IR Versus Web Search–Components of a Search engine

UNIT II MODELING 9

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT III INDEXING 9

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV CLASSIFICATION AND CLUSTERING 9

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V SEARCHING THE WEB 9

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

TOTAL: 45 PERIODS

REFERENCES:

1. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, "Modern Information Retrieval: The concepts and Technology behind Search" (ACM Press Books), Second Edition, 2011.
2. Christopher D. Manning, Prabhakar Raghavan, HinrichSchutze, "Introduction to Information Retrieval", Cambridge University Press, First South Asian Edition, 2008.
3. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, "Information Retrieval Implementing and Evaluating Search Engines", The MIT Press, Cambridge, Massachusetts London, England, 2010

WEB REFERENCES:

1. https://www.udemy.com/course/information-retrieval-and-mining-massive-data-sets /
2. http://web.stanford.edu/class/cs276/

ONLINE RESOURCES:

1. https://www.youtube.com/playlist?list=PL0ZVw5-GryEkGAQT7lX7oIHqyDPeUyOMQ
2. https://nlp.stanford.edu/IR-book/newslides.html

OUTCOMES

On completion of the laboratory course, the student should be able to

1. Build an Information Retrieval system using the available tools
2. Identify and design the various components of an Information Retrieval system
3. Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
4. Design an efficient search engine
5. To analyze the Web content structure

CO- PO,PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	1	-	-	-	-	-	3	3	2
CO2	3	3	2	1	1	1	-	-	-	-	-	3	3	2
CO3	3	3	2	2	1	1	1	2	-	-	1	2	3	3
CO4	3	3	3	3	2	1	1	2	1	1	1	2	3	3
CO5	3	3	3	3	2	1	-	2	-	1	1	2	3	3

PROFESSIONAL ELECTIVES I

20PBDEL204 SDG NO. 4, 9 & 11	DISTRIBUTED SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand foundations of Distributed Systems, Challenges & Examples
- Understand the Distributed shared memory and file system.
- Understand the issues in scheduling and deadlock
- Understand Distributed database and multimedia.

UNIT I INTRODUCTION TO DISTRIBUTED SYSTEMS 9

Architecture for Distributed System, Goals of Distributed system, Hardware and Software concepts, Distributed Computing Model, Advantages & Disadvantage distributed system, Issues in designing Distributed System

UNIT II DISTRIBUTED SHARE MEMORY AND DISTRIBUTED FILE SYSTEM 9

Basic Concept of Distributed Share Memory (DSM), DSM Architecture & its Types, Design & Implementations issues In DSM System, Structure of Share Memory Space, Consistency Model, and Thrashing. Desirable features of good Distributed File System, File Model, File Service Architecture, File Accessing Model, File Sharing Semantics, File Catching Scheme, File Application & Fault tolerance. Naming: - Features, System Oriented Names, Object Locating Mechanism, Human Oriented Name.

UNIT III INTER PROCESS COMMUNICATION AND SYNCHRONIZATION 9

API for Internet Protocol, Data Representation & Marshaling, Group Communication, Client Server Communication, RPC- Implementing RPC Mechanism, Stub Generation, RPC Messages. Synchronization: - Clock Synchronization, Mutual Exclusion, Election Algorithms:- Bully & Ring Algorithms.

UNIT IV DISTRIBUTED SCHEDULING AND DEADLOCK 9

Distributed Scheduling-Issues in Load Distributing, Components for Load Distributing Algorithms, Different Types of Load Distributing Algorithms, Task Migration and its issues. Deadlock-Issues in deadlock detection & Resolutions, Deadlock Handling Strategy, Distributed Deadlock Algorithms

UNIT V DISTRIBUTED MULTIMEDIA & DATABASE SYSTEM 9

Distributed Data Base Management System(DDBMS), Types of Distributed Database, Distributed Multimedia:- Characteristics of multimedia Data, Quality of Service Managements. Case Study of Distributed System:- Amoeba, Mach, Chorus

TOTAL: 45 PERIODS

TEXT BOOK:

1. Pradeep K Sinha, "Distributed Operating System Concepts & Design", PHI, 2012.

REFERENCES:

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.
2. Singhal & Shivratari, "Advance Concept in Operating System", McGraw Hill Attiya & Welch, Distributed Computing, Wiley Pub.
3. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
4. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.

WEB REFERENCES:

1. https://link.springer.com/book/10.1007/978-3-658-14842-3#about
2. https://www.udemy.com/course/distributed-systems-cloudcomputing-with-java/

ONLINE RESOURCES:

1. https://books.google.co.in/books?id=bJ3DgAAQBAJ&pg=PR4&source=kp_read_button&redir_esc=y#v=onepage&q&f=false
2. https://books.google.co.in/books/about/Distributed_Computing.html?id=G7SZ32dPuLgC&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false

OUTCOMES:

Upon Completion of the course, the students will be able to

1. Identify the design issues specific to distributed systems.
2. Demonstrate the structure of the shared memory space and Distributed File system models.
3. Apply Inter process communication and synchronization
4. Apply Distributed scheduling and Deadlock
5. Apply Distributed multimedia and Database system

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	2	-	-	-	3	-	2	3	3
CO2	2	2	-	-	2	3	-	-	-	2	-	3	3	2
CO3	2	3	-	2	-	-	3	-	-	-	-	-	3	3
CO4	3	2	-	-	-	-	-	-	-	2	-	1	2	2
CO5	2	1	2	3	-	-	2	2	-	-	-	3	2	1

PROFESSIONAL ELECTIVES I

20PBDEL205 SDG NO. 9	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

UNIT I FUNDAMENTALS OF IoT **9**

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II IoT PROTOCOLS **9**

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III DESIGN & DEVELOPMENT 9

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT V STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL: 45 PERIODS

TEXT BOOK:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCES:

1. Arshdeep Bahga,Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi ,—The Internet ofThings – Key applications and Protocols, Wiley, 2012 (for Unit 2).
3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

WEB REFRENCES:

1. https://www.hindawi.com/journals/jece/2017/9324035/
2. https://www.iotforall.com/glossary-iot-standards-and-protocols/

ONLINE RESOURCES:

1. https://www.javatpoint.com/iot-internet-of-things
2. https://www.tutorialspoint.com/internet_of_things/index.htm

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Explain the concept of IoT.
2. Analyze various protocols for IoT.
3. Design a PoC of an IoT system using Rasperry Pi/Arduino
4. Apply data analytics and use cloud offerings related to IoT.
5. Analyze applications of IoT in real time scenario

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	2	2	2	3	2
CO2	3	3	2	3	2	2	-	-	-	2	2	2	3	2
CO3	3	3	2	3	2	2	2	-	-	2	2	2	3	2
CO4	3	3	3	2	3	2	2	2	2	2	2	2	3	2
CO5	3	3	2	3	2	2	2	2	3	2	2	2	3	2

PROFESSIONAL ELECTIVES II

20PBDEL301 SDG NO. 4	SOFT COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the key aspects of soft computing and neural networks
- To study the fuzzy logic components
- To gain insight onto neuro-fuzzy modelling and control
- To know about the components and building block hypothesis of genetic algorithm
- To gain knowledge in machine learning through Support Vector Machines

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Evolution of Computing - Soft Computing Constituents – From Conventional AI toComputational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS 9

Introduction to Genetic Algorithms (GA) – Applications of GA - Building block hypothesis-Representation – Fitness Measures – Genetic Operators-. GA based Machine Learning.

UNIT III NEURAL NETWORKS 9

Machine learning using Neural Network, Adaptive Networks – Feed Forward Networks –Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures –Advances in Neural Networks.

UNIT IV FUZZY LOGIC 9

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT V NEURO-FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – ClassificationAnd Regression Trees – Data Clustering Algorithms – Rule base Structure Identification –Neuro-Fuzzy Control – Case Studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2004.
2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

REFERENCES:

1. KwangH.Lee, "First course on Fuzzy Theory and Applications", Springer, 2005.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1996.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.
4. David E.Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1989.
5. Mitchell Melanie, "An Introduction to Genetic Algorithm", MIT Press, 1996.

WEB REFERENCES:

1. https://www.sciencedirect.com/science/article/pii/S1877050916325467
2. https://towardsdatascience.com/soft-computing-6cef872f7704

ONLINE RESOURCES:

1. https://swayam.gov.in/nd1_noc20_cs17/preview

OUTCOMES:

Upon completion of this course, the student should be able to

1. Discuss on machine learning through neural networks
2. Apply knowledge in developing a Fuzzy expert system
3. Model Neuro Fuzzy system for clustering and classification
4. Discover knowledge to develop Genetic Algorithm
5. Support vector machine based machine learning system

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	3	2	-	-	1	2	2	2	3	2
CO2	3	1	3	2	-	2	1	-	-	2	2	2	3	2
CO3	3	1	3	2	-	2	-	1	-	2	2	2	3	2
CO4	3	1	3	2	3	2	-	2	-	2	2	2	3	2
CO5	3	1	3	2	3	2	-	-	2	2	2	2	3	2

PROFESSIONAL ELECTIVES II

20PBDPE302 SDG NO. 4, 9	MULTIMEDIA COMMUNICATION NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of multimedia communication networks.
- To learn the different architecture & layers used in multimedia support services.
- To understand the wireless and mobile multimedia networks.
- To understand the real time software architecture for multimedia communication and management.

UNIT I INTRODUCTION 9

Fundamentals of communications - Present and future telecommunications - Multimedia communication Networks - Motivation for multimedia communications - Evolution of telecommunication networks - trends and driving forces in multimedia communications - services - Digital network library system -Multimedia teleconferencing system - super high definition image system - Video on demand/ Multimedia on demand system.

UNIT II QOS ARCHITECTURE & LAYERS USED IN MULTIMEDIA SUPPORT 9

Qos Framework - Architecture - Traffic Modelling - Traffic Management - Designing ATM Switches - ATM Switch Architecture - Multicast ATM Switches - Transport Network Architecture And Technologies For Multimedia Services - Operations, Administrations And Management In The Multimedia Era.

UNIT III WIRELESS AND MOBILE MULTIMEDIA NETWORKS 9

Introduction - Multimedia Challenges in wireless & mobile systems - Multimedia technologies and devices - wireless communications and mobile networking technology - QOS for multimedia applications - Integration of wireless and wire line networks - future directions in wireless multimedia.

UNIT IV SOFTWARE ARCHITECTURE FOR MULTIMEDIA COMMUNICATION AND MANAGEMENT AND STANDARDS 9

Multimedia OS- Middleware and RM-ODP - CORBA - multimedia on distributed platforms - Multimedia in CORBA - Multimedia in JAVA - Using ODP for designing distributed multimedia applications - Telecommunication and Information Standardization organizations - Forums & Consortia- GII related activities.

UNIT V SECURITY 9

Security Considerations For Multimedia - Service Provider Perspective - User Perspective - Legal And Government Perspective - Network Security Issues - Security Analysis Guidelines And Models - Network Security Services - Security Aspects Of ATM Networks - Security Aspects Of IP Networks- Intelligent Network - Industry Standards And Organizations

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Mallikarjun Tatipamula, Bhumip Khasnabish, "Multimedia Communications Networks Technologies and Services", Artech House Publishers, 1998.
2. Mario Marques da Silva, "Multimedia Communications and Networking", CRC Press,1 edition, 2012.

REFERENCES:

1. Fred Halsall, "Multimedia communications: Applications, Networks, Protocols and Standards", PEARSON, 1st Edition, 2015.
2. Jerry Gibson, "Multimedia Communications, Directions & Innovations", Academic Press,1 edition ,2000.

WEB REFERENCES:

1. https://nptel.ac.in/courses/117105083/
2. www.webopedia.com/TERM/N/network.html

ONLINE RESOURCES:

1. https://nptel.ac.in/content/storage2/courses/117105083/pdf/ssg_m1l1.pdf
2. https://swayam.gov.in/nd1_noc20_ee33/preview

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the basics structure of multimedia communication systems.
2. Apply the concepts of Qos & wireless and mobile multimedia networks.
3. Use the software architecture for multimedia communication.
4. Apply the security models in the multimedia communication environment
5. Implement various standards for multimedia communication systems.

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	-	-	-	2	3	2
CO2	3	3	3	3	1	-	-	-		-	1	2	3	2
CO3	3	3	3	3	2	-	-	-	2	1	1	3	3	3
CO4	3	3	3	2	-	-	-	-		-	1	3	3	2
CO5	3	3	3	3	2	-	-	-	3	2	2	3	3	3

PROFESSIONAL ELECTIVES II

20PBDEL303 SDG NO. 4	PARALLEL AND DISTRIBUTED COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Select the appropriate parallel programming model for the given application.
- To practice the constructs of parallel programming model to convert a sequential program to parallel program.
- To Develop parallel programs using Open MP and MPI constructs
- Study software components of distributed computing systems. Know about the communication and interconnection architecture of multiple computer systems.
- Recognize the inherent difficulties that arise due to distributedness of computing resources. Understanding of networks & protocols, mobile & wireless computing and their applications to real world problems.

UNIT I FUNDAMENTALS **9**

Introduction to Parallel and Distributed Computing - Parallel and Distributed Architectures, Socket programming - Parallel Performance, Shared Memory and Threads – Parallel Algorithms - Parallel Algorithms, OpenMP - Scalable Algorithms, Message Passing - Parallel,work sharing and Synchronization constructs. MPI data types and tags, environment management routines. Data level parallelism - Vector architecture- Graphics processing units- Programming the GPU.

UNIT II PROCESS AND DISTRIBUTED OBJECTS **9**

Characterization of Distributed Systems – Examples – Resource Sharing and the Web –Challenges – System Models – Architectural and Fundamental Models – Networking and Internetworking – Types of Networks – Network Principles – External Data Representation and Marshalling – Client–Server Communication – Group Communication – Case Study –Distributed Objects and Remote Invocation – Communication between Distributed Objects –Remote Procedure Call

UNIT III OPERATING SYSTEM ISSUES I **9**

The OS Layer – Protection – Processes and Threads – Communication and Invocation – OS Architecture – Security – Overview – Cryptographic Algorithms – Digital Signatures –Cryptography Pragmatics – Case Studies – Distributed File Systems – File Service Architecture.

UNIT IV OPERATING SYSTEM ISSUES II **9**

Name Services – Domain Name System – Directory and Discovery Services – Global Name Service – X.500 Directory Service – Clocks – Events and Process States – Synchronizing Physical Clocks – Logical Time and Logical Clocks – Global States – Distributed Debugging– Distributed Mutual Exclusion – Elections – Multicast Communication Related Problems.

UNIT V DISTRIBUTED TRANSACTION PROCESSING **9**

Transactions – Nested Transactions – Locks – Optimistic Concurrency Control – Timestamp Ordering – Comparison – Flat and Nested Distributed Transactions – Atomic Commit Protocols – Concurrency Control in Distributed Transactions – Distributed Deadlocks –Transaction Recovery – Overview of Replication and Distributed Multimedia Systems.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. David E. Culler, Jaswinder Pal Singh, —Parallel Computing Architecture : A Hardware/Software Approach|| , Morgan Kaufmann / Elsevier Science (reprint Technical Science &Engineering) , 2009
2. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts andDesign", Pearson Education, 3rd Edition, 2002.
3. SapeMullender, "Distributed Systems", Addison Wesley, 2nd Edition, 1993.

REFERENCES:

1. Albert Fleishman, "Distributed Systems Software Design and Implementation", SpringerVerlag, 1994.
2. M. L .Liu, "Distributed Computing Principles and Applications", Pearson Education, 2004.
3. Andrew S Tanenbaum, Maartenvan Steen, "Distributed Systems, Principles and Paradigms",Pearson Education, 2002.
4. Mugesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating Systems", Tata McGraw Hill Edition, 2001.

WEB REFERENCES:

1. https://www.cs.uky.edu/~jzhang/
2. https://moodle.risc.jku.at/course/view.php?id=143

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=dlBVWMdGhqw&list=PLUJ7JmcrTifBROWODSG8wgyl20XgBuE-N
2. https://www.youtube.com/watch?v=qbQCQ0U6H0o&list=PLbMVogVj5nJQRvzENlvMKA9q70ScSRZBQ

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Work on appropriate parallel programming model
2. Model and visualize Design protocols for ensuring cache coherence
3. Students will be familiar with the design Distributed System.
4. To implementation and security issues of distributed system.
5. To implement Transaction Processing of distributed system.

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	3	2	-	-	-	2	2	2	3	2
CO2	3	1	3	2	-	2	-	-	-	2	2	2	3	2
CO3	3	1	3	2	-	2	-	-	-	2	2	2	3	2
CO4	3	1	3	2	3	2	-	-	-	2	2	2	3	2
CO5	3	1	3	2	3	2	-	-	2	2	2	2	3	2

PROFESSIONAL ELECTIVES II

20PBDEL304	PREDICTIVE MODELLING	L	T	P	C
SDG NO. 4		3	0	0	3

OBJECTIVES:

- To understand the terms and terminologies of predictive modeling.
- To study the various predictive models, their merits, demerits and application.
- To get exposure to various analytical tools available for predictive modeling.
- To learn the predictive modeling markup language.
- To get familiar with the technologies in predictive modeling.

UNIT I INTRODUCTION TO PREDICTIVE MODELING 9

Core ideas in data mining - Supervised and unsupervised learning Classification vs Prediction - Steps in data mining- SEMMA Approach - Sampling -Pre-processing - Data cleaning - Data Partitioning - Building a model Statistical models - Statistical models for predictive analytics.

UNIT II PREDICTIVE MODELING BASICS 9

Data splitting – Balancing- Over fitting –Oversampling –Multiple Regression Artificial neural networks (MLP) - Variable importance- Profit/loss/prior probabilities - Model specification - Model selection - Multivariate Analysis.

UNIT III PREDICTIVE MODELS 9

Association Rules-Clustering Models –Decision Trees- Ruleset Models-KNearest Neighbors – Naive Bayes - Neural Network Model – Regression Models – Regression Trees – Classification & Regression Trees (CART) –

Logistic Regression – Mulitple Linear Regression Scorecards – Support Vector Machines – Time Series Models - Comparison between models - Lift chart Assessment of a single model.

UNIT IV PREDICTIVE MODELING MARKUP LANGUAGE 9

Introduction to PMML – PMML Converter - PMML Structure – Data Manipulation in PMML – PMML Modeling Techniques - Multiple Model Support – Model Verification.

UNIT V TECHNOLOGIES AND CASE STUDIES 9

Weka – RapidMiner – IBM SPSS Statistics- IBM SPSS Modeler – SAS Enterprise Miner – Apache Mahout – R Programming Language.-Real time case study with modeling and analysis.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kattamuri S. Sarma, "Predictive Modeling with SAS Enterprise Miner: Practical Solutions for Business Applications", 2nd Edition, SAS Publishing, 2007.
2. Alex Guazzelli, Wen-Ching Lin, Tridivesh Jena, James Taylor, "PMML in Action Unleashing the Power of Open Standards for Data Mining and Predictive Analytics", 2nd Edition, Create Space Independent Publishing Platform,2012.

REFERENCES:

1. Ian H. Witten, Eibe Frank , "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann Series in Data Management Systems, Morgan Kaufmann, 3rd Edition, 2011.
2. Eric Siegel , "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", 1st Edition, Wiley, 2013
3. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
4. Jeremy Howard, Margit Zwemer, Mike Loukides, "Designing Great Data Products- Inside the Drive train Approach, a Four-Step Process for Building Data Products – Ebook", 1st Edition, O'Reilly Media, March 2012.

WEB REFERENCES:

1. https://nptel.ac.in/courses/108108111/
2. https://www.coursera.org/learn/predictive-modeling-analytics

ONLINE RESOURCES:

1. https://bookdown.org/egarpor/PM-UC3M/
2. https://cics.nd.edu/research/applications/materials/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Design and analyze appropriate predictive models.
2. Define the predictive models using PMML.
3. Apply statistical tools for analysis.
4. Use various analytical tools available for predictive modeling.
5. Apply predictive modeling markup language in data manipulation.

CO- PO,PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	-	1	-	-	-	-	1	1	1	2
CO2	2	1	1	1	-	2	-	-	-	-	2	2	1	2
CO3	2	2	1	2	-	2	-	-	-	-	2	2	2	2
CO4	2	2	2	2	3	2	-	-	-	-	2	2	2	2
CO5	2	2	3	2	3	2	-	-	2	3	2	2	2	2

PROFESSIONAL ELECTIVE - II

20PBDEL305 SDG NO. 4	IMAGE PROCESSING AND ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of digital images and noise models
- To understand spatial domain filters and frequency domain filters
- To understand the image processing techniques
- To familiarize the image processing environment and their applications
- To appreciate the use of image processing in various applications

UNIT I SPATIAL DOMAIN PROCESSING 9

Introduction to image processing – imaging modalities – image file formats – image sensing and acquisition – image sampling and quantization – noise

models – spatial filtering operations – histograms – smoothing filters – sharpening filters – fuzzy techniques for spatial filtering – spatial filters for noise removal

UNIT II FREQUENCY DOMAIN PROCESSING 9

Frequency domain – Review of Fourier Transform (FT), Discrete Fourier Transform (DFT), and Fast Fourier Transform (FFT) – filtering in frequency domain – image smoothing – image sharpening – selective filtering – frequency domain noise filters wavelets – Haar Transform – multiresolution expansions – wavelet transforms wavelets based image processing

UNIT III SEGMENTATION AND EDGE DETECTION 9

Thresholding techniques – region growing methods – region splitting and merging adaptive thresholding – threshold selection – global valley – histogram concavity edge detection –template matching – gradient operators – circular operators differential edge operators –hysteresis thresholding – Canny operator – Laplacian operator – active contours – object segmentation

UNIT IV INTEREST POINTS, MORPHOLOGY, AND TEXTURE 9

Corner and interest point detection – template matching – second order derivatives median filter based detection – Harris interest point operator – corner orientation local invariant feature detectors and descriptors – morphology – dilation and erosion morphological operators – grayscale morphology – noise and morphology – texture texture analysis – co-occurrence matrices – Laws' texture energy approach – Ade's eigen filter approach

UNIT V COLOR IMAGES AND IMAGE COMPRESSION 9

Color models – pseudo colors – full-color image processing – color transformations smoothing and sharpening of color images – image segmentation based on color noise in color images. Image Compression – redundancy in images – coding redundancy – irrelevant information in images – image compression models – basic compression methods – digital image watermarking.

TOTAL : 45 PERIODS

REFERENCES:

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.
2. W. Burger and M. Burge, "Digital Image Processing: An Algorithmic Introduction using Java", Springer, 2008.

3. John C. Russ, "The Image Processing Handbook", Sixth Edition, CRC Press, 2011.
4. R. C. Gonzalez and R. E. Woods, "Digital Image Processing", Third Edition, Pearson,2008.
5. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
6. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
7. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.

OUTCOMES:

On completion of this course, the student should be able to

1. Design and implement algorithms for image processing applications that incorporates different concepts of medical Image Processing
2. Explain image modalities, sensing, acquisition, sampling, and quantization, noise models and implement spatial filter operations
3. Familiar with the use of MATLAB and its equivalent open source tools
4. Critically analyze different approaches to image processing applications
5. Explore the possibility of applying Image processing concepts in various applications

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	2	2	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	2	-	-		-	1	2	3	2
CO3	3	3	3	3	3	3	-	-	2	3	3	3	3	3
CO4	3	3	3	2	2	-	-	-		-	1	3	3	3
CO5	3	3	3	3	2	-	-	-	3	2	2	3	3	3

PROFESSIONAL ELECTIVES III

20PBDEL306 SDG NO. 4&5	DEEP LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic ideas and principles of Neural Networks
- To understand the basic concepts of Big Data and Statistical Data Analysis
- To familiarize the student with The Image Processing facilities like Tensorflow and Keras
- To appreciate the use of Deep Learning Applications
- To understand and implement Deep Learning Architectures

UNIT I BASICS OF NEURAL NETWORKS 9

Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.

UNIT II INTRODUCTION TO DEEP LEARNING 9

Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout.

UNIT III CONVOLUTIONAL NEURAL NETWORKS 9

CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning

UNIT IV MORE DEEP LEARNING ARCHITECTURES 9

LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard-Sparse – Denoising – Contractive- Variational Autoencoders – Adversarial Generative Networks – Autoencoder and DBM

UNIT V APPLICATIONS OF DEEP LEARNING 9

Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

TOTAL: 45 PERIODS

REFERENCES:

1. Ian Good Fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.
3. Phil Kim, "Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", Apress , 2017.
4. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
5. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.
6. Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016.

WEB RESOURCES:

1. https://nptel.ac.in/courses/106105215/
2. https://nptel.ac.in/courses/106106201/
3. https://www.coursera.org/specializations/deep-learning

ONLINE RESOURCES:

1. https://www.simplilearn.com/deep-learning-tutorial
2. https://www.tutorialspoint.com/machine_learning/deep_machine_learning.htm

OUTCOMES:

On completion of the course, the students will be able to:

1. Understand the role of Deep learning in Machine Learning Applications.
2. To get familiar with the use of TensorFlow/Keras in Deep Learning Applications.
3. To design and implement Deep Learning Applications.
4. Critically Analyse Different Deep Learning Models in Image Related Projects.
5. To design and implement Convolutional Neural Networks.

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO2	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO3	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO4	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO5	3	-	1	-	3	-	-	-	2	1	-	3	3	1

PROFESSIONAL ELECTIVE - III

20PBDEL307 SDG NO. 3,4,13	COGNITIVE COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Cognitive computing is an effort to develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions
- Cognitive computing presents an appealing new model or paradigm for application development.
- To ingesting data from inside and outside the enterprise, and leveraging functionality to identify and evaluate patterns and complex relationships in large and sometimes unstructured data sets, such as natural language text in journals, books, and social media, or images and sounds.

UNIT I THE FOUNDATION OF COGNITIVE COMPUTING 9

Cognitive Computing as a New Generation-Uses of Cognitive System-Artificial Intelligence as the Foundation-Understanding Cognitive-Two System of Judgement and Choice-Understanding Complex Relationships between System-Element of Cognitive System-Continuous Machine Learning.

UNIT II DESIGN PRINCIPLES 9

Component of Cognitive System-Building the Corpus-Bringing Data into Cognitive System Machine Learning-Hypotheses Generation and Scoring-Presentation and Visualization Services.

UNIT III NATURAL LANGUAGE PROCESSING 9

The Role of NLP-The Importance of Context, Connecting Words for Meaning, Understanding Linguistics, Language Identification and Tokenization,

Phonology, Morphology, Lexical Analysis, Syntax and Syntactic Analysis, Construction Grammars, Discourse Analysis , Semantic Web-Applying Natural Language Technologies to Business Problems

UNIT IV BIG DATA AND COGNITIVE COMPUTING 9

Dealing with Human-Generated Data-Defining Big Data-Architecture Foundation-Analytical Data Warehouses-Hadoop-Data in Motion and Streaming Data-Integration of Big Data with Traditional Data

UNIT V EMERGING AREAS 9

Characteristics of Ideal Markets for Cognitive System- Vertical Markets and Industries- Retail, Travel, Transportation and Logistics, Telecommunications, Security and Threat Detection.

TOTAL: 45 PERIODS

TEXTBOOK

1. Hurwitz, Kaufman, and Bowles, "Cognitive Computing and Big Data Analytics", Wiley, Indianapolis, IN, 2005, ISBN: 978-1-118-89662-4.

WEB RESOURCES:

1. IBM Redguide publication: The Era of cognitive systems: An inside look at IBM Watson and how it works
2. IBM Redbooks publication: IBM Watson content analytics: Discovering actionable insight from your content
3. https://cognitivecomputingconsortium.com/
4. Watson Developer Cloud – website with documentation, demo and technical web series and more
5. Watson Services on Bluemix – website to explore how to build cognitive apps on Bluemix
6. Watson Internet of Things – comprehensive website filled with Watson IoT information
7. Cognitive Computing, technical resources on developerWorks
8. Watson events calendar
9. Bluemixmeetups: Worldwide locations, Additional meetups, events, and webcasts
10. IBM Watson University Program – explore case studies, competitions and more

ONLINE RESOURCES:

1. https://www.endava.com/en/blog/Engineering/2019/Cognitive-Computing-Using-Cloud-Based-Resources

2. https://courses.cognitiveclass.ai/register
3. https://www.youtube.com/watch?v=Pwm6DqdC4pU
4. https://www.youtube.com/watch?v=Pwm6DqdC4pU&list=RDCMUCEBb1b_L6zDS3xTUrIALZOw&start_radio=1&t=55

OUTCOMES

Upon completion of the course, the student should be able to:

1. Understand and discuss what cognitive computing is, and how it differs from traditional approaches.
2. Plan and use the primary tools associated with cognitive computing.
3. Plan and execute a project that leverages cognitive computing.
4. Understand and discuss the business implications of cognitive computing.
5. Identify and evaluate patterns and complex relationships in large and sometimes unstructured data sets.

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	1	2	2	2	2
CO2	3	3	3	2	1	1	2	1	1	1	2	2	3	2
CO3	3	3	3	3	1	1	2	1	1	1	2	2	3	3
CO4	3	2	1	1	1	-	-	-	1	2	3	2	2	2
CO5	3	3	2	3	2	1	2	1	2	2	2	3	2	2

PROFESSIONAL ELECTIVE - II

20PBDEL308 SDG NO. 4	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the components of the social network.
- To model and visualize the social network.
- To mine the users in the social network.
- To understand the evolution of the social network.
- To know the applications in real time systems.

UNIT I INTRODUCTION **9**

Introduction to Web - Limitations of current Web – Development of Semantic Web –Emergence of the Social Web – Statistical Properties of Social Networks - Network analysis - Development of Social Network Analysis - Key concepts and measures ii network analysis - Discussion networks - Blogs and online communities - Web-basednetworks.

UNIT II MODELING AND VISUALIZATION **9**

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation – Centrality-Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix- Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

UNIT III MINING COMMUNITIES **9**

Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks- Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT IV EVOLUTION **9**

Evolution in Social Networks – Framework -Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence – Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints- with Score Propagation– Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction – Bayesian Probabilistic Models - Probabilistic Relational Models.

UNIT V APPLICATIONS **9**

A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.

REFERENCES:

1. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

WEB REFERENCES:

1. https://www.datacamp.com/community/tutorials/social-network-analysis
2. https://rpubs.com/wctucker
3. https://mjdenny.com

ONLINE RESOURCES:

1. https://www.datacamp.com/community/tutorials/social-network-analysis-python
2. https://www.slideshare.net/gcheliotis/social-network-analysis-3273045

OUTCOMES

Upon completion of the course, the student should be able to:

1. Work on the internals components of the social network
2. Model and visualize the social network
3. Mine the behaviour of the users in the social network
4. Predict the possible next outcome of the social network
5. Apply social network in real time applications

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1	1	-	-	-	-	1	1	1	2
CO2	2	1	1	1	-	2	-	-	-	-	2	2	1	2
CO3	2	2	1	2	1	2	-	-	-	-	2	2	2	2
CO4	2	2	2	2	3	2	-	-	-	-	2	2	2	2
CO5	2	2	3	2	3	2	2	2	2	3	2	2	2	2

PROFESSIONAL ELECTIVE - III

20PBDEL309 SDG NO. 4,8,9	VIRTUALIZATION TECHNIQUES AND APPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand and deploy practical virtualization solutions and enterprise solutions.
- Able to understand Server Virtualization and Virtualization Platform.
- Understand the technologies of Virtualization and Network Virtualization.
- To understand the concepts of Virtualization storage.
- To study the virtual machine products.

UNIT I OVERVIEW OF VIRTUALIZATION 9

System architectures - Virtual Machine basics - Process vs System Virtual Machines - Taxonomy. Emulation: Basic Interpretation - Threaded Interpretation - Precoded and Direct Threaded Interpretation - Binary Translation. System Virtual Machines - Key concepts - Resource utilization basics.

UNIT II PROCESS VIRTUAL MACHINES 9

Implementation – Compatibility – Levels – Framework – State Mapping – Register – Memory Address Space – Memory Architecture Emulation – Memory Protection – Instruction Emulation – Performance Tradeoff - Staged Emulation – Exception Emulation – Exception Detection – Interrupt Handling – Operating Systems Emulation – Same OS Emulation – Different OS Emulation – System Environment .

UNIT III HIGH LEVEL LANGUAGE VIRTUAL MACHINES AND SERVER VIRTUALIZATION 9

HLL virtual machines: Pascal P-Code – Object Oriented HLLVMs - Java VM architecture - Java Native Interface - Common Language Infrastructure. Server virtualization: Partitioning techniques - virtual hardware - uses of virtual servers - server virtualization platforms.

UNIT IV NETWORK AND STORAGE VIRTUALIZATION 9

Design of Scalable Enterprise Networks – Layer2 Virtualization – VLAN - VFI - Layer 3 Virtualization – VRF - Virtual Firewall Contexts - Network Device Virtualization - Data- Path Virtualization - Routing Protocols. Hardware Devices – SAN backup and recovery techniques – RAID – Classical Storage Model – SNIA Shared Storage Model – Virtual Storage: File System Level and Block Level.

UNIT V APPLYING VIRTUALIZATION 9

Practical Virtualization Solutions: Comparison of Virtualization Technologies: Guest OS/ Host OS – Hypervisor – Emulation – Kernel Level – Shared Kernel, Enterprise Solutions: VMWare Server – VMWare ESXi – Citrix Xen Server – Microsoft Virtual PC – Microsoft Hyper-V – Virtual Box, Server Virtualization: Configuring Servers with Virtualization – Adjusting and Tuning Virtual servers – VM Backup – VM Migration, Desktop Virtualization: Terminal services – Hosted Desktop – Web-based Solutions – Localized Virtual Desktops, Network and Storage Virtualization: Virtual Private Networks – Virtual LAN – SAN and VSAN – NAS.

TOTAL : 45 PERIODS

TEXTBOOK:

1. William von Hagen, "Professional Xen Virtualization", Wrox Publications, January, 2008.

REFERENCES:

1. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
2. David Marshall, Wade A. Reynolds, “Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center”, Auerbach Publications, 2006.
3. Kumar Reddy, Victor Moreno, “Network virtualization”, Cisco Press, July, 2006.
4. Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, APress 2005.

5. Kenneth Hess , Amy Newman, "Practical Virtualization Solutions: Virtualization from the Trenches", Prentice Hall, 2010

WEB REFERENCES:

1. lecturer.eepis-its.edu/ ~isbat/materikuliah/ .../ Virtualization. ppt
2. cs.nju.edu.cn/distribute-systems/lecture-notes/c11.ppt
3. https://edux.fit.cvut.cz/oppa/MI-POA/prednasky/MI-POA10.pdf
4. www.cs.otago.ac.nz/cosc440/lectures/lecture%2010.ppt

ONLINE RESOURCES:

1. https://www.simplilearn.com/virtualization
2. tutorialspoint.com/virtualization2.0/virtualization2.0_overview.htm

OUTCOMES:

Upon completion of this course, the student should be able to

1. Design and develop applications on virtual machine platforms
2. To understand the concepts of virtualization and virtual machines.
3. To understand the implementation of process and system virtual machines.
4. To explore the aspects of high level language virtual machines.
5. To gain expertise in server, network and storage virtualization.

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	2	0	0	0	0	0	0	0	0	0	0	1	0
CO2	1	0	0	0	0	0	0	0	0	0	0	0	2	0
CO3	0	2	0	0	0	0	0	0	0	0	0	0	2	0
CO4	0	2	2	0	0	0	0	0	0	0	0	0	2	2
CO5	0	2	0	0	0	0	0	0	0	0	0	0	2	0

PROFESSIONAL ELECTIVE - III

20PBDEL310 SDG NO. 4,8,9	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Learn the basics and computational properties of natural languages
- Understand the statistical and probabilistic approaches to machine translation of natural language
- Understand the syntax, semantics and pragmatics of natural language
- Familiar with discourse, generation, dialogue of natural language
- Apply the NLP techniques to IR applications

UNIT I INTRODUCTION 9

Introduction: Origins and challenges of NLP – Computing with Language: Texts and Words, Texts as Lists of Words, Computing with Language: Simple Statistics, Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II WORD LEVEL ANALYSIS 9

Accessing Text from the Web and from Disk , Strings: Text Processing at the Lowest Level, Text Processing with Unicode , Regular Expressions for Detecting Word Patterns, Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III SYNTACTIC ANALYSIS 9

Analyzing Sentence Structure,Context-Free Grammars, Grammar rules for English, Treebanks, Grammar Development, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT IV SEMANTICS AND PRAGMATICS 10

Analyzing the Meaning of Sentences : Natural Language Understanding, Propositional Logic, First-Order Logic , Requirements for representation – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word

Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES 8

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin,"Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media. , 2009.

REFERENCES:

1. Breck Baldwin, "Language processing with Java and Ling Pipe Cookbook", Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Java, OReilly Media, 2015.
3. NitinIndurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. TanveerSiddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

WEB REFERENCES:

1. https://www.cse.iitb.ac.in/~cs626-460-2012/
2. https://www.coursera.org/learn/language-processing
3. https://www.udacity.com/course/natural-language-processing-nanodegree--nd892

ONLINE RESOURCES:

1. https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_tutorial.pdf
2. https://web.stanford.edu/~jurafsky/slp3/ed3book.pdf

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Analyze and generate the natural language text and tag a given text with basic Language features
2. Implement a rule based system to tackle morphology/syntax of a language
3. Compare and contrast the use of different statistical approaches for different types of NLP applications.
4. Design a tag set to be used for statistical processing for real-time applications
5. Design an innovative application using NLP components

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2	-	-	-	1	-	1	2	2	2
CO2	3	2	3	3	2	-	-	-	1	-	1	2	2	2
CO3	3	2	3	3	2	-	-	-	1	-	1	2	2	2
CO4	3	2	3	3	2	-	-	-	1	-	1	2	2	2
CO5	3	2	3	3	2	-	-	-	1	-	1	2	2	2

PROFESSIONAL ELECTIVE - IV

20PBDEL311 SDG NO. 4&9	DATA INTENSIVE COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of the various database systems including databases for Big data.
- To learn about the architecture of data intensive computing.
- To learn about parallel processing for data intensive computing.
- To learn about Security in Data Intensive Computing Systems.
- To learn about the applications that involves Data intensive computing.

UNIT I INTRODUCTION 9

Introduction to Distributed systems – Databases Vs. File Systems - Distributed file systems(HDFS) – Distributed Machine-Learning System - Data Parallelism – Characteristics -Hadoop –Execution Engines -Map Reduce- Distributed Storage System for Structured Data – NoSQL databases - Casandra, Mongo DB-Developing a Distributed Application

UNIT II ARCHITECTURES AND SYSTEMS 9

High performance Network Architectures for Data intensive Computing – Architecting Data Intensive Software systems – ECL/HPCC: A Unified approach to Big Data – Scalable storage for Data Intensive Computing - Computation and Storage of scientific data sets in cloud- Stream Data Model - Architecture for Data Stream Management-Stream Queries –Sampling Data in a Stream Filtering Streams

UNIT III TECHNOLOGIES AND TECHNIQUES 9

Load balancing techniques for Data Intensive computing – Resource Management for Data Intensive Clouds – SALT - Parallel Processing, Multiprocessors and Virtualization in Data intensive Computing - Challenges in Data Intensive Analysis and Visualization - Large-Scale Data Analytics Using Ensemble Clustering - Ensemble Feature Ranking Methods for Data Intensive Computing Application - Record Linkage Methodology and Applications-Semantic Wrapper

UNIT IV SECURITY 9

Security in Data Intensive Computing Systems - Data Security and Privacy in Data-Intensive Supercomputing Clusters - Information Security in Large Scale

Distributed Systems -Privacy and Security Requirements of Data Intensive Applications in Clouds

UNIT V APPLICATIONS AND FUTURE TRENDS 9

Cloud and Grid Computing for Data Intensive Applications -Scientific Applications - Bioinformatics Large Science Discoveries - Climate Change - Environment - Energy - Commercial Applications - Future trends in Data Intensive Computing

TOTAL : 45 PERIODS

REFERENCES:

1. Tom White, "Hadoop: The Definitive Guide", O'Reilly Media. October 2010.
2. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom., "Database Systems: The Complete Book", Pearson, 2013.
3. Furht, Borko, Escalante, Armando, "Handbook of Data Intensive Computing", Springer 2011.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Data-intensive_computing
2. https://www.computer.org/csdl/magazine/co/2008/04/mco2008040030/13rRUNvgyZ8

ONLINE RESOURCES:

1. https://www.slideshare.net/huda2018/dataintensive-technologies-for-cloudcomputing

OUTCOMES:

Upon completion of the course, the students will be able to

1. Design applications that involve data intensive computing.
2. Suggest appropriate architecture for data intensive computing systems.
3. Decide on the appropriate techniques of Map Reduce, Mongo DB, for the different Applications.
4. Identify parallel processing techniques for data intensive computing.
5. Decide on the various security techniques that are necessary for data intensive applications.

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	2	-	3	-	-	1	-	2	2	2	3
CO2	3	-	3	-	-	2	-	-	-	-	1	-	3	3
CO3	3	-	2	1	-	2	-	-	-	-	3	2	2	2
CO4	3	-	3	-	-	3	-	-	2	-	1	-	2	1
CO5	3	-	3	3	-	3	-	-	1	-	1	-	3	2

PROFESSIONAL ELECTIVE - IV

20PBDEL312 SDG NO. 4	R LANGUGUAGE FOR MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Study the major data mining problems as different types of computational tasks (prediction, classification, clustering, etc.) and the algorithms appropriate for addressing these tasks
- Learn how to analyze data through statistical and graphical summarization, supervised and unsupervised learning algorithms
- Systematically evaluate data mining algorithms and understand how to choose algorithms for different analysis tasks

UNIT I INTRODUCTION DATA MINING 9

Introduction, Mining Association Rules in Large Databases, Mining Frequent Patterns - basic concepts - Efficient and scalable frequent item set mining methods, Apriori algorithm, FP-Growth algorithm, Associations - mining various kinds of association rules.

UNIT II PREDICTIVE MODELING AND CLUSTERING 9

Classification and Prediction-Issues Classification by Decision Tree Induction–Bayesian Classification – Other Classification Methods – Prediction–Clusters Analysis – Basics of cluster analysis -Types of Data in Cluster Analysis – Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods.

UNIT III MINING DATA STREAMS 9

Introduction To Streams Concepts – Stream Data Model and Architecture -

Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications

UNIT IV DATA ANALYTIC METHODS USING R 9

Introduction to R – Analyzing and exploring data with R - Statistics for model building and evaluation. Analytical Approaches, introducing to various Analytical Tools, Installing R, Handling Basic Expressions in R, Variables in R, Working with Vectors, Storing and Calculating Values in R, Creating and Using Objects, Interacting with Users, Handling Data in R Workspace

UNIT V FUNCTIONS AND PACKAGES IN R 9

Executing Scripts, Reading Datasets and Exporting Data from Manipulating and Processing Data in R, Working with Functions and Packages in R, Performing Graphical Analysis in R, Techniques Used for Visual Data Representation, Types of Data Visualization

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Carlo Vercellis, Business Intelligence: Data mining and Optimization for Decision Making, WILEY.
2. Han J., Kamber M. and Pei J, Data mining concepts and techniques, Morgan Kaufmann Publishers (2011) 3rd ed.
3. Big Data Computing and Communications edited by Yu Wang, Hui Xiong, ShlomoArgamon, XiangYang Li, JianZhong Li Springer

REFERENCES:

1. Pudi V., Krishana P.R., Data Mining, Oxford University press, (2009) 1st ed.
2. Adriaans P., Zantinge D., Data mining, Pearsoneducation press (1996), 1st ed.

WEB REFERENCES:

1. https://onlinecourses-archive.nptel.ac.in/noc18-mg11/announcements
2. https://swayam.gov.in/nd1_noc19_ma33/preview
3. www.datacamp.com/R-Tutorial

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=BB2O4VCu5j8
2. https://www.tutorialspoint.com/r/index.htm
3. http://www.rdatamining.com/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Demonstrate accurate and efficient use of classification using the R system for the computations.
2. Demonstrate the related data mining techniques Using R
3. Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from the theory that underpins classification and related data mining methods
4. Apply problem-solving using classification and related data mining techniques to diverse situations in business, biology, engineering and other sciences
5. Analyze the data visualization

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	-	-	-	-	-	1	2	3	3	2
CO2	3	3	2	3	1	-	-	-	-	1	2	2	2	3
CO3	3	1	1	2	1	2	1	-	-	1	1	2	2	3
CO4	3	3	3	2	3	2	1	-	-	1	1	1	3	2
CO5	3	2	3	2	1	2	1	1	1	1	1	3	2	2

PROFESSIONAL ELECTIVE - IV

20PBDEL313 SDG NO. 9	WEB ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop customer-centric approach in dealing with data.
- To know the principles, tools and methods of web intelligence.
- To apply analytics for business situations.

UNIT I INTRODUCTION **9**

Web Analytics – Basics – Traditional Ways – Expectations – Data Collection – Clickstream Data – Weblogs – Beacons – JavaScript Tags – Packet Sniffing – Outcomes data – Competitive data – Search Engine Data.

UNIT II STRATEGIES FOR ANALYTICS 9

Qualitative Analysis – Customer Centricity – Site Visits – Surveys – Questionnaires – Website Surveys – Post visits – Creating and Running-Benefits of surveys – Critical components of successful strategy.

UNIT III CONCEPTS OF WEB ANALYTICS 9

Web Analytic concepts – URLS – Cookies – Time on site – Page views – Understand standard reports – Website content quality – Navigation reports (top pages, top destinations, site overlay). – Search Analytics – Internal search, SEO and PPC – Measuring Email and Multichannel Marketing - Competitive intelligence and Web 2.0 Analytics – Segmentation – Connectable reports.

UNIT IV GOOGLE ANALYTICS 9

Analytics - Cookies - Accounts vs Property - Tracking Code - Tracking Unique Visitors - Demographics - Page Views & Bounce Rate Acquisitions - Custom Reporting.

UNIT V ADVERTISING AND PROMOTION 9

Goals & Funnels – Filters - Ecommerce Tracking - Real Time Reports - Customer Data Alert - Adwords Linking - Adsense Linking -Attribution Modeling - Segmentation - Campaign Tracking - Multi-Channel Attribution.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Avinash Kaushik, "Web Analytics 2.0: The Art of Online Accountability and Science Of Customer Centricity ", 1st edition, Sybex, 2009.

REFERENCES:

1. Michael Beasley, "Practical Web Analytics for User Experience: How Analytics can help you Understand your Users", Morgan Kaufmann, 2013.
2. Magy Seif El-Nasr, Anders Drachen, Alessandro Canossa, eds., "Game Analytics: Maximizing the Value of Player Data", Springer, 2013.
3. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Content, and Usage Data", 2nd Edition, Springer, 2011.
4. Justin Cutroni, "Google Analytics", O'Reilly, 2010.
5. Eric Fettman, Shiraz Asif, Feras Alhlou , "Google Analytics Breakthrough", John Wiley & sons, 2016.

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Know the concepts and terminologies related to web analytics.
2. Explore various parameters used for web analytics and their impact.
3. Explore the use of tools and techniques of web analytics.
4. Get experience on websites, web data insights and conversions
5. Analyze applications of IoT in real time scenario

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	-	-	-	2	-	-	3	3	2
CO2	3	3	3	2	-	-	-	-	2	-	-	2	3	2
CO3	3	3	3	2	-	2	-	-	2	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	2	-	-	3	3	2
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	2

PROFESSIONAL ELECTIVE - IV

20PBDEL314 SDG NO. 4, 9 &15	BIO INFORMATICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Exposed to the need for Bio informatics technologies
- Be familiar with the modeling techniques
- Learn micro array analysis
- Exposed to Pattern Matching and Visualization

UNIT I INTRODUCTION **9**

Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT II DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS **9**

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

UNIT III MODELING FOR BIOINFORMATICS 9

Hidden Markov modeling for biological data analysis – Sequence identification –Sequence classification – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.

UNIT IV PATTERN MATCHING AND VISUALIZATION 9

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT V MICROARRAY ANALYSIS 9

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model - Benchmark – Tradeoffs.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Yi-Ping Phoebe Chen (Ed), "Bio Informatics Technologies", First Indian Reprint, Springer Verlag, 2007.

REFERENCES:

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
2. Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005

WEB REFERENCES:

1. Academic Earth
2. Future Learn
3. Udacity & Alison (Commercial)
4. MIT Open Courseware
5. Peer-2-Peer University
6. Massive Open Online Course (MOOC)
7. Online Courses.com

8. Canvas Network
9. Khan Academy
10. Open SAP

ONLINE RESOURCES:

1. https://www.classcentral.com/subjects/bioinformatics
2. https://mooc-list.com/tags/bioinformatis?_cf_chi_jschi_tk
3. http://www.udemy.com/topic/bioinformatics/?utm_source=adwords

OUTCOMES:

Upon Completion of the course, the students will be able to

1. Develop models for biological data.
2. Apply pattern matching techniques to bioinformatics data – protein data genomic data.
3. Apply micro array technology for genomic expression study.
4. To design and implement bio-informatics algorithms.
5. To characterize and manage the types of biological data analysis.

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1	2	1	-	1	-	-	2	2	2
CO2	2	3	3	2	2	2	2	1	1	-	1	2	2	2
CO3	3	3	3	3	3	2	2	1	3	1	2	3	2	2
CO4	3	3	3	3	3	2	2	1	3	1	2	3	2	2
CO5	2	1	1	3	-	1	2	2	-	-	-	3	3	1

PROFESSIONAL ELECTIVE - IV

20PXXELXXX SDG NO. 4	STATISTICS FOR BUSINESS ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- This course aims at providing the required skill to apply the statistical tools in engineering Problems.
- To introduce the basic concepts of Time Series and Estimations.
- To acquaint the knowledge of Statistical Inference and Decision Theory.
- The syllabus is designed to provide the basic tools of Statistics for data analysis and Decision making on the sampling and inference.

UNIT I INTRODUCTION TO TIME SERIES 9

Time Series: Meaning And Need Of Time Series Analysis, Components Of Time Series, Additive And multiplicative Model, Utility Of Time Series. Methods Of Determining Trends. Components Of Timeseries, Smoothing Auto Correlation, Stationarity, Concepts Of AR, MA, ARMA & ARIMA Models with Illustrations.

UNIT II ESTIMATION 9

Methods of estimation: Random samples, sampling distributions of estimators, Methods of moments, Unbiasedness: Unbiased estimator, Illustration of unbiased estimator for the parameter and parametric function. Definitions of Consistency, Sufficient condition for consistency, concept of efficiency and sufficiency. Neyman- Factorization theorem (without proof), concept of likelihood function, Maximum Likelihood, Properties of MLE (without proof), Estimation of the parameters of normal distribution and other standard distributions by MLE.

UNIT III STATISTICAL INFERENCE AND DECISION THEORY 9

Statement and proof of Cramer Rao inequality. Definition of Minimum Variance Bound Unbiased Estimator (MVBUE) of $\varphi(\theta)$, (statement only). Rao-Blackwell theorem, Lehmann-Scheffe theorem. Definition of MVUE, Procedure to obtain MVUE (statement only), examples. Minimum Variance Unbiased Estimator (MVUE) and Uniformly Minimum Variance Unbiased Estimator(UMVUE). Basic elements of Statistical Decision Problem. Expected loss, decision rules(nonrandomized and randomized), decision principles (conditional Bayes, frequentist), inference as decision problem, optimal decision rules. Bayes and minimax decision rule. Admissibility ofminimax rules and Bayes rules.

UNIT IV REGRESSION AND RELIABILITY 9

Multiple linear regression, forward, backward & stepwise regression, Logistic Regression. Reliability of system of independent components, association of random variables, bounds on system reliability, improved bounds on system reliability using modular decompositions. Replacement policy comparisons, preservation of life distribution classes under reliability operations. Reversed hazard rate, cumulative reversed hazard function, relation between hazard function and reversed hazard function. Reversed lack of memory property.

UNIT V STATISTICAL QUALITY CONTROL 9

Meaning and purpose of Statistical quality control, Concept of process control, product control, assignable causes, chance causes and rational subgroups. Control charts and their uses, Choice of subgroup sizes, Construction of control chart for (mean), R (range), s (standard deviation), c (no.of defectives),

p (fraction defectives) with unequal subgroup size. Interpretation of non-random patterns of points. Modified control chart. CUSUM Chart. Consumer's risk, producer's risk, OCcurve, acceptance sampling plan by attributes and variables. Concept of Six Sigma.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Barlow, R. E. and Proschan F. (1996). Mathematical Theory of Reliability. John Wiley.
3. Statistical Inference: P. J. Bickel and K. A. Docksum, 2ndEdition, Prentice Hall
4. Duncan A.J. (1974): Quality Control and Industrial Statistics, IV Edition, Taraporewala and Sons.
5. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.

REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences||, Cengage Learning, New Delhi, 8th Edition, 2014.
2. Introduction to Linear Regression Analysis: Douglas C. Montgomery
3. Chatfield C.: The Analysis of Time Series, IInd Edition Chapman and Hall.
4. George Casella, Roger L. Berger (2002), Statistical Inference, 2nd ed., Thomson Learning.
5. Mukhopadhay, Parimal: Theory and Methods of Survey Sampling, Prentice Hall
6. Tobias, P. A. and Trindane, D. C. (1995). Applied Reliability, Second edition, CRC Press.
7. Rao, C.R. Linear Statistical Inference and its Applications, Wiley Eastern.
8. Berger, J.O.: Statistical Decision Theory and Bayesian Analysis, 2nd Edition. Springer Verlag

OUTCOMES:

On completion of this course, the student should be able to

1. Use time Series application in the data analyst.
2. Apply the concept of Point estimation by Method of moments and Maximum likelihood estimation.
3. Evaluate the regression and reliability for the statistical sampling data.
4. apply various estimators for the statistical concepts.
5. Apply various techniques in quality control and acceptance sampling.

CO, PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PS10
CO1	3	1	2	-	-	-	-	-	1	-
CO2	3	2	2	-	-	-	-	-	1	1
CO3	3	2	2	-	1	-	-	-	2	-
CO4	3	2	2	1	1	-	-		1	1
CO5	3	2	2	-	-	-	-	-	2	-

AUDIT COURSES (AC)

20PBDMC102 SDG NO. 4	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS 6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

REFERENCES

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

OUTCOMES

On completion of this course, the student should be able to

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
4. Understand the skills needed when writing the Conclusion
5. Ensure the good quality of paper at very first-time submission

AUDIT COURSES (AC)

20PBDMC103 SDG NO. 4	SANSKRIT FOR TECHNICAL KNOWLEDGE	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Illustrate the basic sanskrit language.
- Recognize sanskrit, the scientific language in the world.
- Appraise learning of sanskrit to improve brain functioning.
- Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power. Extract huge knowledge from ancient literature.

UNIT I ALPHABETS **6**

Alphabets in Sanskrit

UNIT II TENSES AND SENTENCES **6**

Past/Present/Future Tense - Simple Sentences

UNIT III ORDER AND ROOTS **6**

Order - Introduction of roots

UNIT IV SANSKRIT LITERATURE **6**

Technical information about Sanskrit Literature

UNIT V TECHNICAL CONCEPTS OF ENGINEERING 6

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL: 30 PERIODS

REFERENCES

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi, 2017.

OUTCOMES:

On completion of this course, the student should be able to

1. Understanding basic Sanskrit language.
2. Write sentences.
3. Know the order and roots of Sanskrit.
4. Know about technical information about Sanskrit literature.
5. Understand the technical concepts of Engineering.

AUDIT COURSES (AC)

20PBDMC104 SDG NO. 4	VALUE EDUCATION	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Students will be able to Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

UNIT I

Values and self-development–Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgements

UNIT II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT III

Personality and Behavior Development-Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brother hood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT IV

Character and Competence–Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

TOTAL: 30 PERIODS

OUTCOMES

Students will be able to Knowledge of self-development.

1. Learn the importance of Human values.
2. Developing the overall personality.

SUGGESTED READING

1. Chakroborty, S.K."Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

AUDIT COURSES (AC)

20PBDMC105 SDG NO. 4	PEDAGOGY STUDIES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Review existing evidence on there view topic to inform programme design and policy
- Making under taken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

UNIT I INTRODUCTION AND METHODOLOGY 6

Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW 6

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES 6

Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT 6

Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS 6

Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 30 PERIODS

SUGGESTED READING

1. Ackers J, HardmanF (2001) Classroom interaction in Kenyan primary schools, Compare, 31(2): 245-261.
2. Agrawal M (2004)Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36(3):361-379.
3. Akyeampong K (2003) Teacher training in Ghana-does it count? Multi-site teacher education research project (MUSTER) country report 1.London:DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33(3): 272–282.
5. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M(2003) Read India: Amass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf

OUTCOMES:

Students will be able to understand:

1. What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

AUDIT COURSES (AC)

20PBDMC201 SDG NO. 4	DISASTER MANAGEMENT	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION **6**

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS **6**

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA **6**

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT 6

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

REFERENCES

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

OUTCOMES:

1. Ability to summarize basics of disaster
2. Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
3. Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
4. Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
5. Ability to develop the strengths and weaknesses of disaster management approaches

AUDIT COURSES (AC)

20PBDMC202 SDG NO. 4	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional

- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION 5

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION 5

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES 5

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE 5

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION 5

District's Administration head: Role and Importance Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION 5

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

SUGGESTED READING

1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.

3. M.P. Jain, Indian Constitution Law, 7 th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

OUTCOMES

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization
3. of social reforms leading to revolution in India.
4. Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
5. Discuss the passage of the Hindu Code Bill of 1956.

AUDIT COURSES (AC)

20PBDMC203 SDG NO. 4	STRESS MANAGEMENT BY YOGA	L	T	P	C
		2	0	0	0

OBJECTIVES:

- To achieve overall health of body and mind
- To overcome stress

UNIT I

Definitions of Eight parts of yoga.(Ashtanga)

UNIT II

Yam and Niyam - Do`s and Don't's in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

UNIT III

Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 30 PERIODS

SUGGESTED READING

1. 'Yogic Asanas for Group Tarining-Part-I":Janardan Swami Yoga bhyasi Mandal, Nagpur

2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

OUTCOMES

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

AUDIT COURSES (AC)

20PBDMC204 SDG NO. 4	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
		2	0	0	0

OBJECTIVES:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

UNIT I

Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont's) - Verses71,73,75,78 (do's)

UNIT II

Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2- Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III

Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2- Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 30 PERIODS

SUGGESTED READING

1. Gopinath, Rashtriya Sanskrit SansthanamP, Bhartrihari's Three Satakam, Niti- sringarvairagya, New Delhi,2010
2. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016.

OUTCOMES

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neet is hatakam will help in developing versatile personality of students.

4. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari's Three Satakam, Niti- sringarvairagya, New Delhi,2010
5. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016.

Imagine the Future and

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Together let's build a better world where there is NO POVERTY and ZERO HUNGER.

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There is CLEAN WATER AND SANITATION for everyone. AFFORDABLE AND CLEAN ENERGY

which will help to create DECENT WORK AND ECONOMIC GROWTH. Our prosperity shall be fuelled

by investments in INDUSTRY, INNOVATION AND INFRASTRUCTURE that will help us to

REDUCE INEQUALITIES by all means. We will live in SUSTAINABLE CITIES AND COMMUNITIES.

RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.

CLIMATE ACTION will reduce global warming and we will have abundant,

flourishing LIFE BELOW WATER, rich and diverse LIFE ON LAND.

We will enjoy PEACE AND JUSTICE through STRONG INSTITUTIONS

and will build long term PARTNERSHIPS FOR THE GOALS.

For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **People like you.**

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