

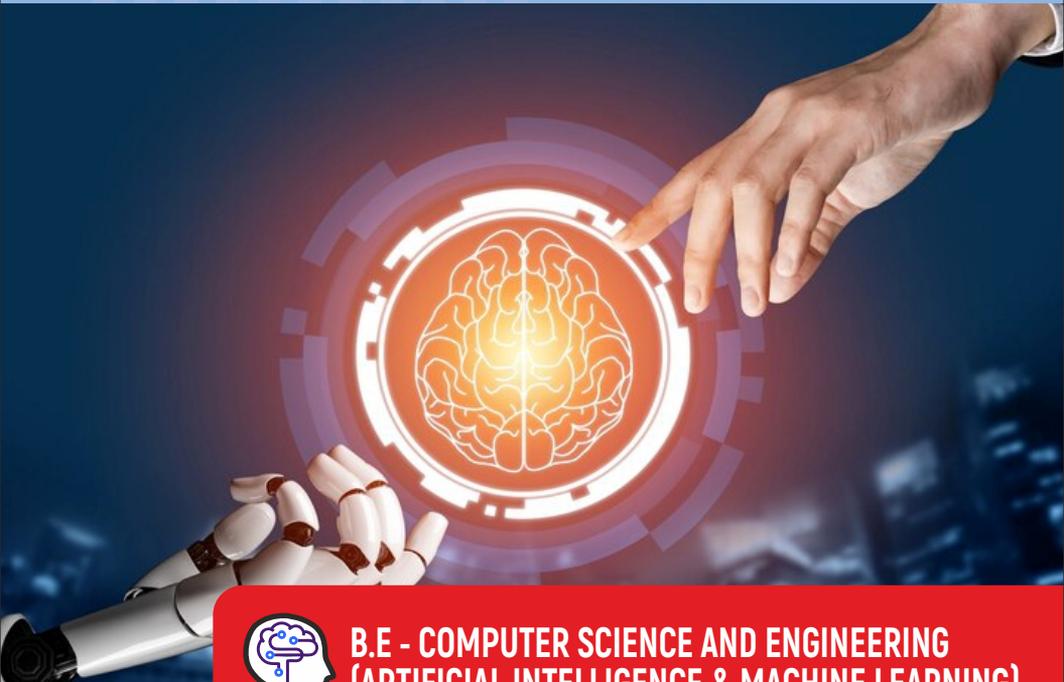


Sri

SAI RAM
ENGINEERING COLLEGE

An Autonomous Institution
West Tambaram, Chennai - 44
www.sairam.edu.in

Approved by AICTE, New Delhi
Affiliated to Anna University



**B.E - COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)**

**REGULATIONS
2020**

Academic Year 2022-23 onwards

**AUTONOMOUS
CURRICULUM AND**

**SYLLABUS
I - II
SEMESTERS**

SRI SAIRAM ENGINEERING COLLEGE



VISION

To emerge as a “Centre of excellence” offering Technical Education and Research opportunities of very high standards to students, develop the total personality of the individual and instil high levels of discipline and strive to set global standards, making our students technologically superior and ethically stronger, who in turn shall contribute to the advancement of society and humankind.



MISSION

We dedicate and commit ourselves to achieve, sustain and foster unmatched excellence in Technical Education. To this end, we will pursue continuous development of infra-structure and enhance state-of-the-art equipment to provide our students a technologically up-to-date and intellectually inspiring environment of learning, research, creativity, innovation and professional activity and inculcate in them ethical and moral values.



QUALITY POLICY

We at Sri Sai Ram Engineering College 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 Service to satisfy the Students, Parents, Industry and Society.

B.E - COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)



VISION

To emerge as a “Centre of Excellence” in the field of Artificial Intelligence and Machine Learning by providing required skill sets, domain expertise and interactive industry interface for students and shape them to be a socially conscious and responsible citizen.



MISSION

Computer Science and Engineering (Artificial Intelligence and Machine Learning), Sri Sairam Engineering College is committed to

- M1** Nurture students with a sound understanding of fundamentals, theory and practice of Artificial Intelligence and Machine Learning.
- M2** Develop students with the required skill sets and enable them to take up assignments in the field of AI & ML
- M3** Facilitate Industry Academia interface to update the recent trends in AI & ML
- M4** Create an appropriate environment to bring out the latent talents, creativity and innovation among students to contribute to the society.

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 Modeling	3	1	0	4	4
2	20AIPC302	Fundamental of Machine Learning Techniques	3	0	0	3	3
3	20AIPC401	Fundamentals of Artificial Intelligence	3	0	0	3	3
4	20CSPC401	Operating Systems	3	0	0	3	3
5	20CSPC402	Database Management Systems	3	0	0	3	3
PRACTICAL							
6	20AIPL301	Probability & Statistical Modeling Laboratory	0	0	3	3	1.5
7	20AMPL301	Data Science and Machine Learning Laboratory	0	0	3	3	1.5
8	20CSPL402	Database Management Systems Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - III							
9	20AMTE301	Live-in-Lab-I	0	0	2	2	1
10	20AMTP301	Skill Enhancement	0	0	2	2	1
TOTAL						29	22.5

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	20CSPC301	Object Oriented Programming	3	0	0	3	3
4	20ECEL709	Digital Image Processing	3	0	0	3	3
5	20AIPC502	Deep Learning	3	0	0	3	3
6	20CSPW401	Computer Networks with Lab	3	0	2	5	4
PRACTICAL							
7	20AIPL401	DAA and AI Laboratory	0	0	3	3	1.5
8	20AIPL501	Deep Learning Laboratory	0	0	3	3	1.5
9	20AMTE401	Live-in-Lab-II	0	0	2	2	1
VALUE ADDITIONS - IV							
10	20AMTP401	Skill Enhancement	0	0	2	2	1
11	20MGMC401	Constitution of India	2	0	0	2	0
TOTAL						33	25

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20AMPW501	Data Visualization Techniques with Lab	3	0	2	5	4
2	20AMPC501	Applied Computer Vision	3	0	0	3	3
3	20AIPC503	Natural language Processing and Chatbot	3	0	0	3	3
4	20AMPC502	IoT & Edge Computing	3	0	0	3	3
5	20XXELXXX	Professional Elective-I	3	0	0	3	3
PRACTICAL							
6	20AMPL501	Computer Vision 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	20AMTE501	Live-in-Lab-III	0	0	2	2	1
10	20AMTP501	Skill Enhancement	0	0	2	2	1
TOTAL						30	22.5

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	20AIPC403	Advanced Machine Learning	3	0	0	3	3
3	20AIPW602	Big Data Analytics 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	20AIPL403	Advanced Machine Learning Laboratory	0	0	3	3	1.5
8	20HSP501	Communication and Soft Skills Lab	0	0	2	2	1
9	20AMPJ601	Innovative Design Project	0	0	2	2	1
VALUE ADDITIONS - VI							
10	20AMTP601	Skill Enhancement	0	0	2	2	1
TOTAL						29	22

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	20AMPC701	Generative Deep Learning	3	0	0	3	3
4	20XXELXXX	Professional Elective-III	3	0	0	3	3
5	20XXOEXXX	Open Elective-V	3	0	0	3	3
PRACTICAL							
6	20AIPL701	Cloud Computing Laboratory	0	0	3	3	1.5
7	20AMPJ701	Project Phase-I	0	0	4	4	2
VALUE ADDITIONS - VII							
8	20AMTP701	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	20XXELXXX	Professional Elective-IV	3	0	0	3	3
PRACTICAL							
2	20AMPJ801	Project Phase-II	0	0	8	8	4
TOTAL						11	7

CREDIT DISTRIBUTION

Category	BS	ES	HS	EL	PC+PL	PW	OE	TE	PJ	TP	IS	MC	TOTAL
Credit	29.5	12	10	9	67.5	12	9	3	7	7	3	0	169
Percentage	17.5	7.1	5.9	5.3	39.9	7.1	5.3	1.8	4.1	4.1	1.8	0	100

*IS-Internship

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AMEL501	Ethics and Policy Issues in AI Computing	3	0	0	3	3	AI
2	20AMEL502	Agent Based Intelligent System	3	0	0	3	3	AI
3	20AMEL503	Data Mining	3	0	0	3	3	ML
4	20ITEL806	Pattern Recognition Techniques	3	0	0	3	3	ML
5	20AIEL505	Social Network Analysis	3	0	0	3	3	Systems & Computing
6	20CBEL604	Computer Graphics & Multimedia	3	0	0	3	3	Systems & Computing
7	20AMEL504	Data and Information security	3	0	0	3	3	IoT & Cyber Security
8	20AMEL505	Data Science for Internet of Things	3	0	0	3	3	IoT & Cyber Security
9	20ECEEL708	Brain Computer Interface and its Applications	3	0	0	3	3	Healthcare
10	20AIEL504	Intellectual Property Rights and Design Thinking	3	0	0	3	3	Management

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AMEL601	Optimization Techniques for Programming	3	0	0	3	3	AI
2	20AMEL602	Virtual Reality and Augmented Reality	3	0	0	3	3	AI
3	20AMEL603	FuzzySystems	3	0	0	3	3	ML
4	20AMEL604	Statistics for Business Analytics	3	0	0	3	3	ML
5	20AMEL605	Data Acquisition System	3	0	0	3	3	Systems & Computing
6	20CBEL504	Web Technology	3	0	0	3	3	Systems & Computing
7	20AMEL606	Cryptography and Network Security	3	0	0	3	3	IoT & Cyber Security
8	20AMEL607	Software and Programming in IoT	3	0	0	3	3	IoT & Cyber Security
9	20AMEL608	Sensors and Transducers in Healthcare	3	0	0	3	3	Healthcare
10	20AMEL609	Accounting and Financial Management	3	0	0	3	3	Management

PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL705	Expert System	3	0	0	3	3	AI
2	20AMEL701	Decision Making under Uncertainty	3	0	0	3	3	AI
3	20AIEL710	Game Theory	3	0	0	3	3	ML
4	20AMEL702	Sentiment Analysis	3	0	0	3	3	ML
5	20AIEL706	Cognitive Computing	3	0	0	3	3	Systems & Computing
6	20CSEL703	Information Retrieval Techniques	3	0	0	3	3	Systems & Computing
7	20AMEL703	Industry IoT 4.0	3	0	0	3	3	IoT & Cyber Security
8	20AMEL704	IoT for Smart Cities	3	0	0	3	3	IoT & Cyber Security
9	20AMEL705	Healthcare Analytics	3	0	0	3	3	Healthcare
10	20AMEL706	Sustainable Business Models	3	0	0	3	3	Management

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDIT	STREAM
			L	T	P			
1	20AIEL714	Artificial Intelligence Search Methods for Problem Solving	3	0	0	3	3	AI
2	20AIEL719	Business Intelligence	3	0	0	3	3	AI
3	20AMEL711	Deep Reinforcement Learning	3	0	0	3	3	ML
4	20AMEL712	Bio-inspired optimization Techniques	3	0	0	3	3	ML
5	20CSEL601	Software Project Management	3	0	0	3	3	Systems & Computing
6	20ITEL708	Full Stack Software Development	3	0	0	3	3	Systems & Computing
7	20AIEL711	Cyber Crime & Computer Ethics	3	0	0	3	3	IoT & Cyber Security
8	20AIEL716	Secure Cloud Computing	3	0	0	3	3	IoT & Cyber Security
9	20AMEL713	Biometric Systems	3	0	0	3	3	Healthcare
10	20AMEL714	Entrepreneurship Development	3	0	0	3	3	Management

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

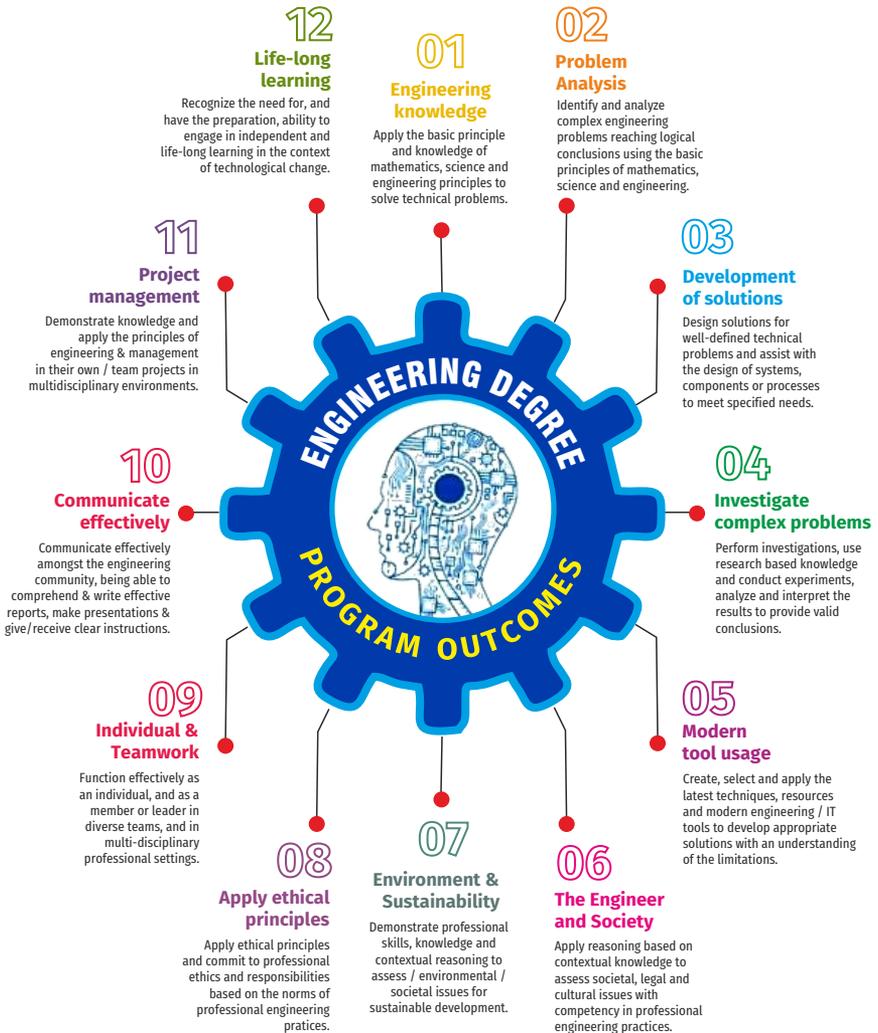
- PEO1** Graduates imbibe fundamental knowledge in Artificial Intelligence, Programming, Mathematical modelling and Machine Learning
- PEO2** Graduates will be trained to gain domain expertise by applying the theory basics into practical situation through simulation and modelling techniques.
- PEO3** Graduates will enhance the capability through skill development and make them industry ready by inculcating leadership and multitasking abilities
- PEO4** Graduates will apply the gained knowledge of AI & ML in Research & Development, Innovation and contribute to the society in making things simpler.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1** The graduates will be in a position to design, develop, test and deploy appropriate mathematical and programming algorithms required for practical applications.
- PSO2** The graduates will have the required skills and domain expertise to provide solutions in the field of Artificial Intelligence and Machine Learning for the Industry and society at large.

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://engineeringvidelectures.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.

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

OUTCOMES:

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

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

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	3	3	-	-	-	-	-	-	-	1
C02	3	2	3	3	-	-	2	-	-	-	-	3
C03	3	3	3	2	-	-	3	-	-	-	-	2
C04	3	3	3	3	-	-	-	-	-	-	-	3
C05	3	3	3	3	-	-	3	-	-	-	-	3
C06	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" DhanpatRai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

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

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

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

CO – PO MAPPING:

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

SEMESTER - I

20ESCS101	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	C
SDG NO. 4&9		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 drawingsheets.
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
CO1	3	3	3	2	1	3	3	2	2	1	1	3
CO2	3	3	3	3	3	3	3	2	2	2	2	3
CO3	3	3	3	3	3	3	3	2	1	1	2	3
CO4	3	2	3	3	1	1	2	2	2	2	3	2
CO5	3	2	3	3	1	1	2	2	2	2	3	2
CO6	3	2	3	3	1	1	2	2	2	2	3	2

SEMESTER - I

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

OBJECTIVES:

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

LIST OF EXPERIMENTS

- 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

20ECTP101 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
C01	-	-	-	-	-	2	2	3	3	1	1	1
C02	-	-	-	-	-	2	2	3	3	1	1	1
C03	-	-	-	-	-	2	2	3	3	1	1	1
C04	-	-	-	-	-	2	2	3	3	1	1	1
C05	-	-	-	-	-	2	2	3	3	1	1	1
C06	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - II

20BSMA204 SDG NO. 4	DISCRETE STRUCTURES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To learn the basic concepts of Relations and Functions
- To learn the concepts of Mathematical induction, Permutation and Combination
- To understand the concepts of Logic, Rules of inference and Quantifiers
- To impart the knowledge on Groups, Normal subgroups, Rings and Fields
- To develop Graph Algorithms by using the concepts of Graphs and Trees

UNIT I RELATION AND FUNCTION 12

Binary Relation, Partial Ordering Relation, Equivalence Relation – Sum and Product of functions – Bijective functions – Inverse and composite functions.

UNIT II COMBINATORICS 12

The Principles of Mathematical Induction-The Well-Ordering Principle – Recursive definition – Basic counting techniques – Inclusion and exclusion , Pigeonhole principle – Permutation – Combination.

UNIT III LOGICS AND PROOFS 12

Basic Connectives – Truth Tables – Logical Equivalence: The Laws of Logic, Logical Implication – Rules of Inference – The use of Quantifiers – Proof Techniques: Some Terminology – Proof Methods and Strategies – Forward Proof – Proof by Contradiction – Proof by Contraposition.

UNIT IV ALGEBRAIC STRUCTURES 12

Algebraic Structures with One Binary Operation – Semi Groups, Monoids, Groups, Permutation Groups – Subgroups – Normal subgroups – Algebraic Structures with two Binary Operations - Definition and Examples of Rings and Fields – Boolean Algebra – Identities of Boolean Algebra.

UNIT V GRAPHS AND TREES 12

Graphs and their properties – Degree, Connectivity, Path, Cycle – Sub Graph – Isomorphism – Eulerian and Hamiltonian Walks – Rooted Trees, Trees and Sorting.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications: with Combinatorics and Graph Theory", 7th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2015.
2. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science", Tata Mc Graw Hill Education (India) Edition 1997.
3. Narsingh Deo, "Graph theory with applications to Engineering and Computer Science", Prentice Hall Inc, Englewood Cliffs,N.J., 1974.

REFERENCES:

1. Susanna S. Epp, "Discrete Mathematics with Applications", 4th edition, Brooks/Cole, Cengage Learning, 2010.
2. Norman L. Biggs, "Discrete Mathematics", 2nd Edition, Oxford University Press, 2002.
3. Seymour Lipschutz, MarcLipson, "Discrete Mathematics, Schaum's Outlines Series", 3rd edition, McGraw-Hill Education, 2009.
4. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", 4th Edition, Tata McGraw–Hill Education Pvt. Ltd, 2012.

WEB REFERENCES :

1. <https://web.stanford.edu/class/cs103x/cs103x-notes.pdf>
2. <https://www.cs.cornell.edu/~rafael/discmath.pdf>
3. <http://home.iitk.ac.in/~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=4LITmsfDS4Y&list=PLEAYkSg4uSQ2Wfc_l4QEZUSRdx2ZcFzi0&index=13
- 4 <https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf>
5. <https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ90QGMqxersk8fUxiUMSIx0DBqsKZS>

OUTCOMES:

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

1. Classify the relations and functions defined on a set. (K2)
2. Apply counting principle and mathematical induction to solve combinatorial problems. (K3)
3. Construct mathematical arguments using logical connectives, quantifiers and verify the correctness of an argument using symbolic logic, truth tables and proof strategies. (K3)
4. Explain the fundamental concepts of algebraic structures such as groups, rings, fields and Boolean algebra. (K3)
5. Illustrate the concepts of graphs and sorting in trees. (K3)

CO- PO MAPPING :

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

SEMESTER - II

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

OBJECTIVES:

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

UNIT I LANGUAGE DEVELOPMENT**9**

Listening – Listening conversations involving two participants – multiple

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

UNIT II VOCABULARY BUILDING

9

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

UNIT III WRITING TECHNICAL REPORTS

9

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

UNIT IV TECHNICAL WRITING

9

Listening – Model debates & documentaries - Speaking – expressing agreement/disagreement, assertiveness in expressing opinions – Reading biographies/autobiographies – Writing – note-making – formal letters – inviting guests – acceptance/declining letters - Language Development – degrees of comparison - numerical adjectives – embedded sentences

UNIT V GROUP DISCUSSION AND JOB APPLICATION

9

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES

1. <https://www.ef.com/wwen/english-resources/>
2. https://www.smilesforlearning.org/gclid=EAIaIQobChMI49DF9bnd6AIVSY6PCh1d_gV9EAAYASAAEgIBPvD_BwE.

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

1. Define technical terms with the correct use of grammar (K1)
2. Identify new words, phrases, idioms and summarize articles/ write ups effectively (K2)
3. Pronounce words correctly, speak fluently and share opinions and suggestions effectively in conversations, debates and discussions (K3)
4. Construct reports convincingly and write official letters emphatically (K3)
5. Communicate confidently while speaking and writing by employing language strategies (K2)
6. Adapt group behavior, execute their role as a contributing team member and prepare winning job applications (K3)

CO - PO MAPPING:

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

SEMESTER - II

20BSPH203 SDG NO. 4	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the essential principles of physics of conducting materials, super conducting and optical properties of materials
- To educate the basic principles of semi conductor device and electron transport properties
- To become proficient in magnetic materials
- To acquire the basic working of nano electronic devices

UNIT I CONDUCTING MATERIALS**9**

Classical free electron theory-Expression for electrical conductivity-Thermal conductivity expression-Wiedemann-Franzlaw-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 SEMI CONDUCTOR MATERIALS**9**

Intrinsic Semiconductors - Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semi conductors-extrinsic semi conductors-Carrier concentration in N-type & P-type semi conductors-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-para magnetism - ferro magnetism - anti ferro magnetism - ferri magnetism -Ferro magnetism: 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-GMRsensor.

UNIT IV SUPER CONDUCTING & 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 NANODEVICES

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 nano materials-Tunneling: single electron phenomena and single electron transistor - Quantum dot laser -Carbon nano tubes: Properties and applications.

TOTAL: 45PERIODS

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 able to

1. Understand the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K2)
2. Illustrate the various types of semiconductors based on band gap energy and doping, expression for carrier concentration, Fermi energy and their variations (K2)
3. Apply the suitable semiconducting materials for Hall device, Schottky and tunnel diode fabrication and acquire the basic knowledge of magnetic materials and its classification (K3)
4. Gain the knowledge on the types of superconducting and optical materials, properties of superconductors, mechanism of carrier generation and recombination in optical data storage devices (K2)
5. Apply the semiconducting, ferri magnetic and superconducting materials in optical devices, data storage devices and magnetic levitation (K3)
6. Understand the basics of 1D, 2D, 3D quantum structures, single electron transport, carbon nano tubes and its applications (K3)

CO - PO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

UNIT I ENVIRONMENT, ECO SYSTEMS AND BIODIVERSITY 10

Definition, scope and importance of environment – need for public awareness– Ecosystem: concept of an ecosystem – structure and functions of an ecosystem – Biotic and abiotic components – Bio geo chemical cycle (C, N & P) –energy flow in the ecosystem – food chains, food webs and ecological pyramids– ecological succession - keystone species. Introduction to bio diversity definition: genetic, species and ecosystem diversity – values of biodiversity –IUCN Red list species classification - endemic, endangered, rare, vulnerable, extinct and exotic species – Biodiversity at global, national and local levels –India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – man-wildlife conflicts. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of Terrestrial (Forest, Grassland, Desert) and Aquatic ecosystem (Pond, Lake, River, Estuary and Marine)

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear pollution – solid waste management: causes, effects and control measures of municipal solid wastes (MSW) – role of an individual in prevention of pollution – Case studies related to environmental pollution. Disaster management: floods, earthquake, cyclone and landslides – nuclear holocaust – Case studies.

UNIT III NATURAL RESOURCES**9**

Forest resources: Use and over – exploitation, deforestation – Land resources: land degradation, man induced landslides, soil erosion and desertification – Water resources: Use and over- utilization of surface and ground water – dams-benefits and problems, conflicts over water – Mineral resources: Environmental effects of extracting and using mineral resources – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – fertilizer – pesticide problems, water logging and salinity. Energy resources: Renewable energy (Solar energy, Wind energy, Tidal energy, Geothermal energy, OTE, Biomass energy) and nonrenewable energy (Coal, Petroleum, Nuclear energy) sources. – role of an individual in conservation of natural resources. Case studies – timber extraction, mining, dams and their effects on forests and tribal people.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**9**

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect- role of greenhouse gases on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures). environmental ethics: Issues and possible solutions – Green chemistry – 12 principles of green chemistry. Urbanisation - Urban problems related to energy - Water conservation: rainwater harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns - case studies. Environment Legislations and Laws : Environment (protection) act – 1986. Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. Biomedical Waste (Management and Handling rules): 1998 and amendments- scheme of labelling of environmentally friendly products (Ecomak) - Issues involved in enforcement of environmental legislation - central and state pollution control boards, role of non-governmental organization – Public awareness - Environmental Impact Assessment (EIA).

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

Population growth, variation among nations – population explosion – family welfare programme – women and child welfare environment and human health – HIV / AIDS – Role of Information Technology in environment and Human health – Case studies – human rights – value education – Sustainable Development – Need for sustainable development – concept – 17

SDG goals – 8 Millennium Development Goals(MDG).

TOTAL : 45 PERIODS

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.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.

REFERENCES:

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

OUTCOMES:

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

1. Explain the different components of environment, structure and function of an ecosystem, importance of bio diversity and its conservation. (K1)
2. Aware about problems of environmental pollution, its impact on human and ecosystem, control measures and basic concepts in Disaster Management. (K2)
3. Disseminate the need for the natural resources and its application to meet the modern requirements and the necessity of its conservation. (K2)
4. Illustrate the various aspects of atmospheric chemistry with a focus on climate change and recognize the principles of green chemistry. Describe suitable scientific, technological solutions and Protection Acts to eradicate social and environmental issues. (K2)
5. Recognize the need for population control measures and the environmental based value education concepts to achieve the Sustainable Development Goals. (K2)

CO - PO MAPPING :

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

SEMESTER - II

20ESIT202 SDG NO. 4&9	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop simple Python programs with conditionals and loops
- To define Python functions and to implement lists, tuples, dictionaries and sets
- To perform file operations and understand OO concepts in Python
- To understand NumPy, Pandas and Matplotlib

UNIT I BASICS OF PYTHON PROGRAMMING**9**

Introduction to Python – Literals – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved words – Indentation – Operators and Expressions - Conditionals: Boolean values and operators - conditional if - alternative if - chained conditional - Iteration - Illustrative programs: Evaluation of expressions - String Operations - Circulate the values of n variables - Square root (Newton's method) - GCD - Sum an Array of Numbers.

UNIT II STRING, LISTS, TUPLES, DICTIONARIES, SETS**9**

Strings: String slices - Immutability - String functions and methods - String module - Lists: List operations - List slices - List methods - List loop - Mutability - Aliasing - Cloning lists - List parameters - Tuples: Tuple assignment - Tuple as return value.

Dictionaries: Operations and Methods - Advanced list processing - List comprehension - Sets: Creating Sets – Operations and methods – Set comprehension - Illustrative programs: Linear search - Binary search - Selection sort - Insertion sort - Merge sort.

UNIT III FUNCTIONS, MODULES, PACKAGES

9

Functions - definition and use - Flow of execution - Parameters and arguments - Fruitful functions: Return values - Parameters - Local and global scope - Function composition - Recursion - Modules – from import statement – Name of Module – Making your own modules - Packages - Packages in Python – Standard Library Modules – Globals(), Locals() and Reload(); Illustrative programs: Fibonacci series using functions - Arithmetic operations using module - Area of different shapes using packages.

UNIT IV FILES, EXCEPTIONS, CLASSES AND OBJECTS

9

Files and exception: Text files - Reading and writing files - Format operator - Command line arguments - Errors and exceptions - Handling exceptions - Classes and Objects: Defining classes - Creating Objects – Data abstraction – Class constructor – Class variables and Object variables – Public and Private data members – Private Methods; Illustrative programs: Word count - Copy file - Creating user defined exception - Creating student class and object.

UNIT V NUMPY, PANDAS, MATPLOTLIB

9

Introduction - Basics of NumPy - N-dimensional Array in NumPy - Methods and Properties - Basics of SciPy - Broadcasting in NumPy Array Operations - Array Indexing in NumPy, Pandas - Introduction - Series - DataFrame - Matplotlib - Basics - Figures and Axes - Method subplot() - Axis container Illustrative Programs: Multiplying a Matrix by a Vector, Solving Linear System of Equations - Using Pandas to Open CSV files - Creating a Single plot.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford University Press 2018.
2. Anurag Gupta, G.P. Biswas, “Python Programming: Problem Solving, Packages and Libraries”, McGrawHill, 2020.

REFERENCES:

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016

2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.
3. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
5. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
6. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
7. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
8. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

WEB REFERENCES:

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

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

1. Understand the syntax and semantics, string operations of python programming language (K2)
2. Develop python programs using control flow statements.(K3)
3. Construct various Data structures to develop python programs. (K3)
4. Illustrate the concepts of Functions, Modules and Packages in Python.(K3)
5. Understand the concepts of ObjectOriented Programming, files and Exception handling.(K2)
6. Examine various problem solving concepts in python to develop real time applications.(K4)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	3	3	1	1	0	0	1	0	1	2	2
C02	3	3	3	3	3	1	0	0	0	0	0	1	2	2
C03	3	3	3	3	3	2	1	0	0	0	0	1	2	2
C04	3	3	3	3	3	2	1	0	0	0	0	1	2	2
C05	3	3	3	3	3	2	2	1	0	2	0	2	3	3
C06	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 ALGORITHM7

Algorithm Specification - Recursion - Performance Analysis - Asymptotic Notation - The Big-O - Omega and Theta Notation - Programming Style - Refinement of Coding-Time-SpaceTrade 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–TreeTraversals-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: Volume1: 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: AnIntroduction (Open Paths to Enriched Learning), 31st Edition, Pat Morin, UBC Press.

WEB RESOURCES:

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
CO1	2	2	1	2	1	1	1	0	2	2	3	3	3	2
CO2	2	2	1	2	1	1	1	0	2	2	3	3	3	2
CO3	3	3	2	3	3	1	1	1	2	2	3	3	3	2
CO4	2	2	1	2	3	2	1	0	1	1	2	1	3	2
CO5	2	2	1	2	3	2	1	0	1	1	2	1	3	2
CO6	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:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
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 counts 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 30Nos OR Server with C compiler supporting 30 terminals or more.

OUTCOMES

On completion of the 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
C01	1	1	-	-	-	1	2	-	1	1	-	2
C02	2	2	2	-	2	2	3	1	2	2	-	2
C03	1	1	1	1	-	1	1	-	1	2	-	1
C04	2	2	2	2	1	1	1	-	1	1	1	1
C05	2	2	1	-	-	1	1	-	-	-	1	-
C06	1	1	1	1	1	1	1	1	1	1	1	1

SEMESTER - II

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

OBJECTIVES:

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

ELECTRICAL ENGINEERING PRACTICE

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

ELECTRONICS ENGINEERING PRACTICE

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

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

CIVIL ENGINEERING PRACTICE

Buildings:

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

Plumbing Works:

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

Carpentry using Power Tools only:

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

MECHANICAL ENGINEERING PRACTICE

Welding:

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

Basic Machining:

1. Simple Turning and Taper turning.
2. Drilling Practice.

Sheet Metal Work:

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

Machine assembly practice:

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

Demonstration on:

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

Total : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. Electrical

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

2. Electronics

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

3. Civil

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

Jigsaw

2 Nos

4. Mechanical

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

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

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

CO - PO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

UNIT I RESUME BUILDING

6

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

UNIT II VIRTUAL MEETINGS

6

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

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

UNIT III ONLINE LEARNING

6

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

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

UNIT IV GOOGLESUITE

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/knowning-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/CommSkil/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.

6

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

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

SAI RAM ENGINEERING COLLEGE

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