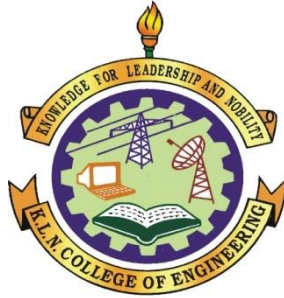


K.L.N. COLLEGE OF ENGINEERING

Pottapalayam, Sivagangai District

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



Estd: 1994

FIRST YEAR

CURRICULUM AND SYLLABUS

REGULATIONS 2024

For Under Graduate Program

B.Tech. ELECTRONICS ENGINEERING (VLSI DESIGN AND TECHNOLOGY)

CHOICE BASED CREDIT SYSTEM

(For the students admitted from the Academic Year 2026 – 2027 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 the analog, digital and mixed-signal VLSI circuits and systems by applying semiconductor device, circuit and system-level fundamentals.
- PSO 2.** Develop and implement VLSI/SoC solutions on FPGA and ASIC platforms using HDL, EDA tools and physical-design flows.
- PSO 3.** Apply emerging techniques such as machine learning and design automation to solve industry and research oriented problems.



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



K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
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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.Tech. ELECTRONICS ENGINEERING
(VLSI DESIGN AND TECHNOLOGY)**

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



K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
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REGULATIONS 2024
CHOICE BASED CREDIT SYSTEM
B.Tech. ELECTRONICS ENGINEERING (VLSI DESIGN AND TECHNOLOGY)
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
11.	24HS2L2	Physical Education - I	HS	2	0	0	2	1*
TOTAL				31	17	2	12	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 and EE (VLSI))	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.	24VL201	Solid State Devices	PC	3	3	0	0	3
6.	24HST02	தமிழரும் தொழில்நுட்பமும்/ 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.	24GE2L3	Electronics Engineering Foundation and Digital Skills Laboratory	ES\$	3	0	0	3	1.5
11.	24HS2L1	Aptitude and Soft Skills – I	EEC#	2	0	0	2	1*
12.	24HS3L2	Physical Education - II	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

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.

TOTAL: 30 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. Veena Selvam, Dr. Sujatha Priyadarshini, 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 Aysha Viswamohan, 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.

TOTAL: 60 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

- 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.

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

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.

LASER: theory of laser - Characteristics - Spontaneous and Stimulated emission - Einstein's coefficients - Population inversion - Nd-YAG laser, CO₂ 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

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).

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.

12

TEXT BOOKS:

1. R. K. Gaur and S. L. Gupta, "Engineering Physics", Dhanpat Rai 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: H₂-O₂ 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.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", 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. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge
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 pointers
- 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.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Balagurusamy E, "Programming in ANSI C", Eighth Edition, Tata Mcgraw-Hill, 2019.
2. Yashavant Kanetkar, "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, Pearson Education India, 2015.
2. Juneja, B. L and Anita Seth, "Programming in C", CENGAGE Learning India pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh, "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. Reema Thareja, "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)**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi 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. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company 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

UNIT - I LANGUAGE AND LITERATURE 3

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

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

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

UNIT - III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT - IV THINAI CONCEPT OF TAMILS 3

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

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

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

TOTAL: 15 PERIODS

24HST01	தமிழர்மரபு	L	T	P	C
		1	0	0	1

அலகு - I மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் சங்க இலக்கியத்தின் சமயச் சார்பற்றதன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்தவ சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

அலகு - II மரபு - பறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன்சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு - III நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கனியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்

அலகு - IV தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு - V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ் புத்தகங்களின் அச்ச வரலாறு.

TEXT & REFERENCE BOOKS:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)

3. கீழடி-வைகைநதிக்கரையில் சங்ககால நகர-நாகரீகம்
(தொல்லியல்துறை வெளியீடு)
4. பொருளந – ஆற்றங்கரை நாகரீகம். (தொல்லியல்துறை வெளியீடு)
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 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)
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 equipment 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/UC9-5oT15dxc81Ml-pUui3Ww>
2. <https://www.oxfordonlineenglish.com/>
3. Oxford Online English - <https://www.youtube.com/channel/UCNbeSPp8RYKmHUiYBUDizg>
4. British Council | Learn English - <https://www.youtube.com/channel/UCOtnu-KKoAbN47luYMeDPOg>
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

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.

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>

TOTAL: 30 PERIODS**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.

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

TOTAL: 60 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. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, 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, New Delhi.
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, Meera Bannerji- 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.apititude-test.com/verbal-aptitude.html>
- <https://www.edudose.com>
- <https://www.fresherslive.com/online-test/apititude-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
C110.1	Compare and contrast ideas in technical texts, identify and report cause and effects in events, industrial processes	I - V	AD
C110.2	Analyze problems, feasible solutions and communicate them in the written format.	I – V	AD
C110.3	Present their ideas, opinions, discuss, analyze concepts and problems by effective speaking in group discussions.	I – V	AD
C110.4	Draft effective emails, official letters and job applications, effective resumes in a planned and logical manner.	I – V	AD
C110.5	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

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.

TOTAL: 60 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, New Delhi, 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
C111.1	Apply Laplace transform and inverse transform to solve the initial value problems.	I	K3
C111.2	Solve the multiple integrals and apply the concept to find areas, volumes.	II	K3
C111.3	Determine the line, surface and volume integrals using Green's, Gauss and Stokes theorems	III	K3
C111.4	Determine Analytic functions, Bilinear Transformations and apply the concept of conformal mapping to find the images of given	IV	K3
C111.5	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 (OHSMS). 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, H₂ 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.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Anubha Kaushik 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.Veeraianand, Dr.L.Devaraj Steohen, '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
C112.1	Describe the environment, ecosystem and their significances and explain the threats to biodiversity.	I	K2
C112.2	Describe the sources, effects, and control methods of environmental pollution.	II	K2
C112.3	Explain the knowledge on various renewable sources and its applications.	III	K2
C112.4	Describe the disposal techniques of solid waste and record the consequences of natural disasters.	IV	K2
C112.5	Outline the different goals of sustainable development and apply them for suitable technology and societal development.	V	K2

24GE201	PYTHON PROGRAMMING	L 3	T 0	P 0	C 3
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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, delete, 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)

TOTAL: 45 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. Yashavant Kanetkar, Aditya Kanetkar, "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.Sai Ramesh, "Problem Solving and Python Programming", 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
C113.1	Explain the basic concepts of python programming like python installation, data types, expression and control statements.	I	K2
C113.2	Apply Python functions, recursive functions and string functions to solve simple problems and perform linear and binary search.	II	K3
C113.3	Illustrate the various operations of lists, tuples, sets, dictionaries and arrays and develop programs to solve various sorting and matrix operations.	III	K3
C113.4	Explain file handling operations, exception handling, modules and packages and develop programs for word count, file copy, merge operations and exception handling.	IV	K3
C113.5	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.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", McGraw Hill Science Engineering, 8th Edition, 11th Reprint 2016.
2. A.Sudhakar, S.Shyammohanand Palli, "Circuits and Network (Analysis and synthesis)" Tata McGraw-Hill, 2015.
3. Nagrath I. and Kothari D.P., "Electric Machines", 5th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.

REFERENCES:

1. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, 5th Edition Reprint 2016.
2. Robert L. Boylested, "Experiments in Circuit Analysis to Ac company Introductory Circuit Analysis", PHI, 2002.
3. Charles K. Alexander, Mathew O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
4. P.C.Sen, "Principles of Electric Machines and Power Electronics" John Wiley & Sons, Third Edition 2013.

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
C114.1	Apply Kirchhoff's law for DC circuits.	I	K3
C114.2	Apply network theorems to evaluate DC circuits.	II	K3
C114.3	Analyze the steady state response of R, L and C circuits.	III	K4
C114.4	Apply the transient response of RLC circuits under DC excitation using Laplace Transform.	IV	K3
C114.5	Explain the construction, working and testing of DC machines and single-phase transformer.	V	K2

24VL201	SOLID STATE DEVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop a strong foundation in semiconductor energy bands, carrier statistics, doping and charge-transport mechanisms.
- To impart the principles of semiconductor junctions and metal-semiconductor contacts and relate their physical behaviour to device characteristics.
- To provide knowledge of bipolar devices, MOS capacitors and their electrical characteristics, operating regions and practical limitations.
- To develop the ability to analyse NMOS and PMOS devices using current-voltage relationships, device parameters and compact-model concepts.
- To introduce MOSFET scaling, short-channel effects, device variability and emerging transistor structures relevant to modern VLSI technologies.

UNIT - I SEMICONDUCTOR MATERIALS, ENERGY BANDS AND CARRIERS 9

Crystal and electronic structure of solids - energy-band formation - conductors, semiconductors and insulators - direct and indirect band gaps - density of states and effective mass - Fermi-Dirac distribution - electrons and holes - intrinsic and extrinsic semiconductors - donor and acceptor doping - charge neutrality - carrier concentration and Fermi-level position.

UNIT - II JUNCTIONS AND CONTACTS 9

Formation of p-n junction - equilibrium band diagram, depletion approximation, built-in potential, electric field and depletion width - forward and reverse bias - diode equation and non-idealities - breakdown mechanisms - junction capacitances and switching behavior - Zener, Schottky and PIN diodes - metal-semiconductor contacts: ohmic and rectifying contacts.

UNIT - III BIPOLAR DEVICES AND MOSFET FUNDAMENTALS 9

Bipolar Junction Transistor structure and transistor action - current components, current gain and operating regions - Ebers-Moll concept and high-frequency limitations (overview) - device data-sheet ratings and safe operating limits.

MOS structure and energy-band diagrams - accumulation, depletion and inversion - flat-band and threshold voltage - oxide and depletion capacitance - ideal high-frequency C-V characteristic - interface charge and work-function effects (overview).

UNIT - IV MOSFET DEVICES AND SCALING 9

NMOS and PMOS structures - gradual-channel approximation - cut-off, linear and saturation regions - I-V equations - transconductance, output resistance and body effect - channel-length modulation and subthreshold conduction - device symbols, terminal conventions and introduction to SPICE/compact-model parameters - CMOS inverter as a device-level application - Constant-field scaling and practical scaling limits.

UNIT - V DEVICE VARIABILITY**9**

Short-channel effects: threshold roll-off, DIBL, velocity saturation, mobility degradation, hot-carrier effects and punch-through - leakage mechanisms and power implications - high-k/metal-gate stacks, strained silicon and silicon-on-insulator (overview) - FinFET and gate-all-around nanosheet FET structure and electrostatic control - process, voltage and temperature (PVT) variation - random and systematic variability (introductory).

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Donald A. Neamen and Dhruves Biswas, "Semiconductor Physics and Devices", McGraw Hill Education, 2017.
2. Ben G. Streetman and Sanjay Kumar Banerjee, "Solid State Electronic Devices", Seventh Edition, Pearson Education India, 2015.

REFERENCES:

1. S.M.Sze and Kwok K. Ng, "Physics of Semiconductor Devices", Third Edition, Wiley, 2007.
2. Yuan Taur and Tak H. Ning, "Fundamentals of Modern VLSI Devices", Third Edition, Cambridge University Press, 2022.
3. Samar K. Saha, "FinFET Devices for VLSI Circuits and Systems", CRC Press, 2021.
4. Robert F. Pierret, "Semiconductor Device Fundamentals", Pearson, 2006.
5. Nandita Dasgupta and Amitava Dasgupta, "Semiconductor Devices: Modelling and Technology", PHI Learning Pvt. Ltd. 2004.

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

COURSE NAME: Solid State Devices		COURSE CODE: 24VL201	
CO	Course Outcomes	Unit	K –CO
C115.1	Apply semiconductor statistics and carrier-transport relations to determine carrier concentration, Fermi-level position, conductivity and related material parameters.	I	K3
C115.2	Analyse the electrostatics and terminal characteristics of p-n junctions and metal-semiconductor contacts under different biasing conditions.	II	K4
C115.3	Apply the operating principles of bipolar devices and MOS capacitors to determine operating regions, threshold voltage and capacitance characteristics.	III	K3
C115.4	Analyse NMOS and PMOS current-voltage characteristics and extract parameters such as threshold voltage, transconductance, output resistance and body-effect coefficient.	IV	K4
C115.5	Evaluate the effects of scaling, short-channel phenomena and process-voltage-temperature variations, and compare planar MOSFET, FinFET and gate-all-around device structures.	V	K4

24HST02

தமிழரும் தொழில்நுட்பமும்

L	T	P	C
1	0	0	1

அலகு - I நெசவு மற்றும் பானை தொழில்நுட்பம்:**3**

சங்க காலத்தில் நெசவுத் தொழில் – பனைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு - II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிப்பாட்டு தலங்கள் – நாயக்கர் கால கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக்கலை

அலகு - III உற்பத்தி தொழில்நுட்பம்**3**

கப்பல்கட்டும் கலை - உலோகவியல் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல் மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

அலகு - IV வேளாண்மை மற்றும் நீர் பாசன தொழில்நுட்பம்**3**

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன் வளம் – முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு அறிவுசார்சமூகம்.

அலகு - V அறிவியல் தமிழ் மற்றும் கணினித் தமிழ்:**3**

அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின்நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்

TOTAL: 15 PERIODS**TEXT & REFERENCE BOOKS:**

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகரநாகரீகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளந - ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)
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)

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. SCR Characteristics

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
C116.1	Experimentally verify and simulate KVL & KCL in Electrical circuits.	1,12	K3
C116.2	Experimentally verify and simulate various Theorems.	2,3,4	K3
C116.3	Determine the resonant frequency, quality factor & Bandwidth of the RLC circuits.	5	K3
C116.4	Perform the transient analysis of RL & RC circuits.	6	K3
C116.5	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

TOTAL: 45 PERIODS**PLATFORM NEEDED:** Python 3 interpreter for Windows/Linux**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
C117.1	Develop simple Python programs using conditional and iterative constructs	1,2,7	K3
C117.2	Construct simple Python programs using built-in functions, user-defined functions and recursion functions.	3,4	K3
C117.3	Make use of array concepts to develop programs for solving various sorting and matrix operations.	5,6,8,9	K3
C117.4	Apply command line arguments and file handling methods to implement programs to read word from text file and merging files.	10,11,12	K3
C117.5	Make use of python SQL database to implement and solve data Manipulation operations.	13	K3

24GE2L3	ELECTRONICS ENGINEERING FOUNDATION AND DIGITAL SKILLS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop fundamental practical skills in electrical and electronic systems through wiring circuits, component identification, measurement techniques, and basic troubleshooting.
- To apply electronic design and fabrication concepts using schematic capture tools, PCB design methods, and soldering techniques for implementing simple electronic circuits.
- To acquire foundational computational skills in Linux operating systems, shell scripting, and command-line environments to support engineering applications.
- To understand and utilize modern version control systems by creating, managing, and maintaining repositories using Git for collaborative project development.
- To integrate engineering, computing, and project management skills to execute mini projects effectively while following systematic documentation and repository-based workflows.

GROUP - A (Electrical and Electronics)

- 1) Residential house wiring using switches, fuse, indicator, Fluorescent lamp and Energy Meter - Staircase wiring- Fluorescent Lamp wiring.
- 2) Energy meter wiring and related calculations
- 3) (i) Resistor Colour coding and verification of series parallel connections.
(ii) Types of capacitor identification
(iii) Measurement of AC signals parameters using DSO (Amplitude and Frequency)
- 4) Schematic and Layout preparation using CAD tool
- 5) PCB fabrication
- 6) Soldering simple electronic circuits and checking continuity.

GROUP – B (Digital Skills)

- 1) Introduction to Linux Operating System and Command-Line Skills
- 2) Introduction to Shell Scripting and Task Automation
- 3) Advanced Linux Commands
- 4) Git, GitHub and Collaborative Version Control
- 5) Introduction to LLMs and Generative AI Tools
- 6) Introduction to Prompt Engineering

TOTAL: 45 PERIODS

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

Course Name: ELECTRONICS ENGINEERING FOUNDATION AND DIGITAL SKILLS LABORATORY		Course Code: 24GE2L3	
CO	Course Outcomes	EXP	K-CO
C118.1	Apply electrical wiring techniques and measurement procedures to construct and test basic electrical and electronic circuits safely.	A 1-2	K3
C118.2	Apply the concepts of electronic components, circuit connections, and measurement tools to identify, verify, and analyze circuit parameters.	A 3	K3
C118.3	Apply schematic design, PCB layout preparation, fabrication methods, and soldering techniques to develop simple electronic circuits.	A 4-6	K3
C118.4	Apply Linux commands and shell scripting techniques to perform basic system operations and automate simple engineering tasks.	B 1-3	K3
C118.5	Apply Git/GitHub, prompt engineering, and Generative AI tools to develop, document, and manage collaborative engineering tasks and mini projects.	B 4-6	K3

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 – Abijith Guha, TMH
3. Quantitative Aptitude for Cat – Arun Sharma, TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa & Co.
5. Prasad, Hari Mohan, “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., "Essentials of physical education", Kalyani Publishers, 2008.
2. Kamlesh M. L., "Psychology in physical education and sport" Third Edition, Metropolitan Book Co., 2006.
3. Mangal S. K., "Psychology of sports performance", Sports Publication, 2009.
4. Kandappan K., "Foundations of physical education", Friends Publications, 2004.

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.