P.S.R. ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Sevalpatti (P.O), Sivakasi – 626140.

B.E. Electronics and Communication Engineering

CURRICULUM AND SYLLABI

UG REGULATION-2023

CURRICULUM AND SYLLABI

1st to 6th Semester]

INSTITUTE VISION AND MISSION VISION

To contribute to the society through excellence in technical education with societal values and thus a valuable resource for industry and the humanity.

MISSION

- To create an ambience for quality learning experience by providing sustained care and facilities.
- To offer higher level training encompassing both theory and practices with human and social values.
- To provide knowledge based services and professional skills to adapt tomorrow's technology and embedded global changes.

DEPARTMENT VISION AND MISSION VISION

- The vision of the Electronics and Communication Engineering Department is to produce graduates with sound knowledge for the betterment of society and to meet the dynamic demands of industry and research.

MISSION

- Offering under graduate and post graduate programmes by providing effective and balanced curriculum and equip themselves to gear up to the ethical challenges awaiting them.
- Providing the technical, research and intellectual resources that will enable the students to have a successful career in the field of electronics and communication engineering.
- Providing need based training and professional skills to satisfy the needs of society and industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Gain the required knowledge with basics in the field of Electronics and Communication Engineering to lead a professional career.

PEO2: Assess and deal with the problems with social values relevant to the field of Electronics and Communication Engineering.

PEO3: Engage in life-long learning by participating in professional activities and carrying out Projects/research.

PEO4: Acquire relevant skills and to lead a team with ethics for success.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Design, and analyze diverse problems in the field of telecommunication with standards.

PSO2: Design and analyze the basics to advanced analog and digital electronics.

PSO3: Apply signal and image processing techniques to study and analyze the systems for applications.

PROGRAMME OUTCOMES (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design / Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and the World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team Work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

SEMESTER I						
Course Code	**Course Title**	**Category**	L	T	P	C
231IP00	Induction Programme	HS	-	-	-	0
THEORY						
231HS11	Functional English	HS	3	0	0	3
231BS11	Matrices and Calculus	BS	2	1	0	3
231BS12	Engineering Physics	BS	3	0	0	3
231BS13	Engineering Chemistry	BS	3	0	0	3
231ES12	Basics of Civil and Mechanical Engineering (for ECE, EEE & BME)	ES	3	0	0	3
231ESF2	Engineering Drawing	ES	1	0	4	3
231HS12	Heritage of Tamil/தமிழர் மரபு	HS	3	0	0	1
PRACTICAL						
231BS17	Physics and Chemistry Laboratory	BS	0	0	3	1.5
231ESF8	Engineering Practices Laboratory	ES	0	0	3	1.5
231HS17	English Communication Laboratory-I	EEC	0	0	2	1
Total Credits						23

SEMESTER II						
Course Code	**Course Title**	**Category**	L	T	P	C
THEORY						
231HS21	English for Engineers	HS	3	0	0	3
231BS21	Partial Differential Equations and Numerical Methods	BS	3	0	0	3
231BS22	Physics of Materials	BS	3	0	2	3
231BS24	Environmental Science	BS	3	0	0	3
231ESF1	Problem Solving and Python Programming (for ECE CSE, AIDS & IT)	ES	3	0	0	3
231EE21	Electric Circuits Analysis	PC	3	0	0	3
231HS22	Tamils and Technology/தமிழரும் தொழில்நுட்பமும்	HS	3	0	0	1
PRACTICAL						
231ESF7	Python Programming Laboratory (for ECE, CSE, AIDS & IT)	ES	0	0	3	1.5
231EE27	Electric Circuits Analysis Laboratory	PC	0	0	3	1.5
231HS27	English Communication Laboratory-II	EEC	0	0	2	1
NCC-L1	NCC Course Level 1*	HS	-	-	-	-
Total Credits						23

SEMESTER III						
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**C**
THEORY						
231BS31	Transforms and Complex Analysis	BS	3	0	0	3
231EC31	Electronic Devices and Circuits	PC	3	0	0	3
231EC32	Digital Electronics	PC	3	0	0	3
231EC33	Microcontrollers and Interfacing	PC	3	0	0	3
231EC34	Electromagnetic Fields	PC	3	0	0	3
231EC35	Data Structures with C and C++ (Theory cum Practical)	ES	3	0	2	4
PRACTICAL						
231EC37	Electronic Devices and circuits Laboratory	PC	0	0	3	1.5
231EC38	Microcontrollers and Interfacing Laboratory	PC	0	0	3	1.5
231HS37	Enhancing Communication Skills	EEC	0	0	2	1*
231MCXX	Mandatory Course -1*	MC	-	-	-	-
Total Credits						**22**

SEMESTER IV						
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**C**
THEORY						
231BS41	Probability and Random Processes	BS	3	0	0	3
231EC41	Linear Integrated Circuits	PC	3	0	0	3
231EC42	Signals and Systems	PC	3	0	0	3
231EC43	Analog and Digital Communication	PC	3	0	0	3
231EC44	Networks and Transmission Lines	PC	3	0	0	3
231EC45	Java Programming (Theory cum Practical)	PC	3	0	2	4
PRACTICAL						
231EC47	Integrated Circuits Laboratory	PC	0	0	3	1.5
231EC48	Communication Systems Laboratory	PC	0	0	3	1.5
231HS47	Enhancing Aptitude and Reasoning Skills	EEC	0	0	2	1*
VACEC0X	Value Added Course – 1*	EEC	-	-	-	-
NCC-L2	NCC Course Level 2*	HS	-	-	-	-
Total Credits						**22**

SEMESTER V						
Course Code	**Course Title**	**Category**	L	T	P	C
THEORY						
231EC51	Embedded System Design and IoT	PC	3	0	0	3
231EC52	Digital Signal processing	PC	3	0	0	3

231EC53	Control Systems	PC	3	0	0	3
-	Programme Elective 1	PE	3	0	0	3
-	Programme Elective 2	PE	3	0	0	3
-	Open Elective 1	OE	3	0	0	3
PRACTICAL						
231EC57	Embedded system Design and IoT laboratory	PC	0	0	3	1.5
231EC58	Digital Signal Processing Laboratory	PC	0	0	3	1.5
231MCXX	Mandatory Course -2*	MC	-	-	-	-

SEMESTER VI						
Course Code	**Course Title**	**Category**	L	T	P	C
THEORY						
231EC61	CMOS VLSI Design	PC	3	0	0	3
231EC62	Data Communication Networks	PC	3	0	0	3
231EC63	Antennas and wave Propagation (Theory cum Practical)	PC	3	0	2	4
PRACTICAL						
231EC67	VLSI Design Laboratory	PC	0	0	3	1.5
231EC68	Data Communication Networks Laboratory	PC	0	0	3	1.5
231EC69	Mini Project / Field Project	EEC	0	0	2	1
231ECV2	Value Added Course – 2*	EEC	-	-	-	-
NCC-L3	NCC Course Level 3*	HS	-	-	-	-

S.No	Theory Courses							Practical Courses			Institution Non-credit Courses	Value Added Courses / Mandatory Courses	Total Credits
1	231HS11-Functional English (3) (HS)	231BS11- Matrices and Calculus (3) (BS)	231BS12-Engineering Physics (3) (BS)	231BS13 Engineering Chemistry (3) (BS)	231ESF2 Engineering Drawing (3) (ES)	231ES12-Basics of Civil and Mechanical Engineering (3)(ES)	231HS12 – Heritage of Tamil (1) (HS)	231BS17-Physics & Chemistry Laboratory (1.5) (BS)	231ESF8-Engineering practices Laboratory (1.5) (ES)	231HS17 – English Communication Laboratory – I (1) (EEC)	SIP Induction Programme (HS)		23
2	231HS21-English for Engineers (3) (HS)	231BS21-Partial Differential Equations and Numerical Methods (3) (BS)	231BS22-Physics of Materials (3) (BS)	231BS24-Environmental Science (3) (BS)	23ESF1-Problem solving and Python Programming (3) (ES)	231EE21-Electric circuit analysis (3) (PC)	231HS22 – Tamil and Technology (1) (HS)	231ESF7-Python Programming Laboratory(1.5) (ES)	231EE27-Electric Circuit analysis Laboratory (1.5) (PC)	231HS27 – English Communication Laboratory – II (1) (EEC)	NCC-L1-NCC Course Level 1* (HS)		23
3	231BS31-Transforms and Complex Analysis (3) (BS)	231EC31 Electronic Devices and Circuits (3) (PC)	231EC32 Digital Electronics (3) (PC)	231EC33-Microcontrollers and Interfacing (3) PC	231EC34 Electromagnetic Fields (3) (PC)	231EC35 Data Structures with C and C++ (4) (ES)	-	231EC37-Elect22EC034ronic Devices and circuits Laboratory (1.5) (PC)	231EC38-Microcontrollers and Interfacing Laboratory (1.5) (PC)	-	231HS37 – Enhancing Communication Skills (EEC)	MC - I	22
4	231BS41-Probability and Random processes (3) (BS)	231EC41 - Linear Integrated Circuits (3) PC	231EC42-Signals and Systems (3) (PC)	231EC43 Analog and Digital Communication (3) (PC)	231EC44 Transmission lines and Waveguides (3) (PC)	231EC45 – Java Programming (4) (ES)	-	231EC47-Integrated Circuits Laboratory (1.5) PC	231EC48-Communication systems Laboratory (1.5) PC	-	231HS47 – Enhancing Aptitude and Reasoning Skills (EEC)/ NCC-L2-NCC Course Level 2*(HS)	VAC- I	22
5	231EC51-Embedded system D and IoT (3) PC	231EC52-Digital Signal processing (3) PC	231EC45-Control systems (3) PC	Programme Elective 1 (3) (PE)	Programme Elective 2 (3) (PE)	Open Elective -1 (3) (OE)	-	231EC57-Embedded system Design and IoT laboratory (1.5) PC	231EC58-Digital Signal Processing Laboratory(1.5) PC	-	-	MC - II	21
6	231EC61-VLSI Design (3)PC	231EC62- Data Communication Networks (3) (PC)	231EC63-Antennas and Wave Propagation (4) PC	Programme Elective 3 (3) (PE)	Programme Elective 4 (3) (PE)	Open Elective- 2 (3) (OE)	-	231EC67-VLSI Design Laboratory (1.5) PC	231EC68-Data Communication Networks Laboratory (1.5)PC	231EC69-Mini Project /Field Project (1)(EEC)	NCC-L3-NCC Course Level 3* (HS)	VAC - II	23
7	231EC71-Wireless Communication (3) PC	231EC72 – Microwave and Optical Communication (4) PC	Elective (Management) (3) (HS)	Programme Elective 5 (3) (PE)	Programme Elective 6 (3) (PE)	Open Elective- 3 (3) (OE)	-	231EC79-Project Phase-I (2) (EEC)	231ECIN – Internship (1) (EEC)	-	-	-	22
8	-	-	-	-		-		231EC89-Project Phase-II/ Internship (8) (EEC)					8
Total Credits													164

231IP00 INDUCTION PROGRAMME

This is a mandatory 2-week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have a broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen, and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity, and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. The methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real-life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

The literary activity would encompass reading, writing, and possibly, debating, enacting a play, etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity, etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would

familiarize them with the area as well as expose them to the underprivileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking, etc.) that are relevant to the particular branch of Engineering / Technology / Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests/assessments during this programme.

References:

Guide to Induction program from AICTE

231HS11	FUNCTIONAL ENGLISH			L-T-P	C
				3-0-0	3
Programme:	**B.E./B.Tech. (Common to all branches)**	**Sem:**	**I**	**Category :**	**HS**
Prerequisites :	Basic Language Proficiency				
Objectives :	To acquire basic Language Skills (LSRW) in order to communicate confidently in academic, professional, and social contexts				

Course Outcomes:

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

CO1: Understand the extensive vocabulary usage in formal English Learning.

CO2: Read and comprehend the content in general and professional contexts.

CO3: Write definitions, descriptions, narrations, and essays on various topics.

CO4: Express their opinions effectively in both oral and written communication.

CO5: Develop listening skills and participate effectively in conversations.

CO6: Apply basics of Language & Grammar relating to English communication.

GENERAL READING AND FREE WRITING	**9**
Listening– Listening to comprehension (story), native accents **Speaking**- Greetings, introducing one's self, one's family, asking for directions **Reading** – Casual reading, skimming & scanning, summarizing, note taking, reading comprehension. **Writing**- Paragraph writing, letter writing (formal & informal), **Grammar**- Parts of Speech. **Vocabulary**- Synonyms & Antonyms	
DEVELOPING CONVERSATIONAL ABILITY	**9**
Listening- Listening to short and long conversations from different domains, telephonic conversations. **Speaking**-Narrating personal experiences/events; Interviewing celebrity, task based speeches, giving instructions. **Reading**- Detecting meaning from context, reading biographies, travelogues, newspaper reports, and technical blogs. **Writing**- e-mail writing, report writing. **Grammar**- Subject Verb Agreement; WH question, Yes or No type questions. **Vocabulary**- misplaced modifiers.	
OPINION READING AND WRITING	**9**
Listening –Watching animated stories, and documentaries & responding to questions, **Speaking**- Product description, stress, and intonates- pronunciation skills, discussing various current issues (GD). **Reading**–Critical reading, short stories, verbal reasoning, reading editorials & opinion blocks. **Writing**-Writing definitions; instructions and interpreting charts. **Grammar**-Degrees of comparison; relative pronoun. **Vocabulary**–Homonyms and Homophones,	
ACCENTS AND MEDIA WRITING	**9**
Listening – Listening to the talks of great personalities, news videos, and phonetic sounds**. Speaking** –summarizing documentaries, interviews, podcasts, and mini presentations. **Reading** – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc.) **Writing** – Note-making/Note taking (*studies skills to be taught, not tested)Writing recommendations; from nonverbal (chart, graph, etc, to verbal mode) **Grammar** – Articles; simple tenses **Vocabulary**- Root words	
DESCRIPTIVES AND NARRATIVES	**9**
Listening–Listening to debates, discussions, scientific lectures & educational videos. **Speaking**– Picture descriptions, Debates, Role play. **Reading** – silent reading (newspapers, books, pamphlets), understanding captions. **Writing** – Essay Writing (Descriptive or narrative). **Grammar**– Continuous	

and Perfect tenses. **Vocabulary-**Idioms and Phrases.

Total Periods: 45

Text Book

1. Dr.Veena Selvam, Dr.Sujatha Priyadarshini – English for Engineering Students S. Chand Edition Jan-2005
2. Jean Susan – English for Science and Technology, Cambridge University Press, 2021

References

1. Technical Communication–Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ.Press, 2016, New Delhi.
2. Kumar Kul Bhushan - Effective Communication Skills, Khanna Book Publishing, 2016
3. Viswamohan Aysha – English for Technical Communication, Mcgraw Hill Education, May 2008

Extensive Reading

1. Shiv Khera, *You Can Win*, Macmillan Books, New Delhi, 2003.

COs	Program Outcomes (POs) 231HS11 FUNCTIONAL ENGLISH												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO1						1			2	3	1	2				
CO2						1			2	3	1	2				
CO3						1			2	3	1	2				
CO4						1			2	3	1	2				
CO5						1			2	3	1	2				
CO6						1			2	3	1	2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS11	MATRICES AND CALCULUS			L-T-P	C
				2-1-0	3
Programme:	**B.E./B.Tech. (Common to all branches)**	**Sem:**	**I**	**Category :**	**BS**
Prerequisites:	Basic knowledge in matrices, differentiation, and integration at the school level.				
Objectives :	To acquire knowledge and skills in handling matrices and calculus in their field of specialization.				

Course Outcomes:

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

CO1: Solve the problems using matrices.
CO2: Solve the ordinary differential equation.
CO3: Apply the concept of multi variable calculus to solve the problems.
CO4: Use double and triple integrals to compute areas and volumes.
CO5: Apply the concepts of Differentiation and Integration in Vectors.
CO6: Compute areas and volumes by the application of vector calculus theorems.

MATRICES	**9**
Review of Basic Matrices -Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley – Hamilton theorem (Statement and applications only) Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Nature of Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation.	
ORDINARY DIFFERENTIAL EQUATIONS	**9**
Higher order linear differential equations with constant coefficients – Method of variation of Parameters – Cauchy's and Legendre's linear equations.	
MULTIVARIABLE CALCULUS	**9**
Partial Derivatives – Total Derivative – Differentiation of Implicit function – Jacobian – Taylor's Expansion - Maxima/Minima for function of two variables – Method of Lagrange's multipliers.	
MULTIPLE INTEGRALS	**9**
Double integration – Change the order of integration – Change of variables(Polar Co-ordinators) – Area as double integral – Triple integration – Volume as Triple Integral.	
VECTOR CALCULUS	**9**
Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's and Gauss divergence theorems (without proof) – Verification of the above theorems and evaluation of integrals using them.	
Total Periods: 45	
The students may be practiced to solve the problems using Software packages.	

Text Book

1. Grewal B.S., "Higher **Engineering Mathematics** ", 44th Edition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E, "**Advanced Engineering Mathematics** ", 10th Edition, John Wiley, New Delhi, India, 2018.

References

1. Veerarajan.T., "**Engineering Mathematics for First Year**", Fourth Edition, Tata Mc-Graw – Hill, New Delhi, 2008.
2. G.B. Thomas and R.L. Finney, "**Calculus and Analytic Geometry**" 9th Edition, Pearson,

Reprint, 2002.
3. N.P. Bali and Manish Goyal, "**A Text Book of Engineering Mathematics**", Laxmi Publications, Reprint, 2008.
4. Ramana B V, "**Higher Engineering Mathematics**", 1st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.

COs	**Program Outcomes (POs)** **231BS11 MATRICES AND CALCULUS**												**Program Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1						2	1		1
CO2	2	3	2	1	1	1						2	1		1
CO3	3	3	2	1	1	1						2	1		
CO4	3	3	2	1	1	1						2	1		
CO5	3	3	2	1	1	1						2	1		1
CO6	3	3	2	1	1	1						2	1		

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS12	ENGINEERING PHYSICS			L-T-P	C
				3-0-0	3
Programme:	**B.E./B.Tech. (Common to all branches)**	**Sem:**	**I**	**Category:**	**BS**
Prerequisites:	Basic Knowledge in Physics at the School level				
Objective:	To endow the students with the fundamentals of Physics for a better understanding of Engineering and Technology.				

Course Outcomes:

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

CO1: Acquire fundamental knowledge on elasticity and its applications relevant to the field of engineering.
CO2: Gain knowledge about the basic concepts of Acoustics and Ultrasonic.
CO3: Know and acquire the basic concepts of Laser, types of lasers and applications.
CO4: Understand the principles behind fiber optic communications and fiber optic sensors.
CO5: Apply the advanced physics concepts of quantum theory to characterize the matters.
CO6: Get a clear idea about the basics of crystals, structures, and crystal growth techniques.

PROPERTIES OF MATTER	**9**
Elasticity-Stress-strain diagram and its uses-Poisson's ratio- 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	
ACOUSTICS AND ULTRASONICS	**9**
ACOUSTICS: Classification of Sound-Loudness and Intensity-Weber-Fechner Law-standard intensity and intensity level-Decibel-Reverberation-Reverberation time-Jaeger's method-Absorption coefficient and its determination–Factors affecting acoustics of buildings focusing, interference, echo, Echelon effect, resonance -Noise and their remedies. **ULTRASONICS**: Ultrasonic - Production – Magnetostriction and piezoelectric methods - Acoustical grating –Industrial applications-NDT.	
LASERS AND FIBER OPTICS	**9**
LASERS: Population of energy levels, Einstein's A and B coefficients derivation-pumping methods-resonantcavity, optical amplification (qualitative)- three level and four level laser-CO2 Laser-Semiconductor lasers: Homo junction and Hetero junction. Industrial Application-Cutting, welding, soldering, drilling. **FIBER OPTICS:** Principle, Numerical aperture, and Acceptance angle - Types of optical fibers (material, refractive index, mode)-Fiber Optical Communication system(Block diagram) –Fiber optic sensors: pressure and displacement.	
QUANTUM PHYSICS	**9**
Blackbody radiation-Planck's theory (derivation)–Photoelectric Effect-wave particle duality–DE Broglie wavelength - Concept of the wave function and its physical significance - Schrödinger's wave equation-Time independent and Time dependent equations-Particle in a box(one dimensional motion)	
CRYSTAL PHYSICS	**9**
Single crystalline, Polycrystalline and Amorphous materials - Unit cell, crystal systems, Braais lattices, directions and planes in a crystal -Miller indices – Inter planar distance – Calculation of number of atoms per unit cell-Atomic radius-Coordination number - Packing factor for SC, BCC, FCC and HCP structures –PolymorphismandallotropyCrystalgrowthtechniques-Solution,melt(BridgemanandCzochralski).	

Total Periods: 45

Text books:
1. M.N. Avadhanulu & P.G. Kshirshagar,"A Text Book of Engineering Physics",S. Chand & Co Ltd. 2021. 2. R.K.Gaur & S.L.Gupta,"Engineering Physics".Dhanpat Rai Publishers, 2012.

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.		
COs	**Program Outcomes (POs)** **231BS12 ENGINEERING PHYSICS**	**Program Specific Outcomes (PSOs)**

	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	3	1										1	1		
CO2	3	3	3			2	2		1			1	2	1	
CO3	3	2	3	3		1	2		1			1	2	1	
CO4	3	3	3	3		1			1			1	2	1	
CO5	3	2	2	1		1	1					1	2	1	
CO6	3	1	2	1		1	1		1			1		1	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS13	ENGINEERING CHEMISTRY			L-T-P	C
				3-0-0	3
Programme:	**B.E./B.Tech. (Common to all branches)**	**Sem:**	**I**	**Category:**	**BS**
Prerequisites:	Basic Knowledge in Chemistry at the School level				
Objective:	To impart a required knowledge on the principles of chemistry involving the different applications required for the engineering fields.				

Course Outcomes:

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

CO1: Demonstrate the essential concept of water, its properties, and applications.
CO2: Know the treatment of water for potable and industrial purposes.
CO3: Acquire knowledge of electrochemistry, corrosion, and its control.
CO4: Understand the basic principles, preparatory methods, and applications of nanomaterials.
CO5: Elaborate different types of important polymers, techniques, and their uses.
CO6: Explain the concepts of batteries and lubricants.

WATER AND ITS TREATMENT	**9**
Hardness –Types and Estimation by EDTA method – alkalinity – types of alkalinity and determination. Domestic water treatment – disinfection methods – Boiler feed water – internal conditioning – external conditioning – desalination and reverse osmosis.	
ELECTROCHEMISTRY AND CORROSION	**9**
Electrode Potential – Nernst Equation– reference electrode – glass electrode – measurement of pH – electrochemical series – significance – Conductometric titrations (strong acid vs strong base and weak acid vs strong base). Corrosion: Types of corrosion – Factors influencing corrosion – Corrosion control – Sacrificial anode and impressed current cathodic methods – Corrosion inhibitors.	
NANOCHEMISTRY	**9**
Basics: Distinction between molecules, nanomaterials, and bulk materials; Types of nanomaterials: Definition, properties, and uses of nanoparticle, nanocluster, nanorod, nanowire, and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, chemical vapour deposition, electrochemical deposition, and hydrothermal. Applications of nanomaterials in medicine, agriculture, energy, electronics, and catalysis.	
POLYMER CHEMISTRY	**9**
Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical); condensation and copolymerization. Techniques of polymerization: Bulk, emulsion, solution, and suspension. Preparation, properties and uses of Nylon 6, 6, Bakelite, and Epoxy resin.	
ENERGY STORAGE DEVICES AND LUBRICANTS	**9**
Batteries – Primary battery – Dry cell and Lithium battery – Secondary battery – Lead acid battery, Ni-Cd battery, and Lithium-ion battery – Fuel cells – H_2-O_2 fuel cells. Lubricants – mechanism of lubrication, liquid lubricants – properties (viscosity index, flash point, fire point, cloud point, pour point, and oiliness) – solid lubricants – graphite and molybdenum disulphide – semisolid lubricants and emulsions.	
	Total Periods: 45

Text books:

1. A. Ravikrishnan, “Engineering Chemistry”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2023.
2. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi, (2015)

References:
1. S.S. Dara, S.S. Umare, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi 2013. 2. B.R. Puri, L.R. Sharma, M.S. Pathania, Vishal, Principles of Physical Che

mistry, Vishal Publishing Co., Punjab, 47th Edition, 2017.
3. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of Nanoscience and Nanotechnology", Universities Press-IIM

Series in Metallurgy and Materials Science, 2018.
4.V.R.Gowarikeer, N.V.Viswanathan and Jayadev Sreedhar, “Polymer Science”, New Age International P (Ltd.,), Chennai, 2021.

COs	Program Outcomes (POs) 231BS13 ENGINEERING CHEMISTRY												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2		1			2					2		1	
CO2	2	2	2			2		1			2	2		1	
CO3	2	1	1	1			2				1	1		1	
CO4	2	1	1	1								2		1	
CO5	2	1		1			1					2		1	
CO6	2	2				1	2				1	2		1	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231ES12	BASICS OF CIVIL AND MECHANICAL ENGINEERING			L-T-P	C
				3-0-0	3
Programme:	**B.E./B.Tech. (Common to ECE, EEE & BM)**	**Sem :**	**I**	**Category :**	**ES**
Prerequisites :	Basic knowledge in physics and mathematics at the school level.				
Objectives :	To provide the students with the significance of Civil and Mechanical Engineering concepts in general useful for their field of specialization.				

Course Outcomes:

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

CO1: Understanding the field of Civil Engineering and its importance.
CO2: Understanding the field of Mechanical Engineering and its importance.
CO3: Summarize the basic knowledge in surveying, construction materials, and equipment.
CO4: Gain knowledge in building plans and types of constructions for society.
CO5: Know about IC engines and power plant mechanisms.
CO6: Explain the concept of refrigeration and air conditioning systems.

OVERVIEW OF CIVIL AND MECHANICAL ENGINEERING	**9**
Civil Engineering Contributions to the Welfare of Society - Specialized Sub-disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation, and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings. Overview of **Mechanical Engineering** - Mechanical Engineering Contributions to the Welfare of Society –Specialized sub-disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.	
SURVEYING AND CIVIL ENGINEERING MATERIALS	**9**
Objects – Classification – Principles – Measurements of Distances and Angles – Leveling – Determination of areas– Contours. Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber – Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building components (brief discussion only)	
BUILDING COMPONENTS AND INFRASTRUCTURE	**9**
Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering. Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.	
INTERNAL COMBUSTION ENGINES AND POWER PLANTS	**9**
Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydroelectric, and Nuclear Power plants- Internal combustion engines as an automobile power plant – Working principle of Petrol and Diesel Engines – Four-stroke and two-stroke cycles – Comparison of four-stroke and two-stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps	

(single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices	
REFRIGERATION AND AIR CONDITIONING SYSTEM	**9**
Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Properties of air - water mixture, concepts of psychometric and its process.	
Total Periods: 45	

Text Book

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018

Reference

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd, 2013.
3. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
4. Shantha Kumar SRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai,2000.

COs	Program Outcomes (POs) 231ES12 BASICS OF CIVIL AND MECHANICAL ENGINEERING												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					1						1			
CO2	3					1						1			
CO3	3	2	2			1					1	1			
CO4	3	2				1			1		1	1			
CO5	3	1				1			1			1		1	1
CO6	3	2				1			1			1		1	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231ESF2	ENGINEERING DRAWING			L-T-P	C
				1-0-4	3
Programme:	B.E./B.Tech. (Common to all branches) – In Sem-1: for ECE, CSE, AIDS & IT In Sem-II: for EEE, MECH, CIVIL, BT & BM	Sem:	I/II	Category:	ES
Prerequisites:	Nil				
Objectives:	To develop basic graphic skills in students to understand the drawings in Engineering fields.				
Course Outcomes:					
On completion of the course, the students will be able to **CO1**: Trace the plane curves and draw its tangent and normal. **CO2**: Construct the orthographic projections of points, lines, and planes. **CO3**: Draw the projections of simple solids. **CO4**: Visualize the sectional views of solids. **CO5**: Develop the surfaces of solids. **CO6**: Practice isometric and orthographic projections.					

Concepts and conventions (Not for Examination) – 5 hrs

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

PLANE CURVES	14
Conics – Construction of ellipse, Parabola, and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.	
PROJECTION OF POINTS, LINES, AND PLANE SURFACES	**14**
Projection of Points in all four quadrants - Projection of straight lines located in the first quadrant – inclined to both planes – Determination of true lengths and true inclinations – Projection of regular polygonal and circular lamina inclined to both reference planes.	
PROJECTION OF SOLIDS	**14**
Projection of simple solids like Prisms, Pyramids, Cylinder, and Cone when the axis is inclined to one reference plane.	
SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	**14**
Sectioning of above solids in a simple vertical position by cutting planes inclined to HP and perpendicular to VP – Obtaining true shape of section; Development of lateral surfaces of truncated solids – Prisms, Pyramids, Cylinder, and Cone.	
ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS	**14**
Principles of isometric projection – isometric scale – isometric projections of truncated Prisms,	

Pyramids, cylinders, and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa.
Total Periods: 75
Text Books
1. Basant Agarwal and Agarwal C.M., **"Engineering Drawing",** Tata McGraw Hill Publishing Company Limited, New Delhi, (2022).
References
1. Venugopal K. and Prabhu Raja V., **"Engineering Graphics",** New Age International (P) Limited (2022). 2. Shah M.B. and Rana B.C., **"Engineering Drawing",** Pearson Education (2022). 3. John K.C., **"Engineering Graphics for degree"** PHI Learning Pvt. Ltd., New Delhi, (2022). 4. Kumar M.S., **"Engineering Graphics",** D.D. Publications, (2022).

COs	Program Outcomes (POs) **231ESF2 ENGINEERING DRAWING**												**Program Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3			1	2	1						1	1		
CO2	3	2	1		2	1						1	1		
CO3	3			1	2	1						1	1		
CO4	3	2		1	2	1						1	1		
CO5	3		1		2	1						1	1		
CO6	3	2	1		2	1						1	1		

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS12	HERITAGE OF TAMILS/ தமிழர் மரபு			L-T-P	C
				1-0-0	1
Programme:	**B.E./B.Tech. (Common to all branches)**	**Sem:**	**I**	**Category:**	**HS**
Prerequisites:	Read and Write in English or Tamil				
Objectives:	Know about the heritage of Tamil language.				

Course Outcomes:

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

CO1: Understand of the heritage of Tamil language and its literature.
CO2: Know about the Tamil ethics and Bakthi literature.
CO3: Know about the development of sculptures, Musical instruments and Handicrafts.
CO4: Understand about the folk and martial arts of ancient tamils.
CO5: Know about the thinai concepts being followed in Sangam literature of Tamil.
CO6: Contribution of Tamils in national movement and Indian culture and Medicinal system.

LANGUAGE AND LITERATURE	**3**
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	
HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	**3**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils	
FOLK AND MARTIAL ARTS	**3**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils	
THINAI CONCEPT OF TAMILS	**3**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas	
CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	**3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books	
Total Periods 15	

Text Books & References

1. jkpof tuyhW – kf;fSk; gz;ghLk; - Nf.Nf. gps;is (ntspaPL jkpo;ehL ghlEhy; kw;Wk; fy;tpapay; gzpfs; fofk;)
2. fzpdpj; jkpo; - Kidth; ,y.Re;juk; (tpfld; gpuRuk;)
3. fPob - itif ejpf;fiuapy; rq;ffhy efu ehfhpfk; (njhy;ypay; Jiw ntspaPL)
4. nghUie – Mw;wq;fiu ehfhpfk; (njhy;ypay; Jiw ntspaPL)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL –

(in print)7
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

COs	Program Outcomes (POs) **231HS12 HERITAGE OF TAMILS/** *தமிழர் மரபு*												**Program Specific Outcomes (PSOs)**			
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO1						3	1			2		2				
CO2						3	1			2		2				
CO3						3	1			2		2				
CO4						3	1			2		2				
CO5						3	1			2		2				
CO6						3	1			2		2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS12	HERITAGE OF TAMILS/ தமிழர் மரபு			L-T-P	C
				1-0-0	1
Programme:	**B.E./B.Tech. (Common to all branches)**	**Sem:**	**I**	**Category:**	**HS**
Prerequisites:	Read and Write in English or Tamil				
Objectives:	jkpo;nkhop kw;Wk; jkpoh;fspd; ghuk;ghpaj;ij gw;wp njhpe;J nfhs;Sjy;.				

Course Outcomes:

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

CO1: jkpo;nkhop kw;Wk; jkpo; ,yf;fpaj;jpd; ghuk;ghpaj;ij Ghpe;J nfhs;Sjy;.

CO2: jkpoh; kuGfs; kw;Wk; gf;fp ,yf;fpaq;fs; gw;wp njhpe;J nfhs;Sjy;.

CO3: jkpoh;fspd; rpw;gf;fiy> ,irf; fUtpfs; kw;Wk; iftpidj; njhopy;fspd; tsh;r;rpfisg; gw;wp mwpe;J nfhs;Sjy;

CO4: jkpoh;fspd; ehl;Lg;Gw fiyfs; kw;Wk; jw;fhg;G fiyfisg; gw;wp mwpe;J nfhs;Sjy;.

CO5: rq;f fhyj;jpd; jpiz tifghLfs; (Itif epyq;fs;) gw;wp mwpe;J nfhs;Sjy;.

CO6: ,e;jpa tpLjiyg; Nghh;> ,e;jpa fyhr;rhuk; kw;Wk; kUj;J Jiwapy; jkpoh;fspd; gq;fpid mwpe;J nfhs;Sjy;.

nkhop kw;Wk; ,yf;fpak;	**3**
,e;jpa nkhopf; FLk;gq;fs; - jpuhtpl nkhopfs; - jkpo; xU nrk;nkhop - jkpo; nrt;tpyf;fpaq;fs; - rq;f ,yf;fpaj;jpd; rkar; rhh;gw;w jd;ik - rq;f ,yf;fpaj;jpy; gfph;jy; mwk; - jpUf;Fwspy; Nkyhz;ikf; fUj;Jf;fs; - jkpo;f; fhg;gpaq;fs;> jkpofj;jpy; rkz ngsj;j rkaq;fspd; jhf;fk; - gf;jp ,yf;fpak;> Mo;thh;fs; kw;Wk; ehad;khh;fs; - rpw;wpyf;fpaq;fs; - jkpopy; etPd ,yf;fpaj;jpd; tsh;r;rp - jkpo; ,yf;fpa tsh;r;rpapy; ghujpahh; kw;Wk; ghujpjhrd; MfpNahhpd; gq;fspg;G.	
kuG - ghiw Xtpaq;fs; Kjy; etPd Xtpaq;fs; tiu rpw;gf; fiy	**3**
eLfy; Kjy; etPd rpw;gq;fs; tiu - Ik;nghd; rpiyfs; - goq;Fbapdh; kw;Wk; mth;fs; jahhpf;Fk; iftpidg; nghUl;fs;> nghk;ikfs; - Njh; nra;Ak; fiy - RLkz; rpw;gq;fs; - ehl;Lg;Gwj; nja;tq;fs; - FkhpKidapy; jpUts;Sth; rpiy - ,irf; fUtpfs; - kpUjq;fs;> giw> tPiz> aho;> ehj];tuk; - jkpoh;fspd; r%f nghUshjhu tho;tpy; Nfhtpy;fspd; gq;F.	
ehl;Lg;Gwf; fiyfs; kw;Wk; tPu tpisahl;Lfs;	**3**
njUf;$j;J> fufhl;lk;> tpy;Yg;ghl;L> fzpahd; $j;J> xapyhl;lk;> Njhy;ghitf; $j;J> rpyk;ghl;lk;> tshp> Gypahl;lk;> jkpoh;fspd; tpisahl;Lfs;.	
jkpoh;fspd; jpizf; Nfhl;ghLfs;	**3**
jkpofj;jpd; jhtuq;fSk;> tpyq;FfSk; - njhy;fhg;gpak; kw;Wk; rq;f ,yf;fpaj;jpy; mfk; kw;Wk; Gwf;Nfhl;ghLfs; - jkpoh;fs; Nghw;wpa mwf;Nfhl;ghL - rq;f fhyj;jpy; jkpofj;jpy; vOj;jwpTk;> fy;tpAk; - rq;ffhy efuq;fSk; Jiw Kfq;fSk; - rq;f fhyj;jpy; Vw;Wkjp kw;Wk; ,wf;Fkjp - fly;fle;j ehLfspy; Nrhoh;fspd; ntw;wp.	
,e;jpa Njrpa ,af;fk; kw;Wk; ,e;jpa gz;ghl;bw;Fj; jkpoh;fspd; gq;fspg;G.	**3**
,e;jpa tpLjiyg;Nghhpy; jkpoh;fspd; gq;F - ,e;jpahtpd; gpwg;gFjpfspy; jkpo;g; gz;ghl;bd; jhf;fk; - Rakhpahij ,af;fk; - ,e;jpa kUj;Jtj;jpy; rpj;j kUj;Jtj;jpd; gq;F - fy;ntl;Lfs;> ifnaOj;Jg;gbfs; - jkpo;g; Gj;jfq;fspd; mr;R tuyhW.	
Total Periods:	**15**

Text – Cum – Reference Books

1. jkpof tuyhW – kf;fSk; gz;ghLk; - Nf.Nf. gps;is (ntspaPL jkpo;ehL ghlEhy; kw;Wk; fy;tpapay; gzpfs; fofk;)
2. fzpdpj; jkpo; - Kidth; ,y.Re;juk; (tpfld; gpuRuk;)
3. fPob - itif ejpf;fiuapy; rq;ffhy efu ehfhpfk; (njhy;ypay; Jiw ntspaPL)

5. nghUie – Mw;wq;fiu ehfhpfk; (njhy;ypay; Jiw ntspaPL)
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8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)
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10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

COs	Program Outcomes (POs) **231HS12 HERITAGE OF TAMILS/** *தமிழர் மரபு*												**Program Specific Outcomes (PSOs)**			
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO1						3	1			2		2				
CO2						3	1			2		2				
CO3						3	1			2		2				
CO4						3	1			2		2				
CO5						3	1			2		2				
CO6						3	1			2		2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS17	PHYSICS AND CHEMISTRY LABORATORY			L-T-P	C
				0-0-3	1.5
Programme:	Common to all Branches	**Sem:**	**I**	**Category:**	**BS**
Pre/Corequisites:	Engineering Physics and Chemistry				
Objectives:	To understand the basic concepts in Physics and Chemistry through experiments.				

Course Outcomes:

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

CO1: Understand the basic concept of LASER application, Interference, and velocity of sound & Compressibility of liquid.

CO2: Gain knowledge on elastic properties of beams & strings and the thermal conductivity of a bad conductor.

CO3: Interpret the fundamentals of the viscosity of a liquid, the wavelength of the mercury spectrum by diffraction, the band gap of the semiconductor, and the Photoelectric effect.

CO4: Analyze the quality of water samples with respect to their alkalinity, hardness, and dissolved oxygen.

CO5: Determine the amount of metal ions through volumetric and gravimetric techniques.

CO6: Determine the amount of particles in an unknown solution.

LIST OF EXPERIMENTS - PHYSICS PART
(A minimum of six to seven experiments shall be offered)

S.No	NAME OF THE EXPERIMENT	
1.	Determination of wavelength of the LASER source	3
2.	(a)Determination of Particle Size using Diode LASER. (b) Determination of Acceptance angle and Numerical aperture of an optical fiber.	3
3.	Determination of thickness of thin wire–Air wedge method	3
4.	Determination of Velocity of sound and compressibility of liquid–Ultrasonic Interferometer.	3
5.	Determination of Young's modulus of the material-Non uniform bending	3
6.	Torsional pendulum – Determination of rigidity modulus.	3
7.	Determination of viscosity of liquid – Poiseuille's method.	3
8.	Determination of wavelength of mercury spectrum- Spectrometer Grating.	3
9.	Determination of Band Gap of semiconductor material.	3
10.	Determination of Planck's constant - Photoelectric effect	3

LIST OF EXPERIMENTS – CHEMISTRY PART
(A minimum of six to seven experiments shall be offered)

S.No	NAME OF THE EXPERIMENT	
1.	Estimation of Total Hardness of water by EDTA method.	3
2.	Determination of types and amount of Alkalinity of a water sample.	3
3.	Determination of DO content of water sample by Winkler's method.	3
4.	Determination of Chloride content of water sample by Argentometric method.	3
5.	Estimation of copper content of the given solution by Iodometry.	3

6.	Estimation of TDS of a water sample by gravimetric.	3
7.	Determination of strength of given hydrochloric acid using pH meter.	3
8.	Determination of strength of acids in a mixture of acids using pH meter.	3
9.	Conduct metric titration of barium chloride against sodium sulphate (Precipitation titration)	3
10.	Estimation of Iron content of the given solution using a Potentiometer.	3

Total Periods 45

References
1. "Experiments in Physics", Indian Academy of Sciences, India (2018)
2. Engineering Physics Laboratory Manual.
3. A. Ravikrishnan "Practical Engineering Chemistry", Sri Krishna Publications, Chennai (2002).
4. Engineering Chemistry Laboratory Manual.

COs	Program Outcomes (POs) **231BS17 PHYSICS AND CHEMISTRY LABORATORY**												**Program Specific Outcomes (PSOs)**			
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2	1		2		1					1	2	1		
CO2	1	2	2				1					1	1	2		
CO3	2	2	2				1					1	2	2		
CO4	2	2	1		1		2					1		1		
CO5	3	2	1	2	2		1					2		1		
CO6	2	1	3		2		2					2		1		

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231ESF8	ENGINEERING PRACTICES LABORATORY			L-T-P	C
				0-0-3	1.5
Programme:	**B.E/B.TECH., (Common to all Branches) In Sem-1: for ECE, MECH, CIVIL, BT & BME In Sem-II: for EEE, CSE, AIDS & IT**	**Sem:**	**I/II**	**Category :**	**ES**
Prerequisites:	Nil				
Objectives:	To provide hands-on experience to the students in handling the basic Mechanical and Electrical tools and equipment.				

Course Outcomes:

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

CO1. Develop simple wooden joints using woodworking tools.

CO2. Understand the concepts of plumping and handling the various components of plumbing.

CO3. Make simple welds of lap and butt joints and fabricate a few models.

CO4. Demonstrate the concept of wiring circuits.

CO5.Explain the measurement of Electrical quantities and the principles of diodes.

CO6. Classify the functions of basic gates.

PART – A – MECHANICAL WORKSHOP (23 hrs)

CARPENTRY
Study of the joints in roofs, doors, windows, and furniture; Hands-on-exercise: Dismantling & Assembling of various wooden furniture; Preparation of T Joint, dovetail joint
PLUMBING
Study of pipeline joints, their location, and functions: valves, taps, couplings, unions, reducers, elbows in household fittings; Hands-on-exercise - basic pipe connections – Mixed pipe material connection – Connections with different joining components
WELDING AND SHEET METAL FORMING
Preparation of arc welding of butt joints and lap joints - Preparation of tray and funnel

PART – B – ELECTRICAL WORKSHOP (22 hrs)

NAME OF THE EXPERIMENT
Practice on Simple wiring connections.
Practice on wiring for Staircase setup.
Practice on wiring Fluorescent lamp.
Measurement of electrical quantities – current, voltage, power, and energy.
Characteristics of semiconductor diode.
Verifying the truth tables of Logic gates.

Total Periods 45

COs	Program Outcomes (POs) **231ESF8 ENGINEERING PRACTICES LABORATORY**												**Program Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1		1	1			3		2	2			
CO2	2	1	1		1	1			3		2	2			
CO3	2	1	1		1	1			3		2	2			
CO4	2	1	1		1	1			3		2	2		2	
CO5	2	1	1		1	1			3		2	2		2	
CO6	2	1	1		1	1			3		2	2		2	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS17	ENGLISH COMMUNICATION LABORATORY - I			L-T-P	C
				0-0-2	1
Programme:	**B.E./B.Tech. (Common to all branches)**	**Sem :**	**I**	**Category:**	**EEC**
Prerequisites:	Basic Language Proficiency.				
Objectives :	To acquire basic Language Skills (LSRW) in order to communicate confidently in academic, professional and social contexts.				

Course Outcomes:

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

CO1: Introduce self and others confidently in English, discuss the events, and fill out forms.

CO2: Understand the documentaries, narrate the events, experiences, places of visit, and interview others in English.

CO3: Describe a product and picture and their uses, devise an advertisement of a product.

CO4: Listen to video lectures and make summaries and inferences.

CO5: Make event and travel plans and describe arrangements.

CO6: Perform debates, panel discussions, express views and opinions on the issues.

INTRODUCTION	**6**
Self-Introduction, Introducing Others, Conversation on the events, Listening and Filling forms.	
NARRATION AND SUMMATION	**6**
Listen to the documentaries and event narration, Narrating personal experiences and events, Interviewing others, Describing the Places of Interest.	
DESCRIPTION OF A PROCESS / PRODUCT	**6**
Listen to the description of a product, Advertisement of a product, Description of a Picture, and use of the products.	
CLASSIFICATIONS AND RECOMMENDATIONS	**6**
Listen to lectures and educational videos, making and describing the plans, arrangements of an event, travel plans, etc.	
EXPRESSIONS	**6**
Listen to debates, panel discussions, expressing the views on an issue, giving brief talk on a topic, giving opinions.	
Total Periods: 30	
Text Book	
Dr.P.Rathna and Jewelcy Jawahar ,English Communication	

Laboratory .June 2023.
Reference
https://www.skillsyouneed.com/ips/conversational-skills.html

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO1					2	1		1	2	3		2				
CO2					2	3		1	1	3		2				
CO3					2	2		1	1	3		2				
CO4					2	3		1	1	3		2				
CO5					2	2		1	1	3	3	2				
CO6					2	3		1	3	3		2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS21 **ENGLISH FOR ENGINEERS** **L-T-P** **C**
3-0-0 **3**

Programme: **B.E./B.Tech. (Common to all Branches)** **Sem:** **II** **Category:** **HS**

Prerequisites: Functional English

Aim: To mould the Learners' style of Language Proficiency with modern aspects of communicative elements which an engineer requires.

CourseOutcomes:

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

CO1: Use the grammatical rules and semantic structures for flawless communication.

CO2: Recognize the importance of listening and to comprehend the connect between interactors.

CO3: Apply the professional aspects of language pattern and to formulate the stylish accent. **CO4**: Analyze the various exposure levels of multi-dimensional skill-based language usage. **CO5**: Evaluate the situational attempts with better learning mechanism.

CO6: Create the extended mode of thinking in expressions both in oral and written communication.

SENTENTIAL SEMANTICS **9**

Listening – Cambridge English Listening practice for beginners (A Level), celebrity interview; **Speaking**- Greetings- self introductory session – collaborative task based topics; **Reading** – Reading editorials, magazines, newspapers, knowing when to use dictionary**; Writing** – Enlist wish list, Blog writing, Processing technical reports; **Grammar**- Sentence pattern, Types of sentences, Simple, Complex and compound; **Vocabulary**- Conjunctions.

VERBAL OPERATORS **9**

Listening – British Council Listening (B1) level, Broadcasting network audios – Cambridge prep up audio clips; **Speaking** – Sharing experiences, Narratives on anecdotes, Brain Teasers**Reading** – Phonics reading practices, Reading pamphlets and catalogues; **Writing** – Fill up the templates/forms (Airline booking, reservations on train, hotel registration), Mapping out articles on press and media, Progress report writing; **Grammar**- Verbs and Verbals – Infinitives- Gerunds – Participles, Voice– Active and Passive voice; **Vocabulary**- Phrasal verbs, one word substitution.

CONTEXTUAL EXPRESSIONS **9**

Listening– Saying 'Please' 'Thank You', and 'Sorry', Responding to ' Thanks' and 'Apologies' TED Talks , Excerpts from literary pieces, listening podcasts related to recent trends in mass media and communication- **Speaking** – Persuasive speech techniques- gimmicks and entrepreneurial speech strategies; **Reading** – exploratory reading and techniques on expository text reading, The Gender Division (Animals & Birds) , Knowing Relationships**Writing** – Controversial essay writing, Review Writing; **Grammar** – Use of Prepositions, Mixed tenses, If conditionals; **Vocabulary** – Minimal pairs.

TECHNICAL BRIEFINGS **9**

Listening – Virtual webinars on language consciousness, Oratory speech; **Speaking** – Short script deliverance, Thematic speech; **Reading –**Matching animal and its young ones (its cry) Deciphering technical texts; **Writing**- Announcement / declaration letter writing, Technical content creations; **Grammar** – Speech –
Direct and Indirect speech, Spot the error; **Vocabulary**- Connotation and denotation, Mismatched words.

STIPULATE WRITINGS **9**

Listening – Practicing audios on competitive elements – Peer/ Panel discussion, Event and specializations;, **Speaking** – Mock Interview, Pros and Cons of Advanced technological systems , Dimensions of engineering and its aspects, **Reading** – Industrial blogs, Meme theory**; Writing** – Profile development- Resume – Project proposal writing , Conceptual writing**; Grammar**- Semi-modal auxiliaries, Question tags; **Vocabulary** –
Idiomatic expressions, Spelling and Punctuation.

TotalPeriods: 45

Text Book:

1. Allen, Alex. 1999. Communication at the English Speaking Union world members conference, Sydney, August.
2. Austin, J.L.1965, *How To Do Things With Words*, Oxford University Press.
3. Mayhugh, Paul W. "A Chinese-English intermediate Greek grammar." Theological Research Exchange Network (TREN), 1990.
4. McCarthy, Michael and Felicity O'Dell. *English Vocabulary in Use*: advanced. Cambridge: CUP, 2002. South Asian Edition, 2008.
5. Soundararaj, Francis.2012. *Basics of Communication in English. New Delhi: Macmillan*

Reference:

1. PushpaLata, Sanjay Kumar, English Language and Communication Skills for Engineers, 2018.
2. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges.
3. John Seely. The Oxford Guide to Effective Writing and Speaking. OUP, 2005.

Course Outcomes	Program Outcomes (POs) - **231HS21** **ENGLISH FOR ENGINEERS**												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					2	1		1	1	3		2			
CO2					2	1		1	1	3		2			
CO3					2	1		1	1	3		2			
CO4					2	1		1	1	3		2			
CO5					2	1		1	1	3		2			
CO6					2	1		1	1	3		2			

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS21	PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS	L-T-P	C
		2-1-0	3

Programme: B.E./B.Tech. (Common to all branches) **Sem:** II **Category:** BS

Prerequisites: Matrices and Calculus

Objectives : To impart a knowledge on the concept of partial differential equations and solve them by applying numerical methods.

Course Outcomes:

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

CO1: Solve the given standard partial differential equations.

CO2: Apply numerical methods to solve transcendental equations, system of equations and eigenvalue problems.

CO3: Use numerical difference interpolation for solving the equations.

CO4: Apply numerical methods to perform differentiation and integration.

CO5: Demonstrate the process of solving first and second-order ordinary differential equations using numerical methods.

CO6: Solve the partial differential equations with boundary conditions.

PARTIAL DIFFERENTIAL EQUATIONS **9**

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first-orderpartial differential equations (without reducing the standard type) –Linear homogenous partial differential equations of second and higher order with constant coefficients.

SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS **9**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of a linear system of equations - Gauss elimination method – Iterative method of Gauss-Seidel - Eigenvalues of a matrix by Power method.

NUMERICAL INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION **9**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivate using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 rules.

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9**

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method – Milne's predictor–corrector methods for solving first order equations – Finite difference methods for solving second order equations.

BOUNDARY VALUE PROBLEMS OF PARTIAL DIFFERENTIAL EQUATIONS **9**

Finite differences solution of one-dimensional heat equation by explicit and implicit methods – One-dimensional wave equation and two-dimensional Laplace and Poisson equations.

Total Periods:45

The students may be practiced to solve the problems using Software packages.

Text Book:

1. Veerarajan.T.,"**Engineering Mathematics for first year**", Fourth Edition, Tata Mc-Graw – Hill,New Delhi, 2008.
2. Grewal, B.S., and Grewal, J.S., "**Numerical Methods in Engineering and Science**", Khanna Publishers, 10th Edition, New Delhi, 2015.

Reference:

1. Greenberg. *M.D.* "Advanced Engineering Mathematics", Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Kreyszig, E., "Advanced Engineering Mathematics", 8th edition, John Wiley Sons, 2001.
3. Chapra S.C. and Canale R.P., "Numerical Methods for Engineers", Tata Mc-Graw Hill, New Delhi, (2007).
4. Gerald C.F., and Wheatley P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, (2006).

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1							1	1		2
CO2	3	3	1	1	1							1	1		1
CO3	3	2										1	1		2
CO4	3	3			1							1	1		1
CO5	3	3		1	1							1	1		2
CO6	3	3	1	1								2	1		1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS22	PHYSICS OF MATERIALS	L-T-P	C
		3-0-0	3

Programme:	**B.E./B.Tech. (ECE, CSE EEE, BM, AIDS, IT)**	**Sem:**	**II**	**Category:**	**BS**

Prerequisites: EngineeringPhysics

Objectives : To impart knowledge on fundamentals of materials and their properties for Engineering applications.

Course Outcomes:

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

CO1: Describe the electrical properties of the materials.

CO2: Distinguish the semiconductor materials and their characteristics.

CO3: Interpret the different magnetic materials and their properties.

CO4: Explain the variousdielectric materials and their properties.

CO5: Summarize the different types of optical devices and their characteristics.

CO6: Outline the characteristics of nanomaterials and their applications.

ELECTRICAL PROPERTIES OF MATERIALS **9**

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, Wiedemann-Franz law – Success and failures – Fermi Distribution function – Effect of temperature on Fermi function –Densityofenergystates–Electroninperiodicpotential–Energybandsinsolids–tightbindingapproximation–Electroneffectivemass –concept of hole.

SEMICONDUCTOR PHYSICS **9**

Energy band diagram – Direct and indirect band gap semiconductors – Intrinsic Semiconductors – Carrierconcentration in intrinsic semiconductors – Extrinsic semiconductors – Carrier concentration in n-type & p-type semiconductors – Variation of carrier concentration with temperature– Variation of Fermi level with temperature and impurity concentration–Hall effect-Determination of Hall Coefficient.

MAGNETICAND DIELECTRIC MATERIALS **9**

Magneticmaterials: Origin of the magnetic moment–Bohrmagnet on–Dia and Paramagnetism–Ferromagnetism– Domain theory– Hysteresis–Soft and hard magnetic materials–Anti-ferro magnetic materials–Ferrites–applications**.**

DielectricMaterials: Polarization-Electronic, Ionic,Orientation and Space charge polarization–Frequency and temperature dependence of polarization–Dielectric loss–Dielectric breakdown–uses of dielectric Materials(capacitor and transformer) –Ferro electricity and applications.

OPTICAL PROPERTIES OF MATERIALS **9**

Classificationofopticalmaterials–Carriergenerationandrecombinationprocesses–Absorption emission and scattering of light in metals, insulators, and semiconductors (concepts only) – Photocurrent in a P-N diode –solar cell-LED– Organic LED–Laser diodes– Optical data storage techniques.

NANODEVICES **9**

Quantum confinement – Quantum structures – Density of states for quantum wells, wires, and dots – Band gapof nanomaterials –Tunneling – Single electron phenomena – Single electron Transistor. Carbon nanotubes - Properties and applications.

Total Periods:45

Text Book:

1. JaspritSingh,"SemiconductorDevices:BasicPrinciples", Wiley (Indian edition),2007.
2. S.O. Kasap. Optoelectronics and Photonics-Principles and practices, Dorling Kindersley Plt. (Indian Edition), 2009.
3. B. Rogers, J. Adams and S. Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2014.

Reference:

1. Charles Kittel, Introduction to Solid State Physics,Wiley India Edition,2019.
2. V.V. Mitin, V.A. Kochelap and M.A. Stroscio, Introduction to Nanoelectronics, Cambridge Univ. Press,2008.
3. B. Rogers, J. Adams and S. Pennathur, Nanotechnology: Understanding Small Systems, CRC Press,2014.
4. Y.B.BandandY.Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press,2013

COs	Program Outcomes (POs) 231BS22 PHYSICS OF MATERIALS												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1									1		2	
CO2	3	2	1									1		2	
CO3	3	1										1		1	
CO4	3	1										1		1	
CO5	3	1				1	1					1		2	
CO6	3	1										1		1	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS24	ENVIRONMENTAL SCIENCE			L-T-P	C
				3-0-0	3
Programme:	**B.E / B.Tech (Common to All Branches)**	**Sem:**	**II**	**Category:**	**BS**

Prerequisites: Nil

Objectives: To raise awareness about environmental issues and potential solutions

Course Outcomes:

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

CO1: Describe the importance of environmental studies and energy resources.

CO2: Explain the concept of various ecosystems and their impacts.

CO3: Outline the importance of biodiversity and its values.

CO4: Discuss the different kinds of pollution and their causes and effects.

CO5: Summarize the various types of disaster and their impacts.

CO6: Recognize the impacts of various social problems and climate change with potential solutions.

ENVIRONMENTAL STUDIES AND ENERGY RESOURCES **9**

Environment- definition, scope, and importance – Need for public awareness – Forest resources- deforestation - dams and their effects on forests and tribal people –Energy resources: Growing energy needs, renewable (solar energy and wind energy) and non-renewable energy sources- Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generation (block diagram only), Petroleum processing and fractions.

ECOSYSTEM AND BIODIVERSITY **9**

ECOSYSTEM: Concept of an ecosystem – Structure and function of an ecosystem: Producers, Consumers and Decomposers-Nitrogen cycle, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the Forest ecosystem and Aquatic ecosystems (lake and rivers). **BIODIVERSITY:** Introduction to Biodiversity – Definition– Value of biodiversity.

ENVIRONMENTAL POLLUTION **9**

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Nuclear hazards (f) Fireworks: Current environmental issues - Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution – Pollution case studies.

DISASTER AND ITS IMPACTS **9**

Definition of Disaster, Hazard, Vulnerability, Risk – Types – Natural disasters (earthquake, landslides, flood, cyclones, tsunami and drought) – Man-made disasters (Chemical, nuclear and biological) – Disaster impacts (environmental, physical, social, ecological and economical) – Case studies.

SOCIAL ISSUES AND THE ENVIRONMENT **9**

Population-variation among Nation-Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rainwater harvesting– climate change, global warming, acid rain, Ozone layer depletion-Goal of Green chemistry.

Total Periods: 45

Text book:

1. A. Ravikrishnan, "Environmental Science", Sri Krishna Hitech Publishing Company Private Limited, 2023.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2017.

Reference:

1. Anubha Kaushik, C.P. Kaushik, "Environmental Science and Engineering", New Age International Publishers, 2016.
2. Raman Sivakumar, Introduction to Environmental Science and Engineering, Tata McGraw Hill Education Private Limited, New Delhi, 2016.
3. ErachBharucha, Textbook for Environmental Studies, New Delhi, 2019.
4. G.Tyler Miller and Scott E. Spoolman," Environmental Science ", Cengage Learning India PVT, LTD, Delhi, 2014.

COs	Program Outcomes (POs) 231BS24 ENVIRONMENTAL SCIENCE												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1			2	2	1	1			2	1	1	
CO2	3	2	1			2	2	1	2			2	1	1	
CO3	3	2	1			2	2	1	1			2	1	1	
CO4	3	2	1			2	2	1	2			2	1	1	
CO5	3	2	1			2	2	1	1			2	1	1	
CO6	3	2	1			2	2	1	2			2	1	1	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231ESF1	PROBLEM SOLVING AND PYTHON PROGRAMMING			L-T-P	C
				3-0-0	3
Programme:	B.E./B.Tech. (Common to all branches) – In Sem-1: for EEE, CSE, AIDS & IT In Sem-II: for ECE, MECH, CIVIL, BT & BM	Sem:	I/II	Category :	ES

Prerequisites : Nil

Objectives : To provide basic knowledge in problem solving and the use of Python programming.

Course Outcomes:

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

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Write and execute simple Python programs.
CO3: Apply conditionals and loop concepts in Python programming.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries, etc.
CO6: Read and write data from/to files in Python programs.

COMPUTATIONAL THINKING AND PROBLEM SOLVING **9**

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find the minimum in a list, insert a card in a list of sorted cards, and guess an integer number in a range, Towers of Hanoi.

DATA TYPES, EXPRESSIONS, STATEMENTS **9**

Python interpreter and interactive mode, debugging; values and types: int, float, Boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, the distance between two points.

CONTROL FLOW, FUNCTIONS, STRINGS **9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

LISTS, TUPLES, DICTIONARIES **9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as a return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

FILES, MODULES, PACKAGES **9**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

Total Periods: 45

Text Book

1. Paul Deitel and Harvey Deitel, "*Python for Programmers*", Pearson Education, 1/e, 2021.
2. Karl Beecher, "*Computational Thinking: A Beginner's Guide to Problem Solving and Programming*", 1/e, BCS Learning & Development Limited, 2017.

Reference

1. Allen B. Downey, "*Think Python: How to Think like a Computer Scientist*", 2/e, O'Reilly Publishers, 2016.

2. G Venkatesh and Madhavan Mukund, "*Computational Thinking: A Primer for Programmers and Data Scientists*", 1/e, Notion Press, 2021.
3. John V Guttag, "*Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data*", 3/e, MIT Press, 2021.
4. Eric Matthes, "*Python Crash Course, A Hands–on Project Based Introduction to Programming*", 2/e, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "*Python: The Complete Reference*", 4/e, Mc-Graw Hill, 2018.

COs	Program Outcomes (POs)												**Program Specific Outcomes (PSOs)**		
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	3	2	1								1	2			2
CO2	3	3	3	1	1										2
CO3	3	3			1										2
CO4	3	3	3	2	1										2
CO5	3	3	3	1	1										2
CO6	3	3	3	2	1										2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EE21	ELECTRIC CIRCUIT ANALYSIS	L-T-P	C
		3-0-0	3

Programme: **B.E./B.Tech (common to ECE & EEE)** **Sem: II** **Category:** **PC**

Prerequisites: Engineering Physics

Objectives : To expose the students to the basic electrical circuits and the application of laws and theorems for analysis of the circuits.

Course Outcomes:

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

CO1: Solve DC and AC circuits using various circuit analysis methods and Mesh and Nodal Analysis. (K3)

CO2: Apply various network theorems for solving DC circuits. (K3)

CO3: Demonstrate frequency response of resonant and coupled circuits. (K2).

CO4: Analyze the transient response of RL, RC, and RLC circuits. (K4)

CO5: Infer star and delta connection conversions in three-phase circuits (K2)

CO6: Interpret phasor diagram of voltages and currents, power and power factor measurements in three-phase circuits. (K2)

BASIC CIRCUIT ANALYSIS (CO1, K3-Apply) **9**

Series and parallel circuits – voltage and current division, source transformation - Mesh and Nodal Analysis for DC circuits with basics laws – Introduction to solving AC Circuits.

NETWORK THEOREMS (CO2, K3-Apply) **9**

Thevenin's and Norton's Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem - Millman's Theorem – Solving of DC circuits with the Theorems.

RESONANCE AND COUPLED CIRCUITS (CO3 - Understanding) **9**

Series and parallel resonance – Frequency response – Resonant frequency, Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Tuned circuits.

TRANSIENT RESPONSE ANALYSIS (CO4, K4-Analyze) **9**

Transient response of RL, RC, and RLC Circuits using Laplace transform for AC with sinusoidal Input – impedance, admittance & Time constant.

THREE PHASE CIRCUITS (CO5, CO6, K2-Understanding) **9**

Introduction to three phase circuits - Star and delta connection – conversions - balanced and unbalanced load – phasor diagram of voltages and currents – power and power factor measurements.

Total Periods:45

Text Book:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, New Delhi, 9th edition 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 6th edition, 2019.

Reference:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 2018.
2. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 3rd edition, 2019.
3. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 5th edition, 2017.
4. NPTEL Course on 'Circuit Theory' by IIT Delhi.

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1								1		3	1
CO2	3	2	1	1								1		3	1
CO3	3	3	2	2								1		3	1
CO4	3	3	2	2								1		3	1
CO5	2	1	1	1								1		3	1
CO6	2	1	1	1								1		3	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS22	TAMILS AND TECHNOLOGY/ தமிழரும் ததொழில் நுட்பமும்	L-T-P	C
		2-0-0	1

Programme: **B.E./B.Tech. (Common to all branches)** **Sem: II** **Category: HS**

Prerequisites: Nil

Objectives : To impart a knowledge about Tamils and their ancient technlogies

Course Outcomes:

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

CO1: Summarize the weaving and ceramic technology of ancient Tamils.

CO2: Recall the ancient design and construction technology of the Tamils.

CO3: Know about the Manufacturing Technology in old age Tamil.

CO4: Understand the Agriculture knowledge.

CO5: Know about the Irrigation technology.

CO6: Development of Scientific Tamil to digital Tamil.

WEAVING AND CERAMIC TECHNOLOGY **3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

DESIGN AND CONSTRUCTION TECHNOLOGY **3**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

MANUFACTURING TECHNOLOGY **3**

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and goldCoins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

AGRICULTURE AND IRRIGATION TECHNOLOGY **3**

Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

SCIENTIFIC TAMIL & TAMIL COMPUTING **3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

Total Periods:15

231HS22	TAMILS AND TECHNOLOGY/ தமிழரும் ததொழில் நுட்பமும்	L-T-P	C
		2-0-0	1

Programme: **B.E./B.Tech. (Common to all branches)** **Sem: II** **Category: HS**
Prerequisites: Nil
Objectives : jkpoh;fspd; ghuk;ghpa njhopy;El;gj;ij gw;wp njhpe;J nfhs;Sjy;.
Course Outcomes:

On completion of the course, the students will be able to
CO1: rq;ffhyj;jpd; nerTkw;Wk; ghidj; njhopy;El;gk; gw;wpGhpe;Jnfhs;Sjy;.
CO2: rq;ffhyj;jpd; fl;blj; njhopy;El;gk;gw;wpGhpe;Jnfhs;Sjy;.
CO3: cw;gj;jpj; njhopy; El;gk**;** gw;wpmwpe;Jnfhs;Sjy;.
CO4: Ntshz;iknjhopy; El;gk**;** gw;wpmwpe;Jnfhs;Sjy;.
CO5: ePh;g;ghrdj; njhopy; El;gk**;** gw;wpnjhpe;Jnfhs;Sjy;.
CO6: mwptpapy; jkpo; kw;Wk; fzpdpj; jkpo; tsh;r;rpgw;wpnjhpe;Jnfhs;Sjy;.

nerT kw;Wk; ghiij; njhopy;El;gk; **3**

rq;ffhyj;jpy; nerTj; njhopy; - ghidj; njhopy;El;gk; - fUg;G rptg;G ghz;lq;fs; - ghz;lq;fspy; fPwy; FwpaPLfs;.

Tbtikg;G kw;Wk; fl;blj; njhopy;El;gk; **3**

rq;ffhyj;jpy; tbtikg;Gkw;Wk; fl;Lkhdq;fs; &rq;ffhyj;jpy; tPl;Lg; nghUl;fspy; tbtikg;G - rq;ffhyj;jpy; fl;LkhdnghUl;fSk; eLfy;Yk; - rpyg;gjpfhuj;jpy; Nkil mikg;G gw;wpa tptuq;fs; - khky;yGur; rpw;gq;fSk;> Nfhtpy;fSk; - Nrhoh; fhyj;Jg; ngUq;Nfhapy;fs; kw;Wk; gpwtopghl;Lj; jyq;fs; - ehaf;fh; fhyf; Nfhapy;fs; - khjphpfl;likg;Gfs; gw;wp mwpjy;>kJiukPdhl;rpmk;kd; Myak; kw;wk; jpUkiyehaf;fh; k`hy; - nrl;behl;LtPLfs; - gphpl;b\; fhyj;jpy; nrd;idapy; ,e;NjhrhNuhnrdpf; fl;blf; fiy.

cw;gj;jpj; njhopy; El;gk; **3**

fg;gy; fl;Lk; fiy – cNyhftpay; - ,Uk;Gj; njhopw;rhiy - ,Uk;igcUf;Fjy;>v.F – tuyhw;Wr; rhd;Wfshf nrk;G kw;Wk; jq;fehzaq;fs; - ehzaq;fs; mr;rbj;jy; - kzpcUthf;Fk; njhopw;rhiyfs; - fy;kzpfs;>fz;zhbkzpfs; - RLkz; kzpfs; - rq;Fkzpfs; - vYk;Gj;Jz;Lfs; - njhy;tpay; rhd;Wfs; - rpyg;gjpfhuj;jpy;; kzpfspd; tiffs;.

Ntshz;ik kw;Wk; ePh;g;ghrdj; njhopy; El;gk; **3**

miz> Vhp> Fsq;fs;> kjF – Nrhoh;fhyf; FKopj; Jhk;gpd; Kf;fpaj;Jtk; - fhy;eilguhkhpg;G – fhy;eilfSf;fhf tbtikf;fg;gl;l fpzWfs; - Ntshz;ik kw;Wk; Ntshz;ikr; rhh;e;jnray;ghLfs; - fly;rhh; mwpT – kPd;tsk; - Kj;Jkw;Wk; Kj;Jf;Fspj;jy; - ngUq;fly; Fwpj;j gz;ilamwpT – mwpTrhh; r%fk;.

mwptpapy; jkpo; kw;Wk; fzpdpj;jkpo; **3**

mwptpay; jkpopd; tsh;r;rp – fzpdppj;jkpo; tsh;r;rp – jkpo; Ehy;fis kpd;gjpg;G nra;jy; - jkpo; nkd;nghUl;fs; cUthf;fk; - jkpo; ,izaf; fy;tpf;fofk; - jkpo; kpd; Ehyfk; - ,izaj;jpy; jkpo; mfuhjpfs; - nrhw;Fitj; jpl;lk;.

Total Periods: 15

Text – Cum – Reference Books

1. jkpoftuyhW – kf;fSk; gz;ghLk; - Nf.Nf. gps;is (ntspaPL jkpo;ehL ghlEhy; kw;Wk;fy;tpapay; gzpfs; fofk;)
2. fzpdpj; jkpo; - Kidth; ,y.Re;juk; (tpfld; gpuRuk;)
3. fPob – itif ejpf;fiuapy; rq;ffhy efu ehfhpfk; (njhy;ypay; JiwntspaPL)
4. nghUie – Mw;wq;fiu ehfhpfk; (njhy;ypay; JiwntspaPL)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by:

International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology& Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference book.

Course Outcomes	Program Outcomes (POs) - 231HS22 TAMILS AND TECHNOLOGY/ தமிழரும் தொழில் நுட்பமும்												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						3	1			2		2			
CO2						3	1			2		2			
CO3						3	1			2		2			
CO4						3	1			2		2			
CO5						3	1			2		2			
CO6						3	1			2		2			

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231ESF7	PYTHON PROGRAMMING LABORATORY			L-T-P	C
				0-0-3	1.5
Programme:	**B.E/B.Tech (Common to all branches)** **In Sem-1: for EEE, CSE, AIDS & IT** **In Sem-II: for ECE, MECH, CIVIL, BT & BM**	**Sem:**	**I/II**	**Category :**	**ES**

Pre/Corequisites: Nil

Objectives: To familiarize the use of Python for solving problems.

Course Outcomes:

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

CO1: Solve simple real life problems and use simple statements and expressions in programming.

CO2: Apply conditional and iterative loops, Lists, Tuples, etc. in applications

CO3: Implement the programs using sets, dictionaries, and functions.

CO4: Use strings and standard libraries like pandas, numpy, scipy and matplotlib.

CO5: Develop programs using file handling like copy, word count, longest word, etc., and exceptional handling like divide by zero error, age validity, etc.

CO6: Use the Pygame tool and develop simple games application.

LIST OF EXPERIMENTS

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

S.No	
1	Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2	Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3	Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4	Implementing real-time/technical applications using Lists, Tuples. (Items present in a library / Components of a car/Materials required for construction of a building – operations of list & tuples)
5	Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6	Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7	Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8	Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9	Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10	Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11.	Exploring Pygame tool.
12.	Developing a game activity using Pygame like bouncing ball, car race etc.

Total Periods 45

COs	Program Outcomes (POs) 231ESF7 PYTHON PROGRAMMING LABORATORY												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1												2
CO2	3	3	3	1	1										2
CO3	3	3			1										2
CO4	3	3	3	2	1										2
CO5	3	3	3	1	1										2
CO6	3	3	3	2	1										2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EE27 **ELECTRIC CIRCUITS ANALYSIS LABORATORY** **L-T-P C**

0-0-3 1.5

Programme: **B.E/B.Tech. (CommontoECE & EEE)** **Sem: II** **Category: PC**

Prerequisites Basic Electrical and Electronics Engineering

Objectives : To apply the laws and theorems experimentally for solving AC and DC circuits, analysis of transient and frequency responses.

Course Outcomes:

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

CO1: Apply and verify the fundamental laws of electric circuits. (K3)

CO2: Solve complex electric circuits using mesh and nodal analysis techniques. (K3)

CO3: Apply Thevenin's and Norton's Theorems to simplify complex electric circuits. (K3)

CO4: Solve the Superposition, Maximum Power Transfer and Reciprocity Theorems. (K3)

CO5: Analyze the transient response of RL and RC circuits to DC inputs. (K4)

CO6: Analyze the frequency response of resonance and tuned circuits. (K4)

LIST OF EXPERIMENTS

1. Verification of ohm's laws and Kirchhoff's laws.
2. Verification of mesh and nodal analysis.
3. Verification of Thevenin's and Norton's Theorem
4. Verification of Superposition Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. Verification of Reciprocity Theorem.
7. Measurement of self-inductance of a coil.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

Total Periods: 45

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1				3	1	1	3		3	
CO2	3	2	1	1	1				3	1	1	3		3	
CO3	3	2	1	1	1				3	1	1	3		3	
CO4	3	2	1	1	1				3	1	1	3		3	
CO5	3	3	2	2	1				3	1	1	2		3	
CO6	3	3	2	2	1				3	1	1	2		3	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS27	ENGLISH COMMUNICATION LABORATORY -II			L-T-P	C
				0-0-2	1
Programme:	**B.E./ B.Tech. (Common to all Branches)**	**Sem:**	**II**	**Category:**	**HS**
Prerequisites:	**English Communication Laboratory -I**				

Aim: To provide students with a digital learning platform to practice their language skills useful for their career.

Course Outcomes:

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

CO1: Learn accurate pronunciation through stress on word accent, intonation and rhythm**.**
CO2: Improve technical language skills.
CO3: Effectively participate in situational conversations like JAM sessions.
CO4: Understand the importance of academic writing.
CO5: Inculcate necessary writing skills to face certification exams.
CO6: Manage stress, emotion and time in order to be amicable in the workplace.

PHONOLOGY **6**

Introduction to Phonetics: Speech Sounds -Vowels and Consonants - Transcriptions - Use of Dictionary
Basic Rules of Word Accent: Structure of Syllables -Weak Forms and Strong Forms in Context -Minimal pairs
Indian Variants in Pronunciation: Differences in British and American Pronunciation -Professional Etiquettes - Telephone Etiquette

TECHNICAL LANGUAGE LEARNING **6**

Listening: Indian and Foreign Speakers – English News Channels - Listening Comprehension Tests - Speech/Audio and Video Recording for Self-Analysis
Creativity: Out of Box Thinking - Lateral Thinking.
Attitude: Factors Influencing Attitude, Challenges and Lessons from Attitude**.**

SITUATIONAL CONVERSATION **6**

Ice-Breaking: Activities- (Eg. Find the hidden words from the following figures, and write a paragraph.)
JAM Session: Greetings – Taking Leave – Introducing Oneself and Others.
Expressions in Various Situations: Making Requests and Seeking Permissions – Describing objects/ Places/ Persons/Situations – Story Telling - Narrating Incidents.

MECHANICS OF WRITING AND GUIDANCE FOR TOEFL & IELTS **6**

Goal Setting: Wish List - SMART Goals - Blue Print for Success - Short Term- Long Term - Life Time Goals
Techniques for Good Academic Writing: Writing Planners, Journal Articles writing - Avoiding Plagiarism - Project Proposal - Statement of Purpose.
Preparation for TOEFL and IELTS - Guidance and Practice Sessions.

SELF-MANAGEMENT SKILLS **6**

Stress Management: Causes of Stress and Its Impact - How to Manage & Distress - Circle of Control - Stress Busters**.**
Emotional Intelligence: What is Emotional Intelligence - Emotional Quotient - Emotion Scales - Managing Emotions**.**
Time management: Value of Time - Diagnosing Time Management.

Total No.of Periods :30

Text Book

1. Academic Writing: A Practical Guide for Students, Stephen Bailey London: Routledge Falmer
2. Technical Communication: Principles and Practice, Meenakshi Raman and Sangeeta Sharma, Oxford University Press, 2015
3. McCarthy, Michael and Felicity O'Dell. *English Vocabulary in Use*: advanced. Cambridge: CUP, 2002. South Asian Edition, 2008.

Reference

1. PushpaLata, Sanjay Kumar, English Language and Communication Skills for Engineers, 2018.
2. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.
3. John Seely. The Oxford Guide to Effective Writing and Speaking. OUP, 2005.
4. Barron's TOEFL IBT 2016 Guide (with DVD) Pamela Sharpe, New Delhi: Galgotia,2013.
5. Professional Presentation, Malcolm Goodale, Cambridge University Press, 2005

Course Outcomes	Program Outcomes (POs) - **231HS27 ENGLISH COMMUNICATION LABORATORY -II**												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					2				2	3		2			
CO2					2				2	3		2			
CO3					2				2	3		2			
CO4					2				2	3		2			
CO5					2				2	3		2			
CO6					2			2	2	3		2			

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS31	TRANSFORMS AND COMPLEX ANALYSIS	L-T-P	C
		2-1-0	3

Programme: **B.E./B.Tech. (Common to all branches)** **Sem: III** **Category: BS**

Prerequisites: Matrices and Calculus

Objectives : To impart the concepts of various transforms and their applications, to handle analytic functions on complex plane and to perform complex integration.

Course Outcomes:

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

CO1: Apply Laplace transform for relevant applications.

CO2: Use Z - transform techniques for solving equations

CO3: Apply the Fourier transform for applications.

CO4: Analyze the functions of Complex Variables.

CO5: Apply the techniques regarding conformal mappings to various fields.

CO6: Apply complex integration in engineering problems.

LAPLACE TRANSFORM **12**

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem - solving ODEs by Laplace Transform method.

Z - TRANSFORM **12**

Z-transform - Elementary properties - Inverse Z - transform - Convolution theorem – Formation of difference equations - Solution of difference equations using Z - transform.

FOURIER TRANSFORM **12**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

ANALYTIC FUNCTIONS **12**

Functions of a complex variable – Analytic functions – Necessary and sufficient conditions (excluding proof) – Cauchy– Riemann equations (Statement only) – Properties of analytic function (Statement only) – Harmonic function – Construction of analytic function – Conformal mapping: w = z + a, az, 1/z – Bilinear transformation.

COMPLEX INTEGRATION **12**

Line integral – Cauchy's theorem and integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi-circular contour with no pole on real axis.

Total Periods: 60

Text Book

1. Grewal B.S., " **Higher Engineering Mathematics** ", 44 th Edition, Khanna Publishers, New Delhi, 2018.
2. Veerarajan,T., " **Engineering Mathematics"** (For Semester I and II), Tata McGraw-Hill publishing New Delhi, 2013.

Reference

1. Kreyszig E, "**Advanced Engineering Mathematics** ", 10th Edition, John Wiley, New Delhi, India, 2018.
2. G.B. Thomas and R.L. Finney, "**Calculus and Analytic Geometry**" 9th Edition, Pearson, Reprint,2002.
3. N.P. Bali and Manish Goyal, "**A text book of Engineering Mathematics**", Laxmi Publications, Reprint, 2008.
4. Ramana B V, "**Higher Engineering Mathematics**", 1st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.

Course Outcomes	Program Outcomes (POs) TRANSFORMS AND COMPLEX ANALYSIS												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1							2	1		2
CO2	3	2	2	1	1							2	1		2
CO3	3	3	2	1	1							2	1		2
CO4	3	2	1	1	1							1	1		2
CO5	3	3	1	1	1							1	1		2
CO6	3	2	1	1	1							1	1		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC31	ELECTRONIC DEVICES AND CIRCUITS			L-T-P	C
				3-0-0	3
Programme:	B.E. - Electronics and Communication Engineering	**Sem**	**3**	**Category**	**PC**

Prerequisites: Electric Circuits Analysis

Objectives : To impart knowledge in all types of electronic devices and analyze the frequency response of amplifiers and oscillators.

Course Outcomes: The students will be able to

CO1: Interpret the energy-band structure of semiconductors and the operation of various semiconductor devices (K2)

CO2: Demonstrate the operation, biasing methods of BJTs and their configurations (K2)

CO3: Infer the working principles, characteristics and applications of FETs. (K2)

CO4: Interpret different types of feedback amplifiers. (K2)

CO5: Construct different types of oscillators for generating signals at various frequencies (K3)

CO6: Design tuned and power amplifiers for various circuit design applications. (K3)

SEMICONDUCTOR DEVICES (CO1, K2-Understanding) **9**

Energy-Band Structure – Semiconductor and it's types- PN junction diode, Zener diode, Tunnel diode, PIN diode, Varactor diode, Schottky diode – Half wave and full wave rectifier – SCR, UJT, DIAC ,TRIAC LED and Photodiode.

BIPOLAR JUNCTION TRANSISTORS (CO2, K2-Understanding) **9**

NPN and PNP Transistor- Construction and Operations -Need for biasing-biasing methods - Fixed bias- Self bias- Bias Stability - Stability factor- – Configuration-I/O Characteristics of CE,CB and CC Configurations -h-Parameters for CE configuration - Comparison of CE,CB and CC configurations.

FIELD EFFECT TRANSISTORS (CO3, K2-Understanding) **9**

FET and MOSFET - Construction and Operations -Drain and Transfer Characteristics- Comparison of JFET and BJT- - Construction and Operation of MOSFET-Depletion Type and Enhancement Type - Comparison of MOSFET with JFET.

FEEDBACK AMPLIFIERS AND OSCILLATORS (CO4, K2-Understanding, CO5, K3-Apply) **9**

Feedback amplifier and its types – Voltage / Current, Series, Shunt feedback Amplifiers - characteristics of negative feedback – positive feedback –Condition for oscillations – General equations for LC oscillator, RC phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

TUNED AMPLIFIERS AND LARGE SIGNAL AMPLIFIER (CO6, K3-Apply) **9**

Single and double tuned voltage amplifiers and their frequency response - Difference between voltage and power amplifiers -Importance of impedance matching in amplifiers - Classification of large signal amplifiers - Class A, B,C and Class AB amplifiers - Push-pull class B amplifier and complementary symmetry push-pull amplifier.

TOTAL PERIODS **45**

Text Book:

1.Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2018.

2. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata Mc Graw Hill,7th Edition ,2017.

References:

1. Donald.A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 3rd Edition, 2014.
2. Muhammad H.Rashid, "Power Electronics", Pearson Education / PHI , 2014.
3. Salivahanan S, Sureshkumar N, “Electronic Devices and Circuits”, Tata Mc Graw Hill, 7th Edition, 2015

4. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7th Edition, 2016.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1								1		3	1
CO2	2	1	1	1								1		3	1
CO3	2	1	1	1								1		3	1
CO4	2	1	1	1								1		3	1
CO5	3	2	1	1								1		3	1
CO6	3	2	1	1								1		3	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC32	DIGITAL ELECTRONICS	L-T-P	C
		3-0-0	3

Programme: B.E. - Electronics and Communication Engineering **Sem: 3** **Category: PC**

Prerequisites: Electric Circuits Analysis

Objectives : The course aims to impart in-depth knowledge in design of digital circuits and system and simulation using the Hardware description Language.

Course Outcomes: The students will be able to

CO1: Interpret number system and its conversion. (K2)

CO2 Demonstrate K-map and Quine Mc-Cluskey methods to simplify Boolean expressions. (K2)

CO3: Design combinational circuits using logic gates for digital system design (K3)

CO4: Design sequential circuits for applications in digital systems. (K3)

CO5: Illustrate different digital logic families and programmable logic devices. (K2)

CO6: Develop the HDL Programs for digital circuits including design levels, concurrency, and functional verification. (K3)

NUMBER SYSTEM & MINIMIZATION TECHNIQUES (CO1, CO2, K2 – Understanding) 9

Number system, Binary Arithmetic Operation, 1's and 2's complements,9's and 10's complement simple problem only, Classification of binary Codes, Boolean logic operations and laws, De-Morgan's Theorem, Minimization of Boolean expressions, Sum of Products (SOP), Product of Sums (POS), Karnaugh map Minimization (Two, Three & Four variable), Quine-McCluskey method (or) Tabulation Method.

LOGIC GATES & COMBINATIONAL CIRCUITS (CO3, K3 – Apply)) 9

Logic Gates, Mixed Logic, Half adder & Half Subtractor, Full Adder & Full Subtractor, Parallel binary adder, Parallel binary Subtractor, Fast Adder, Binary Multiplier, Binary Divider, Multiplexer/Demultiplexer, Decoder/ Encoder, Code converters, Magnitude Comparator, Parity checker, Parity generators.

SEQUENTIAL CIRCUITS (CO4, K3 – Apply) 9

Flip-flops – SR, JK, D, T, and Master-Slave, Characteristic table and equation, triggering of flip flops, Realization of one flip flop using other flip flops. Shift registers and its various types, Counters – Asynchronous & Synchronous Up/Down counter, Design of Algorithmic State Machines and Finite State Machines, Design of Hazard Free Switching circuits.

MSI AND PLD COMPONENTS (CO5, K2 – Understanding) 9

Registers, basics of architecture - Fixed-function devices-TTL, ECL, RTL, CMOS, RAM/ROM, Programmable devices-PROMs, PALs and PLDs, FPGAs Memory Expansion.

HDL FOR DIGITAL CIRCUITS (CO6, K3 – Apply) 9

Introduction to HDL (Verilog): Verilog as HDL Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Simulation and Synthesis Tools, Synthesis of Digital Logic Circuit Design: Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops.

Total Periods: 45

Text Book:

1. M.Morris Mano, Digital Design: With an Introduction to the Verilog HDL, VHDL and system Verilog, Sixth Edition, Pearson Education (Singapore) Pvt. Ltd., 2018.
2. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, Fifth Edition, Oxford University Press, 2018.

References:

1. John. F. Wakerly, Digital Design Principles and Practices, Pearson Education, Fourth Edition, 2008.
2. Donald P.Leach, Albert Paul Malvino, Goutam Shah, Digital principles & Applications, Eighth edition, 2014.
3. Charles H. Roth Jr., Digital Systems Design using VHDL, Cengage Learning, 2014.
4. Thomas. L.Floyd, Digital Fundamentals, Pearson Education, Eleventh edition, 2022.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1								1	1	3	1
CO2	3	2	1	1								1	1	3	1
CO3	3	2	1	1								1	1	3	1
CO4	2	1	1	1								1	1	3	1
CO5	3	2	1	1								1	1	3	1
CO6	3	2	1	1								1	1	3	1

Enter correlation levels1,2 or 3 as defined below:1:Slight(Low)2:Moderate(Medium)3:Substantial(High)

231EC33	MICROCONTROLLERS AND INTERFACING			L-T-P	C
				3-0-0	3
Programme:	B.E. - Electronics and Communication Engineering	**Sem:**	3	**Category :**	PC
Prerequisites:	Electric Circuits Analysis				
Objectives:	The course aims to develop in-depth understanding in the Architecture, Programming and Interfacing techniques of 8051 and ARM microcontrollers.				

Course Outcomes:

CO1 : Illustrate the Architecture of 8051 microcontroller (K2)

CO2 : Develop Assembly Language Programs using 8051 Instruction set. (K3)

CO3 : Demonstrate interfacing of 8051 with supporting chips (K3)

CO4 : Construct microcontroller based Interfacing systems for various applications (K3)

CO5 : Infer the architecture of ARM microcontroller (K2)

CO6 : Develop application programs using the instruction set of ARM microcontroller (K3)

MICROCONTROLLER (CO1, K2 – Understanding) **9**

Introduction to computing, Microprocessor Vs Microcontroller, Processor Architectures – Harvard Vs Von Neumann, CISC Vs RISC, 8051 Architecture, Internal Memory Organization, Registers, Pins and Signals, Port Operation, External Memory and I/O Interfacing, Timers / Counters, Serial Interface, Interrupts

INSTRUCTION SET (CO2, K3 – Apply) 9

8051 Addressing Modes, Data Transfer Instructions, Arithmetic Instructions, Logic Instructions, Control Transfer Instructions

MICROCONTROLLER BASED SYSTEM DESIGN (CO3, CO4,K3 – Apply) **9**

Interfacing to LCD, ADC and DAC, Sensors, Stepper Motor, DC motor, Traffic Light Control Control

ARM ARCHITECTURE (CO5, K2 – Understanding) **9**

ARM Processor fundamentals, Register, CPSR, Pipeline, Exceptions, Interrupts and Interrupt Vector Table, ARM 7 based LPC2148 architecture, ARM CORTEX M4 architecture

ARM INSTRUCTION SET (CO6, K3 – Apply) **9**

Data processing, Branch, Load Store instructions, Software interrupt instructions, Program Status register instructions, loading constants, conditional execution, ARM-THUMB Interworking

Total Periods: 45

TEXT BOOK

1. Kant, K. *Microprocessors and Microcontrollers: Architecture, Programming and System Design 8085, 8086, 8051, 8096*. New Delhi: Prentice-Hall of India, 2013.
2. Sloss, Andrew, Dominic Symes, and Chris Wright. *ARM System Developer's Guide: Designing and Optimizing System Software*. Boston: Morgan Kaufmann Publishers, 2004.

REFERENCES

1. Mazidi, M. A., Mazidi, J., and McKinlay, R. *8051 Microcontroller and Embedded Systems, 2nd ed.* Upper Saddle River, NJ: Pearson Prentice Hall, 2007.
2. Mary, Pablo, and Jeebananda Panda. *Microprocessors and Microcontrollers*. New Delhi: PHI Learning, 2016.
3. Kamal, Raj. *Microcontrollers: Architecture, Programming, Interfacing, and System Design*. New Delhi: Tata McGraw-Hill Education, 2009.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1								1		1	3
CO2	3	2	1	1	1							1		1	3
CO3	3	2	1	1	1							1		1	3
CO4	3	2	1	1	1							1		1	3
CO5	2	1	1	1								1		1	3
CO6	3	2	1	1	1							1		1	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC34	ELECTROMAGNETIC FIELDS	L-T-P	C
		3-0-0	3

Programme: B.E. - Electronics and Communication Engineering **Sem:** 3 **Category:** PC

Prerequisites: Engineering Physics, Physics of Materials

Objectives: To familiarize students with the concepts, theorems and equations pertaining to electromagnetic fields and waves.

Course Outcomes: The students will be able to

CO1: Apply conversions between different coordinate systems in Electromagnetics. (K3)
CO2: Apply Coulomb's law, electric field intensity, and Gauss's law to static electric fields and charge distributions. (K3)
CO3: Apply concepts of divergence, energy and potential in electrostatic fields.(K3)
CO4: Make use of the laws of steady magnetic fields to solve problems in magnetic circuits. (K3)
CO5: Develop Maxwell's equations and Poynting's theorem for Electromagnetic Fields. (K3)
CO6: Derive wave equations and the equations for wave propagation, and wave reflection in dielectrics, free space, and conductors. (K3)

STATIC ELECTRIC FIELDS (CO1, CO2, K3 – Apply) **9**

Introduction to Co-ordinate Systems: Rectangular, Cylindrical and Spherical Coordinate Systems. Coulomb's law and Electric Field Intensity: The experimental Law of Coulomb, Electric field intensity, Field due to a continuous Volume Charge Distribution, Field of a Line Charge, Field of a Sheet of Charge. Electric Flux Density, Gauss's Law, Application of Gauss's Law: Differential Volume Element, Some Symmetrical Charge distributions.

DIVERGENCE, ENERGY AND POTENTIAL (CO3, K3 – Apply) **9**

Divergence and Maxwell's First Equation (Electrostatics), Vector operator and Divergence Theorem, Energy expended in moving a point charge in an electric field, Line integral, Definition of Potential Difference and Potential, Potential field of a point charge, The Potential Field of a System of Charges: Conservative Property, Potential Gradient, The Electric Dipole. Energy Density in the Electrostatic Field, Capacitance, Poisson's and Laplace's equation, Conductors and Dielectrics: Current and Current density, Continuity of current, Boundary Conditions for conductors and perfect dielectric materials.

STEADY MAGNETIC FIELD (CO4, K3 – Apply) **9**

Curl – Stoke's Theorem – Biot-Savart Law – Magnetic Field intensity – Ampere's circuital law and its applications. Magnetic flux and Magnetic flux density – Force and Torque on a closed circuit, — Energy stored in magnetic field, Magnetic moment – Magnetic scalar and Vector Potential- Magnetic Boundary Conditions.

ELECTROMAGNETIC FORCE AND TIME VARYING FIELDS (CO5, K3 – Apply) **9**

The Lorentz force equation for a moving charge – Force on a differential current element – force between differential current elements, Faraday's law for electromagnetic induction, Maxwell's equations-I, II, III & IV in Point form and Integral form, Poynting's Theorem and wave power.

ELECTROMAGNETIC WAVES (CO6, K3 - Apply) **9**

Wave Equations, Wave Propagation in Lossy dielectrics, Plane waves in Lossless Dielectrics, Plane waves in free space, Plane waves in good conductors, Skin effect, Reflection of Plane Waves, Normal and oblique incidence, Brewster angle.

Total Periods 45

TEXT BOOK:

1.Hayt W H, "Engineering Electromagnetics", McGraw Hill Book Co, 8th Edition, NY ,2018.
2.Mathew N.O. Sadiku, "Elements of Electromagnetics", Oxford Press, International Edition, 2018.

REFERENCES:

1. Jordon E C and Balmain K G, "Electromagnetic waves and Radiating System", Prentice Hall, 2nd Edition, 2015.

2. F.T. Ulaby and U. Ravaioli, "Fundamentals of Applied Electromagnetics", 7th Edition, Pearson, 2015.
3. Griffiths, David J. Introduction to electrodynamics, 4th Edition Cambridge University Press, Pearson, 2017.
4. Jian-Ming Jin, "Theory and Computation of Electromagnetic Fields", Wiley, 2015.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	1								1	3		1
CO2	3	2	1	1								1	3		1
CO3	3	2	1	1								1	3		1
CO4	3	2	1	1								1	3		1
CO5	3	2	1	1								1	3		1
CO6	3	2	1	1								1	3		1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC35 DATA STRUCTURES WITH C AND C++ (Theory cum Practical) **L T P C 3 0 2 4**

Programme: B.E. – Electronics and Communication Engineering **Sem: 3 Category: ES**

Prerequisites: Problem Solving and Python Programming, Python Programming Laboratory

Objectives: To enable the students make use of the object-oriented programming paradigm to tackle complex programming problems.

Course Outcomes: The Students will be able to

CO1: Infer the concepts of C programming.(K2)

CO2: Apply OOP concepts in software applications.(K3)

CO3: Interpret linear data structures for various computing problems and applications. (K2)

CO4: Demonstrate the concept of non-linear data structures.(K2)

CO5: Apply sorting algorithms for tasks such as organizing data and optimizing search operations.(K3)

CO6: Construct hashing functions and techniques for faster data access.(K3)

C PROGRAMMING (CO1, K2 – Understanding) **9**

Introduction to ‘ C’ programming - fundamentals - structure of a ‘C’ program - Constants, Variables - Data Types - Operators - Decision Making and Branching - Looping statements - Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays - String- String operations - Function - Definition of function - Declaration of function - Pass by value - Pass by reference - Recursion

OBJECT ORIENTED PROGRAMMING FUNDAMENTALS (CO2, K3 – Apply) **9**

Procedure Oriented Programming Vs. Object Oriented Programming (OOP). Object oriented programming concepts – Classes, reusability, encapsulation, inheritance, polymorphism, dynamic binding, and message passing. C++ Programming features -– member functions – pointers – references - Role of this pointer – Storage classes – function as arguments.

LINEAR DATA STRUCTURES (CO3, K2- Understanding) **9**

Abstract Data Types (ADTs) - List ADT – array based implementation - linked list implementation - singly linked lists - circularly linked lists – doubly linked lists - applications of lists. Stack ADT - Evaluating arithmetic expressions-Queue ADT - circular queue implementation - Double ended Queues - applications of queues.

NON-LINEAR DATA STRUCTURES (CO4, K2 – Understanding) **9**

Trees – Binary Trees- Binary Tree Representation and Traversals - Binary Search Tree -. Graph Algorithms – Representation - Shortest path algorithm – Dijkstra’s algorithm - Minimum Spanning Tree.

SORTING, SEARCHING AND HASH TECHNIQUES (CO5, CO6, K3 – Apply) **9**

Sorting algorithms: Insertion sort - Selection sort - Bubble Sort - Shell sort - Quick sort - Merge sort - Searching: Linear search - Binary Search. Hashing: Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

LIST OF EXPERIMENTS:

Implementation in the following topics:

1. Scientific problem solving using decision making and looping.
2. Simple programming for arrays and strings.
3. Programs with user defined functions and Recursive Functions.
4. Program using structures and unions.
5. Simple programming in C++.
6. Develop with suitable hierarchy, classes for Point, Shape.
7. Design a simple test application to demonstrate dynamic polymorphism using C++.
8. Operations on a Stack and Queue
    a. List implementation
    b. Stack Implementation
    c. Queue Implementation.
9. Implementation of Binary Search Tree.
10. Implementation of Sorting and searching algorithms.

TOTAL PERIODS: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Standalone desktops with C/C++ compiler 30 Nos. (or)
2. Server with C compiler supporting 30 terminals or more.

TEXT BOOKS:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2017.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, 4/e, 2014.

REFERENCES:

1. Kernighan B.W, Ritchie,D.M, "The C Programming language", Pearson Education, 2/e, 2006.
2. Herbert Schildt, "The Complete Reference C++", Fifth Edition, TMH, 2012.
3. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Company Ltd., 7/e, 2017.
4. ReemaThareja, "Data Structures Using C", Oxford University Press, 2/e, 2011.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	2				2	1	1	1			2
CO2	3	2	1	1	2				2	1	1	1			2
CO3	2	1	1	1	2				2	1	1	1			2
CO4	2	1	1	1	2				2	1	1	1			2
CO5	3	2	1	1	2				2	1	1	1			2
CO6	3	2	1	1	2				2	1	1	1			2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC37 **ELECTRONIC DEVICES AND CIRCUITS LABORATORY** **L T P C**
0 0 3 1.5

Programme: B.E. – Electronics and Communication Engineering **Sem: 3** **Category: PC**

Prerequisites: Electric Circuits Analysis

Objectives: To impart skills on the characteristics of electronic devices, amplifiers and oscillator circuits.

Course Outcomes: The Students will be able to

CO1: Analyze the Voltage Current characteristics of diodes. (K4)

CO2: Design rectifier and regulator circuits for power supplies in electronic devices. (K3)

CO3: Analyze the frequency response of BJT and FET amplifiers. (K4)

CO4: Compute the Common Mode Rejection Ratio of Differential amplifiers .(K3)

CO5: Design power amplifiers for use in audio amplification. (K3)

CO6 Simulate oscillator circuits to generate signals with different frequencies. (K3)

List of Experiments

1. Characteristics of PN Junction Diode and Zener diode.
2. Full Wave Rectifier with Filters.
3. Design of Zener diode Regulator.
4. Common Emitter input-output Characteristics.
5. Drain and Transfer Characteristics of JFET and MOSFET.
6. Frequency response of CE and CS amplifiers.
7. Frequency response of Cascade Amplifier
8. CMRR measurement of Differential Amplifier
9. Class A Transformer Coupled Power Amplifier.
10. Simulation Experiments
    a. Voltage Shunt feedback amplifier
    b. Hartley Oscillator
    c. Bistable Multivibrator

TOTAL PERIODS: 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2				2	2	2	2		3	1
CO2	3	2	1	1	2				2	2	2	2		3	1
CO3	3	3	2	2	2				2	2	2	2		3	1
CO4	3	2	1	1	2				2	2	2	2		2	1
CO5	3	2	1	1	2				2	2	2	2		3	1
CO6	3	2	1	1	2				2	2	2	2		3	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC38 MICROCONTROLLERS AND INTERFACING LABORATORY L-T-P C
0-0-3 1.5

Programme: B.E. - Electronics and Communication Engineering **Sem: 3 Category: PC**

Prerequisites: Electric Circuits Analysis

Objectives: To demonstrate programming of 8051 & ARM microcontrollers and their interfacing techniques.

Course Outcomes: The students will be able to

CO1: Develop microcontroller programs for arithmetic operations. (K3)

CO2: Design stepper motor interface with microcontrollers for automation applications. (K3)

CO3: Build traffic light control interface with microcontrollers. (K3)

CO4: Construct circuits for interfacing sensors with ARM microcontrollers. (K3)

CO5: Develop LCD display interface with ARM microcontrollers. (K3)

CO6: Design Microcontroller based system design. (K3)

List of Experiments

1. Arithmetic operations using 8051
2. Stepper motor interface using 8051
3. Traffic light control using 8051
4. Interfacing Water level sensor with ARM microcontroller
5. Interfacing Temperature sensor with ARM microcontroller
6. Interfacing LDR sensor with ARM microcontroller
7. Interfacing sound sensor with ARM microcontroller
8. Interfacing ultrasonic sensor with ARM microcontroller
9. LCD Display interface with ARM microcontroller
10. Microcontroller based system design.

TOTAL PERIODS: 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1	2	2			2	2	2	2		2	3
CO2	3	2	1	1	2	2			2	2	2	2		2	3
CO3	3	2	1	1	2	2			2	2	2	2		2	3
CO4	3	2	1	1	2	2			2	2	2	2		2	3
CO5	3	2	1	1	2	2			2	2	2	2		2	3
CO6	3	2	1	1	2	2			2	2	2	2		2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS37	ENHANCING COMMUNICATION SKILLS	L-T-P	C
		0-0-2	1

Programme:	B.E/B.Tech	Sem: III	Category :	EEC

Objectives

To provide students with necessary tools and techniques to improve their verbal, non-verbal, and written communication skills, and to help individuals express themselves more effectively and confidently in a variety of professional and personal settings.

Course Outcomes:

At the end of the course, learners will be able to:

CO1: Demonstrate the ability to communicate effectively using verbal, non-verbal, written, and visual methods, while overcoming barriers and utilizing elements such as body language, eye contact, and gestures.

CO2: Develop and maintain positive interpersonal relationships through emotional intelligence, active listening, empathy, effective teamwork, conflict resolution, and fostering an inclusive environment.

CO3: Apply fundamental grammar rules and construct various sentence types accurately, avoiding common mistakes and ensuring subject-verb agreement.

CO4: Navigate and adapt to corporate culture by demonstrating ethical behavior, professional etiquette, and maintaining integrity in various professional settings.

CO5: Plan and deliver engaging presentations by understanding the audience, structuring content effectively.

CO6: Designing visual aids, and utilizing public speaking techniques to handle questions and feedback.

COMMUNICATION SKILLS **6**

Importance of Communication in Personal and Professional Life, 7 C's of Communication - Process & Barriers, Types of Communication: Verbal, Non-verbal, Written, and Visual, Elements of Effective Communication, Speaking Clearly and Confidently, Articulation and Pronunciation, Body Language: Understanding and Using Positive Body Language, Eye Contact and Facial Expressions, Gestures and Posture Space and Proxemics.

BUILDING INTERPERSONAL RELATIONSHIPS **6**

Importance of Interpersonal Skills, Building Trust and Rapport, Emotional Intelligence - Recognizing and Managing Emotions, working in Teams: Roles and Responsibilities, Conflict Resolution: Handling Disagreements Constructively, Effective Collaboration Techniques, Developing Empathy: Understanding Others' Perspectives, Active Listening, Interpersonal Interactions, Building Inclusive and Respectful Work Environments.

BASIC GRAMMAR AND SENTENCE STRUCTURE **6**

Parts of Speech: Nouns, Pronouns, Verbs, Adjectives, Adverbs, Prepositions, Conjunctions, Interjections, Sentence Types: Simple, Compound, and Complex Sentences, Common, Grammar Mistakes and How to Avoid Them, Basic Rules of Subject-Verb Agreement, Common Issues with SVA: Singular and Plural Subjects, Practice Exercises and Real-Life Examples.

CORPORATE CULTURE, ETHICS, AND ETIQUETTES **6**

Defining Corporate Culture: Values, Norms, and Practices, Adapting to a New Work Environment, Importance of Cultural Fit in Organizations, Ethical, Behavior: Principles and Examples, Handling Ethical Dilemmas, Maintaining Confidentiality and Integrity, Professional Dress Code and Grooming, Email and Phone Etiquette, Meeting Etiquette: Conducting and Participating in Meetings, Importance of Networking in Professional Growth, Building and Maintaining a Professional Network, Social Media Etiquette for Professionals.

PRESENTATION SKILLS **6**

Preparing for a Presentation - Understanding Your Audience, Structuring Your Presentation: Introduction, Body, and Conclusion. Visual Aids: Designing Effective Slides, Group Presentations, Public Speaking Tips: Overcoming Stage Fright, Engaging the Audience: Using Stories and Examples, Handling Questions and Feedback.

Total Periods: **30**

TEXT BOOKS:

1. Adler, Ronald B., and Jeanne Marquardt Elmhorst. Communicating at Work: Principles and
   Practices for Business and the Professions. 12th ed., McGraw-Hill Education, 2020.
2. Guffey, Mary Ellen, and Dana Loewy. Business Communication: Process and Product. 11th ed., Cengage Learning, 2021.

REFERENCES:

1. Wood, Julia T. Interpersonal Communication: Everyday Encounters. 9th ed., Cengage Learning, 2020.
2. Lucas, Stephen E. The Art of Public Speaking. 13th ed., McGraw-Hill Education, 2020.
3. Markel, Mike, and Stuart A. Selber. Technical Communication. 13th ed., Bedford/St. Martin's, 2020.
4. Knapp, Mark L., Judith A. Hall, and Terrence G. Horgan. Nonverbal Communication in Human Interaction. 8th ed., Cengage Learning, 2013.

231MC13 DESIGN THINKING **L-T-P** **C**
2-0-0 **0**

Programme: B.E., / B. Tech (Common to all) **Category:** **MC**
Prerequisites: Induction Programme
Objectives: To impart knowledge on design thinking process and apply the tools and techniques in designing product / service.

Course Outcomes: Students will be able to
CO1. Interpret the concepts of design thinking process (K2)
CO2. Apply Human Centered Design (HCD) methodology for product or service design (K3)
CO3. Apply the techniques of empathy in design thinking. (K3)
CO4. Make use of ideation techniques for innovative products or services (K3)
CO5. Analyze the issues in design of products or services (K4)
CO6. Perform the steps of prototyping, testing and validation of a product / service (K3)

OVERVIEW OF DESIGN THINKING PROCESS (CO1, K2 – Understanding, CO2, K3-Apply) **6**
Introduction to design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, understanding design thinking and its process model, Design thinking tools. Human-Centered Design (HCD) process - Empathize, Define, Ideate, Prototype and Test and Iterate or Empathize, Analyze, Solve and Test.

EMPATHIZE (CO3, K3 – Apply) **6**
Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, creation of user personas, customer journey mapping, How might we questions

SOLVE / IDEATE (CO4, K3 – Apply) **6**
Silent brainstorming, metaphors for ideation, CREATE and What-If tool for ideation, introduction to TRIZ, Inventive principles and their applications

ANALYZE / DEFINE (CO5, K4 – Analyze) **6**
Root cause analysis, conflict of interest, perspective analysis, big picture thinking through system operator, big picture thinking through function modeling.

TEST (PROTOTYPING AND VALIDATION (CO6, K3 – Apply) **6**
Prototyping, Assumptions during the design thinking process, Validation in the market, best practices of presentation.

Total Periods 30

References

1. Dr. Bala Ramadurai, "Karmic Design Thinking", First Edition,TRIZ Innovation India, 2020.
2. Karl T. Ulrich, “Design Creation of Artifacts in Society”, Trustees of the University of Pennsylvania Publisher, USA, 2011
3. Alma R. Hoffmann, “Sketching as Design Thinking”, Taylor & Francis, UK, 2019
4. Michael Lewrick, Patrick Link and Larry Leifer, “The Design Thinking Playbook”, Wiley,USA,2018.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	2	1	1	1		1	1	1	2	2	1	1	1		1
CO2	3	2	1	1		1	1	1	2	2	1	1	1		1
CO3	3	2	1	1		1	1	1	2	2	1	1	1		1
CO4	3	2	1	1		1	1	1	2	2	1	1	1		1
CO5	3	3	2	2		1	1	1	2	2	1	1	1		1

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

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231BS41 PROBABILITY AND RANDOM PROCESSES L-T-P C
2-1-0 3

Programme: **B.E./B.Tech. (ECE, BME)** **Sem: 4** **Category: BSC**

Prerequisites: Students should have basic knowledge about measures of tendency and probability

Objectives : The main objective of this course is to providing the required skill to apply the statistical tools in engineering problems and to acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.

Course Outcomes:

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

CO1: Interpret the concept of random variables.

CO2: Identify the type of statistical situation to which different distributions can be applied.

CO3: Analyze statistical date using Two Dimensional Random Variables.

CO4: Understand the concepts of correlation and regression and its applications.

CO5: Solving real life problems using ergodic process, Markov process and sine wave process

CO6: Determine Auto correlation and Cross correlation functions

RANDOM VARIABLES **12**

Introduction to Probability – Definition of random variable – Discrete and Continuous random variables – Probability Mass and Probability density functions – Mathematical expectation and Variance Moments – Moment generating functions

STANDARD PROBABILITY DISTRIBUTIONS **12**

Discrete Distributions: Binomial distribution – Poisson distribution – Geometric distribution – Continuous Distributions :Uniform distribution – Exponential distribution – Normal distribution

TWO DIMENSIONAL RANDOM VARIBLES **12**

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem (for 2-D random variables)

CLASSIFICATION OF RANDOM PROCESSES **12**

Definition and examples - first order, second order, strictly stationary, wide-sense stationary and ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process – Random telegraph process.

CORRELATION AND SPECTRAL DENSITIES **12**

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function

Total Periods: 60

Text Book

1. Oliver C. Ibe, “Fundamentals of Applied probability and Random processes”, Elsevier, First Indian Reprint (2007) (For units 1 and 2).

2. Peebles Jr. P.Z., “Probability Random Variables and Random Signal Principles”, Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002. (For units 3, 4and 5).

REFERENCE BOOKS:

1 Miller,S.L and Childers, S.L, "Probability and Random Processes with applications to Signal Processing and Communications", Elsevier Inc., First Indian Reprint 2007.
2. H. Stark and J.W. Woods, "Probability and Random Processes with Applications to Signal

Processing", Pearson Education (Asia), 3rd Edition, 2002.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw-Hill edition, New Delhi, 2004.
4. Leon-Garcia,A, "Probability and Random Processes for Electrical Engineering", Pearson Education Asia, Second Edition, 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2		2							2				
CO2	3	2	2		3							2				
CO3	3	3	2		2							2				
CO4	3	2			2							1				
CO5	3	3	1		1							1				
CO6	3	2	1									2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC41	LINEAR INTEGRATED CIRCUITS			L-T-P	C
				3-0-0	3
Programme	B.E. Electronics and Communication Engineering	**Sem:**	4	**Category:**	**PC**

Prerequisite: Electronic Devices and Circuits

AIM: To learn the fundamental concepts involved in the design, analysis, and practical applications of electronic circuits that utilize linear integrated circuits.

Course Outcomes: The students will be able to

CO1: Interpret the operational amplifier and its characteristics. (K2)

CO2: Design various application circuits using operational amplifiers for instrumentation systems. (K3)

CO3: Illustrate the concepts of analog multiplier IC and PLL. (K2)

CO4: Build digital-to-analog and analog-to-digital converters using various techniques.(K3)

CO5: Construct different types of waveform generators for signal generation. (K3)

CO6: Design astable and monostable multivibrator circuits using timer IC 555. (K3)

CONFIGURATION FOR LINEAR ICs (CO1, K2 – Understanding) 9

Advantages of ICs over discrete components –General operational amplifier stages and internal circuit diagrams of IC 741– DC and AC performance characteristics – Slew rate – Open and Closed loop configurations.

APPLICATIONS OF OPERATIONAL AMPLIFIERS (CO2, K3-Apply) 9

Scale Changer – Adder and Subtractor – Instrumentation amplifier – Phase Shift Circuits – Voltage Follower – V-to-I and I-to-V converters – Peak detector – Clipper and Clamper –Differentiator – Integrator – Comparators – Schmitt trigger –Low-pass, high-pass and band-pass filters

ANALOG MULTIPLIER ICs AND PLL (CO3, K2 – Understanding) 9

Analog Multiplier ICs and its applications — Operation of the basic PLL, Closed loop analysis of PLL, Voltage Controlled Oscillator(VCO), Block diagram of PLL IC 565 and its applications for frequency synthesizing, frequency multiplication and division.

A/D AND D/A CONVERTERS (CO4, K3-Apply) 9

Sampling Process-High speed sample and hold circuit, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type - Dual Slope type - A/D Converter using Voltage-to-Time Conversion - D/A converter – specifications - Weighted resistor type, R-2R Ladder type, Voltage Mode R-2R Ladder and Current-Mode R-2R Ladder types.

WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs (CO5, CO6, K3-Apply) 9

Types of waveform generators: Sine-wave generators, Triangular wave generator, Saw-tooth wave generator, Multivibrators – Special function ICs: ICL8038 function generator, Timer IC 555-General Description - Monostable and Astable operation of Timer IC 555 – LM317 adjustable voltage regulators.

TEXT BOOK

1. RoyChoudhry.D, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd, 4th Edition, 2021.

2. Sergio Frano, Design with Operational Amplifiers and Analog Integrated Circuits, 3rd Edition, Mc Graw Hill Education, New Delhi, 2017.

REFERENCES

1. Salivahanan.S & Kanchana Bhaskaran.V.S., "Linear Integrated Circuits",3rd Edition, McGraw Hill, 2018.

2. Sonde.B.S., "System design using Integrated Circuits" , New Age Pub, 2nd Edition, 2001
3. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2005.
4. Ramakant.A.Gayakwad, "OP-AMP and Linear Ics", Prentice Hall / PE, 4thedition, 2001.

Total Periods: 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1								1		3	1
CO2	3	2	1	1								1		3	1
CO3	2	1	1	1								1		3	1
CO4	3	2	1	1								1		3	1
CO5	3	2	1	1								1		3	1
CO6	3	2	1	1								1		3	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC42 SIGNALS AND SYSTEMS L-T-P C
3- 0-0 3

Programme: B.E. - Electronics and Communication Engineering **Sem: 4 Category: PC**
Prerequisite: Transforms and Complex Analysis
Aim: To study and analyze the characteristics of continuous and discrete time signals and systems.

Course Outcomes: The students will be able to

CO1 Classify different types of signals and systems in time domain. (K2)
CO2 Interpret the continuous time signals using Fourier transform and Laplace transform. (K2)
CO3 Design Linear Time-Invariant (LTI) continuous-time systems for signal processing applications. (K3)
CO4 Analyze discrete-time signals using transform techniques. (K4)
CO5 Develop impulse response of linear time invariant discrete time system for Discrete Time Signals.(K3)
CO6 Make use of Fast Fourier Transform algorithms to obtain the DFT and IDFT coefficients of a discrete time sequence. (K3)

CLASSIFICATION OF SIGNALS AND SYSTEMS (CO1, K2-Understand) 9

Basic signals, Classification of signals – Continuous and Discrete signals, Periodic and Aperiodic signals, Deterministic and Random signals, Energy and Power signals – Classification of systems – Continuous and Discrete systems, Static and Dynamic, Linear and Nonlinear, Time-variant and Time-invariant, Causal and Non causal, Stable and Unstable.

ANALYSIS OF CONTINUOUS TIME SIGNALS (CO2, K2- Understand) 9

Fourier series - Fourier and Laplace Transforms– Properties of Fourier and Laplace Transforms.

LINEAR TIME INVARIANT (LTI) - CONTINUOUS TIME SYSTEMS (CO3, K3-Apply) 9

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transform in Analysis of CT systems.

ANALYSIS OF DISCRETE TIME SIGNALS (CO4, K4-Analyze) 9

Baseband signal Sampling – Aliasing, Reconstruction of CT signal from DT signal- DTFT & its properties - Z Transform & its properties.

LTI DISCRETE TIME SYSTEMS AND FAST FOURIER TRANSFORM (CO5,CO6, K3-Apply) 9

Difference Equations-Block diagram Representation-Impulse response – Convolution sum- linear and circular convolution. Discrete Fourier Transform, Properties of DFT, Fast Fourier Transform, Radix 2 DIF-FFT, Radix 2 DIT-FFT.

Total Periods: 45

TEXT BOOKS:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, Signals and Systems, PHI, 2nd Edition, 2020.
2. Simon Haykins and Barry Van Veen, “Signals and Systems”, Second Edition, John Wiley and Sons, Reprint January 2018.

REFERENCES:

1. B.P. Lathi, Signals, Systems & Communications, BS Publications, 2017.
2. M. J. Roberts, “Signals and Systems Analysis using Transform methods and MATLAB”, McGraw Hill Education, 2018.
3. John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
4. P.Ramesh Babu and R.Anandanatarajan, “Signals and Systems”, Scitech publication, Fourth edition, 2013.

	Program Outcomes (POs)	Program specific

Course Outcomes													Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1								1	2		2
CO2	2	1	1	1								1	2		2
CO3	3	2	1	1								1	2		2
CO4	3	3	2	2								1	2		2
CO5	3	2	1	1								1	2		2
CO6	3	2	1	1								1	2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC43 ANALOG AND DIGITAL COMMUNICATION L T P C
3 0 0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 5 Category: PC**
Prerequisite: Electronic Devices and Circuits, Digital Electronics
AIM: To analyze the various analog and digital modulation and demodulation techniques, transmitters & receivers used in communication systems.

Course Outcomes

CO1: Interpret different amplitude modulation techniques. (K2)
CO2: Develop the various frequency modulation techniques for applications in Communication Systems. (K3)
CO3: Apply digital transmission techniques for efficient data communication. (K3)
CO4: Interpret different digital modulation schemes, bandwidth efficiency and Shanon limit in digital communication. (K2)
CO5: Apply spread spectrum techniques in wireless communication systems. (K3)
CO6: Apply different multiple access techniques in wireless communication systems. (K3)

AMPLITUDE MODULATION (CO1, K2 – Understanding) **9**

Need for modulation, Amplitude modulation, Virtues and limitations of Amplitude modulation, Linear modulation schemes, DSB-SC Modulation, Coherent detection, Costas receiver, Quadrature carrier multiplexing, SSB Modulation, vestigial side band modulation, Television signals, Frequency translation, Comparison of amplitude modulation systems.

ANGLE MODULATION (CO2, K3 – Apply) **9**

Frequency and phase modulation. spectrum of FM Wave, modulation index and Bandwidth of FM Signal, NBFM and WBFM, Comparison between FM and PM Signals, FM and AM signals, AM and NBFM Signals, Generation of FM signals, Demodulation of FM signals, slope detector, ratio detector, Foster Seeley discriminator, Pre-emphasis & De-emphasis, – Capture effect, threshold effect, Super heterodyne radio receiver and its characteristics.

DIGITAL TRANSMISSION AND DATA COMMUNICATION (CO3, K3 – Apply) **9**

Introduction, pulse modulation, PCM – PCM sampling, sampling rate, signal to quantization noise rate, companding – analog and digital – percentage error, delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission – ISI, eyepattern, source and error control coding, Entropy, Source encoding theorem, Shannon Fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem,Error control coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

DIGITAL COMMUNICATION (CO4, K2 – Understanding) **9**

Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying – binary phase shift keying – QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery – squaring loop, Costas loop, DPSK.

SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES (CO5, CO6, K3 – Apply) **9**

Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and FDMA, wireless communication systems, source coding of speech for wireless communications.

Total Periods: 45

TEXT BOOKS

1. Wayne Tomasi, "Advanced Electronic Communication Systems", 6th Edition, Pearson

Education, 2009.

REFERENCES

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, 2004
2. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3. H.Taub, D L Schilling and G Saha, "Principles of Communication", 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, "Modern Analog and Digital Communication Systems", 3rd Edition, Oxford University Press, 2007.
5. Blake, "Electronic Communication Systems", Thomson Delmar Publications, 2002.
6. Martin S.Roden, "Analog and Digital Communication System", 3rd Edition, Prentice Hall of India, 2002.
7. B.Sklar, "Digital Communication Fundamentals and Applications" 2nd Edition Pearson Education 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	2	1	1	1								1	3		1
CO2	3	2	1	1								1	3		1
CO3	3	2	1	1								1	3		1
CO4	2	1	1	1								1	3		1
CO5	3	2	1	1								1	3		1
CO6	3	2	1	1								1	3		1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC44 NETWORKS AND TRANSMISSION LINES L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:**4 **Category: PC**
Prerequisite: Electromagnetic Fields
Aim: To study and analyze the Networks and Transmission line parameters.

Course Outcomes:

The student will be able to
CO1: Model the two port networks using impedance, admittance, hybrid, and transmission parameters for communication systems. (K3)
CO2: Design lumped filters for signal processing applications. (K3)
CO3: Construct passive networks using positive real functions and Hurwitz polynomials for network analysis and design. (K3)
CO4: Interpret the physical significance of transmission line equations and the characteristics of transmission lines. (K3)
CO5: Make use of Smith chart for impedance matching in transmission lines. (K3)
CO6: Design TE and TM wave propagation in rectangular waveguides. (K3)

SYMMETRICAL AND ASYMMETRICAL TWO PORT NETWORKS (CO1, K3-Apply) 9

Two port networks- Characterization in terms of impedance, Admittance, Hybrid and Transmission parameters - Inter relationships among parameter sets - Lattice Networks- T and π Equivalent of a two port network - Image impedance

LUMPED FILTERS (CO2, K3-Apply) 9

The neper - the decibel - Propagation constant, - Filter fundamentals – Pass and Stop bands. Constant K Filters - Low pass, High pass band, pass band elimination filters - m - derived sections – Filter circuit design – Filter performance – Crystal Filters. Attenuators - T and π sections.

PASSIVE NETWORK SYNTHESIS (CO3, K3-Apply) 9

Synthesis: Positive real functions - Driving point functions - Brune's positive real functions - Properties of positive real functions. Properties of Hurwitz polynomials -Even and odd functions - Strum's theorem - Driving point synthesis - Foster and Cauer forms of LC, RC and RL networks.

TRANSMISSION LINE THEORY (CO4, K3-Apply) 9

A Line of cascaded T sections – Transmission lines – General Solutions , Physical Significance of the equations, The infinite line, Wavelength, Velocity of Propagation, Distortion less line, The telephone cable, Reflection on a line not terminated in Z_0, Reflection Coefficient, Open and Short Circuited Lines, Insertion loss.

LINE AT RADIO FREQUENCIES (CO5, CO6, K3 – Apply) 9

Parameters of open wire line and co-axial line at high frequencies- Standing wave ratio-Relation between VSWR and reflection co-efficient-Quarter wave transformer-Single stub matching-Smith chart and its applications - Introduction to wave guides –TE and TM waves in rectangular wave guides - Impossibility of TEM waves in wave guides

Total Periods: 45

TEXT BOOKS:

1. Sudhahar.A, Shyammohan S.P, "Circuits and Networks: Analysis and Synthesis", Mc Graw Hill education , New Delhi, 5th edition 2015.
2. John.D.Ryder "Network lines and fields", Prentice Hall of India Pvt. ltd, 4th Edition 2014.

REFERENCES:

1. Umesh Sinha "Network analysis and Synthesis", Sathya Prakashan Publishers, 2012.
2. Van Valkenburg "Introduction to modern Synthesis", Wiley Eastern Publication, 2007.
3. Les Besser and Rowan Gilmore, "Practical RF circuit Design for Modern Wireless Systems- Passive circuits and Systems", Vol.1, Artech House Publishers, Boston, London 2008.
4. D. Roy Choudhary, "Network and Systems", New Academic Science, 5th Edition, 2014.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1								1	3	2	
CO2	3	2	1	1								1	3	2	
CO3	3	2	1	1								1	3	2	
CO4	2	1	1	1								1	3	2	
CO5	3	2	1	1								1	3	2	
CO6	3	2	1	1								1	3	2	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC46	JAVA PROGRAMMING		L-T-P	C
			3-0-2	4
Programme:	B.E. - Electronics and Communication Engineering	**Sem:**	**Category:**	**PC**
Prerequisite:	Data Structures with C and C++			

Aim: The aim of this course is to provide students with a deep understanding of the Java programming is multifaceted, as it serves as a versatile, platform-independent, and secure language designed for various applications.

Course Outcomes: The students will be able to

CO1: Infer Object Oriented Programming concepts and basics of Java programming language. (K2)
CO2: Develop Java classes, abstract classes, interfaces, and exception handling for software applications. (K3)
CO3: Apply input/output streams, object serialization, and multithreading concepts for software applications (K3)
CO4: Make use of AWT and Swing components for GUI development, event handling, and applet lifecycle management in Java applications (K3)
CO5: Design JDBC architecture for database-driven applications. (K3)
CO6: Develop SQL statements and queries to interact with databases.(K3)

JAVA FUNDAMENTALS (CO1, K2-Understanding) **9**

Features of Java, OOPs concepts, Java virtual machine, Reflection byte codes, Byte code interpretation, Data types, variable, arrays, expressions, operators, and control structures, Objects and classes.

JAVA CLASSES (CO2, K3 – Apply) **9**

Abstract classes, Static classes, Inner classes, Packages, Wrapper classes, Interfaces, This, Super Access control; Exception handling Exception as objects, Exception hierarchy, Try catch finally Throw, throws.

I/O PACKAGE (CO3, K3 – Apply) **9**

Input streams, Output streams, Object serialization, Deserialization, Sample programs on IO files Filter and pipe streams; Multi-threading: Thread Life cycle, Multi-threading advantages and issues, Simple thread program, Thread synchronization.

GRAPHICAL USER INTERFACE (GUI) (CO4, K3 – Apply) **9**

Introduction to AWT programming , Layout and component managers, Event handling, Applet class Applet life-cycle, Passing parameters embedding in HTML , Swing components – JApplet, JButton, JFrame, etc.,

DATABASE CONNECTIVITY (CO5, CO6, K3 – Apply) **9**

JDBC architecture, Establishing connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, Working with Result Set.

LIST OF EXPERIMENTS:

1. The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence
2. Write a Java program to multiply two given matrices
3. Write a Java program to make frequency count of words in a given text.
4. Write a Java program to create a Student class with following fields i. Hall ticket number ii. Student Name iii. Department. Create ‘n’ number of Student objects where ‘n’ value is passed as input to constructor.
5. Write a Java program that displays the number of characters, lines and words in a text file
6. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.
7. Develop simple calculator using Swings.

TOTAL PERIODS: 45

Text Book:

1.Programming with Java A Primer, E. Balaguruswamy Tata Mc Graw Hill Companies. ISBN: 0070617139, Nov 2010.

References:

1.Java Programming Language Ken Arnold Pearson. Addison-Wesley,4th Edition, Aug 2005.
2. The complete reference JAVA2, Hervert schildt. TMH.4th Edition, July2017.
3. Big Java, Cay Horstmann 2nd edition, Wiley India Edition, June 2006.
4. Java server programming, Ivan Bayross SPD, Penguin Books Ltd., Jan 2008.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	2				2	1	1	1			2
CO2	3	2	1	1	2				2	1	1	1			2
CO3	3	2	1	1	2				2	1	1	1			2
CO4	3	2	1	1	2				2	1	1	1			2
CO5	3	2	1	1	2				2	1	1	1			2
CO6	3	2	1	1	2				2	1	1	1			2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC47	INTEGERATED CIRCUITS LABORATORY			L-T-P	C
				2-0-0	1.5
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	**4**	Category	PC

Prerequisite: Electronic Devices and circuits Laboratory

AIM: To make the students to design and implement the various Electronics circuits using Linear and digital ICs.

Course Outcomes: The students will be able to

CO1: Construct arithmetic and logic circuits using logic gates. (K3)
CO2: Build various combinational logic circuits using logic gates. (K3)
CO3: Develop the sequential logic circuit of flip-flops. (AP)
CO4: Implement amplifier, integrator and differentiator using Op- amp IC741. (K3)
CO5: Design waveform generators using Op-amp IC741 (K3)
CO6: Implement waveform generators using NE555 Timer. (K3)

LIST OF EXPERIMENTS:

DIGITAL ICs

1. Study of Logic gates.
   - **a)** Basic Logic gates.
   - **b)** Universal Logic gates.
   - **c)** Exclusive Logic gates.
2. Design and implementation of Arithmetic circuits.
   - a) Half adder and Full adder.
   - b) Half subtractor and Full subtractor..
3. Design and Implementation of Code Converters.
4. Design and Implementation of Multiplexer and De-multiplexer.
5. Design and Implementation of Encoder and Decoder.
6. Design and Implementation of Flip Flop.

LINEAR ICs

1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Schmitt Trigger using Op-amp.
4. Astable & Monostable multivibrators using NE555 Timers.
5. Phase shift and Wien bridge oscillators using op-amp.

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO 2**	**PSO 3**
CO1	3	2	1	1	2				2	2	2	2	1	3	1
CO2	3	2	1	1	2				2	2	2	2	1	3	1
CO3	3	2	1	1	2				2	2	2	2	1	3	1
CO4	3	2	1	1	2				2	2	2	2	1	3	1
CO5	3	2	1	1	2				2	2	2	2	1	3	1
CO6	3	2	1	1	2				2	2	2	2	1	3	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231EC48 COMMUNICATION SYSTEMS LABORATORY L-T-P C
0-0-3 1.5

Programme: B.E. Electronics and Communication Engineering **Sem:** 4 **Category** **PC**

Prerequisite: Electronic Devices and circuits Laboratory

AIM: To expose the students in various analog communication and digital communication techniques

Course Outcomes: The students will be able to

CO1: Develop circuits for sampling and time division multiplexing. (K3)

CO2: Build Amplitude and Frequency modulation and demodulation circuits for analog communication systems. (K3)

CO3: Design Pre-emphasis and De-emphasis circuits for analog communication systems.

CO4: Implement digital pulse modulation schemes, including Pulse Code Modulation and Delta Modulation and their demodulation techniques (K3)

CO5: Construct digital modulation techniques, including Frequency Shift Keying, Phase Shift Keying, and Differential Phase Shift Keying Techniques. (K3)

CO6: Develop line coding and error control coding schemes for reliable data transmission in digital communication systems (K3)

LIST OF EXPERIMENTS

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. Pre-emphasis and De-emphasis
5. FM Modulator and Demodulator
6. Pulse Code Modulation and Demodulation
7. Delta Modulation and Demodulation
8. Simulation of BPSK, QPSK and QAM modulation schemes
9. Line coding schemes
10. FSK, PSK and DPSK schemes (Simulation)
11. Error control coding schemes - Linear Block Codes (Simulation)

TOTAL PERIODS: 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1				3	1	2	2	3		3
CO2	3	2	1	1	1	1			3	1	2	2	3	2	3
CO3	2	1	1	1	1				3	1	2	2	2	2	3
CO4	3	2	1	1	2	1			2	1	2	2	2		2
CO5	3	2	1	1	1				2	1	2	2	3		2
CO6	2	1	1	1	1	1			3	2	2	2	3	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

231HS47	ENHANCING APTITUDE AND REASONING SKILLS	L-T-P	C
		0-0-2	1

Programme: B.E/B.Tech **Sem:** 4 **Category:** EEC

Prerequisite: Enhancing Communication Skills

Objectives: To equip students with essential quantitative, logical, data interpretation, verbal aptitude, and general awareness skills necessary for excelling in competitive exams and real-world problem-solving scenarios, focuses on developing critical thinking and analytical abilities.

Course Outcomes:

At the end of the course, learners will be able to:

CO1: Apply mathematical concepts and techniques to solve complex quantitative problems, demonstrating a solid understanding of number systems, arithmetic operations, and algebra.

CO2: Develop and apply logical reasoning skills to analyze patterns, sequences, and relationships, enabling effective problem-solving in various reasoning scenarios such as puzzles and seating arrangements.

CO3: Interpret and analyze data presented in various forms, such as tables, graphs, and charts, to make informed decisions and solve problems based on quantitative data analysis.

CO4: Enhance communication skills by building a robust vocabulary, understanding grammar rules, and effectively comprehending and analyzing written texts.

CO5: Demonstrate awareness of current affairs and general knowledge across various domains, including history, geography, science, and politics, to participate in informed discussions and make educated decisions.

CO6: Develop effective test-taking strategies, including time management and analytical review of test results, to improve performance in competitive exams and enhance overall test readiness.

QUANTITATIVE APTITUDE **6**

Number Systems and Simplifications - Types of Numbers: Natural, Whole, Integers, Rational, Irrational, Divisibility Rules, Simplification Techniques, HCF and LCM, Arithmetic Operations and Algebra, Basic Operations: Addition, Subtraction, Multiplication, Division, Fractions and Decimals, Percentage Calculations, Introduction to Algebra:, Variables, Expressions, and Equations, Ratio, Proportion, and Averages, Direct and Inverse Proportions, Averages: Mean, Median, and Mode, Speed, Time, and Distance - Basics of Speed, Time, and Distance, Relative Speed, Problems on Trains, Boats, and Streams.

LOGICAL REASONING **6**

Analytical Reasoning - Series Completion: Number, Alphabet, and Picture Series, Analogies and Classification, Coding-Decoding, Deductive Reasoning

Syllogisms: Statements and Conclusions, Logical Deduction, Statement and Assumption, Statement and Conclusion, Puzzles and Seating Arrangements, Linear and Circular Arrangements, Complex Puzzles, Blood Relations and Family Trees.

DATA INTERPRETATION **6**

Introduction to Data Interpretation - Importance and Types of Data Interpretation, Reading and Interpreting Tables and Charts, Bar Graphs and Line Graphs, Advanced Data Interpretation, Pie Charts and Venn Diagrams, Caselets and Data Sufficiency, Practice Exercises on Data Interpretation.

VERBAL APTITUDE 6

Vocabulary and Grammar, Building Vocabulary: Synonyms, Antonyms, and Homonyms, Common Grammar Rules, Spotting Errors and Sentence Correction, Reading Comprehension, Techniques for Efficient Reading, Types of Questions: Fact-based, Inference, and Vocabulary-based, Practice, Passages and Exercises, Verbal Reasoning, Critical Reasoning: Arguments and Conclusions, Logical Sequencing of Sentences, Para Jumbles and Sentence Rearrangement.

GENERAL AWARENESS AND PRACTICE TESTS 6

Importance of Current Affairs - Basic General Knowledge: History, Geography, Science, and Politics, Recent Developments and News Analysis, Practice Tests and Mock Exams, Full-length Mock Tests: Quantitative Aptitude, Logical Reasoning, Data Interpretation, and Verbal Aptitude, Time Management Strategies, *Reviewing and Analyzing Test Results*.

Total Periods: 30

TEXT BOOKS:

1. Aggarwal, R.S. *Quantitative Aptitude for Competitive Examinations*. S. Chand Publishing, 2020.
2. Aggarwal, R.S. *A Modern Approach to Logical Reasoning*. S. Chand Publishing, 2019.
3. Ashisha, Ananta. *Data Interpretation & Data Sufficiency*. Arihant Publications, 2021.
4. Aggarwal, R.S. *A Modern Approach to Verbal & Non-Verbal Reasoning*. S. Chand Publishing, 2020.
5. Pandey, Manohar. *General Knowledge 2024*. Arihant Publications, 2024.

REFERENCES:

1. Verma, Sarvesh K. *Quantitative Aptitude Quantum CAT*. Arihant Publications, 2022.
2. Sinha, Nishit K. *Logical Reasoning and Data Interpretation for the CAT*. Pearson, 2021.
3. Sinha, Nishit K. *The Pearson Guide to Data Interpretation and Logical Reasoning for the CAT*. Pearson, 2019.
4. Wren, P.C., and H. Martin. *High School English Grammar and Composition*. S. Chand Publishing, 2018.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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CO2	3	2	1	1								1	2		2
CO3	2	1	1	1								1	2		2
CO4	3	2	1	1								1	2		2
CO5	2	1	1	1								1	2		2
CO6	2	1	1	1								1	2		2

Enter correlation levels1,2 or 3 as defined below:1:Slight(Low) 2:Moderate(Medium) 3:Substantial(High)