K.L.N.COLLEGE OF ENGINEERING

Pottapalayam, Sivagangai District

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

Estd: 1994

FIRST AND SECOND YEAR

CURRICULUM AND SYLLABUS

REGULATIONS 2024

For Under Graduate Program

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CHOICE BASED CREDIT SYSTEM

(For the students admitted from the Academic Year 2025 - 2026 onwards)

Dr.V.KEJALAKSHMI
PROFESSOR & HEAD
DEPARTMENT OF ECE

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

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

VISION OF THE INSTITUTION

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society

MISSION OF THE INSTITUTION

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry.

VISION OF THE DEPARTMENT

To promote as a center of excellence in educational and research activities related to electronics and communication engineering and its allied areas.

MISSION OF THE DEPARTMENT

1. To create educational and research environment to meet ever changing and ever demanding needs of electronics and communication industry along with IT and other interdisciplinary fields.

2. To mould the students to become ethically upright and recognized as responsible engineers.

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1. To prepare graduates with a strong foundation in Engineering science and Technology with more emphasis in Electronics and Communication Engineering and its allied areas.

PEO 2. To prepare the students to pursue successful career in industry and to motivate them for higher education.

PEO 3. To prepare the graduates to sustain as good professional, researcher and to practice them in emerging technologies through lifelong learning.

PEO 4. To impart students with ethical standards, professional excellence through effective communication skills, team work, multi-disciplinary projects and social responsibility.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1. Design and analyze the basic analog and digital electronic circuits.

PSO 2. Design and analyze the spectral components of communication signals and systems.

PSO 3. Develop the modules in VLSI and embedded systems.

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Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice are as in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice are as in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

Program Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively 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. (WK1 to WK4)

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. (WK5)

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. (WK8).

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. (WK2 and WK6)

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. (WK1, WK5, and WK7)

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

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. (WK8)

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REGULATIONS 2024

For Under Graduate Program

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CHOICE BASED CREDIT SYSTEM

CATEGORY OF COURSES

i. **Humanities Social Sciences and Management (HSM) courses** include Technical English, Foreign Language, Engineering Ethics and Human Values, Communication skills, Entrepreneurship, Physical Education and Environmental Sciences and Sustainability

ii. **Basic Sciences (BS) courses** include Mathematics, Physics, Chemistry, etc.

iii. **Engineering Sciences (ES) courses** include Industrial Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, Instrumentation etc.

iv. **Professional Core (PC) courses** include the core courses relevant to the chosen specialization/branch.

v. **Professional Elective (PE) courses** include the elective courses relevant to the chosen specialization / branch.

vi. **Open Elective (OE) courses** include the courses from other branches which a student can choose from the list specified in the curriculum of B.E. / B. Tech. Programmes.

vii. **Employability Enhancement Courses(EEC)** includes Project Work, Internship, Creative and Innovative Project, Seminar, Professional Practices, Industrial/Practical Training.

viii. **Mandatory Courses (MC)** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc

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REGULATIONS 2024

CHOICE BASED CREDIT SYSTEM

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - I

(Common to all B.E/B.Tech Programmes)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
		Induction program						
THEORY								
1.	24HS101	Professional English – I	HS	2	2	0	0	2
2.	24BS101	Engineering Mathematics	BS	4	3	1	0	4
3.	24BS102	Engineering Physics	BS	3	3	0	0	3
4.	24BS103	Engineering Chemistry	BS	3	3	0	0	3
5.	24GE101	Problem solving and C Programming	ES	3	3	0	0	3
6.	24GE102	Engineering Graphics	ES	3	2	1	0	3
7.	24HST01	தமிழர்மரபு / Heritage of Tamils	HS	1	1	0	0	1
PRACTICAL								
8.	24BS1L1	Basic Science Laboratory	BS	4	0	0	4	2
9.	24GE1L1	C Programming laboratory	ES	4	0	0	4	2
10.	24HS1L1	English Laboratory	HS	2	0	0	2	1
TOTAL				**29**	**17**	**2**	**10**	**24**

SEMESTER - II

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	24BS201	Advanced Calculus **(Common to B.E. Mech,EEE& ECE)**	BS	4	3	1	0	4
2.	24HS202	Environmental Sciences and Sustainability	HS#	2	2	0	0	2
3.	24GE201	Python Programming	ES#	3	3	0	0	3
4.	24EC201	Electric Circuits and Machines	PC	3	3	0	0	3
5.	24EC202	Electron Devices	PC	3	3	0	0	3
6.	24HST02	தமிழரும்தொழில்நுட்பமும்/ Tamils and Technology	HS#	1	1	0	0	1
THEORY CUM PRACTICAL								
7.	24HS201	Professional English – II	HS#	4	2	0	2	3
PRACTICAL								
8.	24EC2L1	Circuits & Devices Laboratory	PC	4	0	0	4	2
9.	24GE2L1	Python Programming Laboratory	ES#	3	0	0	3	1.5
10.	24GE2L2	Industrial practices Workshop	ES#	3	0	0	3	1.5
11.	24HS2L1	Aptitude and Soft Skills – I	EEC#	2	0	0	2	1*
12.	24HS2L2	Physical Education - I	HS#	2	0	0	2	1*
TOTAL				**34**	**17**	**1**	**16**	**24**

[#] Common to all B.E. / B.Tech programmes

*The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA

SEMESTER III

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	24BS302	Linear Algebra and Partial Differential Equations	BS	4	3	1	0	4
2.	24EC301	Analog Circuits	PC	3	3	0	0	3
3.	24EC302	Signals and Systems	PC	4	3	1	0	4
4.	24EC303	Digital Electronics	PC	3	3	0	0	3
5.	24HS301	Human Values and Ethics (Common to all B.E./B.Tech. programmes)	HS	2	1	1	0	2
6.		Foreign Language (Common to all B.E./B.Tech. programmes)	HS	2	2	0	0	-
THEORY CUM PRACTICAL								
7.	24CS306	Data Structures Using C	PC	5	3	0	2	4
PRACTICAL								
8.	24EC3L1	Analog Circuits Laboratory	PC	3	0	0	3	1.5
9.	24EC3L2	Digital Electronics and Simulation Laboratory	PC	3	0	0	3	1.5
10.	24HS3L1	Aptitude and Soft Skills – II (Common to all B.E./B.Tech. programmes)	EEC	2	0	0	2	1*
11.	24HS3L2	Physical Education – II (Common to all B.E./B.Tech. programmes)	HS	2	0	0	2	1*
TOTAL				**33**	**18**	**3**	**12**	**23**

SEMESTER IV

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	24EC401	Random Process and Communication Systems	PC	4	3	1	0	4
2.	24EC402	Electromagnetic Fields	PC	4	3	1	0	4
3.	24EC403	Analog Integrated Circuits	PC	3	3	0	0	3
4.	24EC404	Control System Engineering	PC	3	3	0	0	3
5.	24EC405	Microprocessor and Microcontroller	PC	3	3	0	0	3
THEORY CUM PRACTICAL								
6.	24EC406	Communication Networks and Security	PC	4	2	0	2	3
PRACTICAL								
7.	24EC4L1	Analog Integrated Circuits Laboratory	PC	3	0	0	3	1.5
8.	24EC4L2	Microprocessor and Microcontroller Laboratory	PC	3	0	0	3	1.5
9.	24EC4L3	Micro Project	EEC	2	0	0	2	1
10.	24HS4L1	Aptitude and Soft Skills – III (Common to all B.E./B.Tech. programmes)	EEC	2	0	0	2	1*
TOTAL				**31**	**17**	**2**	**12**	**24**

*** The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA**

24HS101	PROFESSIONAL ENGLISH – I	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To improve the communicative competence of learners.
- To learn to apply basic grammatical structures in appropriate contexts.
- To acquire lexical competence, use them appropriately in sentences, and comprehend their meaning in a text.
- To help learners use language effectively in professional contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

UNIT-I INTRODUCTION TO EFFECTIVE COMMUNICATION 6

Exploring the Elements of Effective Communication through various Activities - Unveiling the Significance of Effective Communication in Academic, Research, and Professional Achievements - Dissecting the Seven Components Integral to Effective Communication -Analyzing the Characteristics of Effective Writing - Enhancing English Language and Communication Skills for Optimal Course Outcome

INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

Reading – Reading Brochures (Technical Context) – Telephone Messages / Social Messages. **Writing –** Email to MNC's (Requesting for IV, Internship, and Requesting HR for College Function, Internal & External Business Communication) - Letter to the Principal (Requesting Bona-fide Certificate, Getting Original Certificate, etc.,) **Grammar –** Present Tense – Questions Types. **Vocabulary** – Technical Vocabulary.

UNIT-II NARRATION AND SUMMATION 6

Reading – Biographies. **Writing –** Guided Writing – Paragraph Writing – Travel & Technical Blogs – Report on Events. **Grammar** – Simple Past Tense – Concord. **Vocabulary** – Word Formation – Prefix, Suffix and Roots

UNIT-III DESCRIPTION OF A PROCESS / PRODUCT 6

Reading – Project Reviews – User Manuals. **Writing –** Definitions – Instructions – Process Description. **Grammar –** Modals. **Vocabulary** – Compound Nouns – Voices

UNIT- IV CLASSIFICATION AND RECOMMENDATIONS 6

Reading – Newspaper Articles, Note Taking. **Writing –** Inference – Charts, Diagrams, Tables – Note Making – Recommendations. **Grammar –** Articles – Possessive & Relative Pronouns – Degrees of Comparison.

UNIT-V EXPRESSION 6

Reading – Opinion Blogs. **Writing –** Essay Writing – Descriptive Writing - Social Issues (Public Transportation, Drinking Water) - Narrative Writing (Cyber Crime, Experience of First Semester). **Grammar –** Future Tense – Punctuation – Cause & Effect – Discourse Markers.

CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 60 PERIODS

TEXT BOOKS:

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. VeenaSelvam, Dr. SujathaPriyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles And Practices By Meenakshi Raman &Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English for Technical Communication (With CD) By AyshaViswamohan, Mcgraw Hill Education, ISBN: 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.
6. A Course in Technical English by Mr. D. Praveen Sam, KN Shoba, Cambridge University Press, 2020, India.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME :PROFESSIONAL ENGLISH – I		**COURSE CODE :** 24HS101	
CO	**Course Outcomes**	**Unit**	**K –CO**
C101.1	Remember and use appropriate words in a professional context in precise and efficient way on technological contexts	I-V	AD
C101.2	Form situational conversations and technical writing styles for interpersonal and effective communication	I-V	AD
C101.3	Gain understanding of basic grammatical structures and use them in right context	I-V	AD
C101.4	Read and infer the denotative and connotative meanings of technical texts	I-V	AD
C101.5	Write definitions, descriptions, narrations and essays on various topics	I-V	AD

24BS101	ENGINEERING MATHEMATICS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To relate various methods of Matrix Algebra to handle practical problems arising in the field of engineering.
- To achieve conceptual understanding and to retain the best traditions of Calculus.
- To provide the basic tools of Calculus of Single and Multivariable, mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.

UNIT - I MATRICES 9+3

Introduction to Matrices-Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton Theorem(without proof) – Diagonalization of matrices – Reduction of a Quadratic form to Canonical form by Orthogonal transformation – Nature of Quadratic forms.

UNIT - II DIFFERENTIAL CALCULUS 9+3

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Differentiation of Polynomials, Exponential, Trigonometric, Hyperbolic, Logarithmic and Implicit functions- Maxima and Minima of functions of single variable.

UNIT - III FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial differentiation – Homogeneous functions and Euler's theorem(without proof) – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT - IV INTEGRAL CALCULUS 9+3

Definite and Indefinite integrals - Substitution rule - Techniques of integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

UNIT - V ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Veerarajan. T., "Engineering Mathematics I", The Tata McGraw Hill Publication-New Delhi, First Edition, 2018.

REFERENCES:

1. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015. [For units II & III].
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2006.
3. Wiley, "Calculus- International Student version", 10th Edition, Wiley India Pvt. Ltd, New Delhi 2017.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
5. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 9th Edition, 2014.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : ENGINEERING MATHEMATICS		**COURSE CODE : 24BS101**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C102.1	Determine the Eigen values, Eigen vectors to diagonalize a matrix and reduce quadratic form to canonical form.	I	K3
C102.2	Apply the concepts of Concavity, Convexity to determine the critical points, point of Inflection, Maxima and Minima of Single variable functions.	II	K3
C102.3	Compute the derivatives of functions of two variables and apply them to calculate the maxima and minima.	III	K3
C102.4	Determine integrals using techniques of integration, such as substitution, partial fractions and integration by parts.	IV	K3
C102.5	Apply the various techniques to solve higher order differential equations with constant and variable coefficients.	V	K3

		L	T	P	C
24BS102	ENGINEERING PHYSICS	3	0	0	3

OBJECTIVES:

- To inculcate properties of matter and characteristics of electromagnetic waves.
- To introduce the basics of LASER, fiber optics and crystallography.
- To enhance the knowledge on importance and applications of quantum physics.

UNIT - I PROPERTIESOFMATTER 9

Elasticity – Hooke's Law – Stress-Strain diagram and its uses – three modulus of elasticity (qualitative) – Poisson's ratio – Factors affecting elastic modulus and tensile strength – Twisting couple – Torsional pendulum: theory and experiment – Bending of beams – Bending moment – Cantilever: theory and experiment – Uniform and Non-uniform bending – theory and experiment – I-shaped girders

UNIT - II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - Wave equation: plane electromagnetic waves in vacuum, conditions on the wave field - Properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - Polarization producing electromagnetic waves - Reflection and Transmission of electromagnetic waves from a non-conducting medium - Vacuum interface for normal incidence.

UNIT - III LASER AND FIBER OPTICS 9

LASER: theory of laser - Characteristics - Spontaneous and Stimulated emission - Einstein's coefficients - Population inversion - Nd-YAG laser, CO_2 laser – Basic applications of lasers in industry. Fiber optics: principle, Numerical aperture and Acceptance angle - Types of optical fibers (material, refractive index, mode) – Losses associated with optical fibers - Fiber optic sensors: Pressure and Displacement

UNIT - IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory – Compton effect: theory and experimental verification – wave particle duality – Concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – Particle in a one-dimensional box – Tunneling (qualitative) - Scanning tunneling microscope (STM).

UNIT - V CRYSTALLOGRAPHY 9

Crystalline and amorphous materials – Unit cell, Crystal systems, Bravais lattices, Lattice planes - Miller indices – Interplanar spacing in cubic lattice – Atomic radius, Coordination number and Packing factor for SC, BCC, FCC, HCP structures - Growth of single crystals: Solution and melt growth techniques.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. R. K. Gaur and S. L. Gupta, “Engineering Physics”, DhanpatRai Publishers,2012.
2. B. K. Pandey and S. Chaturvedi, “Engineering Physics”, Cengage Learning India, 2018.

REFERENCES:

1. D. K. Bhattacharya and T. Poonam, “Engineering Physics”, Oxford University Press 2017.
2. R. Wolfson, “Essential University Physics”, Volume 1 & 2, Pearson Education (Indian Edition), 2009.
3. K.Thyagarajan and A.Ghatak, “Lasers: Fundamentals and Applications”, Laxmi Publications (Indian Edition), 2019.
4. D. Halliday, R. Resnick and J. Walker, “Principles of Physics”, Wiley (Indian Edition), 2015.
5. P. A. Tipler and G. Mosca W. H. Freeman, “Physics for Scientists and Engineers with Modern Physics”, 2007.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : ENGINEERING PHYSICS		**COURSE CODE: 24BS102**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C103.1	Demonstrate the properties of elasticity and measure the different moduli of elasticity	I	K3
C103.2	Discuss the characteristics of electromagnetic waves.	II	K2
C103.3	Examine the characteristics of laser and optical fiber.	III	K2
C103.4	Explain black body radiation, properties of matter waves and Schrodinger equation.	IV	K2
C103.5	Classify Bravais lattices, different types of crystal structures and crystal growth techniques	V	K3

24BS103	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.
- To introduce the basic concepts and applications of corrosion and alloys.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.

UNIT – I WATER AND ITS TREATMENT 9

Water: Sources and impurities, Water quality parameters: Estimation of hardness by EDTA method (Problems). Desalination of brackish water: Reverse Osmosis, Electro dialysis. Waste water treatment. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment: phosphate, colloidal, sodium aluminate and calgon conditioning and External treatment: Ion-exchange demineralization and zeolite process.

UNIT - II ENERGY SOURCES AND STORAGE DEVICES 9

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials, Wind energy.

Batteries- Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles - working principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell.

UNIT - III CORROSION AND ALLOYS 9

Corrosion-causes-factors-types-chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control-material selection and design aspects-electrochemical protection-sacrificial anode method and impressed current cathodic method.

Alloys – introduction, definition, properties of alloys, significance of alloying; Functions and effects of alloying elements; Heat treatment of steel - annealing, hardening, tempering, carburizing, nitriding; Ferrous alloys- nichrome and stainless steel (18/8); Non-ferrous alloys – brass and bronze.

UNIT - IV FUELS AND COMBUSTION 9

Fuels: Introduction: Classification of fuels; Coal proximate analysis of coal and manufacture of metallurgical coke (Otto Hoffmann method). Petrol characteristics, knocking - octane number, diesel oil characteristics, cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method.

UNIT - V NANOCHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties: optical, electrical, mechanical and magnetic; Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. P. C. Jain and Monica Jain, *"*EngineeringChemistry*",* 17th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., *"*EngineeringChemistry*"*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, *"*A Text book of Engineering Chemistry*",* S. Chand Publishing, 12th Edition, 2018

REFERENCES:

1. 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.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : ENGINEERING CHEMISTRY		**COURSE CODE : 24BS103**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C104.1	Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.	I	K2
C104.2	Describe the different forms of energy resources, apply them in suitable energy sectors and illustrate the working of various batteries.	II	K2
C104.3	Explain the principles, various type of corrosion, corrosion control methods and alloys.	III	K2
C104.4	Categorize various fuels for Engineering processes and describe about applications.	IV	K2
C104.5	Identify basic concepts of nano science and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.	V	K2

24GE101 PROBLEM SOLVING AND C PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basic C programming constructs
- To learn about usage of arrays and strings
- To understand the concepts of functions and pointes
- To understand structures and unions
- To expose to file handling operations in C

UNIT - I PROBLEM SOLVING USING C PROGRAMMING 9

Introduction to computer system – Block Diagram of Computer, Types of Memory, I/O Devices, Application Programs and System Programs – Loader, linker, assembler, compiler, interpreter, Programming process – source code to executable code, Problem Solving Strategies – Problem analysis, Algorithms, Flow Charts, Pseudo Code, Overview of C : Features of C, structure of C program, data types, variables, Constants, Keywords, Operators–Precedence and Associativity, Expressions, statements, Control structures- Branching and Looping , Illustrative problems: odd or even number, Leap year, Biggest of three numbers, square root of a number, Sum of n numbers, Armstrong number, Palindrome, Fibonacci Series, Prime number

UNIT - II ARRAYS AND STRINGS 9

Arrays– Declaration and Initialization of one dimensional array , Example Programs– Insertion sort, Selection sort, Linear search, Binary search, Declaration and Initialization of two dimensional array, Example programs- Matrix Addition and Multiplication, Determinant and Transpose of a matrix.

Strings- Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, String-handling Functions, Example Programs- with and without using built-in string functions

UNIT - III FUNCTIONS AND POINTERS 9

Introduction to functions – need of Function, Function prototype, function definition, function call, Return Values and their Types, Category of Functions, Built- in functions (string functions, math functions), Passing Arrays to Functions, Recursion, Scope, Visibility and Lifetime of variables, Example Program – Computation of Sine series, Scientific calculator using built-in functions. Pointers- Declaration and Initialization of pointer, Pointer operators, Pointer arithmetic, Pointer Increments and Scale Factor, Array of pointers, Example Program – Sorting of names, Parameter passing – Pass by value, Pass by reference, Example Program – Swapping of two numbers using pass by reference

UNIT - IV STRUCTURES AND UNIONS 9

Structure – Defining a structure, declaring structure variables, accessing structure members, structure initialization, Nested structures, Pointer and Structures, Array of structures, Example Program – using structures and pointers, typedef, Self referential structures, Union, Dynamic memory allocation, Illustrative programs – allocating block of memory, sum of n numbers using malloc, calloc.

UNIT - V FILE PROCESSING 9

Files – File operations, Types of file processing– Sequential access and Random access, Error Handling on Files - Example Program– Finding average of numbers stored in sequential access file, Random access file -Example Program– Transaction processing using random access files, Command line arguments.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. Balagurusamy E, “Programming in ANSI C”, Eighth Edition, Tata Mcgraw-Hill,2019.
2. YashavantKanetkar, “Let Us C”, BPB Publications, 17th Edition,2020.
3. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education,2015.

REFERENCES:

1. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, PearsonEducation India, 2015.
2. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd.,2011
3. PradipDey, ManasGhosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press,2013.
4. Byron Gottfried, "Schaum’s outlines- Programming with C", McGraw-Hill Education, Fourth edition, 2018.
5. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition,2016.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME :PROBLEM SOLVING AND C PROGRAMMING		**COURSE CODE: 24GE101**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C105.1	Explain the basic concepts of computer system and develop simple C programs.	I	K3
C105.2	Apply one dimensional and two dimensional arrays for implementing matrix operations and string operations.	II	K3
C105.3	Make use of function concept and develop programs to implement pointer arithmetic and arrays with pointers for solving simple mathematical problems.	III	K3
C105.4	Illustrate simple programs for structures and unions.	IV	K3
C105.5	Apply various file operations and develop programs to implement file access procedures.	V	K3

24GE102	ENGINEERING GRAPHICS	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To understand the importance of the drawing in engineering applications
- To develop graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to existing national standards related to technical drawings.
- To improve their visualization skills so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning

UNIT-I PROJECTION OF POINTS AND LINES 9

Orthographic projection – Principles - Principal planes - Projection of points in all quadrants - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.

UNIT-II PROJECTION OF PLANE SURFACES 9

Projection of planes (Polygonal and Circular surfaces) inclined to both the principal planes by rotating object method.

UNIT-III PROJECTION OF SOLIDS 9

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

UNIT- IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 9

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

UNIT-V ISOMETRIC PROJECTION 9

Principles of Isometric Projection – Isometric scale – Isometric projections of simple solids – Frustum and truncated Prisms and Pyramids.
Introduction to Perspective projections. (Not for Examination)

DEMONSTRATION ON DRAFTING PACKAGES(For Internal Evaluation Weightage only)

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. Natarajan K.V., “A text book of Engineering Graphics”, Dhaallnalakshmi Publishers, Chennai, 33rd Edition, 2020.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 17th Multicolor Edition, 2021.
3. N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 54th Edition, 2023.

REFERENCES:

1. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education, 5th Edition, 2022
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2019
3. Luzadder and Duff, Fundamentals of Engineering Drawing, 11th edition, Pearson Education, 2015
4. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill PublishingCompany Limited, New Delhi, 2019
5. M.S.Kumar, "Engineering Graphics", DD Publications, 2018
6. http://nptel.ac.in/courses/112103019/
7. https://archive.nptel.ac.in/courses/112/102/112102304/

BUREAU OF INDIAN STANDARDS:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001: Technical drawings - General principles of presentation.
4. IS 11669 – 1986: General principles of dimensioning on technical drawings.
5. SP 46 (2003): Engineering Drawing Practice for Colleges.
6. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

SPECIAL POINTS APPLICABLE TO EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either or type covering units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME :ENGINEERING GRAPHICS		**COURSE CODE : 24GE102**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C106.1	Build the orthographic projections of points and lines.	I	K3
C106.2	Sketch the projection of polygonal and circular planes.	II	K3
C106.3	Project simple solids like prisms, pyramids, cylinder and cone.	III	K3
C106.4	Construct the section and develop lateral surfaces of solids.	IV	K3
C106.5	Apply the concept of isometric projection to sketch 3D views.	V	K3

24HST01	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT-I LANGUAGE AND LITERATURE 3

nguage Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism& Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry-Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT-II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram-Role of Temples in Social and Economic Life of Tamils.

UNIT-III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam,Valari, Tiger dance - Sports and Games of Tamils.

UNIT- IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils &Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquestof Cholas.

UNIT-V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

CLASS HOURS: 15 PERIODS TERM HOURS: 15 PERIODS TOTAL: 30 PERIODS

24HST01	தமிழர்மரபு	L	T	P	C
		1	0	0	1

அலகு -I மொழிமற்றும்இலக்கியம் 3

[illegible] - [illegible] - [illegible] - [illegible] - [illegible] - [illegible] - [illegible], [illegible] - [illegible], [illegible] - [illegible] - [illegible] - [illegible]

அலகு – II மரபு - பறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை - சிற்பக்கலை 3

[illegible] - [illegible] - [illegible], [illegible] - [illegible] - [illegible] - [illegible] - [illegible] - [illegible] - [illegible] - [illegible], [illegible], [illegible], [illegible], [illegible] - [illegible].

அலகு – III நாட்டுப்புறகலைகள்மற்றும்வீரவிளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கனியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்விளையாட்டுகள்

அலகு – IV தமிழர்களின்திணைக்கோட்பாடுகள் 3

[illegible] [illegible], [illegible] - [illegible] - [illegible] - [illegible], [illegible] - [illegible] - [illegible] - [illegible].

அலகு –V [illegible] 3

இந்தியவிடுதலைப்போரில்தமிழர்களின்பங்கு- இந்தியாவின்பிற்ப்பகுதிகளில்தமிழ்பண்பாட்டின்தாக்கம்–சுயமரியாதைஇயக்கம்–இந்தியமருத்துவத்தில், சித்தமருத்துவத்தின்பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள்–தமிழ்புத்தகங்களின்அச்சுவரலாறு

TEXT & REFERENCE BOOKS:

1. தமிழகவரலாறு–மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு:

தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்)

2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்
3. .கீழடி-வைகைநதிக்கரையில்சங்ககாலநகரநாகரீகம்
   (தொல்லியல்துறைவெளியீடு)
4. பொருனை - ஆற்றங்கரைநாகரீகம். (தொல்லியல்துறைவெளியீடு
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL
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, TamilNadu
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)
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)

24BS1L1	BASIC SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY

OBJECTIVES:

- To inculcate the proper usage of various physics laboratory equipments and interpretation of experimental data.
- To stimulate problem solving skills related to physics principles.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS: (ANY SIX)

1. Torsion Pendulum – determination of moment of inertia of a disc and rigidity modulus of wire.
2. Uniform Bending – determination of Young's modulus of a given material.
3. Determination of band gap of a semiconductor.
4. Air wedge – determination of thickness of a thin wire / sheet.
5. Newton's ring – determination of radius of curvature of plano convex lens.
6. Ultrasonic interferometer – determination of velocity of sound and compressibility of liquid.
7. a. Optical fiber – determination of Numerical aperture and acceptance angle.

   b. Diode laser – determination of width of groove in compact disc.
8. Spectrometer grating – determination of wavelength of mercury spectrum.
9. Spectrometer hollow prism – determination of refractive index of a given liquid.

TOTAL: 30 PERIODS

LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Quantity
1	Torsion pendulum set	6
2	Travelling microscope & accessories	6
3	Air wedge set up	6
4	Ultrasonic interferometer	6
5	Laser kit	6
6	Spectrometer &hollow prism	6
7	Spectrometer & grating	6
8	Semiconductor band gap kit	6
9	Newton's ring set up	6

CHEMISTRY LABORATORY

OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters through volumetric analysis.
- To have hands on experience in using instruments like pH meter, conductivity meter, potentiometer.
- To determine the amount of metal ions in alloys& molecular weight of polymer.
- To acquaint the students with the determination of molecular weight of polymer by viscometer

LIST OF EXPERIMENTS:(ANY SIX)

1. Determination of types and amount of alkalinity in a water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Estimation of copper content of the brass solution by EDTA.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Determination of strength of acids in a mixture of acids using conductivity meter.
7. Conductometric titration of barium chloride against sodium sulphate. (precipitation titration)
8. Estimation of iron content of the given solution using potentiometer.
9. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
10. Estimation of Nickel in steel.

TOTAL: 30 PERIODS

LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Quantity
1	Burette (50ml)	30
2	Pipette(20ml)	30
3	Beaker (100ml)	30
4	Conical Flask (250ml)	30
5	Conductivity meter	10
6	Potentiometer	10
7	pH meter	10
8	Viscometer	14
9	Electronic Balance	1

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME :BASIC SCIENCE LABORATORY		COURSE CODE: 24BS1L1	
CO	**Course Outcomes**	**EXP**	**K –CO**
PHYSICS LABORATORY			
C107.1	Calculate rigidity modulus, Young's modulus of a given material and band gap of a semiconductor diode	1,2, 3	K3
C107.2	Predict the thickness of a given thin object, radius of curvature of Plano convex lens and velocity of ultrasound, compressibility of liquid	4,5,6	K3
C107.3	Determine the basic parameters of optical fiber, width of groove in CD, wavelength of the prominent spectral lines and refractive index of a given liquid	7,8,9	K3
CHEMISTRY LABORATORY			
C107.4	Estimate the chemical quality of a water sample by volumetric analysis.	1,2, 3, 4	K3
C107.5	Determine the molecular weight of polymer and amount of metal ions and impurities in solution through volumetric and electro analytical techniques.	5,6,7,8,9,10	K3

24GE1L1	C PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:

1. Programs using I/O statements, expressions and decision-making constructs.
2. Program for finding given year is leap year or not and finding given number is Armstrong number or not.
3. Design a calculator to perform the operations namely, addition, subtraction, multiplication, division and square of a number.
4. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
   a. if it is a perfect cube.
   b. if it is a multiple of 4 and divisible by 6.
   c. if it is a prime number.
5. Sort the numbers based on the weight in the increasing order as shown below <10,its weight><36,its weight><89,its weight>
6. Matrix addition and subtraction
7. Matrix multiplication and transpose of a matrix
8. Program using string with and without using string functions: string copy and Reverse the String.
9. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
10. From a given paragraph perform the following using built-in functions:
    a. Find the total number of words.
    b. Capitalize the first word of each sentence.
    c. Replace a given word with another word.
11. Program using recursion – factorial and Fibonacci series
12. Sort the list of numbers using pass by reference.
13. Generate salary slip of employees using structures and pointers.
14. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
15. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
16. **Mini project (Any one project : Maximum 4 per Team)**
    - Railway reservation system
    - Library Management System
    - University Result Publication System
    - Hospital Management System
    - Student Automation System
    - Payroll System
    - Banking System
    - Inventory System

PLATFORM NEEDED: Turbo C++ Compiler **TOTAL: 60 PERIODS**

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Laboratory requirements for a batch of 30 students - Systems with Linux Operating System with gnu compiler.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME :C PROGRAMMING LABORATORY		**COURSE CODE : 24GE1L1**	
CO	**Course Outcomes**	**EXP**	**K –CO**
C108.1	Develop simple programs using decision making and looping statements.	1-5	K3
C108.2	Utilize array concepts to perform matrix addition, subtraction and multiplication.	6-7	K3
C108.3	Develop programs using user defined functions, built-in functions and recursion and utilize string operations to show string copy and reverse	8-12	K3
C108.4	Develop applications using sequential and random access files.	14-15	K3
C108.5	Develop simple real time projects using the concepts of structures and union.	13,16	K3

24HS1L1	ENGLISH LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities which are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT-I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6

Listening for General Information - Specific Details - Conversation: Introduction to Classmates - Audio / Video (Formal & Informal); Telephone Conversation; Listening to Voicemail & Messages; Listening and Filling a Form. Speaking - Making Telephone Calls - Self Introduction; Introducing a Friend; Politeness Strategies - Making Polite Requests, Making Polite Offers, Replying to Polite Requests and Offers - Understanding Basic Instructions (Filling Out a Bank Application for Example).

UNIT-II NARRATION AND SUMMATION 6

Listening - Listening to Podcasts, Anecdotes / Stories / Event Narration; Documentaries and Interviews with Celebrities. Speaking - Narrating Personal Experiences / Events - Talking about Current and Temporary Situations & Permanent and Regular Situations - Describing Experiences and Feelings Engaging in Small Talk - Describing Requirements and Abilities.

UNIT-III DESCRIPTION OF A PROCESS / PRODUCT 6

Listening - Listen to Product and Process Descriptions; a Classroom Lecture; and Advertisements about Products. Speaking – Picture Description & Video Description - Describing Locations in Workplaces - Giving Instruction to Use the Product - Explaining Uses and Purposes - Presenting a Product - Describing Shapes and Sizes and Weights - Talking about Quantities (Large & Small) - Talking about Precautions; Tips to Create YouTube Channel.

UNIT- IV CLASSIFICATION AND RECOMMENDATIONS 6

Listening – Listening to TED Talks; Listening to Various Online Video Repository. Speaking – SMALL Talk; Discussing and Making Plans - Talking about Tasks - Talking about Progress - Talking about Positions and Directions of Movement - Talking about Travel Preparations - Talking about Transportation.

UNIT-V EXPRESSION 6

Listening – Listening to Debates / Discussions; Different View Points on an Issue; and Panel Discussions. Speaking – Making Predictions - Talking about a Given Topic - Giving Opinions Understanding a Website - Describing Processes.

TOTAL: 30 PERIODS

REFERENCES:

1. Learn English with Cambridge - https://www.youtube.com/channel/UC9-5oT15dxc81MI-pUui3Ww
2. https://www.oxfordonlineenglish.com/
3. Oxford Online English - https://www.youtube.com/channel/UCNbeSPp8RYKmHUliYBUDizg
4. British Council | Learn English - https://www.youtube.com/channel/UCOtnu-KKoAbN47IuYMeDPOg
5. https://tcesrenglish.blogspot.com/

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME :ENGLISH LABORATORY		**COURSE CODE: 24HS1L1**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C109.1	Listen to and comprehend general as well as complex academic information	I - V	AD
C109.2	Listen to and understand different points of view in a discussion	I – V	AD
C109.3	Speak fluently and accurately in formal and informal communicative contexts	I – V	AD
C109.4	Describe products and processes and explain their uses and purposes clearly and accurately	I – V	AD
C109.5	Express their opinions effectively in both formal and informal discussions	I - V	AD

24HS201	PROFESSIONAL ENGLISH - II	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To engage learners in meaningful language activities to improve their reading and writing skills.
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

UNIT-I MAKING COMPARISONS 12

Reading - Reading New Product Features, Invitations – Technical Seminar, Conferences, Workshops, Inter-College Functions; Writing – Safety Instructions - Compare and Contrast Essay; Grammar – Preposition – Position, Movement, Direction - Prepositional Phrases – Connectives, Common Errors in Technical Writing.

LAB COMPONENT

Speaking – Self Introduction **-**Role Play Exercises Based on Workplace Contexts – Discussion on Goal Setting. **Listening –** about Important Events – Experts Talks

UNIT-II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING 12

Reading - Reading Longer Technical Texts – Technological Inventions – Flaws – Rectifications Writing - Cause and Effect Essays, and Letters to Companies - Product Enquiry – Service Information - Emails of Complaint - Writing Responses to Complaints. Grammar - Voice Transformations – Impersonal Passive Voice, Infinitive and Gerunds, Smileys & Abbreviations for Email Writing - Resume Preparation

LAB COMPONENT

Speaking – Technical Presentations (TED Talk) **-** Recent Media Updates – Travel Experiences – Devising Plans and Making Decisions. **Listening –** FAQ on Technological Contexts – Making Itineraries

UNIT-III PROBLEM SOLVING 12

Reading - Journal Abstracts, Case Studies, Excerpts from Literary Texts, News Reports etc. Writing – Letter to the Editor, Checklists, Problem Solution Essay / Argumentative Essay. Grammar – Present Perfect Tense, If conditional Sentences, Digital Vocabulary, Spell Check, Tips to Create Technical Blogs - Introduction to Word Processing Online Tools (Quillbot, Grammarly, etc.,)

LAB COMPONENT

Speaking – Group Discussions**-**Likes & Dislikes **–** Climate Conditions **–** Narrating Imaginary Situations. **Listening –** Talks on Purchase and TRADES – Merits and Demerits – Advantages & Disadvantages.

UNIT- IV REPORTING OF EVENTS AND RESEARCH 12

Reading – Newspaper Archives; **Writing** – Suggestions, Transcoding - Flow Charts, Pie / Bar Diagrams, Accident Report, Survey Report. Grammar – Reported Speech; **Vocabulary** (Social Media Platforms) – Coherence Markers - Use of Prepositions.

LAB COMPONENT

Speaking – Discussion on Environments –Socio Political Systems, Mandatory Systems. **Listening –** Technical Instructions – Positions and Challenges of Higher Officials

UNIT-V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 12

Reading – Technical Articles / Papers, Company Profiles, Statement of Purpose (SOP), an Excerpt of Interview with Professionals; Writing – Job / Internship Application – Cover Letter & Resume - Letter of Recommendation (To the Principal from NRI); Grammar – Numerical Adjectives - Relative Clauses – .PPT Preparation Tips

LAB COMPONENT

Speaking – Job Interview Practice **-** Describing Personal Outlook, Grooming, Safety Issues. **Listening –** Instructions about Electrical Devices, Timely Remedial Measures, Precautionary Measures

CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.
3. Authored by Dr. VeenaSelvam, Dr. SujathaPriyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, MeeraBannerji- Macmillan India Ltd. 1990, Delhi.
6. A Course in Technical English by Mr. D. Praveen Sam, KN Shoba, Cambridge University Press, 2020, India.

Lab Component References:

Free, Authentic Online Repositories for English Proficiency and General Aptitude Practice for Higher Studies and Placement.

- https://www.examenglish.com
- https://www.aptitude-test.com/verbal-aptitude.html
- https://www.edudose.com

- https://www.fresherslive.com/online-test/aptitude-test/questions-and-answers
- https://www.indiabix.com/
- https://www.oxfordonlineenglish.com/english-level-test
- https://learnenglish.britishcouncil.org/english-levels/online-english-level-test
- https://www.ted.com
- https://tcesrenglish.blogspot.com/

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : PROFESSIONAL ENGLISH - II		**Course Code : 24HS201**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C111.1	Compare and contrast ideas in technical texts, identify and report cause and effects in events, industrial processes	I - V	AD
C111.2	Analyze problems, feasible solutions and communicate them in the written format.	I – V	AD
C111.3	Present their ideas, opinions, discuss, analyze concepts and problems by effective speaking in group discussions.	I – V	AD
C111.4	Draft effective emails, official letters and job applications, effective resumes in a planned and logical manner.	I – V	AD
C111.5	Write critical reports from inferred data and information with clarity and precision	I - V	AD

24BS201	ADVANCED CALCULUS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To make the student familiar with topics such as Multiple Integrals, Vector Calculus, Analytic Functions, Complex Integration and Laplace Transform.
- To learn the concept of basic Vector Calculus which can be widely used for Modeling the various laws of Physics.
- To understand the various methods of Complex Analysis and Laplace Transform can be used for efficiently solving the problems that occur in various branches of Engineering disciplines.

UNIT - I LAPLACE TRANSFORM 9+3

Existence Conditions – Transforms of Elementary Functions – Transform of Unit Step Function and Unit Impulse Function – Basic Properties – Shifting Theorems -Transforms of Derivatives and Integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of Periodic Functions – Application to Solution of Linear Second Order Ordinary Differential Equations with Constant Coefficients.

UNIT - II MULTIPLE INTEGRALS 9+3

Double integrals – Change of order of integration – Double integrals in Polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of Variables in Double and Triple integrals.

UNIT - III VECTOR CALCULUS 9+3

Gradient and Directional Derivative – Divergence and Curl - Vector Identities – Irrotational and Solenoidal Vector fields – Line Integral over a Plane curve – Surface Integral - Area of a Curved Surface - Volume Integral – Green's, Gauss divergence and Stoke's theorems (without proof) – Verification and Application in evaluating Line, Surface and Volume Integrals.

UNIT - IV ANALYTIC FUNCTIONS 9+3

Analytic functions – Necessary and Sufficient Conditions for Analyticity in Cartesian and Polar Coordinates – Properties – Harmonic Conjugates – Construction of Analytic Function – Conformal Mapping – Mapping by Functions $w = z+c$, cz, $1/z$, z^2 - Bilinear transformation.

UNIT - V COMPLEX INTEGRATION 9+3

Line integral – Cauchy's Integral Theorem (without proof) – Cauchy's Integral Formula – Taylor's and Laurent's Series – Singularities – Residues – Residue Theorem (without proof) – Application of Residue Theorem for Evaluation of Real Integrals – Use of Circular Contour.

CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Veerarajan.T"Engineering Mathematics I", The Tata McGraw Hill Publication-New Delhi, First Edition 2018.

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, NewDelhi, 2006.
2. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 9th Edition, 2014.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics II", Narosa Publications, New Delhi, 5th Edition, 2016.
5. Robert C.Wrede, Murray R.Spiegel, "Advanced Calculus"Schaum's outline series, McGraw Hill, New Delhi, Second Edition, 2002.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : ADVANCED CALCULUS		**Course Code : 24BS201**	
CO	**Course Outcomes**	**Unit**	**K – CO**
C112.1	Apply Laplace transform and inverse transform to solve the initial value problems.	I	K3
C112.2	Solve the multiple integrals and apply the concept to find areas, volumes.	II	K3
C112.3	Determine the line, surface and volume integrals using Green's, Gauss and Stokes theorems	III	K3
C112.4	Determine Analytic functions, Bilinear Transformations and apply the concept of conformal mapping to find the images of given curves.	IV	K3
C112.5	Determine the Contour Integrals using Cauchy's Integral and Residue theorems.	V	K3

24HS202 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L	T	P	C
	2	0	0	2

OBJECTIVES:

- To study the scope and significance of environment, understand the interrelationship between living organism and environment.
- To get a concept knowledge on various types of pollution and its effects.
- To gain knowledge on various renewable energy sources and its applications.
- To provide knowledge on solid waste disposal methods and natural disasters and its management.
- To development goals and protocol- sustainability and gain knowledge on carbon credit and carbon footprint.

UNIT – I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT - II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Climate change, Global warming, Acid rain, Ozone layer depletion. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection.

UNIT - III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Solar, Wind, Tidal, Geothermal, H_2 energy & Ocean energy. Applications of Hydrogen energy, Ocean energy resources.

UNIT - IV SOLID WASTE AND DISASTER MANAGEMENT 6

Solid waste management - Introduction,types,e-waste, effects on human beings and disposal management. Disaster management - Introduction, causes, effects and management of flood, cyclone, earthquake, landslide disasters, case studies – roles and responsibilities of Government and community.

UNIT - V SUSTAINABILITY AND MANAGEMENT 6

Development, GDP, sustainability – concept, needs and challenges- economic, social and aspects of sustainability –from unsustainability to sustainability – millennium development goals, and protocols – Sustainable Development Goals-targets, indicators and intervention areas. Climate change – Global Regional and local environmental issues and possible solutions – case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry – A case study.

CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 60 PERIODS

TEXT BOOKS:

1. AnubhaKaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition,New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

REFERENCES:

1. Dr.A.Ravikrishnan, 'Environmental Science & Engineering', Sri Krishna Hitech Publishing Company Pvt.Ltd. Revised Edition 2023-2024.
2. Dr.V.VeeraiyanandDr.L.DevarajSteohen, 'Environmental Science & Engineering', VRB Publishers Pvt.Ltd. Reised& Updated Edition 2018-19.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : ENVIRONMENTAL SCIENCES AND SUSTAINABILITY		**Course Code : 24HS202**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C113.1	Describe the environment, ecosystem and their significances and explain the threats to biodiversity.	I	K2
C113.2	Describe the sources, effects, and control methods of environmental pollution.	II	K2
C113.3	Explain the knowledge on various renewable sources and its applications.	III	K2
C113.4	Describe the disposal techniques of solid waste and record the consequences of natural disasters.	IV	K2
C113.5	Outline the different goals of sustainable development and apply them for suitable technology and societal development.	V	K2

24GE201	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Python basics and programs with conditional and looping constructs.
- To understand Python functions and strings.
- To understand various operations using Python data structures– lists, tuples, sets and dictionaries.
- To understand exception handling and modules, packages in Python
- To understand usage of data base in python

UNIT - I PYTHON BASICS AND PROGRAM FLOW 9

Introduction to python - Features of python, python syntax compared to other programming languages, python installation, python interpreter and interactive mode, values and types – int, float, boolean, string and list, variables, expressions, statements, comments, operators and precedence of operators,control flow statements – conditionals – conditional (if), alternative (if-else), chained conditional (if-elif-else), iteration – state, while, for, break, continue, pass ,illustrative programs – exchange the values with and without using temporary variables, circulate the values of n variables, distance between two points.

UNIT - II FUNCTIONS, STRINGS 9

Functions – function definition and use, flow of execution, parameters and arguments, function composition, Fruitful functions – return values, parameters, local and global scope, recursion , Illustrative programs- Decimal binary conversion, Tower of Hanoi , Strings – string slices, immutability, string functions and methods, string module, Illustrative programs – square root, GCD, exponentiation, Factorial of a number, linear search, binary search.

UNIT - III LISTS, TUPLES, SETS AND DICTIONARIES 9

Lists – list operations, list slices, list loop, mutability, aliasing, cloning lists, list parameters, Lists as arrays, list methods, List comprehension, **Tuples** –Tuple operations (create, access, modify, delate, append, membership test, concatenation and repeat), tuple assignment, tuple as return value, Iterating a tuple, Built-in functions with tuple, **Sets** – Creating, Modifying a set, Removing elements from a set, Set operations- Set Union, Set intersection, Set difference, Set membership test, Iterating through a set, Built-in functions and methods with set, **Dictionaries** – creation, accessing elements, operations and methods, Illustrative programs – selection sort, insertion sort, Matrix addition and subtraction, sum an array of numbers.

UNIT - IV FILES HANDLING, MODULES, PACKAGES 9

Files and exception – text files, reading and writing files, format operator, command line arguments, errors and exceptions, handling exceptions, modules, packages – Math and Rand, Illustrative programs – word count, copy file, merge two files

UNIT - V DATA BASES IN PYTHON 9

Python SQL database: Installation, DB connection, create table, Data Manipulation operations (Insert, read, update, delete, commit and rollback), **Additional topics:** Lambda function, filter, map, reduce, decorators, Frozenset – creation, accessing elements, operations, collections (Counters, Ordered Dict, Default Dict Chain Map, Named Tuple, DeQue, User Dict, User List, User String)

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. E. Balagurusamy, "Problem solving and Python Programming", First edition, McGraw Hill Education (India) Private Limited, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

REFERENCES:

1. YashavantKanetkar, AdityaKanetkar, "Let Us Python", 2nd Edition, BPB Publications, 2020.
2. John V Guttag, "Introduction to Computation and Programming Using Python: With Application to Understanding Data", 2nd Edition, PHI Publisher,2017.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,2015.
5. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3.6", 3rd edition, Shroff/O' Reilly Publishers,2018.
6. Dr.A.Kannan,Dr.L.SaiRamesh,"ProblemSolvingandPythonProgramming",Updated Edition, United Global Publishers Pvt. Ltd., April 2018.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME :PYTHON PROGRAMMING		**Course Code : 24GE201**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C114.1	Explain the basic concepts of python programming like python installation, data types, expression and control statements.	I	K2
C114.2	Apply Python functions, recursive functions and string functions to solve simple problems and perform linear and binary search.	II	K3
C114.3	Illustrate the various operations of lists, tuples, sets, dictionaries and arrays and develop programs to solve various sorting and matrix operations.	III	K3
C114.4	Explain file handling operations, exception handling, modules and packages and develop programs for word count, file copy, merge operations and exception handling.	IV	K3
C114.5	Apply python SQL database and additional functions like Lambda function and Frozenset to solve real world applications.	V	K3

24EC201	ELECTRIC CIRCUITS AND MACHINES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the basic laws on Circuits and to calculate the voltage and current in circuit using basic theorems.
- To apply the concept of basic network theorems and transient response of series RL, RC and RLC circuits for DC and sinusoidal inputs.
- To explain the Constructional details, principle of operation, speed control of DC machines and constructional details, principle of operation, performance of transformers.

UNIT - I DC CIRCUIT ANALYSIS 9

Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff‘s Current Law, Kirchoff‘s voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis & Mesh analysis using Independent and Dependent Sources. Super Mesh, Super Node, Delta-Wye Conversion.

UNIT-II NETWORK THEOREM AND DUALITY FOR DC CIRCUITS 9

Superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Reciprocity Theorem, Duals, Dual circuits.

UNIT-III SINUSOIDAL STEADY STATE ANALYSIS 9

Sinusoidal Steady – State analysis, Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance, Nodal and Mesh Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

UNIT-IV RESONANCE AND TRANSIENTS IN RLC CIRCUITS 9

Frequency Response, Series Resonance, Parallel Resonance, Quality Factor- Basic RL and RC Circuits, The Source-Free RL Circuit, The Source-Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits.

UNIT-V TRANSFORMERS AND D.C.MACHINES (QUALITATIVE TREATMENT ONLY) 9

Single phase transformer – Construction – Principle of operation – Emf equation – Transformation ratio – Transformer on no load – Regulation through load test – Open circuit and short circuit tests. DC motor–Principle of operation – Back Emf and torque equation – Speed control of D.C. shunt motor.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. WilliamH.Hayt,Jr.JackE.KemmerlyandStevenM.Durbin,“EngineeringCircuitAnalysis”, McGrawHillScienceEngineering,8th Edition,11thReprint2016.
2. ASudhakar,SShyammohanandPalli,“CircuitsandNetwork(Analysisandsynthesis)”TataMcGraw-Hill, 2015.
3. Nagrath.I. and Kothari. D.P, "Electric Machines", 5th Edition, Tata McGraw Hill PublishingCompany,NewDelhi,2017.

REFERENCES:

1. JosephEdministerandMahmoodNahvi,“ElectricCircuits”,Schaum‘sOutlineSeries,Tata McGraw Hill Publishing Company, NewDelhi, 5th Edition Reprint 2016.
2. LRobertBoylested,“ExperimentsinCircuitAnalysistoAccompanyIntroductoryCircuitAnalysis”,PHI, 2002.
3. CharlesK.Alexander,Mathew.O.Sadiku,“FundamentalsofElectricCircuits”,SecondEdition,McGrawHill, 2013.
4. P.C.Sen,"Principles of Electric Machines and Power Electronics” John Wiley&Sons,ThirdEdition2013.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : ELECTRIC CIRCUITS AND MACHINES		**COURSE CODE : 24EC201**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C115.1	Apply Kirchhoff’s law for DC circuits.	I	K3
C115.2	Apply network theorems to evaluate DC circuits.	II	K3
C115.3	Analyze the steady state response of R,L and C circuits.	III	K4
C115.4	Apply the transient response of RLC circuits under DC excitation using Laplace Transform.	IV	K3
C115.5	Explain the construction, working and testing of DC machines and single-phase transformer.	V	K2

24EC202	ELECTRON DEVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of electronic states and energy band structure formation.
- To study the operation and characteristics of PN junction diode and BJTs.
- To know about the special semiconductor devices.

PRE-REQUISITE: NIL

UNIT - I ELECTRONIC STATES 9

Quantum free electron theory - Fermi distribution and energy – Density of states– Energy bands in solids – Conductors – Semiconductors – Insulators –– Electron effective mass – properties of conduction and valence bands.

UNIT - II CARRIERS AND DOPING 9

Intrinsic concentration – intrinsic Fermi level – n and p type doping – density of carriers in extrinsic semiconductors – extrinsic semiconductor Fermi energy level – degenerate and non-degenerate semiconductors – Direct and Indirect band gap semiconductors.

UNIT - III PN DIODE AND BIPOLAR JUNCTION TRANSISTOR 9

PN junction diode, current equations, V-I characteristics, Zener Diode, Bipolar Junction Transistor- bipolar transistor action, minority carrier distribution, Ebers Moll Model, Hybrid-pi model, large signal switching characteristics, SiGe and hetro-junction, Applications of Diodes.

UNIT - IV FIELD EFFECT TRANSISTORS 9

Two terminal MOS structures, threshold voltage and charge distribution, capacitance-voltage characteristics, MOSFET structures, I-V relationships, transconductance and substrate effects, non-ideal effects, MOSFET scaling, threshold voltage modification due to short and narrow channel effects.

UNIT - V SPECIAL SEMICONDUCTOR DEVICES 9

UJT, LDR,SCR, DIAC, TRIAC, IGBT, LED, LCD, Photo transistor, Opto Coupler, Solar cell, MESFET, Varactor diode – Tunnel diode - GUNN diode, Thyristor, LASER diode, UJT, LDR.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. R.F.Pierret, “Semiconductor Device Fundamentals”, Pearson, 2006.
2. D.Neamen and D.Biswas, “Semiconductor physics and devices”, McGraw Hill Education, 2017.

REFERENCES:

1. N.Garcia, A.Damask and S.Schwarz, “Physics for Computer Science Students”, Springer Verlag, 2012.
2. Umesh Mishra and Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
3. Nandita Dasgupta and Amitava Dasgupta, “Semiconductor Devices: Modelling and Technology”, PHI Learning Pvt. Ltd., 2004.
4. F.H.Mitchell, “Introduction to Electronics Design”, Prentice Hall of India Pvt. Ltd., 1995.
5. Robert L. Boylestad, Louis Nashelsky “Electronic devices and circuit theory”, Pearson, 2009.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : ELECTRON DEVICES		**COURSE CODE : 24EC202**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C116.1	Explain the concept of quantum free electron theory and analyze the formation of energy bands in solids for conductors, semiconductors, and insulators.	I	K2
C116.2	Determine carrier concentrations and Fermi levels in intrinsic and extrinsic semiconductors.	II	K3
C116.3	Interpret the characteristics of PN junction diodes and bipolar junction transistors (BJTs) including their models and applications.	III	K3
C116.4	Apply the principles of MOSFET operation to determine I–V characteristics.	IV	K3
C116.5	Compare the working principles and applications of special semiconductor devices.	V	K2

24HST02	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT-I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT-II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

UNIT-III MANUFACTURING TECHNOLOGY 3

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

UNIT-IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT-V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

CLASS HOURS: 15 PERIODS TERM HOURS: 15 PERIODS TOTAL: 30 PERIODS

24HST02	தமிழரும்தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

அலகு -I நெசவுமற்றும்பானைதொழில்நுட்பம்: **3**

சங்ககாலத்தில்நெசவுத்தொழில் - பனைத்தொழில்நுட்பம் - கருப்புசிவப்புபாண்டங்கள் - பண்டங்களில்கீறல்குறியீடுகள்.

அலகு-II வடிவமைப்புமற்றும்கட்டிடத்தொழில்நுட்பம் **3**

சங்ககாலத்தில்வடிவமைப்புமற்றும்கட்டுமானங்கள்&சங்ககாலத்தில்வீட்டுப்பொருட்களில்வடிவமைப்பு–சங்ககாலத்தில்கட்டுமானபொருட்களும்நடுகல்லும்–
சிலப்பதிகாரத்தில்மேடைஅமைப்புபற்றியவிவரங்கள் - மாமல்லபுரச்சிற்பங்களும், கோவில்களும்–
சோழர்காலத்துப்பெருங்கோயில்கள்மற்றும்பிறவழிப்பாட்டுதலங்கள்–
நாயக்கர்காலகோயில்கள்–
மாதிரிகட்டமைப்புகள்பற்றிஅறிதல்,மதுரைமீனாட்சிஅம்மன்ஆலயம்மற்றும்திருமலைநாயக்கர்மஹால்–செட்டிநாட்டுவீடுகள்–
பிரிட்டிஷ்காலத்தில்சென்னையில்இந்தோ–சாரோசெனிக்கட்டிடக்கலை

அலகு-III உற்பத்திதொழில்நுட்பம் **3**

கப்பல்கட்டும்கலை - உலோகவியல் - இரும்புதொழிற்சாலை - இரும்பைஉருக்குதல், எஃகு–
வரலாற்றுச்சான்றுகளாகசெம்புமற்றும்தங்கநாணயங்கள்–
நாணயங்கள்அச்சடித்தல்–மணிஉருவாக்கும்தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடிமணிகள் - சுடுமண்மணிகள் - சங்குமணிகள் - எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள்–சிலப்பதிகாரத்தில்மணிகளின்வகைகள்

அலகு- IV வேளாண்மைமற்றும்நீர்பாசனதொழில்நுட்பம் **3**

அணை, ஏரி, குளங்கள், மதகு–சோழர்காலக்குமிழித்தூம்பின்முக்கியத்துவம்- கால்நடைபராமரிப்பு - கால்நடைகளுக்காகவடிவமைக்கப்பட்டகிணறுகள் - வேளாண்மைமற்றும்வேளாண்மைசார்ந்தசெயல்பாடுகள் - கடல்சார்அறிவு - மீன்வளம்–முத்துமற்றும்முத்துக்குளித்தல் - பெருங்கடல்குறித்தபண்டையஅறிவுஅறிவுசார்சமூகம்.

அலகு-V அறிவியல்தமிழ்மற்றும்கணினித்தமிழ்: **3**

அறிவியல்தமிழின்வளர்ச்சி–கணித்தமிழ்வளர்ச்சி–
தமிழ்நூல்களைமின்பதிப்புசெய்தல் - தமிழ்மென்பொருட்கள்உருவாக்கம்–
தமிழ்இணையக்கல்விக்கழகம் - தமிழ்மின்நூலகம்–
இணையத்தில்தமிழ்அகராதிகள் - சொற்குவைத்திட்டம்

TEXT & REFERENCE BOOKS:

1.தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்)
2.கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்)
3.கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரீகம் (தொல்லியல்துறைவெளியீடு)
4.பொருனை - ஆற்றங்கரைநாகரீகம். (தொல்லியல்துறைவெளியீடு)
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, TamilNadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: 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

24HS2L1	APTITUDE AND SOFT SKILLS – I	L	T	P	C
		0	0	2	1

Module I Aptitude Skills I **15**

Quantitative Aptitude Modules : Number System, square root and cube root, average, problems on numbers, Ages, Percentages, Profit and Loss, Ratio and Proportion, Partnership, Chain rule, time and work, time and distance.

Module II Soft Skills I **15**

Self-Introduction - Self analysis, Attitude, perceptions, Positive approach to challenges, Change management –ideas and approach, Goal setting vision, Time management, Planning, Entrepreneurial skills - Leadership skills, presentation and performance giving and receiving feedback, setting expectations and exhibiting professional behavior – Group Discussion.

TOTAL: 30 PERIODS

REFERENCES:

1. Quantitative aptitude for competitive examinations , R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – AbijithGuha, TMH
3. Quantitative Aptitude for Cat – ArunSharma,TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan,A Handbook of Spotting Errors, Mcgraw Hill Education, 2010

24EC2L1	CIRCUITS AND DEVICES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To gain hands on experience in KVL&KCL
- To understand the working of RL and RC circuits
- To learn the Characteristics of basic electronic devices such as diode, BJT, FET & SCR

LIST OF EXPERIMENTS:

1.Verification of Electrical circuits using Ohm’s law, KVL&KCL

2.Verification of Electrical circuits using Superposition Theorem

3.Verification of Thevenin &Norton theorem

4.Verification of maximum power transfer & reciprocity theorem

5.Determination of Resonance Frequency of Series & Parallel RLC Circuits

6.Transient analysis of RL and RC circuits.

7.Characteristics of PN junction Diode

8.Characteristics of Zener Diode.

9.Common Emitter input –output Characteristics.

10.FET Characteristics

11.SCRCharacteristics

TOTAL: 60 PERIODS

LABORATORY REQUIREMENTS

BC107, BC148, 2N2646, BFW10

1N4007, Zener diodes

Resistors, Capacitors, Inductors

CRO /DSO

Function Generators

Dual Regulated Power Supplies

PC with circuit simulation software

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: CIRCUITS AND DEVICES LABORATORY		Course Code:24EC2L1	
CO	**Course Outcomes**	**EXP**	**K–CO**
C119.1	Experimentally verify and simulate KVL & KCL in Electrical circuits.	1,12	K3
C119.2	Experimentally verify and simulate various Theorems.	2,3,4	K3
C119.3	Determine the resonant frequency, quality factor& Bandwidth of the RLC circuits.	5	K3
C119.4	Perform the transient analysis of RL & RC circuits.	6	K3
C119.5	Analyze the V-I characteristics of PN diode, Zener diode, BJT,FET and SCR.	7,8,9,10,11	K4

24GE2L1	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To write, test, and debug simple Python programs using conditional statements.
- To implement Python programs using loops.
- To use functions for structuring Python programs.
- To implement Python programs using lists.
- To write Python programs for implementing file operations and data manipulation on data base.

LIST OF EXPERIMENTS:

1. Biggest of three numbers, odd or even number, Leap year.
2. GCD, Armstrong Number, Palindrome, Fibonacci Series, Prime number
3. Find the square root and exponentiation of a number with and without built-in functions
4. Linear search and Binary search using Recursion.
5. Find the maximum of a list of numbers
6. Selection sort, Insertion sort
7. First n prime numbers
8. Transpose of a Matrix
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Merge two files
13. Data Manipulation operations using python SQL database access

PLATFORM NEEDED: Python 3 interpreter for Windows/Linux

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Systems with Linux or Windows 7 or later Operating System with Python versions: 2.7.X, 3.6.X.,3.8.X, MySQL software.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: PYTHON PROGRAMMING LABORATORY		` Course Code:24GE2L1	
CO	**Course Outcomes**	**EXP**	**K–CO**
C120.1	Develop simple Python programs using conditional and iterative constructs	1,2,7	K3
C120.2	Construct simple Python programs using built-in functions, user-defined functions and recursion functions.	3,4	K3
C120.3	Make use of array concepts to develop programs for solving various sorting and matrix operations.	5,6,8,9	K3
C120.4	Apply command line arguments and file handling methods to implement programs to read word from text file and merging files.	10,11,12	K3
C120.5	Make use of python SQL database to implement and solve data Manipulation operations.	13	K3

24GE2L2	INDUSTRIAL PRACTICES WORKSHOP	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand various pipe fittings used in common household plumbing work and wood work.
- To know about arc welding and machining processes.
- To gain knowledge on sheet metal work.
- Wiring various electrical joints in common house hold electrical wire work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP A (CIVIL AND MECHANICAL)

PART I CIVIL ENGINEERING PRACTICE

CARPENTRY PRACTICE:

1. Sawing, Planning and making T-Joint / Cross lap joint / Dovetail joint

PLUMBING PRACTICE:

2. Providing basic water line connection for a residential house using plumbing components and household utilities like water heater, wash basin etc.,

PART II MECHANICAL ENGINEERING PRACTICE

SHEET METAL PRACTICE:

3. Preparation of a Model of Rectangular Tray/ Conical Funnel.

WELDING PRACTICE:

4. Joining two metal plates by single butt joint / T fillet joint / lap joint using arc welding.
5. Demonstration on Gas welding

BASIC MACHINING PRACTICE:

6. Exercise on Simple turning, Facing / Taper turning / Drilling and Tapping.

Simple model development using above practices

GROUP–B(ELECTRICALANDELECTRONICS)

PART- III ELECTRICALENGINEERINGPRACTICES

7. Residential house wiring using switches, fuse, indicator, Fluorescent lamp and Energy Meter
8. Staircase wiring
9. Fluorescent Lamp wiring.
10. Energy meter wiring and related calculations
11. Study of Iron Box wiring and assembly
12. Study of Fan Regulator/ emergency lamp wiring

PARTIV ELECTRONICENGINEERINGPRACTICES

13. Resistor Colour coding and verification of series parallel connections.
14. Measurement of AC signals parameters. (Amplitude and Frequency)
15. Verification of logic gates.
16. Soldering simple electronic circuits and checking continuity.
17. PN Diode as a switch.
18. Study of Lap Top

TOTAL: 45 PERIODS

EQUIPMENT FOR A BATCH OF 30 STUDENTS:		
CIVIL		
1.	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, coupling, unions, elbows, plugs and other fittings	15 sets
2.	Carpentry Vice (fitted to work bench)	15 nos
3.	Standard wood working tools	15 sets
4.	Models of industrial trusses, door joints, furniture joints	5 each
5.	Power Tools a. Rotary Hammer b. Demolition Hammer c. Circular Saw d. Planer e. Hand Drilling Machine f. Jigsaw	2 nos 2 nos 2 nos 2 nos 2 nos 2 nos 2 nos
MECHANICAL		
6.	Arc welding transformer with cables and holders	5 nos
7.	Welding booth with exhaust facility	5 nos
8.	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 sets
9.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 nos
10.	Centre Lathe	2 nos
11.	Power Tool: Angle Grinder	2 nos
12.	Standard Sheet metal working tools	15 sets
ELECTRICAL		
1	Assorted electrical components for house wiring	5 sets
2	Electrical measuring instruments (Energy meter, ammeter, voltmeter)	2 nos each
3	Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
ELECTRONICS		
1	Assorted electronic components for making circuits. (Resistor, Capacitor, Diode)	20 nos each
2	Small PCBs	10 nos
3	Multimeter	5 nos
4	CRO, AFO, Transformer	3 nos each
5	Soldering guns	5 nos
6	IC Trainer kit	5 nos
7	AND, OR, NAND, NOR, NOT, XOR Gate ICs	5 nos each
8	Used Lap top (for demo purpose)	1 no

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: INDUSTRIAL PRACTICES WORKSHOP		Course Code:24GE2L2	
GROUP A (CIVIL&MECHANICAL) GROUP B (Electrical & Electronics)			
CO	**Course Outcomes**	**EXP**	**K–CO**
C121.1	Apply the knowledge of engineering fundamentals to the professional engineering practice.	1-18	K3
C121.2	Identify, formulate and analyze engineering problems reaching conclusions using engineering sciences	1-18	K3
C121.3	Design solutions for societal and environmental considerations.	1-18	K3
C121.4	Apply reasoning informed by the contextual knowledge relevant to the professional engineering practice.	1-18	K3
C121.5	Function effectively as an individual, as a leader and write effective reports and documentation.	1-18	K3

24HS2L2 **PHYSICAL EDUCATION - I**

L	T	P	C
0	0	2	1

OBJECTIVES:

- To impart the fundamentals of physical education for development of students' physical, mental, and social well-being.
- To instill a lifelong appreciation for physical activity towards the development of positive attitude and fostering values of team work and sportsmanship.

Introduction to physical education: Exercise for Good Posture – Conditioning and Calisthenics for Before start, Jogging, Bending, Twisting, Standing, Sitting and Relaxation, Training on First Aid practices. **Participation of athletic events**: Rules and regulations of important athletic events, Sprint, Jumps, Throws and Hurdles. **Skill development in any one of the following outdoor games:** Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis. **Skill development in any one of the following indoor games:** Shuttle Badminton, Chess and Table Tennis.

TOTAL: 30 PERIODS

REFERENCES:

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.

2.Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.

3. Mangal, S. K. (2009). Psychology of sports performance. Sports Publication.

E-resources: 1. https://www.who.int/health-topics/physical-activity

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : PHYSICAL EDUCATION - I	
CO	**Course Outcomes**
CO1	Understand and explain the importance of physical activity for mental and physical health.
CO2	Apply basic principles of exercise science in the routine life
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively
CO4	Demonstrate independent learning in health, nutrition, and fitness-related topics.

24BS302	LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the basic concepts of Vector space, linear transformations and diagonalization.
- To apply the concept of inner product spaces in orthogonalization.
- To understand the procedure to solve partial differential equations and to learn application of partial differential equation.

UNIT - I VECTOR SPACES 9+3

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

UNIT - II LINEAR TRANSFORMATION AND DIAGONALIZATION 9+3

Linear transformation - Null spaces and ranges - Dimension theorem (Without Proof) - Matrix representation of a linear transformations – Eigen values and Eigenvectors - Diagonalizability.

UNIT - III INNER PRODUCT SPACES 9+3

Inner product, norms - Gram Schmidt orthogonalization process (Without Proof) - Adjoint of linear operations – Least square approximation.

UNIT - IV PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation – Solutions of first order equations – Standard types and equations reducible to standard types – Singular solutions – Lagrange's linear equation – Classification of partial differential equations - Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.

UNIT - V FOURIER SERIES SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Dirichlet's conditions – General Fourier series – Half range sine and cosine series - Method of separation of variables – Solutions of one-dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions inCartesian coordinates.

CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS

TEXT BOOKS:

1. A.H.Friedberg, A.J.Insel and L.Spence, "Linear Algebra", Prentice Hall ofIndia, New Delhi, 2017.
2. T.Veerarajan, "Linear Algebra and Partial Differential Equations", Tata McGraw Hill, New Delhi, 2018.

REFERENCES:

1. B.S.Grewal," Higher Engineering Mathematics",KhannaPublishers,New Delhi,4th Edition, 2017.
2. G.James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th Edition, 2016.
3. D.C.Lay, "Linear Algebra and it's Applications", Pearson Education, 5th Edition, 2018.
4. S.Kumaresan, "Linear Algebra – A Geometric Approach", Prentice Hall of India, New Delhi, Reprint 2018.
5. M.Chandrasekar, "Linear Algebra and Partial Differential Equations", Vishnu prints media, 2nd Edition, 2019.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS		**Course code: 24BS302**	
CO	**Course Outcomes**	**Unit**	**K- CO**
C201.1	Apply the concepts of Vector space to determine bases and dimensions.	I	K3
C201.2	Determine Eigen values and Eigen vectors using Linear transformations.	II	K3
C201.3	Construct the least square fit and orthonormal basis for an inner product space by using Gram-Schmidt process.	III	K3
C201.4	Solve the given first order and higher order partial differential equations with constant coefficients.	IV	K3
C201.5	Derive the Fourier series solutions of the given function and Partial differential equations of wave and heat equations problems.	V	K3

24EC301	ANALOG CIRCUITS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the methods of Transistor biasing.
- To learn the mid band analysis of BJT amplifier circuits using small signal equivalent model.
- To learn the analysis of MOSFET amplifier circuits using small signal equivalent model.
- To realize the concept of power amplifiers and Tuned amplifiers.
- To understand the concept of feedback amplifier and differential amplifier.

UNIT - I TRANSISTOR BIASING AND STABILITY 9

BJT biasing – DC, AC Load line and quiescent point – Factors affecting quiescent point – Stability factor – Different types of biasing circuits and its comparison – Bias compensation – Diode and Thermistor compensations – Biasing the MOSFET.

UNIT - II LOW FREQUENCY AND HIGH FREQUENCY ANALYSIS OF BJT 9

CE amplifiers with and without bypass capacitor, CB and CC amplifiers – Hybrid – π equivalent circuit of BJTs – Method of drawing small signal equivalent circuit – Mid band analysis of various types of single stage amplifiers – High frequency analysis of CE amplifier - Darlington amplifiers - Cascode amplifiers.

UNIT - III LOW FREQUENCY AND HIGH FREQUENCY ANALYSIS OF MOSFET 9

CS amplifiers with and without bypass capacitor, CD and CG amplifiers – Hybrid – π equivalent circuit of FET – Method of drawing small signal equivalent circuit – small signal analysis of MOSFET amplifiers - High frequency analysis of CS amplifier.

UNIT - IV POWER AMPLIFIERS AND TUNED AMPLIFIERS 9

Classification of power amplifiers – Class A large signal amplifiers – transformer coupled class A audio power amplifier – efficiency of Class A amplifiers – Class B amplifier – push pull amplifier – complementary symmetry push pull amplifier. Tuned amplifiers – Analysis of capacitor coupled Single tuned amplifier – Stagger tuned amplifiers – Class C Tuned Amplifier.

UNIT - V FEEDBACK AMPLIFIERS AND DIFFERENTIAL AMPLIFIERS 9

Classification of amplifiers – The Feedback concept – Transfer gain with feedback – General characteristics of Negative feedback amplifiers – Input resistance – Output Resistance – Method of Analysis of a Feedback amplifier – Feedback Examples-Emitter Follower-CE amplifier with un bypassed RE. Current mirror - Differential amplifiers - CMRR.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. J.Millman and Christos C. Halkias, “Integrated Electronics”, 2nd Edition, McGraw Hill Education, 2017.
2. Donald. A. Neamen, “Electronic Circuits Analysis and Design”, McGraw Hill Education (India) Pvt. Ltd., 3rd Edition, 2010

REFERENCES:

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Standard Edition, Shree Hari Publications, 2021.
2. David A. Bell, “Electronic Devices and Circuits”, 5th Edition, Oxford University Press, 2008.
3. Thomas L. Floyd, “Electronic Devices: Conventional Current Version”, 10h Edition, Pearson Education, 2017.
4. I.J. Nagrath, “Electronic Devices and Circuits”, John Wiley & Sons, 2020.

5. B.P.Singh and Rekha Singh, “Electronic Devices and Integrated Circuits”, Pearson Education, 2006.
6. Muhammad Rashid, “Microelectric Circuit Analysis and Design”, CI-Engineering,2010
7. S.Salivahanan and N.Suresh Kumar, “Electronic Devices and Circuits”, 4th Edition, McGraw Hill Education, 2017.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : ANALOG CIRCUITS		**Course code :24EC301**	
CO	**Course Outcomes**	**Unit**	**K- CO**
C202.1	Apply various biasing techniques for BJTs and MOSFETs to achieve bias point stability using appropriate compensation methods.	I	K3
C202.2	Analyze CE, CB, and CC amplifiers with and without bypass capacitors, and use small-signal models to determine voltage gain, current gain, input and output impedance	II	K4
C202.3	Analyzesmall-signal model to determine the voltage gain, current gain, input impedance, and output impedance of CS, CD, and CG amplifiers.	III	K4
C202.4	Apply the principles of power amplifier and tuned amplifier circuits to determine the efficiency and frequency response respectively.	IV	K3
C202.5	Identify the type of feedback employed in amplifier circuits and derive CMMR in differential amplifiers.	V	K3

24EC302	SIGNALS AND SYSTEMS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand the Mathematical Representation of Signals and Systems.
- To explain the concept of Linear Time Invariant Systems and the Convolution property.
- To represent a given Continuous Time signal in frequency domain using Fourier series, Fourier Transform and Laplace Transform.
- To represent a given Discrete Time signal in frequency domain using discrete time Fourier Transform and Z-Transform.
- To understand Spectrum Analysis of Continuous Time signals and sampled version of the CT signal

UNIT - I CLASSIFICATION OF SIGNALS AND SYSTEMS 9 + 3

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

UNIT - II ANALYSIS OF CONTINUOUS TIME SIGNALS 9 + 3

Fourier Transform and its Inverse - properties - Laplace Transforms and its Inverse - properties - Region of Convergence

UNIT - III LINEAR TIME INVARIANT - CONTINUOUS TIME SYSTEMS 9 + 3

Impulse response - convolution integrals - Differential Equation - Fourier and Laplace Transforms in Analysis of CT systems - Systems connected in series / parallel.

UNIT - IV ANALYSIS OF DISCRETE TIME SIGNALS 9 + 3

Baseband signal Sampling - Fourier Transform of discrete time signals (DTFT) and its Inverse Properties - Z Transform and its Inverse - Properties - Region of Convergence.

UNIT - V LINEAR TIME INVARIANT - DISCRETE TIME SYSTEMS 9 + 3

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

CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS

TEXT BOOKS:

1. Allan V. Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2015.
2. B.P.Lathi and R.A.Green, “Principles of Linear Systems and Signals”, Oxford University Press, 3rd Edition, 2018.

REFERENCES:

1. Hwei P. Hsu, “Schaum Outlines - Signals and Systems Matlab Examples”, McGraw
2. Hill, 4th Edition 2019.
3. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”,

Pearson, 2007.

4. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.
5. S.Nagoorkani, “Signals and Systems - Simplified”, McGraw Hill, 1st Edition, 2018.
6. Simon Haykin and Barry Van Veen, “Signals and Systems”, Wiley, 2nd Edition, 2007

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : SIGNALS AND SYSTEMS		**Course code :24EC302**	
CO	**Course Outcomes**	**Unit**	**K- CO**
C203.1	Classify and simulate the given Continuous time and Discrete time signals and systems.	I	K3
C203.2	Analyze the spectral components of the given continuous time signals using Fourier transforms and Laplace transforms.	II	K4
C203.3	Solve continuous-time LTI systems represented by a differential equation using Fourier and Laplace transforms.	III	K3
C203.4	Analyze the spectral components of the given discrete time signals using discrete time Fourier transforms and z-transforms.	IV	K4
C203.5	Solve discrete-time LTI systems using difference equations represented by a discrete time Fourier transforms and z-transforms.	V	K3

24EC303	DIGITAL ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

UNIT - I INTRODUCTION TO DIGITAL SYSTEM 9

Digital Systems and Binary Numbers - Octal and Hexadecimal Numbers - Boolean Algebra and Logic Gates – Gate Level Minimization- Introduction - The Map Method – Four and Five Variable K-Map - Don't Care Conditions - Tabulation Method.

UNIT - II COMBINATIONAL LOGIC 9

Introduction - of Combinational Circuits - Analysis Procedure-Deriving truth table and logic diagram for few examples - Design Procedure - Binary Adder/Subtractor– Half adders, Full adders, Parallel Adder, Carry Look ahead Adder, Binary subtractor-Code converters- Magnitude Comparators – Encoder - Priority encoder – Decoder - Decimal Adder – Binary Multiplier – Multiplexers – Demultiplexers

UNIT - III SYNCHRONOUS SEQUENTIAL LOGIC 9

Storage Elements: Latches – Flip Flops -Analysis of Clocked Sequential Circuits – Analysis Examples with D, T and JK flip-flops, Moore and Mealy Finite State Machines - Synthesizable HDL Models of Sequential Circuits –State Reduction and Assignment-Design Procedure - Shift Registers – SISO, SIPO, PIPO, PISO, Universal shift register – Counters - Ripple and Synchronous Counters, Ring counter, Jhonson counter.

UNIT - IV MEMORY AND PROGRAMMABLE LOGIC 9

Introduction – Random Access Memory – Read/Write operation - Memory description in HDL - Memory Decoding – Address Multiplexing – Read Only Memory - Programmable Logic Array - Programmable Array Logic – Design of various combinational logic circuits using Programmable Logic Devices.

UNIT - V SYSTEM DESIGN USING VERILOG 9

Introduction to Hardware Description Language - module description, gate delays, Boolean expressions, User Defined Primitives - HDL Models of Combinational Circuits - Gate level modeling, Data flow modeling, Behavioral modeling, Writing test bench for simple logics HDL model for Flip-Flops, Latches, HDL Model of ZERO detector (Moore/Mealy model) - HDL for Registers and Counters.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. M.Morris R. Mano and Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL”, 5th Edition, Pearson Education, 2012.
2. D.P.Leach and A.P.Malvino, “Digital Principles and Applications”, Tata McGraw Hill, 2011.

REFERENCES:

1. M. Morris R. Mano, “Digital Design”, 3rd Edition, Pearson Education, 2002.
2. G.K.Kharate, “Digital Electronics”, Oxford University Press, 2010.
3. John F. Wakerly, “Digital Design Principles and Practices”, 5th Edition, Pearson Education, 2017.
4. Charles H. Roth Jr. and Larry L. Kinney, “Fundamentals of Logic Design”, 6th Edition, cengage Learning, 2013.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : DIGITAL ELECTRONICS		**Course code :24EC303**	
CO	**Course Outcomes**	**Unit**	**K- CO**
C204.1	Apply Boolean algebra, number systems, and gate-level minimization techniques such as K-maps and tabulation methods to simplify digital circuits.	I	K3
C204.2	Design and analyze combinational circuits including adders, subtractors, code converters, multiplexers, and demultiplexers.	II	K4
C204.3	Analyze synchronous sequential circuits, including flip-flops, shift registers, and counters, using Moore and Mealy state machines and HDL models.	III	K4
C204.4	Design memory systems and combinational logic circuits using RAM, ROM, memory decoding techniques, and various programmable logic components	IV	K4
C204.5	Develop Verilog-based models for combinational and sequential circuits using gate-level, data flow, and behavioral modeling, and write test benches for verification.	V	K4

24HS301	HUMAN VALUES AND ETHICS	L	T	P	C
		1	1	0	2

OBJECTIVES:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT - I INTRODUCTION TO VALUE EDUCATION 3+3

Value Education – Definition - Concept and Need for Value Education - Natural acceptance, Self exploration - Fundamentals of value education - Happiness and Prosperity as parts of Value Education - fulfilling human aspirations.

Practice Session: Sharing about Oneself, Exploring Human Consciousness – self exploration, Exploring Natural Acceptance.

UNIT - II HARMONY IN THE HUMAN BEING 3+3

Understanding Myself as Co-existence of the Self and the Body – I' and Body synchronization - Realization of Self, Body needs - Self-regulation and Health.

Practice Session: Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self, Harmony of Self with the Body - program for ensuring health vs dealing with disease.

UNIT - III HARMONY IN THE FAMILY, SOCIETY AND NATURE 3+3

Family as a basic unit of Human Interaction - Values in Relationships - The Basics for Trust and Respect in today's Crisis: Affection, e-Guidance, Reverence, Glory, Gratitude and Love – Harmony in society: Resolution, Prosperity, Fearlessness and Co-existence as Comprehensive Human Goal- Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

Practice Session: Exploring the Feelings of Trust, Respect and Gratitude, Exploring Systems to fulfil Human Goals considering society and nature - Co-existence in Existence.

UNIT - IV SOCIAL ETHICS 3+3

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.

Practice Session: Exploring Ethical Human Conduct, Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order.

UNIT - V PROFESSIONAL ETHICS 3+3

Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies.

Practice Session: Holistic Technologies - Production Systems and Management Models, Holistic vision of life - Socially responsible behavior and environmentally responsible work

CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 60 PERIODS

TEXT BOOKS:

1. R.R.Gaur, R.Asthana and G.P.Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd revised edition, Excel Books, New Delhi, Reprint 2019.
2. A.N.Tripathy, "Human Values", New Age International Publishers, New Delhi, 2003.

REFERENCES:

1. E.G.Seebauer and Robert L. Berry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2000.
2. M.Govindrajran, S.Natrajan and V.S.Senthil Kumar, “Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd., Reprint 2011.
3. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York, 4th Edition, Reprint 2017.
4. Charles E. Harries, Michael S. Protchard and Michael J. Rabins, “Engineering Ethics-concepts and Cases”, Thomson Learning, 2000.
5. S.K. Chakraborty and DabangshuChakraborty, “Human Values and Ethics: Achieving Holistic Excellence”, ICFAI University Press, 2006.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : HUMAN VALUES AND ETHICS		**Course code : 24HS301**	
CO	**Course Outcomes**	**Unit**	**K- CO**
C205.1	Explain the significance of value inputs and start applying them in their life and profession to ensure happiness and prosperity.	I	AD
C205.2	Differentiate between Thyself and the Body to ensure competency of an individual.	II	AD
C205.3	Explain the role of a human being in ensuring harmony in family, society, and nature.	III	AD
C205.4	Develop an awareness of human values to appreciate the rights of others and to enable social balance	IV	AD
C205.5	Differentiate between ethical and unethical professional practices and apply suitable strategies to actualize a harmonious working environment.	V	AD

24HS203	JAPANESE - I	L	T	P	C
		2	0	0	-

OBJECTIVE:

1. To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation.
2. Develop basic communicative competence in everyday Japanese
3. Enable learners to understand and use fundamental grammar pattern

Module- I Japanese Writing System & Basic Sentence Structure 6

Introduction to Japanese writing systems: Hiragana, Katakana, basic Kanji (introduction), Pronunciation and sound patterns, Greetings and self-introduction.

Module- II Basic Sentence Structure & Vocabulary 4

Sentence pattern: **A は B です**, Question formation using **か**, Particles: **は, の**, Basic vocabulary: nationality, occupations, majors, Subject pronouns, Family.

Module -III Demonstratives, Numbers & Daily Objects 6

Demonstratives: **これ, それ, あれ, どれ**, Demonstratives with noun**: この, その, あの, どの,** Location words: **ここ, そこ, あそこ,** Numbers, time, prices, counters, Particles: **も、ね、よ**, Classroom and daily-use vocabulary.

Module- IV Verbs, Actions , Time Expressions & Present Tense 8

Verb classification: Group I, II, III, Verb ます form (present & negative), Time expressions and frequency adverbs, Particles: **を、で**, Making invitations: **～ませんか,** Word order, Days, Weeks, Months, and Years.

Module-V Past Tense & Movement Expressions 6

Past tense forms: **ました／ませんでした** form (past & negative)**,** Location and direction particles: **に、へ、で,** Means of transport, Talking about past events, Basic movement-related expressions**.**

TOTAL:30 PERIODS

Text Books

1. GENKI I – An Integrated Course in Elementary Japanese (3rd Edition)
2. Minna no Nihongo Shokyuu I – Main Text
3. Minna no Nihongo I – Translation & Grammatical Notes (English)

Reference Books

1. GENKI I Workbook (3rd Edition)
2. Minna no Nihongo I Workbook
3. JLPT N5 Official Practice Workbook

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: JAPANESE - I	
CO	**Course Outcomes**
CO1	Understand simple spoken Japanese in everyday contexts.
CO2	Communicate with widely used Japanese words effectively.
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.

24HS204	DEUTSCH-I	L	T	P	C
		2	0	0	-

OBJECTIVE:

- To impart fundamentals of the German language, including reading, writing systems, pronunciation, and speaking.

Module- I **Basic Communication - Sprechen** **10**

Basics & Introduction: German alphabet and pronunciation, Vowels (long & short), consonants, Umlauts (ä, ö, ü) and ß. Greetings and farewells (formal & informal), Polite expressions (Bitte, Danke, Entschuldigung). Numbers 1–100 and days of the week, Months, Seasons, Personal pronouns (ich, du, er, sie…), Telling time (Wie spät ist es?) – Official timings and Unofficial timings.Grammar Essentials & Everyday Vocabulary: Present tense of regular verbs (spielen, arbeiten, machen…)

Activities: Self- Introduction and Talking about hobbies

Module -II **Basic German grammar** **10**

Common irregular verbs: sein (to be), haben (to have), gehen, kommen, Artikel and gender (der, die, das; ein, eine), Modal verbs, and its conjugations. Nouns- Rules for Artikel (Masculine gender, Feminine gender and Neutram gender) Artikel - Nominativ Case. (Was oder Wer, kein oder nicht)

Activities: Conversation in the office, Hotel Reception, composition of simple texts giving information about person, daily routine, family members etc.,

Module- III **German grammar-II** **10**

Artikel-Akkusativ case (e.g., einen, keinen, doch), Akkusativ case- Pronomen, Possessivartikel, Präpositionen, Es gibt. Describing people and things: adjectives and colors, Family, food, furniture, and common vocabulary with gender.

Activities: Food culture in Germany, Ordering food and drinks at a café or Listening to short conversations and responding appropriately.History, geography and aspects of German culture as group task / project work.

TOTAL:30 PERIODS

REFERENCES:

1. Funk, H., Kuhn, C., & Demme, S. (2015). Menschen A1: Deutsch als Fremdsprache Kursbuch. Hueber Verlag
2. Studio d A1: Deutschals Fremdsprache, Hermann Funk and Christina Kuhn Cornelsen Verlag publication **(**2005).
3. Evans, S., &Pude, A. (2012).Menschen A1. HueberVerlag.
4. Niebisch, D., Penning-Hiemstra, S., et al. (2016). Schritte International Neu A1.1. HueberVerlag.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: DEUTSCH-I	
CO	**Course Outcomes**
CO1	Communicate with widely used German words effectively
CO2	Understand German grammar and German culture
CO3	Understand German civilization and Translation

24CS306	DATA STRUCTURES USING C	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the concepts of ADTs.
- To learn the concepts of linear data structures.
- To learn the concepts of non-linear data structures and hashing.
- To explore the applications of linear and non-linear data structures
- To get familiarized to sorting and searching algorithms.

UNIT - I ARRAYS AND LISTS **9**

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list – Doubly-Linked Lists – Circularly Linked List – Polynomial Manipulation using Linked List.

LAB COMPONENT

1. Implementation of Singly Linked List **6**
2. Implementation of Polynomial Manipulation using Linked List

UNIT - II STACKS AND QUEUES 9

Stack ADT- Implementation of Stack - Applications: Evaluating Postfix Expressions, Infix to Postfix conversion -Queue ADT -Queue Implementation - Applications.

LAB COMPONENT

3. Linked list implementation of Stack ADT
4. Linked list implementation of Queue ADT **6**

UNIT - III TREES **9**

Trees - Binary Trees -Tree Traversals - Expression Trees - Binary Search Tree - AVL Trees, B-Tree, B+ Tree- Heap representation

LAB COMPONENT

5. Implementation of Binary Tree and Tree Traversals **6**
6. Implementation of Binary Search Tree

UNIT - IV GRAPHS **9**

Graph Definition - Representation of Graphs - Types of Graph - Breadth-first traversal Depth-first traversal - Applications of Graphs - Dijkstra’s Algorithm - Prim’s algorithm - Kruskal's Algorithm.

LAB COMPONENT

7. Implementation of Dijkstra’s Algorithm **6**
8. Implementation of Prim’s Algorithm

UNIT - V SEARCHING, SORTING AND HASHING TECHNIQUES **9**

Linear Search - Binary Search - Insertion sort - Selection sort - Merge Sort -Quick sort, Bubble sort, Radix sort- Hashing -Hash Functions - Separate Chaining - Open Addressing - Double Hashing – Rehashing-b Extendable hashing.

LAB COMPONENT

9. Implementation of Linear Search and Binary Search **6**
10. Implementation of Insertion Sort and Merge Sort

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL:120 PERIODS

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education,1997.
2. Kamthane, “Introduction to Data Structures in C”, 1st Edition, Pearson Education, 2007.

REFERENCES:

1. E.Balagurusamy, “Data Structures using C”, 1st Edition, Mc-Graw Hill, 2013.
2. Langsam, Augenstein and Tanenbaum, “Data Structures using C and C++”, 2nd Edition, Pearson Education, 2015.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest and Clifford Stein, “Introduction to Algorithms”, 2nd Edition, Mc-Graw Hill, 2002.
4. Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, “Data Structures and Algorithms”, 1st Edition, Pearson, 2002.
5. Kruse, “Data Structures and Program Design in C”, 2nd Edition, Pearson Education, 2006.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : DATA STRUCTURES USING C		**Course code: 24CS306**	
CO	**Course Outcomes**	**Unit**	**K- CO**
C206.1	Apply abstract data types and implement various algorithmic problems using arrays and linked list.	I	K3
C206.2	Apply the different linear data structures like stack and queue to solve various computing problems.	II	K3
C206.3	Build different types of trees and apply various operations for tree manipulation.	III	K3
C206.4	Solve graph based problem using traversal techniques and path finding.	IV	K3
C206.5	Apply different sorting, searching and hashing techniques for data manipulation and storing.	V	K3

24EC3L1 ANALOG CIRCUITS LABORATORY

L	T	P	C
0	0	3	1.5

OBJECTIVES:

- To study the stability of different biasing techniques.
- To study the frequency response of CE and CS amplifier.
- To design Amplifier circuits using different biasing techniques and to measure gain, Input and output resistances.
- To simulate various circuits using SPICE.

LIST OF EXPERIMENTS:

1. Design and demonstrate the bias network for Common emitter amplifiers.
2. Design and demonstrate the bias network for Common Source amplifiers.
3. Design and demonstrate the bias network for Cascode amplifiers.
4. Design and demonstrate the Class A Power Amplifier.
5. Design and demonstrate the Class B Power Amplifier.
6. Design and analyze the frequency response of Class C Tuned amplifier.
7. Design and analyze the frequency response series feedback amplifiers.
8. Design and analyze the frequency response Shunt Feedback Amplifier.
9. Design and demonstrate Differential amplifiers.

SIMULATION USING SPICE (USING TRANSISTOR):

10. Design and simulate CG & CD configuration of FET amplifiers with various active load configuration.
11. Design and simulate Common Collector Amplifier using various Bias techniques.

TOTAL: 45 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

1. CRO/DSO – 15 Nos.
2. Signal Generator / Function Generators – 15 Nos.
3. Dual Regulated Power Supplies – 15 Nos.
4. Desktop PCs with SPICE software – 15 Nos.
5. Transistor/FET (BJT – NPN – PNP, NMOS/PMOS) – 30 Nos.
6. PN Junction Diodes – 30 Nos.
7. Digital Multimeter – 15 Nos.
8. Decade Resistance Box – 10 Nos.
9. Decade Inductance Box – 10 Nos.
10. Decade Capacitance Box – 10 Nos

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : ANALOG CIRCUITS LABORATORY		**Course code :24EC3L1**	
CO	**Course Outcomes**	**Expt**	**K- CO**
C207.1	Design and demonstrate biasing networks for BJT and MOSFET amplifiers including Common Emitter, Common Source, and Cascode configurations.	1,2,3	K4
C207.2	Design and implement Class A and Class B power amplifiers and evaluate their performance characteristics.	4,5	K4
C207.3	Design and analyze frequency response characteristics of Class C tuned amplifiers and feedback amplifier configurations (series and shunt).	6,7,8	K4
C207.4	Design and demonstrate the working of differential amplifiers and analyze their significance in analog circuit design	9	K4
C207.5	Design and simulate FET and BJT amplifier configurations, including Common Gate, Common Drain, and Common Collector amplifiers, using various biasing techniques.	10,11	K4

24EC3L2	DIGITAL ELECTRONICS AND SIMULATION LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Be familiar with various combinational circuits.
- Understand the various components used in the design of digital computers.
- Be exposed to sequential circuits
- Learn to use HDL and FPGA.

LIST OF EXPERIMENTS:

I. Design and implementation of the following combinational circuits:
   1. Verification of Boolean Laws using basic gates
   2. Half Adder and Full Adder using basic gates.
   3. Code Converters using basic gates.
   4. 4 –bit binary adder / subtractor using MSI.
   5. Magnitude Comparator using basic gates and MSI.
   6. Multiplexer and Demultiplexer using basic gates
   7. Multiplexer and Demultiplexer using MSI

II. Design and implementation of sequential circuits:
   8. Shift registers.
   9. Synchronous counters.
   10. Asynchronous counters.

III. Coding combinational using HDL and Verify with FPGA:
   11. Half Adder
   12. Full Adder

TOTAL: 45 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

1. Digital trainer kits 20 Nos.
2. Digital ICs required for the experiments in sufficient numbers.
3. FPGA kit.

SOFTWARE:HDL simulator.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : DIGITAL ELECTRONICS AND SIMULATION LABORATORY		**Course code : 24EC3L2**	
CO	**Course Outcomes**	**Expt**	**K- CO**
C208.1	Design combinational circuits like adders, code-converters and magnitude comparators by using logic gates / MSI with respect to the design specifications.	1,2,3,4, 5	K3
C208.2	Analyze the application of multiplexers by implementing various combinational logic / Boolean expressions with the help of multiplexers.	6,7	K4
C208.3	Develop and verify the function table of 4-bit SISO, SIPO, PIPO, PISO shift registers using D Flip-Flops.	8	K4
C208.4	Design synchronous and asynchronous counters by using Flip-Flops as per the design specifications.	9,10	K4
C208.5	Design and implement half adder and full adder using Verilog HDL and Synthesize the same using FPGA .	11,12	K4

24HS3L1	APTITUDE AND SOFT SKILLS – II	L	T	P	C
		0	0	2	1

Module I Aptitude Skills II **15**

Pipes and cisterns, boats and streams, Problems on trains, Alpha Numeric Puzzles, Simple Interest, Compound Interest, Mixtures and Allegations, calendar, clock, permutation and combination, probability, height and distance.

Module II Soft Skills II **15**

Introduction to Soft skills – Non-Verbal Communication - Role play - Learning styles – Writing Bio-data and Process description - Peak Life Moment / Challenging moment - People management –team work, leadership, Decision making – problem identification - Email and Essay writing - Just a minute (JAM).

TOTAL: 30 PERIODS

REFERENCES:

1. Quantitative aptitude for competitive examinations ,R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – AbijithGuha, TMH
3. Quantitative Aptitude for Cat – ArunSharma,TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan,A Handbook of Spotting Errors, Mcgraw Hill Education, 2010

24HS3L2 **PHYSICAL EDUCATION – II**

L	T	P	C
0	0	2	1

Objective:
To impart knowledge on gymnastic exercises and pressing needs for up skilling in a particular game.

Basic gymnastics exercises: Warming up, Suitable exercise, Lead up games, Safety education, Movement education, Balanced Walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, horizontal bar exercise, flic-flac-walk

Up skilling in any one of the athletics: Broad Jump, High Jump, Triple Jump, Relay Sprints, Javelin Throw, Discuss Throw, Shot Put, Short and Long-distance Running.

Advance skills in any one of the indoor/outdoor games, which has been opted by the student in the previous semester.

TOTAL: 30 PERIODS

References:
1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). Psychology of sports performance. Sports Publication.
4. Kandappan, K. (2004). Foundations of physical education. Friends Publications.
E-resources: 1. https://www.who.int/health-topics/physical-activity

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : PHYSICAL EDUCATION – II	
CO	**Course Outcomes**
CO1	Understand and explain the importance of physical activity for mental and physical health.
CO2	Apply safety principles and methods during sports activities.
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.
CO4	Demonstrate the advanced technical skills and strategic understanding in the game of their interest.

24EC401 RANDOM PROCESS AND COMMUNICATION SYSTEMS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To develop a strong foundation in probability, random variables, and random processes to enable students to analyze and model communication systems effectively.
- To equip students with the skills to apply modulation techniques (both amplitude and angle modulation) in real-world communication systems, ensuring optimal performance and noise reduction.
- To enable students to understand and apply information theory principles for efficient data transmission, source coding, and maximizing communication channel capacity.

UNIT - I PROBABILITY AND RANDOM VARIABLES 9+3

Probability – Axioms of Probability - Baye's theorem - Conditional probability – Discrete and continuous Random variables – Moments – Moment Generating functions - Binomial, Poisson and Normal distributions - Joint distributions - Marginal and conditional distributions.

UNIT - II RANDOM PROCESS 9+3

Random Process: Basic Concepts-Stationary Processes - Mean, Correlation and Covariance Functions - Ergodic Processes - Transmission of Random - Process over LTI Systems - Random Processes in the Frequency Domain - Power spectral density –Properties Cross spectral density Gaussian Processes – Properties-Central limit theorem.

UNIT - III NOISE 9+3

Noise sources and types - White Noise - Narrow band Noise - Representation of Narrow band noise – in-phase and quadrature Phase components - Envelope and phase Components - Sine wave plus narrow band noise.

UNIT - IV AMPLITUDE MODULATION 9+3

Generation and detection of AM wave – spectra - DSBSC, Hilbert Transform, Pre-envelope & complex envelope - SSB and VSB – comparison - Performance analysis in Amplitude Modulation - Super heterodyne Receiver.

UNIT - V ANGLE MODULATION 9+3

Phase and frequency modulation - Narrow Band and Wind band FM - Spectrum - FM modulation and demodulation – FM Discriminator - PLL as FM Demodulator - Transmission bandwidth - Performance analysis in Frequency Modulation.

CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS

TEXT BOOKS:

1. O.C.Ibe, "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Simon Haykin, "Communication Systems", Wiley, 5th Edition, 2021.Press, 3rd Edition, 2018

REFERENCES:[ii]

1. J.G.Proakis and M.Salehi, "Fundamentals of Communication Systems", Pearson Education 2014.
2. P.Z.Peebles, "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4th Edition, New Delhi, 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. B.P.Lathi, "Modern Digital and Analog Communication Systems" Oxford University Press, 4th Edition, 2017.
5. H.P.Hsu, "Schaum Outline Series - Analog and Digital Communications", TMH 2006.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : RANDOM PROCESS AND COMMUNICATION SYSTEMS		**Course code :24EC401**	
CO	**COURSE OUTCOMES**	**UNIT**	**K- CO**
C209.1	Apply the concepts of probability and standard distributions with real life phenomenon.	I	K3
C209.2	Apply the concept of random processes to the design of communication systems	II	K3
C209.3	Apply noise concepts to analyze white and narrowband noise and their effects on signals.	III	K3
C209.4	Apply the concepts of amplitude modulation to generate and detect AM, DSB-SC, SSB and VSB signals, compare their characteristics, and analyze the performance of a super heterodyne receiver.	IV	K3
C209.5	Apply the concepts of phase and frequency modulation to perform FM modulation and demodulation, determine bandwidth, analyze performance, and examine the operation of a super heterodyne receiver.	V	K3

24EC402	ELECTROMAGNETIC FIELDS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce students with different coordinate systems.
- To familiarize the students with the different concepts of electrostatic, magneto static and time varying electromagnetic systems.
- To expose the students to the ideas of electromagnetic waves.

UNIT - I INTRODUCTION 9+3

Coordinate systems and transformation – Introduction - Cartesian Coordinates - Circular Cylindrical Coordinates - Spherical Coordinates - Constant-Coordinate Surfaces. Vector calculus - Introduction - Differential Length, Area, and Volume - Line, Surface, and Volume Integrals - Del Operator - Gradient of a Scalar - Divergence of a Vector and Divergence Theorem - Curl of a Vector and Stokes's Theorem - Laplacian of a Scalar -Classification of Vector Fields.

UNIT - II ELECTRO STATICS 9+3

Electrostatic fields- Introduction - Coulomb's Law and Field Intensity - Electric Fields due to Continuous Charge Distributions - Electric Flux Density - Gauss's Law - Applications - Electric Potential - Relationship between E and V - An Electric Dipole and Flux Lines - Energy Density in Electrostatic Fields - Application - Electrostatic Discharge – MATLAB simulation.

Electrostatic Boundary Conditions – Introduction - Poisson's and Laplace's Equations - Uniqueness Theorem - General Procedures for Solving Poisson's or Laplace's Equation - Resistance and Capacitance.

UNIT - III MAGNETO STATICS 9+3

Magneto static Fields-Introduction - Biot–Savart's Law - ampere's circuit law - Maxwell's equation - applications of ampere's law - magnetic flux density – magnetic scalar and vector potentials - derivation of Biot–savart's law and Ampere's law.

Magnetic Forces, Materials, and Devices - Introduction -forces due to magnetic fields -magnetic torque and moment - a magnetic dipole - magnetization in materials - classification of materials - magnetic boundary conditions - inductors and inductances -magnetic energy - magnetic circuits - force on magnetic materials.

UNIT - IV MAXWELL'S EQUATIONS 9+3

Introduction - Faraday's Law - Transformer and Motional Electromotive Forces -Displacement Current - Maxwell's equation -Final Forms - Time-Varying Potentials - Time-Harmonic Fields.

UNIT - V ELECTROMAGNETIC WAVE PROPAGATION 9+3

Introduction - Waves in General - Wave Propagation in Lossy Dielectrics - Plane Waves in Lossless Dielectrics - Plane Waves in Free Space - Plane Waves in Good Conductors - Wave Polarization - Power and the Poynting Vector - Reflection of a Plane Wave at Normal Incidence - Reflection of a Plane Wave at Oblique Incidence - Case study on Wi Fi wave Propagation.

CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS

TEXT BOOKS:

1. Mathew N.O. Sadiku, "Elements of Electromagnetics", 7th Edition, Oxford University Press, 2018.
2. W.H.Hayt and J.A.Buck, "Engineering Electromagnetics", 8th Edition, McGraw-Hill (India), 2011.

REFERENCES:

1. Edward C. Jordan and Keith G. Balmain, "Electromagnetic waves and Radiating Systems", 2nd Edition, Prentice-Hall Electrical Engineering Series, 2012.
2. D.K.Cheng, "Field and wave Electromagnetics", 2nd Edition, Pearson (India), 1989.
3. Griffiths, "Introduction to electrodynamics", 4th Edition, Pearson (India), 2013.
4. K.A.Gangadhar and P.M.Ramanathan, "Electromagnetic Field Theory", 8th Edition, Khanna Publishers, 2015.
5. NannapaneniNarayanaRao, "Elements of Engineering Electromagnetics" 6th Edition, Pearson Education, 2004.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : ELECTROMAGNETIC FIELDS		**Course Code :24EC402**	
CO	**COURSE OUTCOMES**	**UNIT**	**K- CO**
C210.1	Apply coordinate systems and vector calculus operations (gradient, divergence, curl, and integrals) to analyze and interpret vector fields.	I	K3
C210.2	Explain fundamental laws governing electric fields and Apply Gauss's Law and Coulomb's Law to compute electric fields and potentials for various charge distributions.	II	K3
C210.3	Apply Biot-Savart's Law and Ampere's Circuital Law to calculate magnetic fields for different current distributions and magnetic materials.	III	K3
C210.4	Apply Maxwell's equations to analyze time-varying electromagnetic fields and predict the behavior of electromagnetic wave propagation.	IV	K3
C210.5	Apply principles of electromagnetic wave propagation to determine wave behavior in various media and calculate reflection and transmission at interfaces.	V	K3

24EC403	ANALOG INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the basic building blocks of Linear Integrated Circuits.
- To learn the linear and non-linear applications of Operational Amplifiers.
- To introduce the theory and applications of PLL and data converters.
- To learn the fundamentals of voltage regulators and 555 timers.

UNIT - I BASICS OF OPERATIONAL AMPLIFIER 9

Introduction and classification of IC – Basic information about Op-amp – Internal circuit diagram of IC 741 - General operational amplifier stages - Differential amplifier - Low frequency small signal analysis - Constant Current mirror and Current sources - Ideal op-amp characteristics – open and closed loop configurations – DC and AC characteristics, Slew rate.

UNIT - II LINEAR AND NONLINEAR APPLICATIONS OF OPAMP 9

Basic op-amp circuits: Sign changer, Scale changer, Phase shift circuits, voltage follower, adder, subtractor, Differential amplifier Linear Applications: Instrumentation amplifier, V-to-I and I-to-V converters Integrator, Differentiator Non-linear Applications: Precision rectifier, peak detector, clipper and clamper, Active filters: Low pass, High pass.

UNIT - III COMPARATORS AND WAVEFORM GENERATORS 9

Comparator: Open loop Op-amp configuration – Inverting and Non-inverting comparator – Applications of comparator - Regenerative comparator (Schmitt trigger) Waveform generators: Sine wave generators – Square / Triangle / RC phase shift and We in bridge oscillator, Multi vibrators – Astable and Mono stable multivibrator.

UNIT - IV DATA CONVERTERS AND PLL 9

Data converters: D/A converters – Specifications – Weighted Resistor type, R-2R ladder - Inverted R-2R ladder – A/D converters – Specifications – Flash type – Successive Approximation type – Counter type – Dual slope type. PLL: Operation of basic PLL, Closed loop analysis - Voltage controlled oscillator – Monolithic PLL IC 565 – Applications of PLL - FSK modulation and demodulation.

UNIT - V 555 TIMER AND VOLTAGE REGULATORS 9

555 timer : Mono stable Multi vibrators – As table Multi vibrators – Application. Voltage regulators: Linear mode power supply - Rectifiers - Half-Wave Rectifier – Full Wave Rectifiers - Filters - Voltage regulation - Linear series and shunt Voltage Regulators - IC723 general purpose regulator - LDO-Buck and Boost Converter.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. D.RoyChoudhry and Shail Jain, “Linear Integrated Circuits”, 5th Edition, New Age International Pvt. Ltd., 2018.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4th Edition, Tata McGraw-Hill, 2016.

REFERENCES:

1. J.B.Gupta, “Electronic Devices and Circuits”, S.K. Kataria& Sons, 6th Edition, 2016.
2. S.Salivahanan and V.S.KanchanaBhaskaran, “Linear Integrated Circuits”, Tata McGraw Hill, 2nd Edition (4th reprint), 2016.
3. Ramakant A. Gayakwad, “Op-amp and Linear ICs”, Prentice Hall / Pearson Education, 4th Edition, 2015.
4. Robert F. Coughlin and Frederick F. Driscoll, “Operational amplifiers and linear integrated circuits”, PHI, 6th Edition, 2001.

5. B.S.Sonde, “System design using Integrated circuits”, New Age publications, 2nd Edition, 2001.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : ANALOG INTEGRATED CIRCUITS		**Course Code : 24EC403**	
CO	**COURSE OUTCOMES**	**UNIT**	**K- CO**
C211.1	Summarize the fundamental features of ICs and op-amps including the structure and characteristics of the IC 741.	I	K2
C211.2	Design the operational amplifier circuits for various linear and non-linear applications	II	K3
C211.3	Use comparator and waveform-generator circuits to create essential switching and oscillating outputs.	III	K3
C211.4	Apply the principles and specifications of DACs, ADCs, and PLL systems to solve basic signal conversion and frequency control applications.	IV	K3
C211.5	Analyze the operation of the 555 timer in mono stable and as table modes and examine the performance of linear power supplies for various electronic applications.	V	K4

24EC404	CONTROL SYSTEM ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the components and their representation of control systems.
- To study various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the state variable analysis.

UNIT - I CONTROL SYSTEM MODELING 9

Basic Elements of Control System - Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph.

UNIT - II TIME RESPONSE ANALYSIS 9

Transient response - steady state response – standard test signals- step and ramp response of first order - step and impulse Response of second order system – Time domain Specifications - Steady state errors - P, PI, PD and PID Compensation.

UNIT - III FREQUENCY RESPONSE ANALYSIS 9

Frequency Response - Bode Plot, Polar Plot - Frequency Domain specifications from the plots - Constant M and N Circles – Compensators - Lead, Lag and Lead Lag Compensators.

UNIT - IV STABILITY ANALYSIS 9

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability.

UNIT - V STATE VARIABLE ANALYSIS 9

State space representation of Continuous Time systems - State equations - Transfer function from State Variable Representation - Solutions of the state equations - concepts of controllability and observability - State feedback controller design.

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. J.Nagrath and M.Gopal, “Control System Engineering”, New Age International Publishers, 5th Edition, 2017.
2. Norman S. Nise, “Control Systems Engineering”, Wiley, 2018.

REFERENCES:

1. Benjamin C. Kuo, “Automatic control systems”, McGraw Hill Education, 2018.
2. Schaum’s Outline Series, “Feedback and Control Systems”, McGraw Hill Education, 2017.
3. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, Pearson Education India, 2013.
4. M.Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition, 2012.
5. K.Ogata, “Modern Control Engineering”, PHI, 5th Edition, 2012.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : CONTROL SYSTEM ENGINEERING		**Course code : 24EC404**	
CO	**COURSE OUTCOMES**	**UNIT**	**K- CO**
C212.1	Develop a transfer function for a given electrical and mechanical system and derive the transfer function using block diagram reduction and signal flow graph.	I	K3
C212.2	Derive the transient and steady state response of first and second order control systems for standard input signals.	II	K3
C212.3	Determine the frequency response parameters for the given open loop system using Bode and Polar plots.	III	K3
C212.4	Analyze the stability of a system using Routh Hurwitz, Root locus, Nyquist criterion.	IV	K4
C212.5	Develop a state space model and analyze its stability for a system.	V	K3

		L	T	P	C
24EC405	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3

OBJECTIVES:

- To study the architecture of 8086 microprocessor.
- To learn the working of peripherals and its communication with 8086
- To learn the architecture of 8051 microcontroller.
- To understand the different protocols used to interface peripherals with microcontroller
- To design a microcontroller based system for various applications.

UNIT - I 8086 MICROPROCESSOR 9

8085 Architecture, 8086 Architecture- Minimum and Maximum mode configurations, Instruction set, Addressing modes, Assembly Language Programming, Bus timing, Memory and I/O interfacing.

UNIT - II PERIPHERALS AND INTERFACING 9

Programmable Peripheral Interface (8255), Keyboard Display Controller (8279), Programmable Timer Controller (8254), Programmable Interrupt Controller (8259), Serial Communication Interface (8251), ADC0808 and DAC0808 Interface.

UNIT - III MICROCONTROLLER 9

8051 – Architecture, Special Function Registers (SFRs), I/O Ports, Timers / Counters, Interrupts, Serial communication, Instruction set, Addressing modes, Assembly language programming.

UNIT - IV PERIPHERAL INTERFACE PROTOCOLS 9

Introduction to synchronous and Asynchronous communication. UART with RS232 and RS485 signal scheme, SPI, I^2C and CAN**.** Interfacing RTC and interfacing EEPROM using I2Cprotocol. Case Studies: Data logger, Smart Home system.

UNIT - V MICROCONTROLLER BASED SYSTEM DESIGN 9

Interfacing - DAC, ADC, matrix display, (16x2) LCD, Sensor, Actuators and Relay, Interfacing Stepper Motor, DC Motor with Speed Control using PWM

CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. Krishnakant, “Microprocessors and Microcontrollers: Architecture, programming and system design 8085, 8086, 8051, 8096”, PHI Learning, 2014.
2. Mohamed Ali Mazidi, Janice GillispieMazidi and RolinMcKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, 2nd Edition, Pearson Education, 2011.

REFERENCES:

1. J. Kenneth. J. Ayala, “The 8051 Microcontroller”, Cengage Learning, 3rd Edition, 2004.
2. Doughlas V. Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : MICROPROCESSORS AND MICROCONTROLLERS		**Course code :24EC405**	
CO	**COURSE OUTCOMES**	**UNIT**	**K- CO**
C213.1	Develop the assembly language programs of 8086 microprocessor.	I	K3
C213.2	Apply the functionalities of peripheral devices to interface and control microprocessor-based systems.	II	K3
C213.3	Develop the assembly language programs of 8051 microcontroller.	III	K3
C213.4	Apply synchronous and asynchronous communication protocols to develop simple embedded applications.	IV	K3
C213.5	Apply appropriate interfacing techniques to operate displays, motors, and sensors through ADC, DAC, and PWM control.	V	K3

24EC406	COMMUNICATION NETWORKS AND SECURITY	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To understand the division of network functionalities into layers.
- To be familiar with the components required to build different types of networks.
- To be exposed to the required functionality at each layer.
- To learn the flow control and congestion control algorithms.

UNIT - I FUNDAMENTALS OF COMPUTER NETWORKS AND LINK LAYER 6

Overview of Data Communications - Networks - Building Network and its types - Overview of Internet - OSI Mode - Physical Layer - Overview of Data and Signals - Introduction to Data Link Layer - Link layer Addressing - Error Detection and Correction.

LAB COMPONENT

1. Implementation of Error Detection / Error Correction Techniques **6**

UNIT - II MEDIA ACCESS AND INTERNETWORKING 6

Overview of Data link control and Media access control - Ethernet (802.3) - Wireless LANs - HDLC Protocols - Bluetooth - Packet switching - IPv4 address - Network layer protocols (IP, ICMP).

LAB COMPONENT

1. Implementation of Bit Stuffing.
2. Implementation of stop and wait protocol. **6**

UNIT - III NETWORK LAYER 6

Routing - Unicast Routing - Algorithms - Protocols - Multicast Routing and its basics - Overview of Intra-domain and inter-domain protocols - Overview of IPv6 addressing - Transition from IPv4 to IPv6.

LAB COMPONENT

1. Implementation of distance vector routing algorithm. **6**
2. Implementation of Link state routing algorithm.

UNIT - IV TRANSPORT LAYER 6

Introduction to Transport layer – Protocols - User Datagram Protocols (UDP) and Transmission Control Protocols (TCP) Congestion Control - Congestion avoidance (DEC bit, RED) - QoS - Application requirements.

LAB COMPONENT

1. Implementation of Sliding Window - Go back-N and selective repeat protocols **6**

UNIT - V APPLICATION LAYER 6

Application Layer Paradigms - HTTP - DNS - Electronic Mail (SMTP, POP3, IMAP, MIME) - Need for Cryptography and Network Security - Layers of Network Security – Firewalls.

LAB COMPONENT

1. Encryption and Decryption. **6**

CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 90 PERIODS

TEXT BOOKS:

1. Behrouz A. Forouzan, “Data communications and Networking”, McGraw Hill Education, 5th Edition, 2017.
2. Larry L. Peterson and Bruce S. Davie, “Computer Networks: A Systems Approach”, Morgan Kaufmann Publishers, 5th Edition, 2011.

REFERENCES:

1. James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Seventh Edition, 2016.
2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, Second Edition, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
4. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: COMMUNICATION NETWORKS AND SECURITY		**Course Code :24EC406**	
CO	**COURSE OUTCOMES**	**UNIT**	**K- CO**
C214.1	Identify the components required to build different types of networks and implement Error control algorithms.	I	K3
C214.2	Implement and demonstrate data link layer algorithms.	II	K3
C214.3	Construct routing and forwarding solutions for packet switching networks.	III	K3
C214.4	Choose the required functionality at transport layer for a given application.	IV	K3
C214.5	Identify how network security is implemented in different layers.	V	K3

24EC4L1	ANALOG INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use SPICE software for circuit design.

LIST OF EXPERIMENTS:

1. Inverting Amplifier, Non-Inverting Amplifier.
2. Clipper, Clamper and Full wave rectifier.
3. Integrator and Differentiator.
4. Active – Low pass and High Pass filter.
5. Phase shift oscillator.
6. As table multi vibrator using op-amp IC 741
7. Mono stable multi vibrator using NE555 timer.
8. Schmitt trigger.
9. DC power supply using LM 317.

SIMULATION USING SPICE:

10. Simulation of We in bridge oscillator.
11. Simulation of Mono stable multi vibrator using IC741.
12. Simulation of R-2R ladder type D-A converter and Successive approximation type A-D converter.

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

1. CRO/DSO – 15 Nos.
2. Signal Generator / Function Generators – 15 Nos.
3. Dual Regulated Power Supplies – 15 Nos.
4. Digital Multimeter – 15 Nos.
5. IC Tester – 5 Nos.
6. Desktop PC with SPICE Circuit Simulation Software – 15 Nos.
7. Components and Accessories: Resistors, Capacitors, Diodes, Bread Boards.

Note: Op-Amps uA741, LM317, NE555 may be used.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: ANALOG INTEGRATED CIRCUITS LABORATORY		**Course Code :24EC4L1**	
CO	**COURSE OUTCOMES**	**Expt.No**	**K- CO**
C215.1	Construct fundamental amplifier circuits and waveform-shaping circuits such as clippers, clampers, and full-wave rectifiers.	1,2	K3
C215.2	Analyze the behavior of integrator, differentiator, and active low-pass/high-pass filter circuits.	3,4	K4
C215.3	Examine the operation of phase-shift oscillators, A stable multi vibrators using IC 741and Mono stable multi vibrators using the NE555 timer.	5,6,7	K4
C215.4	Build a Schmitt trigger circuit and a DC power supply using LM317.	8,9	K3
C215.5	Evaluate the operation of oscillators, mono stable multi vibrators and data converters through simulation.	10,11,12	K4

24EC4L2 MICROPROCESSOR AND MICROCONTROLLER LABORATORY

L	T	P	C
0	0	3	1.5

OBJECTIVES:

- To write ALP for arithmetic and logical operations in 8086
- To interface 8086 with peripherals using 8255,8279,8254
- To write ALP for arithmetic and logical operations in 8051
- To write programs to interface I/Os with 8051.

LIST OF EXPERIMENTS:

8086 Programs using MASM

1. Basic arithmetic and Logical operations.
2. Sorting, searching and string manipulations.

Programs using Kits

3. 8086 interfacing with parallel interface 8255
4. 8086 interfacing with keyboard display controller 8279
5. 8086 interfacing with ADC and DAC.
6. 8086 interfacing with programmable interval timer 8254

8051 Programs using Kits

7. Basic arithmetic and Logical operations.
8. Searching and Code conversion.
9. Stepper motor interface using 8051
10. Traffic light interface using 8051
11. 8051 interfacing with ADC and DAC
12. Serial communication between two 8051 kits

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

1. PCs with MASM, Keil, any equivalent software- 15 Nos.
2. 8086 trainer Kits – 15 Nos.
3. 8051 trainer Kits – 15 Nos.
4. Interfacing units – Each 5 Nos.
5. RS232 cable

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: MICROPROCESSOR AND MICROCONTROLLER LABORATORY		**Course Code :24EC4L2**	
CO	**COURSE OUTCOMES**	**Expt.No.**	**K- CO**
C216.1	Develop ALPs for Arithmetic and logical operations using 8086 microprocessors.	1,2	K3
C216.2	Develop ALPs to interface 8086 microprocessor with different peripherals.	3,4,5,6	K3
C216.3	Develop ALPs for Arithmetic and logical operations using 8051 microcontrollers.	7,8	K3
C216.4	Develop ALPs to interface 8051 microcontroller for different applications.	9,10,11	K3
C216.5	Develop an ALP to configure the serial port of the 8051 microcontroller and establish serial communication with another 8051 kit.	12	K3

		L	T	P	C
24EC4L3	**MICRO PROJECT**	**0**	**0**	**2**	**1**

OBJECTIVES:

- To allow the students to explore the breadth of research that is being performed within the college.
- To implement electronic hardware by learning PCB artwork design, soldering techniques, testing, and troubleshooting, etc.
- To set the students apply the programming knowledge into a real-world situation/problem.
- To work as an individual or in a team in development of technical projects.
- To communicate and report effectively project related activities and findings.

LIST OF EXPERIMENTS

The mini project will be in the area of basic electronic and basic communication engineering. The projects may be fabricated to address any of the following SDGs.

SDG 1 - No Poverty: All forms of poverty must be eradicated worldwide.

SDG 2 - Zero Hunger: eliminate hunger, increase food security, improve nutrition, and promote sustainable agriculture.

SDG 3 - Good Health and Well-Being: Ensure healthy lifestyles and promote well-being for people of all ages.

SDG 4 - Quality Education: Ensure that all students receive an inclusive and equitable education, as well as opportunities for lifelong learning.

SDG 5 - Gender Equality: Ensure gender equality and empower all women and girls.

SDG 6 - Clean Water and Sanitation: Ensure that water and sanitation are available to everyone and managed sustainably.

SDG 7 - Affordable and Clean Energy: Ensure that everyone has access to affordable, reliable, sustainable, and modern energy sources.

SDG 8 - Decent Work and Economic Growth: Encourage long-term, inclusive, and sustainable economic growth, full and productive employment, and decent jobs for all.

SDG 9 - Industry, Innovation, and Infrastructure: Create resilient infrastructure, encourage inclusive and sustainable industrialisation and foster innovation.

SDG 10 - Reduced Inequality: Reduce inequality within and between countries.

SDG 11- Sustainable Cities and Communities: Create cities and human settlements that are inclusive, safe, resilient, and sustainable.

SDG 12 - Responsible Consumption and Production: Ensure your consumption and production patterns are sustainable.

SDG 13 - Climate Action: Take immediate steps to combat climate change and its consequences.

SDG 14 - Life below Water: Conserve and sustainably use the oceans, seas, and marine

resources to promote sustainable development.

SDG 15 - Life on Land: Protect, restore, and promote the sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, and stop biodiversity loss.

SDG 16 - Peace, Justice, and Strong Institutions: Encourage peaceful and inclusive societies, ensure equal access to justice for all, and establish effective, accountable, and inclusive institutions.

SDG 17 - Partnerships for the Goals: Strengthen implementation mechanisms and revitalize global partnerships for sustainable development..

TOTAL: 30 PERIODS

Micro Project Guidelines:

The micro-project is a team activity having 3-4 students in a team. This is electronic circuit building and testing for developing real life small electronic applications. The micro-project may be a complete hardware or hardware with small programming aspect. It should encompass electronics components, devices, analog or digital ICs, micro controller etc. Micro- Project should cater to a small system required in laboratory or real-life application. Based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of Micro-project.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: MICRO PROJECT		**Course Code :24EC4L3**
CO	**COURSE OUTCOMES**	**K- CO**
C217.1	Identify and define a problem statement from the requirements raised from literature survey /need analysis.	K2
C217.2	Build and Test electronic circuits/prototype for developing real life small electronic applications.	K3
C217.3	Work in teams, write comprehensive report and effective presentation of the project work.	K3
C217.4	Demonstrate prototyping which will lead them towards entrepreneurship	K4
C217.5	Deliver a compelling presentation of the academic project.	K3

Dr.V.KEJALAKSHMI,
PROFESSOR & HEAD
DEPARTMENT OF ECE

24HS4L1	APTITUDE AND SOFT SKILLS - III	L	T	P	C
		0	0	2	1

Module I LOGICAL REASONING SKILLS 10

Logical Reasoning, Letter and Symbol series, Number series, Analyzing arguments, Making judgments, Logical Reasoning, Direction Sense test, Venn diagrams, Seating arrangements, Cause and effect, Blood relation test, Dice Logical, verbal puzzles, Analytical puzzles and sudoku.

Module II BEHAVIOURAL SKILLS 5

Interview Etiquettes - Body language, Dress code, Eye contacts, Handshakes for Interview - Interview handling – Mock Interview Videos - High Frequency words in resume and interviews - Visual Interpretation – HR Interview question – Sell yourself - Interpersonal and intrapersonal communication

Module III VERBAL SKILLS 15

Vocabulary basics, Grammar basics, Critical Reasoning, Reading comprehension, Synonyms, Antonyms, Idioms and phrases - sentence completion, Spotting errors, Error correction, Sentence correction, Writing Resume, Letter writing, Official mail correspondence - Ways to communicate in different scenarios-job interview, business meeting, project proposal submission, informal gathering, speech for a large audience and debate.

TOTAL: 30 PERIODS

REFERENCES:

1. Quantitative aptitude for competitive examinations , R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – AbijithGuha, TMH
3. Quantitative Aptitude for Cat – ArunSharma,TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan,A Handbook of Spotting Errors, Mcgraw Hill Education, 2010