



Sri

SAI RAM

INSTITUTE OF TECHNOLOGY

An Autonomous Institution

West Tambaram, Chennai - 44

www.sairamit.edu.in

Approved by AICTE, New Delhi
Affiliated to Anna University



DEPARTMENT OF

ARTIFICIAL INTELLIGENCE & DATA SCIENCE ENGINEERING

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 ARTIFICIAL INTELLIGENCE AND DATA SCIENCE ENGINEERING



VISION

To emerge as a “Centre of Excellence in the field of Artificial Intelligence and Data Science” and to uphold students by imparting Cognitive learning environment with continuous education, research and industrial collaboration to become inventive Artificial Intelligence and Data Science Eminent.



MISSION

Department of Artificial Intelligence and Data Science Engineering, Sri Sairam Institute of Technology is committed to

- M1** To enlighten students to experience content based learning with premier quality data science education, research and industrial collaboration to update their knowledge in the field of AI and Data science
- M2** To provide training programs that bridges the gap between academia and industry.
- M3** To instil societal, safety, cultural, environmental and ethical responsibilities in all professional activities
- M4** To equip aspiring students with the skills to perform intelligent data analysis which in turn provide dynamic and lucrative careers in technology.

AUTONOMOUS CURRICULUM 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	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	20CBPC201	Data Structures & Algorithms	3	0	0	3	3
PRACTICALS							
7	20ESPL201	Python Programming Laboratory	0	0	3	3	1.5
8	20CBPL202	Data Structures & Algorithms Laboratory	0	0	3	3	1.5
9	20ESGE201	Engineering Practices Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - II							
10	20TPHS201	Skill Enhancement	0	0	2	2	1
11	20HSMG201	Interpersonal Values	2	0	0	2	0
TOTAL						32	24.5

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA302	Probability & Statistical Modelling	3	1	0	4	4
2	20CSPC401	Operating Systems	3	0	0	3	3
3	20CSPC402	Database Management Systems	3	0	0	3	3
4	20AIPW301	Fundamental of Data Science with lab	3	0	2	5	4
5	20AIPC302	Fundamental of Machine Learning Techniques	3	0	0	3	3
PRACTICAL							
6	20AIPL301	Probability & Statistical Modelling Laboratory	0	0	3	3	1.5
7	20CSPL402	Database Management Systems Laboratory	0	0	3	3	1.5
8	20AIPL302	Machine Learning Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - III							
9	20AITE301	Live-in-Lab – 1	0	0	2	2	1
10	20AI TP 301	Skill Enhancement	0	0	2	2	1
TOTAL						31	23.5

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA404	Linear Algebra and its Applications	3	1	0	4	4
2	20ITPC401	Design and Analysis of Algorithms	3	0	0	3	3
3	20CSPW401	Computer Networks with Lab	3	0	2	5	4
4	20AIPC401	Fundamentals of Artificial Intelligence	3	0	0	3	3
5	20AIPC402	Biomedical Signal & Image Processing	3	0	0	3	3
6	20AIPC403	Advanced Machine Learning	3	0	0	3	3
PRACTICAL							
7	20AIPL401	DAA and AI Laboratory	0	0	3	3	1.5
8	20AIPL402	Biomedical Signal & Image Processing Laboratory	0	0	3	3	1.5
9	20AIPL403	Advance Machine Learning Laboratory	0	0	3	3	1.5
10	20AITE401	Live-in-Lab – II	0	0	2	2	1
VALUE ADDITIONS - IV							
11	20AITP401	Skill Enhancement	0	0	2	2	1
12	20MGMC301	Constitution of India	2	0	0	2	0
TOTAL						36	26.5

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	20HSP501	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

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20AIPC701	Cloud Computing	3	0	0	3	3
2	20HSMG601	Principles of Engineering Management	3	0	0	3	3
3	20XXELXXX	Professional Elective-III	3	0	0	3	3
4	20XXELXXX	Professional Elective-IV	3	0	0	3	3
5	20XXOEXXX	Open Elective-II	3	0	0	3	3
PRACTICAL							
6	20AIPL701	Cloud Computing Laboratory	0	0	3	3	1.5
7	20AIPJ701	Project Phase - I	0	0	4	4	2
VALUE ADDITIONS - VII							
8	20AITP701	Skill Enhancement	0	0	2	2	1
TOTAL						24	19.5

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20XXOEXXX	Open Electives - III	3	0	0	3	3
PRACTICAL							
2	20AIPJ801	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													
Percentage													

*IS-Internship

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL501	Operation Research	3	0	0	3	3	Mathematics
2	20AIEL502	Software Engineering	3	0	0	3	3	Testing
3	20AIEL503	Distributed Systems	3	0	0	3	3	Cloud
4	20AIEL504	Software Project Management	3	0	0	3	3	Cloud
5	20AIEL505	Social Network Analysis	3	0	0	3	3	AI
6	20AIEL506	Process Automation	3	0	0	3	3	Automation
7	20AIEL507	Human Computer Interaction	3	0	0	3	3	AI
8	20AIEL508	Fuzzy Systems	3	0	0	3	3	Machine Learning
9	20AIEL509	Ethics in Data Science	3	0	0	3	3	Data Science
10	20AIEL510	Artificial Intelligence and Green Power Technology	3	0	0	3	3	AI

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL601	Information Security and Legal Compliance	3	0	0	3	3	Security
2	20AIEL602	Intellectual Property Rights and Design Thinking	3	0	0	3	3	Management
3	20AIEL603	Information Retrieval Techniques	3	0	0	3	3	Data Mining
4	20AIEL604	Robotics and Intelligent System	3	0	0	3	3	Robotics
5	20AIEL605	Biometric Systems	3	0	0	3	3	Security
6	20AIEL606	Statistics for Business Analytics	3	0	0	3	3	Mathematics
7	20AIEL607	Advanced Artificial Intelligent System	3	0	0	3	3	AI
8	20AIEL608	Agent Based Intelligent System	3	0	0	3	3	AI
9	20AIEL609	Application of Artificial Intelligence on Geospatial Data	3	0	0	3	3	AI
10	20AIEL610	Web Technology	3	0	0	3	3	Security

PROFESSIONAL ELECTIVES - 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	Financial Management	3	0	0	3	3	Management
3	20AIEL703	Virtual Reality and Augmented Reality	3	0	0	3	3	AI
4	20AIEL704	Security Risk Assessment and Management	3	0	0	3	3	Security
5	20AIEL705	Expert System	3	0	0	3	3	AI
6	20AIEL706	Cognitive Computing	3	0	0	3	3	AI
7	20AIEL707	Reinforcement Learning	3	0	0	3	3	AI
8	20AIEL708	Mining Massive Datasets	3	0	0	3	3	Data Science
9	20AIEL709	Database Security and Auditing	3	0	0	3	3	Data Science
10	20AIEL710	Game Theory	3	0	0	3	3	AI

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL711	Cyber Crime & Computer Ethics	3	0	0	3	3	Cyber Security
2	20AIEL712	Quantum Computing and Quantum Cryptography	3	0	0	3	3	AI
3	20AIEL713	Decision Making under Uncertainty	3	0	0	3	3	AI
4	20AIEL714	Artificial Intelligence Search Methods for Problem Solving	3	0	0	3	3	AI
5	20AIEL715	Actuarial Science Applications	3	0	0	3	3	Security
6	20AIEL716	Secure Cloud Computing	3	0	0	3	3	Cloud
7	20AIEL717	Time Series Analysis	3	0	0	3	3	AI
8	20AIEL718	Secure Web App	3	0	0	3	3	Security
9	20AIEL719	Business Intelligence	3	0	0	3	3	AI
10	20AIEL720	Artificial Intelligence Constraint Satisfaction	3	0	0	3	3	AI

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

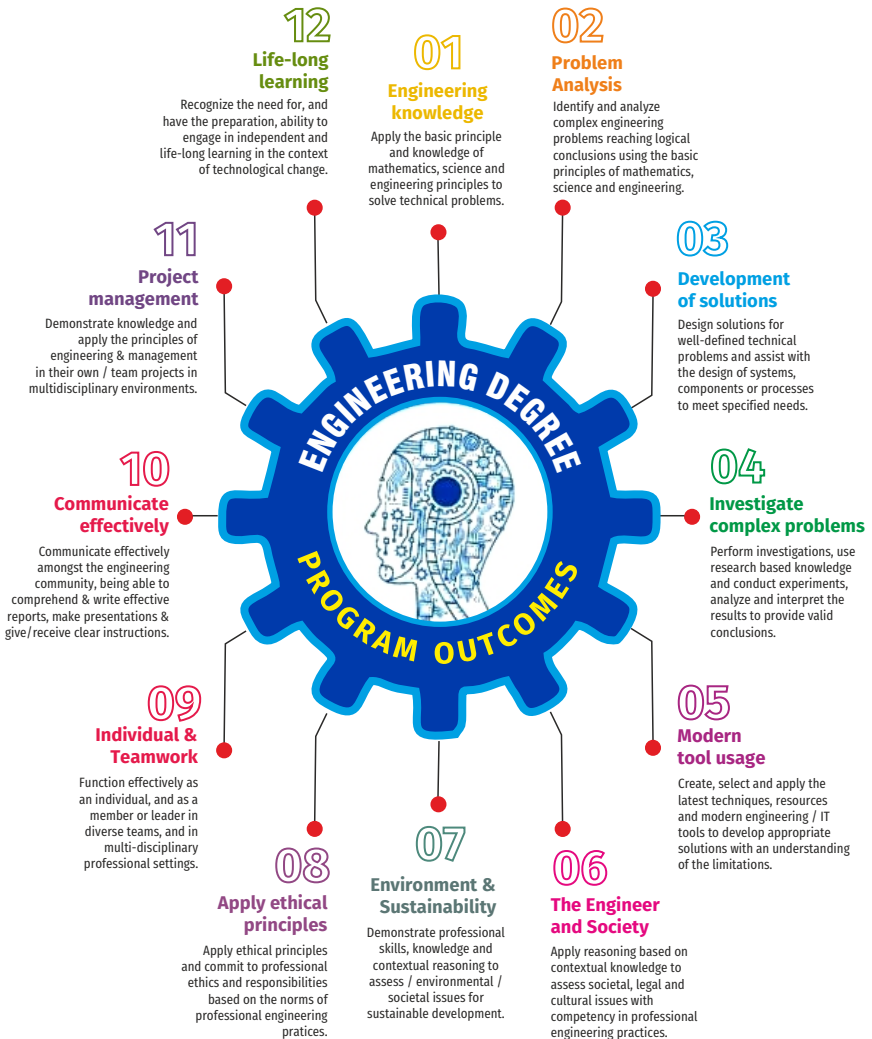
- PEO 1** Graduates will have solid basics in Mathematics, Programming, Machine Learning, Artificial Intelligence and Data Science fundamentals and advancements to solve technical problems.
- PEO2** Graduates will have the capability to apply their knowledge and skills acquired to solve the issues in real world Artificial Intelligence and Data Science sectors and to develop feasible and viable systems.
- PEO3** Graduates will have the potential to participate in life-long learning through the successful completion of advanced degrees, continuing education, certifications and/or other professional developments.
- PEO4** Graduates will have the ability to apply the gained knowledge to improve the society ensuring ethical and moral values.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO 1** Artificial Intelligence and Data Science graduates are able to become leaders in the Industry and Academia with the help of advanced knowledge and skill, which can empower them to analyse, design, develop and implement their learning to develop the society.
- PSO2** Ability to develop skills to address and solve social and environmental problem with ethics and perform multidisciplinary projects with advanced technologies and tools.

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



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

- To understand and gain knowledge in the concepts of matrix algebra
- To introduce the notion of limits, continuity, differentiation and maxima and minima of functions
- To acquaint the concept of definite and improper integrals and their applications
- To provide an understanding of double and triple integrals
- To acquire knowledge in representing elementary and periodic functions as an infinite 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

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. 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 and hyperbolic 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

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. Comprehend conversations and talks presented in English (K2)
2. Speak fluently in informal and formal contexts (K1)
3. Read articles of any kind and be able to comprehend (K2)
4. Write technical concepts in simple and lucid style (K2)
5. Prepare informal letters and e-mails efficiently (K3)
6. 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 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 - CO₂ 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.

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

OUTCOMES:

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

- Understand the basics of crystals, structures and crystal growth techniques (K3)
- 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)
- Apply the advanced physics concepts of quantum theory to characterize the matter (K4)
- Understand the basic concepts in laser and its types and fiber optics (K3)
- Acquire adequate knowledge on the fundamental concepts of thermal properties of materials (K2)
- 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 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 – H₂ -O₂ 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" Dhanpat Rai 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 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.
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, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	3	2	1	1	-	2	2	-	3	2	3
C02	3	3	3	3	2	-	1	1	2	2	3	3	2	3
C03	3	3	3	3	2	1	1	1	2	-	3	-	3	2
C04	3	3	3	3	2	1	-	1	2	2	3	3	1	2
C05	3	3	3	3	2	1	1	1	2	2	3	3	2	1
C06	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. Jeyapooan, "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
C01	3	2	2	-	-	-	-	-	2	2	-	2	2	2
C02	3	2	2	-	-	-	-	-	2	2	-	2	2	2
C03	3	2	2	-	-	-	-	-	2	2	-	2	2	2
C04	3	2	2	-	-	-	-	-	2	2	-	2	2	2
C05	3	2	2	-	-	-	-	-	2	2	-	2	2	2
C06	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. Apply the different techniques of quantitative chemical analysis to generate experimental skills in building technical competence. (K2)

- Apply basic techniques used in chemistry laboratories for water analyses/purification and estimates the ions/metal ions present in domestic/industry wastewater. (K2)
- 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
C01	3	3	3	2	1	3	3	2	2	1	1	3
C02	3	3	3	3	3	3	3	2	2	2	2	3
C03	3	3	3	3	3	3	3	2	1	1	2	3
C04	3	2	3	3	1	1	2	2	2	2	3	2
C05	3	2	3	3	1	1	2	2	2	2	3	2
C06	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

- Write a program using I/O statements and expressions.
- Write programs using decision-making constructs.
- 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)
- Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
- 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 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. Develop C programs for simple applications making use of basic constructs, arrays and strings. (K4)
4. Develop C programs involving functions and recursion. (K4)

5. Develop C programs involving pointers, and structures. (K6)
6. Design applications using sequential and random access file. (K4)

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 Building, 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 compiler 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, Marc Lipson, “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/~aralal/book/mth202.pdf>

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=h_9WjWENWV8&list=PL3o9D4Dl2FJ9q0_gtFXPh_H4POI5dK0yG
2. <https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D203>
3. https://www.youtube.com/watch?v=4LlTmsfDS4Y&list=PLEAYkSg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13
4. <https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf>
5. <https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ90QGMqxersk8fUxiUMSlx0DBqsKZS>

OUTCOMES:

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

1. Check whether the relation is Binary, Partial Order or equivalence and a function is injective, subjective or bijective, compute inverse and composite of functions (K3)
2. Solve problems on permutations and combinations using the Counting principle and Pigeon hole Principle(K3)
3. Construct mathematical arguments and test the validity of statements using the rules of logic, rules of inference, quantifiers, proof strategies and mathematical induction. (K3)
4. Identify a set with the given binary relation as a group, normal group, ring, fields and Boolean algebra. (K3)
5. Identify Graph isomorphism, Eulerian and Hamiltonian walks and sorting in trees(K3)
6. Explain the properties of functions, relations and graph(K2)

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
CO6	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_gV9EAAAYASAAEgIBPvD_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

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-Hill Education, 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 & Poonam Tandon, "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 be able to

1. Understand the basic concepts of various free electron theory and to determine the electrical properties of solids. (K3)
2. Apply the classical and quantum free electron theory to determine the properties of conductors (K3)
3. To analyze the properties of semiconductors and its applications (K4)
4. To analyze the mechanisms involved in the magnetic and optical materials using the quantum concepts (K4)
5. To gain the knowledge on superconducting materials and nanostructures and its applications. (K2)
6. To demonstrate the working principles of micro and nanoelectronic devices. (K3)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	-	-	-	-	-	-	-	-	-	-
C02	3	3	-	3	-	-	-	-	-	-	-	-
C03	3	3	-	3	-	-	-	-	-	-	-	-
C04	3	3	2	-	1	-	-	-	-	-	-	1
C05	3	3	3	-	2	1	-	-	-	-	-	2
C06	3	3	3	-	3	1	1	-	-	-	-	3

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 **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 SOCIAL ISSUES 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 – Case studies.

TOTAL: 45 PERIODS**TEXT BOOKS:**

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., Hyderabad, 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

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. Define the syntax and semantics of python programming language and Understand control flow statements, strings and functions. [K1]

- Determine the methods to create and manipulate python programs by utilizing the data structures like lists, dictionaries, tuples and sets. [K3]
- Annotate the concepts of functions, modules and packages in python. [K2]
- Understand the concepts of files, exception handling and also apply the object oriented programming concept by creating classes and objects. [K6]
- Illustrate and use some of the libraries available with python. [K4]
- Applying the problem solving concepts to various applications using python. [K6]

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

20CBPC201 SDG NO. 4 & 9	DATA STRUCTURES & ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the basic terminologies of algorithm and data organization
- Understand the concepts of ADTs
- Learn linear data structures – lists, stacks, and queues
- Understand sorting, searching and hashing algorithms
- Learn dynamic data structures - Tree and Graph

UNIT I BASIC TERMINOLOGIES AND INTRODUCTION TO ALGORITHM 7

Algorithm Specification - Recursion - Performance Analysis - Asymptotic Notation - The Big-O - Omega and Theta Notation - Programming Style - Refinement of Coding - Time-Space Trade Off - Testing - Data Abstraction.

UNIT II LINEAR DATA STRUCTURE**11**

Array - Stack – Operations - Evaluating Arithmetic Expressions - Conversion of Infix to Postfix Expression - Queue – Circular Queue – DeQueue - Operations - Linked_List and its Types - Various Representations - Applications of Linear Data Structures.

UNIT III NON-LINEAR DATA STRUCTURE – TREES & GRAPHS**11**

Trees – Tree Traversals - Binary Tree - Threaded Binary Tree - Binary Search Tree - B & B+ Tree - AVL Tree - Splay Tree - Graph - Directed - Undirected - Basic Terminologies and Representations - Graph Search and Traversal Algorithms - Operations & Applications of Non-Linear Data Structures.

UNIT IV SEARCHING AND SORTING ON VARIOUS DATA STRUCTURES **11**

Sequential Search - Binary Search - Breadth First Search - Depth First Search - Insertion Sort - Selection Sort - Shell Sort - Divide and Conquer Sort - Merge Sort - Quick Sort - Heapsort - Introduction to Hashing.

UNIT V FILES**5**

File Organisation - Sequential - Direct - Indexed Sequential - Hashed and Various Types of Accessing Schemes.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. E. Horowitz, S. Sahni, S. A-Freed, "Fundamentals of Data Structures", Universities Press, Second Edition, 2008.
2. A.V.Aho, J. E.Hopperoft, J. D.Ullman, "Data Structures and Algorithms", Pearson Education, 1983.

REFERENCES:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth.
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31st Edition, Pat Morin, UBC Press.

WEB REFERENCES:

1. https://swayam.gov.in/nd2_cec19_cs04/preview
2. <https://nptel.ac.in/courses/106102064/>

ONLINE RESOURCES:

1. <https://www.codechef.com/certification/data-structures-and-algorithms/prepare>
2. <https://www.coursera.org/specializations/data-structures-algorithms>

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 algorithms(K3)
5. Implement the various searching algorithms(K3)
6. Implement files and graph data structures for various applications(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	1	2	1	1	1	0	2	2	3	3	3	2
C02	2	2	1	2	1	1	1	0	2	2	3	3	3	2
C03	3	3	2	3	3	1	1	1	2	2	3	3	3	2
C04	2	2	1	2	3	2	1	0	1	1	2	1	3	2
C05	2	2	1	2	3	2	1	0	1	1	2	1	3	2
C06	2	2	1	2	1	1	1	0	2	2	3	3	3	2

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. Implement simple programs for describing the syntax, semantics and control flow statements. [K3]
2. Examine the core data structures like String, lists, dictionaries, tuples and sets in Python to store, process and sort the data. [K2]
3. Articulate the concepts of functions, modules and packages in Python. [K2]
4. Illustrate the applications of python libraries. [K3]
5. Create files and perform read and write operations in it. [K3]
6. Handle exceptions and create 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
C01	-	1	2	1	2	-	-	-	1	-	3	3	-	1
C02	1	2	3	3	3	2	1	1	1	1	1	3	1	2
C03	-	1	3	3	2	1	-	-	-	-	1	3	-	1
C04	1	2	3	3	2	-	-	-	-	-	1	3	1	2
C05	-	-	3	3	2	-	-	1	-	-	2	3	-	-
C06	-	-	3	3	2	-	-	1	-	-	2	3	-	-

SEMESTER - II

20CBPL202 SDG NO. 4	DATA STRUCTURES & ALGORITHMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Design and implement linear and non-linear data structures
- Develop & implement binary search trees with all operations
- Write functions to implement graph traversal algorithms
- Familiarize in sorting and searching algorithm
- Appropriately use the linear / non-linear data structure operations for a given problem

LIST OF EXPERIMENTS

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.
5. All graph algorithms.
6. Saving / retrieving non-linear data structure in/from a file

TOTAL: 45 PERIODS

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

Equipments:

Standalone desktops with C compiler 30 Nos OR Server with C compiler supporting 30 terminals or more.

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(K4)
2. Write programs to implement binary search trees with all operations(K4)
3. Write functions to implement graph traversal algorithms(K4)
4. Familiarize in sorting algorithm(K1)
5. Familiarize in searching algorithm(K1)
6. Appropriately use the linear / non-linear data structure operations for a given problem (K1)

CO- PO, PSO 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

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	2 Nos 2 Nos 2 Nos 2 Nos

Hand Drilling Machine
Jigsaw

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

- Elaborate on the components, gates, soldering practices. Calculate electrical parameters such as voltage, current, resistance and power. (K1)
- Design and implement Rectifier and Timer circuits (K2)
- Measure the electrical energy by single phase and three phase energy meters. (K2)
- Prepare the carpentry and plumbing joints. (K2)
- Perform different types of welding joints and sheet metal works (K2)
- 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

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 MockAssessment / 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.garreynolds.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

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

20BSMA302	PROBABILITY AND STATISTICAL MODELLING	L	T	P	C
SDG NO. 4		3	1	0	4

OBJECTIVES:

- To understand the Probability and Random Variables
- To analyze two dimensional random variables
- To understand linear statistical models and testing of hypothesis
- To understand non-parametric inference
- To understand estimation and time series analysis

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 – Joint moment generating functions and its properties-Multinomial distribution –Bivariate normal distribution – Central limit theorem (for independent and identically distributed random variables).

UNIT III LINEAR STATISTICAL MODELS AND TESTING OF HYPOTHESIS 12

Simple linear regression and correlation, multiple regression and multiple correlation. Test of hypothesis – concept and formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing. Analysis of Variance (one-way, two-way with as well as without interaction).

UNIT IV NON-PARAMETRIC INFERENCE 12

Comparison with parametric inference, use of order statistics, Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test, Spearman’s and Kendall’s test. Tolerance region.

UNIT V ESTIMATION AND TIME SERIES ANALYSIS 12

Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation. Basics of Time Series: Stationary, ARIMA Models: Identification, Estimation and Forecasting.

TOTAL: 60 PERIODS

TEXT BOOKS :

1. Probability and Statistics for Engineers (4th Edition), I. R. Miller, J. E. Freund and R. Johnson, 2016.
2. Introduction to Probability Models, S. M. Ross, Academic Press, N.Y, 2009.
3. Fundamentals of Statistics (Vol. I and Vol. II), A. Goon, M. Gupta and B. Dasgupta, 2013.
4. The Analysis of Time Series: An Introduction, Chris Chatfield, 2003.

REFERENCES:

1. A first course in Probability, S. M. Ross, Prentice Hall, 2013.
2. Introduction to the Theory of Statistics, A. M. Mood, F. A. Graybill and D.C. Boes, 2017.
3. Introduction to Linear Regression Analysis, D. C. Montgomery and E. Peck, 2006.
4. Applied Regression Analysis, N. Draper and H. Smith, 1998.
5. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, 2014.

WEB REFERENCES:

1. <https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/>
2. <https://www.stat.berkeley.edu/~aldous/134/gravner.pdf>

ONLINE RESOURCES:

1. <https://www.nptel.ac.in/courses/110107113/>
2. <https://nptel.ac.in/courses/103106123/>

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

1. Solve problems using the concepts of probability, random variables and standard discrete and continuous distributions. (K3)
2. Compute the probabilities of two-dimensional random variables and use the central limit theorem to find the probability of the sum of independent and identically distributed random variables. (K3)
3. Compute linear correlation and regression, multiple correlation and regression and test the hypothesis for small and large samples. (K3)
4. Use Non-Parametric tests to analyze data. (K3)
5. Apply methods of estimation in statistical analysis. (K3)
6. Interpret data using Time series analysis. (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - III

20CSPC401 SDG NO. 9	OPERATING SYSTEMS				L	T	P	C
					3	0	0	3

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 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.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
2. Achyut S.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.

- Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
- Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

WEB REFERENCES

- <https://nptel.ac.in/courses/106/106/106106144/>
- <https://www.coursera.org/courses?query=operating%20system>
- <https://www.computerhope.com/jargon/o/os.html>
- <https://www.os-book.com/OS9/slide-dir/>
- <http://web.iitd.ac.in/~minati/MTL458.html>

ONLINE REFERENCES

- <https://www.udacity.com/course/introduction-to-operating-systems--ud923>
- <https://freevideolectures.com/course/3670/introduction-to-operating-systems>

OUTCOMES:

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

- Understand the basic concepts and functions of the operating system. (K2)
- Analyze various scheduling algorithms. (K4)
- Understand deadlock, prevention and avoidance algorithms. (K2)
- Compare and contrast various memory management schemes. (K4)
- Understand the functionality of file systems (K2)
- 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
C01	3	3	1	-	1	-	1	1	-	-	-	1	2	2
C02	3	3	3	2	2	-	1	1	-	-	-	1	2	2
C03	3	3	2	2	2	-	1	1	-	-	-	1	2	2
C04	2	2	3	2	2	-	1	1	-	-	-	1	2	2
C05	3	3	3	2	2	-	1	1	-	-	-	1	2	2
C06	3	3	2	2	2	-	1	1	-	-	-	1	2	2

SEMESTER - III

20CSPC402 SDG NO. 4	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/Codd Normal 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. Execute various SQL queries for the Transaction Processing & Locking using concept of Concurrency control. (K4)
4. Evaluate the query processing techniques for the optimization of SQL queries. (K4)
5. Implement the indexing and hashing techniques for the organisation of database records. (K3)

6. Appraise how the advanced databases differ from the traditional databases. (K5)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	1	1	1	2	1	0	0	0	0	0	0	2	2
C02	2	2	2	2	1	1	0	0	0	0	0	0	2	2
C03	2	1	2	1	2	1	0	0	0	0	0	0	2	2
C04	2	2	2	2	1	1	0	0	0	0	0	0	2	2
C05	2	2	2	2	1	1	0	0	0	0	0	0	2	2
C06	2	2	2	1	2	1	0	0	0	0	0	0	2	2

SEMESTER - III

20AIPW301 SDG NO. 4	FUNDAMENTAL OF DATA SCIENCE WITH LAB	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the concept of Real Time data representations.
- To learn the various Excel Function to solve Data Science Problems
- To understand the Mathematical Basics of Data Science.
- To gain Knowledge in data science Tools.
- To highlight different data science opportunities in industry

UNIT I INTRODUCTION TO DATA SCIENCE

12

Introduction to Data Science – History of Data Science – Relationship between Data Warehouse – Big Data and Data Science – Scope of Data Science – Data Science with other fields – Relationship between Data Science and Information Science. Data: Data Types-Structured Vs. Unstructured data – Quantitative vs. Qualitative data-The four Levels of Data-Data Collection-Data Pre-Processing- Roles and Responsibilities of a data scientist- Data Science concerns

UNIT II DATA REPRESENTATION

12

Data Acquisition-Data Preparation-Data Formats-Data quality - High dimensionality of data- Principal Component Analysis-Data representation; Matrices, Vectors- Libraries of graphs, matrices, and vectors - Data Frames - Lists - Graphs and Networks-Data Models

UNIT III DATA SCIENCE IN SPREADSHEET 12

Introduction to Basic functions of Spreadsheet- Data Collection and Preparation – Importing Data into Spreadsheet from Different Data Sources – Data Cleaning and Preliminary Data Analysis – Correlation and importance of variables technical requirements- Data Visualization in Spreadsheet – Pivot Tables and Charts-VLOOKUP-Dashboard in Spreadsheet

UNIT IV DATA SCIENCE TOOLS & DATA VISUALIZATION 12

Introduction to Data Science Tools – Data Cleaning Tools – Data Munging and Modelling Tools-Data Visualization Tools-Tools for Data Science- Need for visualization - Elementary visualization means - box plots, charts, graphs - Advanced tools for visualization

UNIT V DATA ANALYTICS, ETHICS AND APPLICATIONS 12

Data analytics – methodologies - CRISP-DM Methodology - SEMMA - Big data life cycle - SMAM - ASUM- DM- Ethical guidelines for Data Scientist - Data Science concerns - Data Privacy and Legal aspects - Rightful use of data science-Applications-Bioinformatics-Education-Engineering-Finance and Economy-Gaming.

TOTAL: 60 PERIODS

LIST OF EXPERIMENTS

1. Study of Basic function in Excel
2. Study of Basic Data Science Libraries in Python
3. Working with Range Names and Tables
4. Cleaning Data with Text Functions
5. Cleaning Data containing Data Values
6. Working with VLOOKUP functions and Pivot Table.
7. Demonstration of Data Visualization in Excel.
8. Demonstration of Data Visualization in Python.
9. Importing Data from External Source Using Excel & Python
10. Creating a data model
11. Create a dashboard for a given requirement
12. Implement a data analytics for the real time data set

LAB REQUIREMENTS :

1. Microsoft Excel
2. Python 3

TEXT BOOKS:

1. Chirag Shah, "A Hands-on Introduction to Data Science", Cambridge University Press, 2020.
2. Sinan Ozdemir, "Principles of Data Science", Packt Publication, 2016.
3. Julio Cesar Rodriguez Martino, "Hands-on Machine Learning with Microsoft Excel", Packt Publication, 2019.

REFERENCES:

1. Hector Guerrero, "Excel Data Analysis: Modelling and Simulation", Springer International Publishing, 2nd Edition, 2019.
2. Paul Curzon, Peter W McOwan, "The Power of Computational Thinking", World Scientific Publishing, 2017
3. Steven S Skiena, "Data Science Design Manual", Spring International Publication, 2017.
4. Rajendra Akekar, Priti Srinivas Sajja, "Intelligence Techniques for Data Science", Spring International Publication, 2016.
5. Longbing Cao, "Data Science Thinking: The Next Scientific, Technological and Economic Revolution", Spring International Publication, 2018.

WEB REFERENCES:

1. <https://www.coursera.org/learn/excel-data-analysis>
2. https://www.tutorialspoint.com/learn/excel_data_analysis/index.htm
3. <https://www.coursera.org/learn/open-source-tools-for-data-science>

ONLINE RESOURCES:

1. <https://www.jeremyjordan.me/data-science>
2. <https://www.ngdata.com/top-data-science-resources>

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

1. Understand the real-world data and information. (K2)
2. Apply data science using excel & Python. (K3)
3. Design of mathematical model for problem solving. (K5)
4. Interpret various tools and its advantages. (K2)
5. Illustrate the different opportunities in industries. (K3)
6. Apply data modelling for real-world 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	2	1	1	1	1	2	1	2	3	3
CO2	3	3	3	3	3	2	2	2	2	2	2	2	3	2
CO3	3	3	3	3	3	1	2	1	3	2	2	3	2	2
CO4	3	2	2	2	2	1	1	1	2	1	1	2	3	3
CO5	3	2	2	2	2	1	1	1	2	1	1	2	3	3
CO6	3	2	2	2	2	1	1	1	2	1	1	2	3	3

SEMESTER - III

20AIPC302 SDG NO. 4	FUNDAMENTAL OF MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Explain the different types of Machine learning techniques
- Understand the Predictive, Descriptive and Prescriptive Analytics
- Apply different types of classification models in Supervised Machine learning
- Apply the different regression modelling and Optimization in Supervised learning
- Apply the basic clustering algorithm models

UNIT I INTRODUCTION TO MACHINE LEARNING**9**

Introduction to Machine Learning – Types of Machine learning – Supervised – Un-supervised – Reinforcement Learning types – Applications of Machine learning techniques with Case study– Banking and Finance – Healthcare – Insurance – Issues in Machine learning

UNIT II PREDICTIVE AND DESCRIPTIVE LEARNING MODELS**9**

Basic Types of data in Machine Learning – Exploring structure Data – Numerical data – Categorical data – Data Quality and Remediation – Data Pre-processing – Descriptive models – predictive models – prescriptive models – Applications of descriptive, predictive and prescriptive models - Training the models - Evaluating the performance of the model – Improving the performance of the model

UNIT III CLASSIFICATION ALGORITHM

9

Introduction to Feature Engineering – Feature construction – Feature extraction – Feature subset selection – Classification learning models and steps - Classification Algorithms – KNN – Decision Tree – Random Forest Model – Support Vector Machine

UNIT IV REGRESSION MODELLING

9

Introduction regression modelling – Mathematical model for Linear regression – Simple Linear regression – Multiple Linear Regression – Improving Accuracy of Linear regression model - Polynomial Regression - Logistic regression – Maximum likelihood Estimation - Stepwise regression – Ridge regression – Lasso Regression – Elastic Net regression modelling

UNIT V CLUSTERING ALGORITHM AND OTHER TYPES OF LEARNING

9

Introduction to Clustering – Different types of clustering techniques – Partitioning methods – K – Medoids: Object based technique – Hierarchical Clustering – Density based methods – Pattern Using Association Rules – Association Rule – Apriori algorithm for association rule learning – build the apriori principle rules – Other types of learning – Representation learning – Active Learning – Instance Based Learning - Association Rules Learning – Ensemble Learning

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, “Machine Learning”, First Edition, McGraw Hill Education, 2013
3. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, First Edition, Pearson, 2018
4. Thomas P. Trappenberg, “Fundamentals of Machine Learning”, Oxford University Press, 2020

REFERENCES:

1. Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, First Edition, Cambridge University Press, 2012.
2. Jason Bell, “Machine learning – Hands on for Developers and Technical Professionals”, First Edition, Wiley, 2014
3. Ethem Alpaydin, “Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)”, Third Edition, MIT Press, 2014.

WEB REFERENCES:

1. <http://digimat.in/nptel/courses/video/106106202/L01.html>
2. <http://digimat.in/nptel/courses/video/106106139/L01.html>

ONLINE RESOURCES:

1. <http://digimat.in/nptel/courses/video/106106213/L01.html>
2. <http://digimat.in/nptel/courses/video/106106198/L01.html>

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

1. Explain the types of Machine Learning with example application. (K2)
2. Differentiate between descriptive, predictive and prescriptive models with case study. (K4)
3. Apply the suitable classification algorithm for a given problem. (K3)
4. Apply an appropriate regression modelling technique and improve the performance of the technique for a given problem. (K3)
5. Apply suitable clustering algorithm model for a given problem. (K3)
6. Compare different types of Machine Learning models with suitable use case. (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
CO2	3	3	3	2	-	-	-	-	-	-	-	1	1	1
CO3	3	3	3	2	-	-	-	-	-	-	-	1	1	1
CO4	3	3	3	2	-	-	-	-	-	-	-	1	1	1
CO5	3	3	3	2	-	-	-	-	-	-	-	1	1	1
CO6	3	3	3	2	-	-	-	-	-	-	-	1	1	1

SEMESTER - III

20AIPL301 SDG NO. 9	PROBABILITY AND STATISTICAL MODELLING LABORATORY	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To understand data definitions and data manipulation commands
- To learn the R Programming
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front-end tool
- To understand design and implementation of typical database applications

LIST OF EXPERIMENTS

1. Introduction to R: basic commands, graphics, indexing data, loading data;
2. Implementation of Bayes' theorem
3. Implementation of Binomial, Poisson theorem
4. Implementation of Erlang, Normal distribution
5. Verification of two-dimensional random variables
6. Implementation of Regression model
7. Implementation of Co-relation model
8. Implementation of Non-parametric inference
9. Verification of estimation and time series analysis

TOTAL: 45 PERIODS

OUTCOMES

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

1. Install and use R for simple programming tasks. (K3)
2. Extend the functionality of R by using add-on packages. (K2)
3. Extract data from files and other sources and perform various data manipulation tasks on them. Code statistical functions in R. (K4)
4. Use R Graphics and Tables to visualize results of various statistical operations on data. (K3)
5. Apply the knowledge of R gained to data Analytics for real life applications. (K3)
6. Design Different Models using R. (K6)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	-	-	3	-	-	-	3	-	-	-	-	2	1
C02	-	3	-	-	3	3	-	-	3	-	3	3	3	2
C03	3	-	2	-	3	-	-	2	3	-	3	-	3	2
C04	-	3	-	3	-	-	3	3	3	-	-	3	2	1
C05	-	3	-	2	-	2	-	3	-	3	2	-	2	1
C06	-	3	-	3	-	-	3	3	3	-	-	3	2	1

SEMESTER - III

20CSPL304 SDG NO. 9	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1

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 - III

20AIPL302 SDG NO. 4	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To learn Prolog Program.
- To Implement in prolog and its working environment
- To Implement N-Queen problem and puzzle problem using Prolog
- To Analyze the problem using BFS and DFS algorithm
- To Analyze Decision Tree and back Propagation Algorithm

LIST OF EXPERIMENTS :

1. Study of Prolog
2. Write simple fact for the statements using prolog
3. Write predicates one convert's 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 Depth First Search
8. Write a program to solve Travelling salesman Problem
9. Write a prolog program to solve water jug problem.
10. Write a program to solve missionaries and cannibal problem
11. Write a prolog program to implement library management system.
12. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
13. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Implement in prolog and its working environment. (K3)
2. Implement N-Queen problem and puzzle problem using Prolog. (K3)
3. Analyze the problem using BFS and DFS algorithm. (K4)
4. Implement water jug and missionaries and cannibal problem using prolog. (K3)
5. Develop library management system. (K5)
6. Develop Decision Tree and Artificial Neural Network Algorithm. (K5)

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
CO6	2	3	2	3	3	1	1	-	2	-	-	1	2	2

SEMESTER - III

20AITE301 SDG NO. 4,11,15	LIVE-IN-LAB PROJECT-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
C01	3	3	2	2	2	2	2	2	3	2	2	3	3	3
C02	3	3	3	2	3	3	2	2	3	3	3	3	3	3
C03	3	3	3	2	3	3	2	2	3	3	3	3	3	3
C04	2	2	2	1	2	1	1	1	3	2	3	3	3	2
C05	2	2	2	1	2	1	1	1	3	2	3	3	3	2
C06	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - III

20AITP301 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.

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. 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".

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 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 OPERATORS, EXPRESSIONS AND CONTROL STATEMENTS 6

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 INTRODUCTION TO PRINTED CIRCUIT BOARD & PCB DESIGNING TOOLS 6

Fundamental of electronic components- Basic electronic circuits- Basics of printed circuit board designing: Layout planning-general rules and parameters- ground conductor considerations- thermal issues- check and inspection of artwork-Design rules for Digital circuit PCBs-Analog circuit PCBs-high frequency and fast pulse applications- Brief Introduction of various simulators.

UNIT V IMPLEMENTATION OF PCB DESIGN 6

Building simple schematics – Fabrication of DC Regulated Power Supply – Artwork & Printing of Simple PCB – Etching & Drilling of PCB – Wiring & Fitting Shop – Testing of Regulated Power supply Fabricated.

TOTAL : 30 PERIODS

TEXT BOOKS:

1. Printed circuit board design, fabrication assembly and testing By R. S. Khandpur, Tata McGraw Hill 2006.

REFERENCES:

1. Balagurusamy, "Programming in ANSI C", Tata McGraw-Hill Education, 2008
2. Stephen G. Kochan, "Programming in C" (3rd Edition), Sams, 2004
3. Stephen G. Kochan, "Programming in C", III Edition, Pearson Education.
4. Printed circuit Board Design and technology, Walter C. Bosshart, 1983
5. Printed Circuits Handbook, Sixth Edition, by Clyde F. Coombs, Jr, Happy T. Holden, Publisher: McGraw-Hill Education Year: 2016
6. Complete PCB Design Using OrCAD Capture and PCB Editor, Kraig Mitzner Bob Doe Alexander Akulin Anton Suponin Dirk Müller, 2nd Edition 2009.

ONLINE RESOURCES

1. <https://nptel.ac.in/courses/108/102/108102045/>
2. <https://www.coursera.org/courses?query=embedded%20systems>

WEB RESOURCES

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

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 analyse 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
C01	-	-	-	-	3	2	-	3	2	3	-	2	-	-
C02	-	-	-	-	3	2	-	3	2	3	-	2	-	-
C03	-	-	-	-	3	2	-	-	1	3	-	2	-	-
C04	-	-	-	-	3	2	-	3	3	3	-	2	2	2
C05	-	-	-	-	3	2	-	-	2	3	-	2	2	2
C06	-	-	-	-	3	2	-	-	2	3	-	2	2	2

SEMESTER - IV

20BSMA404 SDG NO. 4	LINEAR ALGEBRA AND ITS APPLICATIONS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To learn about solving system of linear equations using matrices
- To learn about vector spaces, subspaces, bases and dimension of Vector Spaces
- To learn about the Linear transformation and the matrix representation and diagonalizability
- To learn about the inner product Spaces, orthogonalization and Least Square Approximations
- To learn about the applications of singular value decomposition and principal component analysis in data science.

UNIT I SOLUTION OF SYSTEM OF LINEAR EQUATIONS 12

Vectors and linear combinations – rank of a matrix – Gaussian elimination – LU Decomposition – Solving Systems of Linear Equations using the tools of Matrices.

UNIT II VECTOR SPACES 12

Introduction-Field (definitions and examples)-Vector Spaces-Subspaces-Linear Combination and system of linear equations-Linear Dependence and Linear Independence of Vectors-Bases and Dimensions.

UNIT III LINEAR TRANSFORMATIONS 12

Introduction-Linear Transformations-Range and Null Space-Dimension Theorem-Matrix representation of a Linear Transformation-Eigen Values and Eigen Vectors-Positive definite matrices-Diagonalizability

UNIT IV INNER PRODUCT SPACES 12

Introduction-Inner Product Spaces-orthogonality – projections- Gram Schmidt Orthogonalization Process-QR decomposition-Least Square Approximation

UNIT V APPLICATIONS OF LINEAR ALGEBRA 12

Singular value decomposition and Principal component analysis – Introduction to their applications in data Science.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, 1965
2. Linear Algebra, Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, 2018

REFERENCES:

1. Advanced Engineering Mathematics, 7th Edition, Peter V. O'Neil, 2011
2. Advanced Engineering Mathematics, 2nd Edition, Michael. D. Greenberg, 2002
3. Introduction to Linear Algebra, 5th Edition, Gilbert Strang, 2016
4. Applied Mathematics (Vol. I & II), by P. N. Wartikar & J. N. Wartikar, 2008

WEB REFERENCES:

1. <https://nptel.ac.in/courses/111106135/>
2. https://swayam.gov.in/nd1_noc20_ma08/preview

ONLINE RESOURCES:

1. <https://freevideolectures.com/course/3382/linear-algebra-i>
2. <https://cosmolearning.org/courses/1806-linear-algebra/video-lectures/>
3. <https://towardsdatascience.com/understanding-singular-value-decomposition-and-its-application-in-data-science-388a54be95d>
4. <https://towardsdatascience.com/principal-component-analysis-intro-61f236064b38>

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

1. Apply LU decomposition and Gauss elimination methods to solve systems of linear equations. (K3)
2. Determine the bases and dimensions of vector spaces and subspaces. (K3)
3. Construct the matrix of a linear transformation and determine whether the linear transformation is onto, one-to-one. (K3)
4. Compute eigenvalues and eigenvectors of a matrix and use it for diagonalizing the matrix. (K3)
5. Construct orthonormal basis using Gram Schmidt orthogonalisation process and use it for QR decomposition of a matrix. (K3)
6. Apply Singular Value Decomposition and Principal Component Analysis in analyzing data. (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 - IV

20ITPC401 SDG NO. 4	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	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/CoursePage.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
CO1	3	3	1	0	0	0	0	0	0	0	0	0
CO2	3	3	1	0	0	0	0	0	0	0	0	0
CO3	2	3	0	1	0	0	0	0	0	0	0	0
CO4	2	3	0	2	0	0	0	0	0	0	0	0
CO5	1	2	0	1	0	0	0	0	0	0	0	0
CO6	1	2	1	2	0	0	0	0	0	0	0	0

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 – 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 AND APPLICATION 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", Fifth Edition TMH, 2013.
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, 2013.
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.

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. Access the performance of a network. (K5)
3. Understand the basics of how data flows from one node to another. (K2)
4. Analyse IEEE standards and Analyze and design routing algorithms. (K3)
5. Implementing the working of various transport and application layer protocols.(K3)
6. Analyse the protocols for various functions in the network.(K4)

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

20AIPC401 SDG NO. 4	FUNDAMENTALS OF 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
- To know 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

9

Planning- Planning problems, Simple planning agent, Planning languages, Blocks world ,Goal stack planning, Mean Ends Analysis, Non-linear Planning, Conditional planning, Reactive planning, Implementation of block world problem

UNIT V APPLICATIONS

9

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Robot – Hardware – Perception – Planning – Moving

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

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", Fifth Edition, Springer, 2003.

WEB REFERENCES:

1. <https://books.google.co.in/books?id=uSvYmki2yg0C&printsec=frontcover&dq=Supervised+Learning&hl=en&sa=X&ved=0ahUKEwigkN>

OUTCOMES:

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

1. Formulate a problem and build intelligent agents. (K1)
2. Apply appropriate searching techniques to solve a real-world problem. (K3)
3. Analyse the problem and infer new knowledge using suitable knowledge representation schemes. (K4)
4. Develop planning and apply learning algorithms on real world problems. (K5)
5. Design an expert system and implement natural language processing techniques. (K5)
6. Implement advance techniques in Artificial Intelligence. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C02	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C03	2	3	2	3	2	1	1	-	1	-	-	1	3	2
C04	2	3	2	3	3	1	1	-	2	-	-	1	2	2
C05	2	3	2	3	3	1	1	-	2	-	-	1	2	3
C06	2	3	2	3	3	1	1	-	2	-	-	1	2	2

SEMESTER - IV

20AIPC402 SDG NO. 4	BIOMEDICAL SIGNAL AND IMAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the types and characteristics of standard and biomedical signals
- To gain knowledge about the various physiological parameters both electrical and non-electrical and the methods of recording and transmitting these parameters
- To gain knowledge in removing the noise and artifacts in biomedical signals
- To provide fundamentals of the image in time and frequency domain
- To understand the basic concepts of image enhancement, image restoration, image segmentation, feature extraction in medical images

UNIT I CLASSIFICATION OF SIGNALS 9

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids_ Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals

UNIT II ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

Sources of bio medical signals, Bio-potentials, Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT III FILTERING FOR REMOVAL OF ARTIFACTS 9

Time-domain Filters - synchronized averaging, Moving Average Filters, Derivative-based operators to remove low-frequency artifacts. Frequency-domain filters - Removal of High Frequency noise, Removal of low frequency noise.

UNIT IV FUNDAMENTALS OF IMAGE PROCESSING 9

Image perception, MTF of the visual system, Image fidelity criteria, Image model, Image sampling and quantization – two-dimensional sampling theory, Image quantization, Optimum mean square quantizer, Image transforms – 2D-DFT and other transforms,

UNIT V BIO-MEDICAL IMAGE PREPROCESSING

9

Introduction - Overview of X-ray, CT, MRI and Ultrasound imaging, Preprocessing- Image Enhancement operations – Image noise and modeling, Image restoration – Image degradation model, Inverse and Wiener filtering, Geometric transformations and correction, Overview of image segmentation and Feature extraction.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allan V. Oppenheim, S. Wilsky and S. H. Nawab, "Signals and System", Pearson, 2015(Unit-I)
2. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007. (UNIT II-III)
3. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008, New Delhi (Unit IV-V)
4. Anil J Jain, "Fundamentals of Digital Image Processing", PHI, 2006 (Unit IV-V)

REFERENCES:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA Mc Graw-Hill, New Delhi, 2003.
2. John G. Webster, "Medical Instrumentation Application and Design", 3rd Edition, WileyIndia89Edition, 2007
3. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.
4. https://www.physio-pedia.com/Medical_Imaging
5. Atam P. Dhawan, "Medical Image Analysis", Wiley Inter science Publication, NJ S. Sridhar, –Digital Image Processing||, Oxford University Press, 2011, New Delhi.
- 6.. Alasdair McAndrew, "Introduction to Digital Image Processing with Matlab", Cengage Learning 2011, India
7. John L. Semmlow, "Bio signal and Biomedical Image Processing Matlab Based applications", Marcel Dekker Inc., New York, 2004

WEB REFERENCES:

1. <http://digimat.in/nptel/courses/video/108105101/L01.html>
2. <http://digimat.in/nptel/courses/video/117105135/L01.html>

SEMESTER - IV

20AIPC403 SDG NO. 4	ADVANCED MACHINE LEARNING	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce students to the advanced concepts and techniques of Machine Learning.
- To have a thorough understanding of the Graphical Model Representation
- To study the various Modelling
- To understand the importance of Uncertainty Estimation

UNIT I GRAPHICAL MODEL REPRESENTATION

9

Directed Graphical Model-Overview, representation of probability distribution and conditional independence statements. Undirected Graphical Model- potentials, conditional independence and graph separability, factorization- Constructing undirected models from distributions- Relationship between directed and undirected models- Common undirected graphical models: Factor models, Ising and Potts model, Gibbs distribution, log-linear models, CRFs-Feature-based potentials for flexible deployment in many applications-Applications in vision and text mining.

UNIT- II INFERENCE IN GRAPHICAL MODELS

9

Overview- Variable elimination- Junction trees and sum product message passing. Graphical model parameters- Learning conditional graphical models (CRFs), conditional likelihood training- Learning with partially observed data

UNIT III HIGH DIMENSIONAL OBJECTS AND SAMPLING

9

Generative models for text- Variational Autoencoders- Generative Adversarial Networks- Forward sampling- Importance sampling- MCMC sampling

UNIT IV UNCERTAINTY ESTIMATION

9

Bayesian Neural Networks: Uncertainties in Parameters Estimated with Neural Networks- Meta-Learning- Counterfactual reasoning, Causality. Neural models for density estimation- Masked Autoregressive Flow for Density Estimation- MADE: Masked Autoencoder for Distribution Estimation- Masked Autoregressive Flow for Density Estimation- Density estimation using real NVP- Few-shot Autoregressive Density Estimation: Towards Learning to Learn Distributions- TensorFlow Distributions

UNIT V MODELLING

9

Gaussian Process- Time series forecasting: encoder-decoder approach as in Deep AR- Correlated time series- High-dimensional multivariate forecasting with low-rank Gaussian Copula Processes.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, and Jerome Friedman, Publisher-Springer (Unit-I, II, III)
2. Understanding Machine Learning, Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press (Unit-IV, V)

REFERENCES:

1. Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning series), Kevin P. Murphy, The MIT Press.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurélien Géron, O'Reilly Media.

WEB REFERENCES:

1. <http://digimat.in/nptel/courses/video/106102220/L01.html>

ONLINE RESOURCES:

1. <http://digimat.in/nptel/courses/video/106106140/L01.html>
2. <http://digimat.in/nptel/courses/video/106106226/L01.html>

OUTCOMES:

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

1. Distinguish between different graphical models. (K4)
2. Suggest apt inference for different graphical models. (K2)
3. Design high dimensional objects. (K5)
4. Design systems that use the appropriate graph models of machine learning. (K5)
5. Modify existing machine learning algorithms based on Uncertainty Estimation. (K3)
6. Apply concept of advanced machine learning for real time applications. (K3)

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
CO2	3	3	2	2	-	-	-	-	-	-	-	1	1	1
CO3	3	3	2	2	-	-	-	-	-	-	-	1	1	1
CO4	3	3	2	2	-	-	-	-	-	-	-	1	1	1
CO5	3	3	2	2	-	-	-	-	-	-	-	1	1	1

SEMESTER - IV

20AIPL401 SDG NO. 4	DAA AND AI LABORATORY	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To learn Design and Analysis Algorithm
- To learn Prolog Program.
- To Implement in prolog and its working environment
- To Implement N-Queen problem and puzzle problem using Prolog
- To Analyze the problem using BFS and DFS algorithm

LIST OF EXPERIMENTS :

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2. Using Open MPI, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3. Implement Binary tree traversal techniques using recursion and without recursion. Identify the best method, Justify your answer.
4. Print all the nodes reachable from a given starting node in a digraph using BFS method. Check whether a given graph is connected or not using DFS method.

5. Write and implement an algorithm determining articulation points and the biconnected components in the given graph.
6. Implement an algorithm to find the minimum cost spanning tree using i) Prim's algorithm ii) Kruskal's Algorithm.
7. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
8. Study of Prolog
9. Write simple fact for the statements using prolog
10. Write predicates one convert's centigrade temperature to Fahrenheit, other checks if a temperature is below freezing.
11. Write a program to solve 4-Queen problem.
12. Write a program to solve 8-puzzle problem.
13. Write a program to solve any problem using Breadth First Search.
14. Write a program to solve any problem Depth First Search
15. Write a program to solve Travelling salesman Problem

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Implement Design and Analysis Algorithm. (K3)
2. Implement in prolog and its working environment. (K3)
3. Implement N-Queen problem and puzzle problem using Prolog.(K5)
4. Analyze the problem using BFS and DFS algorithm. (K3)
5. Implement water jug and missionaries and cannibal problem using prolog.(K4)
6. Implement water jug and missionaries and cannibal problem using prolog.(K5)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C02	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C03	2	3	2	3	2	1	1	-	1	-	-	1	3	2
C04	2	3	2	3	3	1	1	-	2	-	-	1	2	2
C05	2	3	2	3	3	1	1	-	2	-	-	1	2	3
C06	2	3	2	3	3	1	1	-	2	-	-	1	2	3

SEMESTER - IV

20AIPL402 SDG NO. 4	BIOMEDICAL IMAGE AND SIGNAL PROCESSING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop basic knowledge in Signal and Image.
- To expose the various Signal and image Processing Techniques
- To extend the skill to use Visualization Methods
- To Analyze the real time data sets
- To develop Image Compressed and Segmented Model
- To analyze and visualize Image and Signal data

LIST OF EXPERIMENTS :

SIGNAL PROCESSING:

1. Representation of basic discrete time signals
2. Computation of convolution -linear convolution
3. Response of a difference equation to initial conditions; stability
4. DFT and FFT computation
5. FIR filter design using windowing techniques
6. IIR filters design-digital Butterworth filter and Chebyshev filter
7. Simulation of Bio-signals.
8. Analysis of ECG signals.
9. Analysis of EEG signals
10. Analysis of EMG signals

IMAGE PROCESSING:

1. Display of an image, negative of an image.
2. Contrast stretching of a low contrast image.
3. Display of a histogram, and histogram equalization.
4. Bit plane slicing of an image.
5. Image enhancement by Intensity/Gray level slicing.
6. Implementation of FT for an image.
7. Implementation of High pass, Low pass filtering.
8. Mean and Median filtering of an image.
9. Implementation of image sharpening filters and edge detection using gradient filters.

10. Image Rotation (Clockwise and anticlockwise) and Flipping (Horizontal and Vertical)
11. Canny edge detection.
12. Image compression by DCT.
13. Implementation of image segmentation techniques.

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Describe common Characteristics of Signal and image. (K1)
2. Analyze and Construct Signal and Image. (K4)
3. Configure different filters for Signal and Image. (K2)
4. Analyze real time data set. (K4)
5. Implement Image Segmentation Techniques. (K3)
6. Implement Visualization methods. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C02	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C03	2	3	2	3	2	1	1	-	1	-	-	1	3	2
C04	2	3	2	3	3	1	1	-	2	-	-	1	2	2
C05	2	3	2	3	3	1	1	-	2	-	-	1	2	3
C06		2	3	2	3	3	1	1	-	2	-	-	1	2

SEMESTER - IV

20AIPL403 SDG NO. 4	ADVANCE MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To develop advance knowledge in Machine Learning.
- To expose the various algorithms In Machine Learning
- To extend the skill to use Advance Machine Learning Algorithms
- To Analyze the real time data sets
- To analyze Model-Based Algorithms
- To analyze and visualize data

LIST OF EXPERIMENTS :

1. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
2. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
3. Write a program to construct model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
4. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Mean's algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
5. Write a program to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
6. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
7. Implement Support Vector Machine Algorithm for advanced classification of data.
8. Write a program to implement CNN algorithm.
9. Implement Deep Q Network for the analysis of data.
10. Write a program to implement Reinforcement Learning and Model-Based Reinforcement Learning.

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Describe Advance Machine Learning Algorithms. (K1)
2. Analyze and Construct the Data Visualization. (K4)
3. Configure the Programming Environment. (K2)
4. Analyze real time data set. (K4)
5. Implement Advanced Machine Learning Algorithms for data analysis. (K3)
6. Implement advanced machine learning concepts for real time applications. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C02	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C03	2	3	2	3	2	1	1	-	1	-	-	1	3	2
C04	2	3	2	3	3	1	1	-	2	-	-	1	2	2
C05	2	3	2	3	3	1	1	-	2	-	-	1	2	3
C06	2	3	2	3	3	1	1	-	2	-	-	1	2	3

SEMESTER - IV

20AITE401 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

PROBLEM SOLVING 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**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 - 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

6

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

6

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

6

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 ORACLE BASICS

6

Java Fundamental-Java Programming- Artificial Intelligence and Machine Learning in Java.

UNIT V KAGGLE

6

Introduction to Kaggle- Projects on Kaggle Data Set

TOTAL : 30 PERIODS

TEXT BOOKS :

1. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
4. Herbert Schildt, "Java The complete reference", 8th Edition, McGraw Hill Education, 2011.
5. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.

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. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
5. Steven Holzner, "Java 2 Black book", Dreamtech press, 2011.

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

SEMESTER - IV

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	-	-	-	-

Imagine the Future and Make it happen!



1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



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

CEO - Sairam Institutions

We build a Better nation
through Quality education.



Sri

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An Autonomous Institution

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