Academic Program: UG

Academic Year 2024-25

I & II Semester B.E.

Syllabus

Under NEP 2022

Stream: Electrical & Electronics Engineering

Branch: Electronics and Communication Engineering

SHRI DHARMASTHALA MANJUNATHESHWARA
COLLEGE OF ENGINEERING & TECHNOLOGY,
DHARWAD – 580 002

(An Autonomous Institute Approved by AICTE & Affiliated to VTU, Belagavi
Accredited by NBA under Tier-1 2023-2026

Ph: **0836-2447465** **Fax: 0836-2464638** **Web:** www.sdmcet.ac.in

SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for I & II semester B.E. in Electronics and Communication Engineering is recommended by the Board of Studies of Electronics and Communication Engineering Department and approved by the Academic Council, SDM College of Engineering & Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2024-25 till further revision.

Chairman BOS & HOD

Principal

SDM College of Engineering & Technology, Dharwad-02

Department of Electronics & Communication Engineering

College – Vision and Mission

VISION:

To develop competent professionals with human values

MISSION:

1. To have contextually relevant Curricula.
2. To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
3. To enhance Research Culture.
4. To involve Industrial Expertise for connecting classroom content to real life situations.
5. To inculcate Ethics and impart soft-skills leading to overall Personality Development.

SDMCET- Quality Policy

- In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

SDMCET- Core Values

- Competency
- Commitment
- Equity
- Team work and
- Trust

Department- Vision and Mission

Vision

Fostering excellence in the field of Electronics & Communication Engineering, showcasing innovation, research and performance with continuous Industry – Institute Interaction with the blend of Human values.

Mission

M1: To provide quality education in the domain of Electronics & Communication Engineering through state of the art curriculum, effective teaching learning process and the best of laboratory facilities.

M2: To encourage innovation, research culture and team work among students.

M3: Interact and work closely with industries and research organizations toaccomplish knowledge at par.

M4: To train the students for attaining leadership with ethical values in developing and applying technology for the betterment of society and sustaining the global environment.

Program Educational Objectives (PEOs)

The Graduates, after a few years of Graduation will be able to:

I. **Apply** the latest in-depth knowledge in the field of Electronics and Communication Engineering with Mathematical applications to address real life challenges.

II. **Exhibit** the confidence for independent working and / or spirit to work cohesively with group.

III. **Readily** be accepted by the Industry globally.

IV. **Develop** design skills, fault diagnosis skills, communication skills and create research orientation.

V. **Inculcate** professional, social ethics and to possess awareness regarding societal responsibility, moral and safety related issues

Programme Outcomes (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

13. Design economically and technically sound analog and / or digital systems based on the principles of signal processing, VLSI and communication Engineering (PO-13)
14. Integrate hardware – software, and apply programming practices to realize the solutions inelectronics domain. (PO-14).

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD
Department of Electronics and Communication Engineering
Stream: Electrical and Electronics Engineering
I Semester
Scheme of Teaching and Examinations 2024 – 25

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week			Examination				Credits
					Theory/ Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	ASC(IC)	22MATE11	Mathematics –I for EEE stream	Maths	2	2	2	3	50	100	100	4
2	ASC(IC)	22PHYE12	Physics for EEE stream	PHY	2	2	2	3	50	100	100	4
3	ESC	22BEE13	Basic Electronics	ECE	2	2	0	3	50	100	100	3
4	ESC-I	22ESC144	Introduction to Mechanical Engineering	MECH	3	0	0	3	50	100	100	3
		22ESC145	Principles of Programming Using C	ECE	2	2	0	3	50	100	100	3
5	ETC-I	22ETC15D	Introduction to Embedded Systems	ECE	3	0	0	3	50	100	100	3
6	AEC	22ENG16	Communicative English	Humanities	1	0	0	1	50	50	100	1
7	HSMC	22KSK17/ 22KBK17	Samskrutika Kannada/Balake Kannada	Humanities	1	0	0	1	50	50	100	1
8	AEC	22IDT18	Innovation and Design Thinking	ECE Dept.	1	0	0	1	50	50	100	1
				TOTAL					**400**	**650**	**800**	**20**

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD
Department of Electronics and Communication Engineering
Stream: Electrical and Electronics Engineering
II Semester
Scheme of Teaching and Examinations 2024 – 25

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week			Examination				Credits
					Theory/ Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	ASC(IC)	22MATE21	Mathematics –II for EEE stream	Maths	2	2	2	3	50	100	100	4
2	ASC(IC)	22CHEE22	Chemistry for EEE stream	Chemistry	2	2	2	3	50	100	100	4
3	ESC	22CED23	Computer-Aided Engineering Drawing	Mechanical	2	0	2	3	50	100	100	3
4	ESC-I	22ESC242	Introduction to Electrical Engineering	EEE	3	0	0	3	50	100	100	3
5	PLC-I	22PLC25B	Introduction to Python Programming	ECE	2	0	2	3	50	100	100	3
6	AEC	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	1	50	50	100	1
7	HSMC	22ICO27	Indian Constitution	Humanities	1	0	0	1	50	50	100	1
8	HSMC	22SFH28	Scientific Foundations of Health	EEE	1	0	0	1	50	50	100	1
				TOTAL					**400**	**650**	**800**	**20**

I Semester

22MATE11	Mathematics-I for EEE stream	(2-2-2-0)4

Contact Hours: 39

Course Learning Objectives (CLOs):

- **Familiarize** the importance of calculus associated with one variable and multi-variable for Electrical & Electronics Engineering.
- **Analyze** Electrical & Electronics engineering problems by applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra to solve the system of equations.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be		Mapping to Pos(1-12)/PSOs (1,2)		
		Substantial Level(3)	Moderate Level(2)	Slight Level(1)
CO-1	Apply the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multi variate functions.	--	--	1
CO-2	Analyze the solution of linear and nonlinear ordinary differential	--	--	1
CO-3	Apply the concept of change of order of integration and variables to evaluate multiple Integrals and their usage in computing area and volume.	--	2	--
CO-4	Make use of matrix theory for solving for system of linear equations and compute Eigen values and Eigen	--	--	1
CO-5	Familiarize with modern mathematical tools namely Mathematica /MATLAB /Python/Scilab	--	2	--

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	1	2	--	---	--	--	--	--	--	--	--	--

Pre- requisites: Knowledge of fundamentals of calculus.

Course Contents:

Unit–1(Calculus)

Introduction to polar coordinates and curvature relating to EC & EE Engineering Applications: Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature: Cartesian, Parametric, Polar and Pedal forms. Problems.

Self study: Centre and circle of curvature, evolutes and involutes.

Applications: Communication theory, signals processing and Image Processing.

7 Hours

Unit–2 (Series Expansion and Multivariable Calculus)

Introduction of series expansion and partial differentiation in EC & EE Engineering Applications: Taylor's and Maclaurin's series expansion for one variable (Statement only)–problems. Indeterminate forms-L' Hospital's rule-Problems. Partial differentiation, total derivative, differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables and Problems.

Self-study: Euler's Theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

Applications: Errors and approximations, vector calculus and related applications in communication theory and signals processing. **8 Hours**

Unit–3 (Ordinary Differential Equations (ODEs) of First Order)

Introduction to first-order ordinary differential equations pertaining to the applications for EC& EE Engineering: Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations-Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Applications: Orthogonal Trajectories(Cartesian) and R-L circuits, Problems.

Non-linear differentia equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, reducible to Clairaut's equations. Problems.

Self-Study: Applications of ODEs, Solvable for x and y.

Applications of ordinary differential equations: Rate of Growth or decay, Conduction of heat. **8 Hours**

Unit–4 (Integral Calculus)

Introduction to Integral Calculus in EC and EE Engineering Applications:

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integrals. Problems.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems.

Self-Study: Volume by triple integration, Centre of gravity.

Applications: Antenna and wave propagation, Calculation of optimum power in electrical circuits, field theory. **8 Hours**

Unit-5 (Linear Algebra)

Introduction of linear algebra and Engineering Applications related to EC & EE: Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations: Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors, Rayleigh's power method to find the dominant Eigen value and Eigen vector.

Self-study: Solution of system of equations by Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Applications of Linear Algebra: Network Analysis, Markov Analysis, Critical point of a network system. Optimum solution. **8 Hours**

List of Laboratory experiments (2 hours/week per batch/batch strength15)

10 lab sessions +1 repetition class +1 Lab Assessment

1. 2D plots for Cartesian and polar curves
2. Finding angle between polar curves, curvature and radius of curvature of a given curve.
3. Finding partial derivatives, Jacobian and plotting the graph.
4. Applications to Maxima and Minima of two variables
5. Solution of first-order differential equation and plotting the graphs
6. Program to compute area, volume and centre of gravity.
7. Evaluation of improper integrals
8. Numerical solution of system of linear equations, test for consistency and graphical representation.
9. Solution of system of linear equations using Gauss-Seidel iteration method
10. Compute eigen values and eigen vectors and find the largest and smallest eigen value by Rayleigh power method.

Suggested software's: Mathematica /MATLAB /Python/ Scilab

Reference Books:

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th edition, 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
3. **Gupta C. B, Sing S. R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc- Graw Hill Education (India) Pvt.Ltd 2015.
4. **H.K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics", S. Chand Publication, 3rd Ed.,2014.
5. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111

- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTUe-Shikshana Program
- VTU EDUSAT Program

22PHYE12 Physics for EEE stream (2-2-2) 4

Contact Hours: 39

Engineering Physics course is designed to deliver optimum knowledge of materials and energy concepts. Content explores fundamental theories, experimental demonstrations and their applications in various engineering fields. The scope of the curriculum includes the study of special theory of quantum mechanics, conductors, dielectric, superconductors and semiconducting properties of materials and photonics.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12)/ PSOs (13,14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Describe** the fundamental principles of Quantum Mechanics and the essentials of Photonics	2	1	
CO-2	**Elucidate** the concepts of Conductors, dielectrics and superconductivity	1	2	
CO-3	**Explicate** Fundamentals of Laser and Optical fibers and Applications.	1	2	
CO-4	**Discuss** the fundamentals Photoconductivity and Photovoltaics and their applications.	1	2	
CO-5	**Summarize** the properties of semiconductors and the working principles of semiconductor devices	1		
CO-6	**Practice** working in groups to conduct experiments in physics and perform precise and honest measurements		1	

Pre-requisites: Nil

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	**2.8**	**2.25**	-	-	-	-	-	-	-	-	-	-	-	-

Contents:

Unit-I

Quantum Mechanics:

de Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle and its application (Non-existence of electron inside the nucleus-Non Relativistic), Wave Function, Time independent Schrodinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Particle inside one-dimensional infinite potential well, Waveforms and Probabilities. Numerical Problems.

7 Hours

Unit-II

Electrical Properties of Solids:

Quantum free electron theory: Introduction, Fermi factor - Density of states and their temperature dependence. Expression for Electric resistivity of a conductor merits of Quantum free electron theory.

Dielectrics: Introduction, solid, liquid and gaseous dielectrics. Application of dielectrics in transformers, Capacitors, and Electrical Insulation.

Superconductivity: Introduction to Superconductors, Temperature dependence of resistivity, Meissner's Effect, Silsbee Effect, Types of Super Conductors, Temperature dependence of Critical field, BCS theory (Qualitative), High Temperature superconductivity, SQUID, MAGLEV, Numerical Problems. **8 Hours**

Unit-III

Lasers and Optical Fibers:

Lasers: Characteristics of LASER, Interaction of radiation with matter, Expression for energy density equation and its significance. Requisites of a Laser system. Conditions for Laser action. Principle, Construction and working of Semiconducting Laser. LIDAR, Laser drilling and Laser beam welding. Numerical problems.

Optical Fibers: Propagation mechanism, TIR, angle of acceptance, Numerical aperture, fractional index change, Modes of propagation, Number of modes and V parameter, Types of optical fibers. Attenuation and Mention of expression for attenuation coefficient, Attenuation spectrum of an optical fiber with optical windows. Discussion of the block diagram of point-to-point communication, Intensity-based fiber optic displacement sensor, Merits and demerits. Numerical problems. **8 Hours**

Unit-IV

Photoconductivity and Photovoltaics:

Introduction, Photoconductivity in Insulating Crystals, Simple Model of Photoconductor, Effect of Traps, Space charge effects, Effect of Impurity in Photoconductivity, Applications – Photo Conductive Cell – Construction, working and Spectral response. Applications of photoconductivity – photo diode and phototransistor. Solar cell – Construction, Working and Output characterization, Applications of solar cells. **8 Hours**

Unit-V

Semiconductor Physics:

Fermi energy and Fermi level, Fermi level in intrinsic semiconductors (derivation), Expression for concentration of electrons in conduction band & holes concentration in valance band (only mention the expression), Law of mass action, Electrical conductivity of a semiconductor (derivation), Hall effect, Expression for Hall coefficient (derivation) and its application. Direct and Indirect band gap semiconductors (qualitative), four probe method to determine resistivity, Numerical problems. **8 Hours**

Reference Books:

1) A Textbook of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand. & Company Ltd, New Delhi.
2) An Introduction to Lasers theory and applications by M.N. Avadhanulu and P.S.Hemne revised Edition 2012. S. Chand and Company Ltd -New Delhi.
3) Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017.
4) Concepts of Modern Physics-Arthur Beiser: 6th Ed; Tata McGraw Hill Edu Pvt Ltd-New Delhi 2006.
5) Fundamentals of Fibre Optics in Telecommunication & Sensor Systems, B.P. Pal, New Age International Publishers.
6) Modern Physics for Engineers – S. P. Taneja, R. Chand and Co., New Delhi.

Laboratory Component:

Any Ten Experiments have to be completed from the list of experiments.

Note: The experiments have to be classified into

a) Exercise

b) Demonstration

c) Structured Inquiry

d) Open Ended Based on the convenience classify the following experiments into above categories selecting at least three experiments for each type.

List of Experiments:

1. Determination of wavelength of LASER using Diffraction Grating.

2. Determination of acceptance angle and numerical aperture of the given Optical Fiber.
3. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
4. Determination of resistivity of a semiconductor by Four Probe Method
5. Study the I-V Characteristics of the Given Bipolar Junction Transistor.
6. Determination of dielectric constant of the material of capacitor by Charging and discharging method.
7. Study the Characteristics of a Photodiode and to determine the power responsivity / Verification of Inverse Square Law of Intensity of Light.
8. Study the frequency response of Series & Parallel LCR circuits.
9. Determination of Plank's Constant using LEDs.
10. Determination of Fermi Energy of Copper.
11. Identification of circuit elements in a Black Box and determination of values of the components.
12. Determination of Energy gap of the given Semiconductor.
13. Step Interactive Physical Simulations.
14. Study of motion using spread Sheets
15. Study of Application of Statistics using spread sheets
16. PHET Interactive

22BEE13	BASIC ELECTRONICS	(2-2-0)3

Contact Hours: 39

Course Learning Objectives (CLOs):

At the end of the course the student will be able to: Develop the basic knowledge on construction, operation and characteristics of semiconductor devices. Apply the acquired knowledge to construct small scale circuit consisting of semiconductor devices. Develop competence knowledge to construct basic digital circuits by make use of basic gate and its function. Construct the conceptual blocks for basic communication system. Apply the knowledge of various transducers principle in sensor system.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12)/ PSOs (13,14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	3,5,6	-
CO-2	Apply the acquired knowledge to construct small scale circuit consisting of semiconductor devices.	1,3	2,5	6

CO-3	Develop competence knowledge to construct basic digital circuit by make use of basic gate and its function.	1,3,5	2	9
CO-4	Construct the conceptual blocks for basic communication system.	-	1,5	2,3,6,9, 12
CO-5	Apply the knowledge of various transducers principle in sensor system.	-	1,5	2,3,6,9, 12

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	2.6	1.8	2	-	2.2	1.25	-	-	1	-	-	1	-	-

Pre-requisites: Elementary Physics and Elementary Mathematics

Contents:

Unit-I

Semiconductor Diodes: Introduction, PN Junction diode, Characteristics and Parameters, Diode Approximations, DC Load Line analysis (Text1:2.1, 2.2, 2.3, and 2.4)
Diode Applications: Introduction, Half Wave Rectification, Full Wave Rectification, Full Wave Rectifier Power Supply: Capacitor Filter Circuit, RC π Filter (includes numerical) (Text1:3.1, 3.2, 3.4, 3.5)
Zener Diodes: Junction Breakdown, Circuit Symbol and Package, Characteristics and Parameters, Equivalent Circuit, Zener Diode Voltage Regulator. (Text1:2.9,3.7)

8 Hours

Unit-II

Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, BJT Biasing: Introduction, DC Load line and Bias point (Text1:4.2,4.3,4.5,4.6, 5.1)

Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs (Text1:9.1, 9.2, 9.5)

8 Hours

Unit-III

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp Parameters-Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias

Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non-Inverting Amplifier

Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator

(Text2:1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,6.5.1,6.5.2,6.5.3,6.12,6.13). **8 Hours**

Unit-IV

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text3:1.2, 1.3,1.4,1.5,2.1,2.2,2.3,2.4,2.5,2.6,2.7)

Combinational Logic: Introduction, Design procedure, Adders-Half adder, and Full adder (Text3:4.1, 4.2, and 4.3). **8 Hours**

Unit-V

Introduction to Transducers: Introduction, Resistive Transducers, Inductive Transducers, Capacitive Transducers, Thermal transducers, Opto electronic transducer, and Piezo electric transducers (Text4:Chapter18:18.1,18.2,18.3,18.4,18.5)

Communications: Introduction to communication, Communication System, Modulation (Textbook5:1.1, 1.2, 1.3) **7 Hours**

Reference Books:

1. Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford,2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4thEdition
3. Digital Logic and Computer Design, M. Morris Mano, PHILearning,2008ISBN-978-81-203-0417-8
4. Electronic Instrumentation and Measurements (3rdEdition) – David. Bell, Oxford University Press,2013
5. Electronic Communication Systems, GeorgeKennedy,4th Edition,TMH

22ESC144	INTRODUCTION TO MECHANICAL ENGINEERING	(3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs):

To develop basic Knowledge on Mechanical Engineering ,Fundamentals and Energy Sources, understand the concept of different types of Machine tool operations and Modern Manufacturing Processes like CNC, 3Dprinting, to know the concept of IC engines and Future Mobility vehicles, to give exposure in the field of Engineering Materials and Manufacturing Processes Technology and its applications, to acquire a basic understanding role of Mechanical Engineering in the Robotics and Automation in industry.

Course outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able	**Mapping to Pos(1-12)/ PSOs (1,2)**		
	Substantial	Moderate	Slight

to:		Level (3)	Level (2)	Level (1)
CO-1	Explain the concepts of Role of Mechanical Engineering and Energy sources.	-	-	1,2
CO-2	Describe the Machine Tool Operations and advanced Manufacturing process.	-	1,2	-
CO-3	Explain the Working Principle of IC engines and EV vehicles.	-	-	1,2
CO-4	Discuss the Properties of Common Engineering Materials and various Metal Joining Processes.	-	-	1,2
CO-5	Explain the Concepts of Mechatronics Robotics and Automation in IoT	-	-	1,2

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	1.2	1.2												

Unit-I

Introduction: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing,

Automotive, Aerospace, and Marine sectors.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion **8 Hours**

Unit-II

Machine Tool Operations: Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Milling operations: plane milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations).

Introduction to Advanced Manufacturing Systems: Introduction, components of

CNC, advantages and applications of CNC,3D printing. **8 Hours**

Unit-III

Introduction to IC Engines: Components and Working Principles, 4-Strokes Petrol and Diesel Engines, Application of IC Engines.

Insight into Future Mobility: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles. **7 Hours**

Unit-IV

Engineering Materials: Types and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer. Shape Memory Alloys.

Joining Processes: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames. **8 Hours**

Unit-V

Introduction to Mechatronics and Robotics: open –loop and closed- loop Mechatronics systems. Classification based on robotics configuration: polar cylindrical, Cartesian coordinate and spherical. Application, Advantages and disadvantages.

Automation in industry: Definition, types – Fixed, programmable and flexible automation, basic elements with block diagrams, advantages.

Introduction to IOT: Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models. **8 Hours**

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year) Textbooks:

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications,2008
2. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012

Reference Books:

1. Elements of Workshop Technology (Vol.1 and2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt.Ltd., 2010.
2. Manufacturing Technology- Foundry, Forming and Welding, P. N. Rao Tata McGraw-Hill 3rdEd. 2003.
3. Internal Combustion Engines, V.Ganesan,Tata McGraw Hill Education;4th edition,2017
4. Robotics, Appu Kuttan KKK. International Pvt Ltd, volume1
5. Dr SRN Reddy, Rachit Thukral and Manasi Mishra, “Introduction to Internet of Things: A Practical Approach”, ETI Labs
6. Rajkamal, “Internet of Things: Architecture and Design”, McGraw hill.

Web links and Video Lectures (e-Resources):

- https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-And-process-industry/)
- Videos |Makino (For Machine Tool Operation)

Activity Based Learning (Suggested Activities in Class)/Practical Based learning

- Demonstration of lathe/milling/drilling operations
- Demonstration of working of IC Engine.
- Study arc welding, oxy-acetylene gas flame structure.
- Video demonstration of latest trends in mobility robotics and Automation
- Demonstration of developing models on machine tools

22ESC145 Principles of Programming Using C (2-2-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning results:

- Developing the problem-solving skills that can be applied to problems in different areas which enables students to take-up subsequent course work and professional career.
- Provides a comprehensive study of the features of C programming language.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Design** a solution by analyzing the given problem scenario and **represent** it using algorithm or flowchart and should able to explain the data types operators, input and output statements.	-	1,2,3	-
CO-2	**Write** C programs using If statements, switch statements.	-	1,2,3	-
CO-3	**Write** C programs using proper Loop, conditional and unconditional jump statements,	-	1,2,3	-
CO-4	**Write** a C program using arrays and strings to solve simple problems.	-	2,6	-
CO-5	**Explain** the usage and the need for writing modular programs and demonstrate its use in writing programs.	-	-	1,2,3

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	1.7	1.8	1.7	-	-	2.0	-	-	-	-	-	-	-	-	-	-

Pre-requisites: None

Contents:

Unit-I

Flow-Chart and Algorithm: Solving various scientific, engineering and business related problems of varying complexity.

Fundamentals of C Programming Language: Program structure and execution. Character set, data types, operators, type conversion, expression evaluation. Inputand output statements. **8 Hours**

Unit-II

Decision making and Branching: if statement and its different forms, switch statement. **8 Hours**

Unit-III

Decision making and Looping: loops and their behavior – entry and exit controlledloops, conditional and unconditional jump statements, Nested loops. **8 Hours**

Unit-IV

Arrays: Single and multidimensional arrays, advantages and disadvantages of arrays, searching and sorting

Strings: Definition, Different ways of reading and printing strings, string handling functions, applications. **8 Hours**

Unit-V

Modular Programming: Declaration, definition and use of functions, passing parameters to function, Recursion. **7 Hours**

Reference Books:

1) E Balagurusamy, “Programming in ANSI C”, Tata McGraw Hill, 6/E, 2012.
2) Brian W Kernighan & Dennis M Ritchie, “The C programming language”, Prentice-Hall India, 2/E, 2004.
3) R.G. Dromey., “How to solve it by Computer”, Prentice-Hall India,2008
4) B A Forouzan and R F Gilberg, “Computer Program: A structured programming approach using C”, Thomson Learning, 3/E, 2005
5) Brain W. Kernighan and Rob Pike, “The Practice of Programming”, Pearson Education Inc.2008.

22ETC15D Introduction to Embedded Systems (3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs):

The course focuses on embedded system concepts, design and its challenges. Design of single embedded processor. Develop the prototype using hardware software co-design approach.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12)/ PSOs (13,14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** characteristics of Embedded System design	-	2	1
CO-2	**Describe** quality attributes of embedded systems	-	2	1
CO-3	**Analyze** embedded system software and hardware requirements	-	14	2
CO-4	**Develop** programming skills in embedded systems for various applications.	5	-	3
CO-5	**Acquire** knowledge about basic concepts of circuit emulators, debugging and RTOS	-	2	1

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3	2	1	-	3	-	-	-	-	-	-	-	-	2

Prerequisites: Digital Logic

Contents:

Unit-I

Introduction: Embedded Systems and general-purpose computer systems, history, classifications, applications and purpose of embedded systems.

The Typical Embedded System: Core of Embedded Systems, Microprocessors and microcontrollers, RISC and CISC controllers, Harvard and Princeton architectures, Big endian and Little-endian processors, Memory (ROM and RAM types), Application specific ICs, Programmable logic devices, COTS, sensors and actuators, embedded firmware. **8 Hours**

Unit-II

Characteristics and quality attributes of embedded systems: Characteristics, Operational and nonoperational quality attributes, Application specific embedded system - washing machine, domain specific – automotive **8 Hours**

Unit-III

Hardware Software Co design and Program Modeling: Fundamental issues in Hardware Software Co-design, Computational models in Embedded System Design

Embedded Hardware Design and Development: Analog Electronic Components, Digital Electronic Components. **8 Hours**

Unit-IV

Embedded Firmware Design and Development: Embedded Firmware Design Approaches, Embedded Firmware Development Languages

Embedded System Development Environments: Types of files generated on cross compilation (only explanation – programming codes need not be dealt), disassemble/decompile. **7 Hours**

Unit-V

Real-time Operating System (RTOS) based Embedded System Design:

Operating System basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking. **8 Hours**

Reference Books:

1. Shibu K V “Introduction to Embedded Systems”, , Second Edition, McGraw Hill Education, 2009
2. Frank Vahid and Tony Givargis, Embedded System Design: “A Unified Hardware/Software Approach”, 1999
3. James K. Peckol, Embedded systems- A contemporary design tool & quot, John Wiley, 2008, ISBN: 978-0-471-72180-2.
4. K.V. K. K Prasad, Embedded real time systems, Dream tech publications, 2003

22ENG16	COMMUNICATIVE ENGLISH	(1-0-0) 1

Contact Hours: 13

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- To know about Fundamentals of Communicative English and Communication Skills in general.
- To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
- To impart Basic English grammar and essentials of important language skills.
- To enhance with English vocabulary and language proficiency for better communication skills.
- To learn about Techniques of Information Transfer through presentation.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Apply** the Fundamentals of Communication Skills in their Career.		**10**	
CO-2	**Identify** the nuances of phonetics, intonation and **enhance** pronunciation skills.		**10**	
CO-3	**Impart** basic English grammar and essentials of language skills as per present requirement.	**10**		
CO-4	**Acquire** vocabulary and language proficiency.		**10**	
CO-5	**Adopt** the Techniques of Information Transfer through presentation.	**10**		

Pre-requisites: None

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level										**2.4**						

Course Contents:

Unit-I

Introduction to Communicative English: meaning and Definition, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills. **3 Hours**

Unit-II (Language Lab)

Introduction to Phonetics: Sounds- consonants, vowels and diphthongs, Syllables and Structure. Word Accent, Stress Shift and Intonation, Phonetic Transcription,

Common Errors in Pronunciation. **3 Hours**

Unit-III (Language Lab)

Vocabulary: Word formation Synonyms, Antonyms, Homophones, Homonyms, Affixes, Abbreviations, Strong and Weak forms of Words, Word pairs, One Word Substitutes and Error identification. **2 Hours**

Unit-IV

Grammar: Parts of Speech, Articles and Preposition Tense, Sentences, Kinds of sentences, types of sentences, Transformation. Of sentences Question Tags and Exercises on it. **2 Hours**.

Unit-V

Communication Skills for Employment: Presentation Skills, Extempore, Public Speaking, Mother Tongue Influence (MTI), Reading and Listening Comprehensions – Exercises. **3 Hours**

Reference Books:

1 Communication Skills by Sanjay Kumar & PushpLata, Oxford University Press India Pvt Ltd - 2019

2 A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

3 Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.

4 English for Engineers by N.P. Sudharshana and C.Savitha, Cambridge University Press – 2018.

5 English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.

6 A Course in Technical English – D Praveen Sam, KN Shoba, Cambridge University Press – 2020.

7 Practical English Usage by Michael Swan, Oxford University Press – 2016.

8. Rogers, C., Farson, R. E. Active Listening. Gordon Training Inc., www.gordontraining.com/free-workplace- articles/active listening/, Extract from 1957 article

9. Wood, Frederick. A Remedial English Grammar for Foreign Students Macmillan Education, India, 1990.

10. Yadugiri, M A. Making Sense of English - A Textbook of Sounds, Words and Grammar, Viva Books, 2020.

22KSK17/22KBK17 Samskrutika Kannada / Balake Kannada (1-0-0) 1

Contact Hours: 13

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಕನ್ನಡ ಬಲ್ಲ ಮತ್ತು ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ

Course Title:	**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ**		
Course Code:	22KSK17 / 27	CIE Marks	50
Course Type (Theory/Practical /Integrated	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

The course (22KSK17/27) will enable the students,

1. ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸಿವುದು.
3. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
4. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
5. ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.

ಘಟಕ -1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು (03 hours of pedagogy)	
1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ 2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ 3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ	
ಘಟಕ - 2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ (03 hours of pedagogy)	
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ. 2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ	
ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ (03 hours of pedagogy)	
1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	
ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ (03 hours of pedagogy)	
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	
ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ (03 hours of pedagogy)	
1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	

Course outcome (Course Skill Set)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ (22KSK17/27) ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ :

At the end of the course the student will be able to:

CO1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.
CO2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ.
CO3	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO4	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO5	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

University Prescribed Textbook :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,
ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,
ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.
2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಪದ್ಯ & ಗದ್ಯ ಭಾಗ ಹಾಗೂ ಇತರ ಲೇಖನಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

==========

3. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.
4. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

22IDT18	Innovation and Design Thinking	(1:0:0) 1

Contact Hours: 13

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives: To explain the need for design thinking for product and service development. To explain the fundamental concepts of innovation and design thinking. To discuss the methods of implementing design thinking in the real world.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12) / PSOs (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Understand** design process procedure.	-	-	3
CO-2	**Generate and develop** design ideas through different techniques	-	-	3
CO-3	**Identify** the significance of reverse Engineering to Understand products.	-	-	6
CO-4	Draw technical drawing for design ideas	-	-	1
CO-5	**Idea and** tasks for some design ideas.	-	-	1

PO's	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	1.0	-	1.0	-	-	1.0	-	-	-	-	-	-	-	-

Contents:

Unit-I

Introduction: Process Of Design: Understanding Design thinking concepts Shared model in team-based design process – Theory and practice of Design thinking – Explore major design ideas across globe – MVP or Prototyping. **3 Hours**

Unit-II

Tools for Design Thinking: Real-Time design interaction capture and analysis – Enabling efficient design process collaboration in digital space – Empathy for design – Collaboration in distributed Design **2 Hours**

Unit-III

Design Thinking in IT Design: Thinking to Business Process modelling – Agile processes in design collaboration environment – Scenario based Prototyping. **3 Hours**

Unit-IV

Design Thinking For strategic innovations: Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design. **3 Hours**

Unit-V

Design thinking workshop: Empathize, Design, Ideate, Prototype and Test. **2 Hours**

Reference Books:

1) John.R. Karsnitz, Stephen O"Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) 2nd Edition, 2013.

2) Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.

3) Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 1st Edition, 2011.

4) Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 1st Edition, 2013.

5) Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, 2nd Edition, 2011.

6) Jeanne Liedtka, Andrew King, and Kevin Bennett, "Solving Problems with Design Thinking - Ten Stories of What Works", Columbia Business School Publishing, 1st Edition, 2013.

II Semester

22MATE21	Mathematics-II for EEE stream	(2-2-2)4

Contact Hours: 39 Theory + 12 Lab Sessions

Course Learning Objectives (CLO's):

- **Develop** the knowledge of solving electronics and electrical engineering problems numerically.
- **Familiarize** the importance of Integral calculus and Vector calculus essential for electronics and electrical engineering.
- **Analyze** Electronics and Electrical Engineering problems by applying Partial Differential Equations.

Course outcomes (CO's):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)**		
		Substantial	**Moderate Level(2)**	**Slight Level(1)**
CO1	Apply the knowledge of numerical methods in solving physical and engineering phenomena.			1,2,12
CO2	To understand the concept of Laplace, transform and to solve initial value problems.			1,2,12
CO3	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line Integral and surface integral.			1,2,12
CO4	Demonstrate the idea of Linear dependence and independence of sets in the vector space, And linear transformation			1,2,12
CO5	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB			1,2,12

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	1	1										1

Pre- requisites: Knowledge of fundamentals of calculus.

Unit-1 (Numerical methods -1)

Importance of numerical methods for discrete data in the field of EC&EE Engineering Applications.

Solution of algebraic and transcendental equations: Regula-Falsi method and Newton-Raphson method (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof). Problems.

N**umerical integration**: Trapezoidal, Simpson's (1/3)rdand (3/8)thrules (without proof). Problems.

S**elf-Study:** Bisection method, Lagrange's inverse Interpolation, Weddle's rule.

Applications: Estimating the approximate roots, extremum values, Area, volume, and surface area. **8 Hours**

Unit-2 (Numerical Methods -2)

Introduction to various numerical techniques for handling EC& EE Applications.

Numerical Solution of Ordinary Differential Equations (ODEs):

Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor- corrector formula (No derivations of formulae). Problems.

Self-Study: Adam-Bashforth method.

Applications: Estimating the approximate solutions of ODE for electric circuits.

7 Hours

Unit-3 (Laplace Transform)

Importance of Laplace Transform for EC &EE Engineering Applications.

Existence and Uniqueness of Laplace transform (LT), transform of elementary functions, region of convergence, Properties–Linearity, Scaling, t-shift property, s-domain shift, differentiation in the s-domain, division by t, differentiation and integration in the time domain, LT of special functions- periodic functions (square wave, saw-tooth wave, triangular wave, full & half wave rectifier), Heaviside Unit step function, Unit impulse function.

Inverse Laplace Transforms:

Definition, properties, evaluation using different methods, convolution theorem (without proof), problems, and Applications to solve ordinary differential equations.

Self-Study: Verification of convolution theorem.

Applications: Signals and systems, Control systems, LR, CR & LCR circuits.

8 Hours

Unit-4 (Vector Calculus)

Introduction to Vector Calculus in EC&EE Engineering Applications.

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence-physical interpretation, solenoidal and irrotational vector fields. Problems.

Vector Integration: Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems.

Self-Study: Volume integral and Gauss divergence theorem.

Applications: Conservation of laws, Electrostatics, Analysis of streamlines and electric potentials. **8 Hours**

Unit-5 (Vector Space and Linear Transformations)

Importance of Vector Space and Linear Transformations in the field of EC&EE Engineering Applications.

Vector spaces: Definition and examples, subspace, linear span, linearly independent and dependent sets, Basis and dimension.

Linear Transformations: Definition and examples, Algebra of transformations, Matrix of a linear transformation. Change of coordinates, Rank and nullity of a linear operator, Rank-Nullity theorem. Inner product spaces and orthogonality.

Self-study: Angles and Projections. Rotation, reflection, contraction and expansion.

Applications: Image processing, AI & ML, Graphs and networks, computer graphics.

8 Hours

List of Laboratory experiments

(2hours/week per batch/batchstrength15)10 lab sessions + 1repetitionclass + 1LabAssessment

1. Solution of algebraic and transcendental equations by Regula-Falsiand Newton-Raphson method.
2. Interpolation/Extrapolation using Newton's forward and backward difference formula.
3. Computation of area under the curve using Trapezoidal, Simpson's (1/3)rd and (3/8)th rule
4. Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method.
5. Solution of ODE of first order and first degree by Runge-Kutta 4th order and Milne's predictor-corrector method.
6. Computing inverse Laplace transform of standard functions.
7. Laplace transform of convolution of two functions.
8. Finding gradient, divergent, curl and their geometrical interpretation. Verification of Green's theorem.
9. Computation of basic and dimension for a vector space and Graphical representation of linear transformation.
10. Visualization in time and frequency domain of standard functions.

Reference Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
3. **N.P Bali and Manish Goyal**: "Atext book of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. **Gupta C.B,SingS. Rand Mukesh Kumar**: "Engineering Mathematic for Semester I and II", Mc- Graw Hill Education (India) Pvt. Ltd 2015.

5. **H.K.Dass and Er.Rajnish Verma**: "Higher Engineering Mathematics"S. Chand Publication,3rd Ed., 2014.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTUe-Shikshana Program
- VTU EDUSAT Program

22CHEE22 Chemistry for EEE Stream (2-2-2)4

Contact Hours: 39 Theory + 12 Lab Sessions

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs(13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Identify** the terms and processes involved in scientific and engineering applications.	1	-	2,3,7
CO-2	**Explain** the phenomena of chemistry to describe the methods of engineering processes.	1	-	2,3,7
CO-3	**Solve** for the problems in chemistry that are pertinent in engineering applications.	1	-	2,3,7
CO-4	**Apply** the basic concepts of chemistry to explain the chemical properties and processes.	1	-	2,3,7
CO-5	**Analyze** properties and processes associated with chemical substances in multidisciplinary situations.	1	-	2,3,7

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level	3.0	1.0	1.0	-	-	-	1.0	-	-	-	-	-	-	-	-	-

Pre-requisites: Basics of Electrochemistry.

Contents:

Unit-I

Electrode System: Introduction, types of electrodes. Ion selective electrode – definition, construction, working and applications of glass electrode. Determination of pH using glass electrode. Reference electrode - Introduction, calomel electrode – construction, working and applications of calomel electrode. Concentration cell – Definition, construction and Numerical problems.

Sensors: Introduction, working principle and applications of Conductometric sensors, Electrochemical sensors and Optical sensors.

Analytical Techniques: Introduction, principle and instrumentation of Colorimetric sensors; its application in the estimation of copper, Potentiometric sensors; its application in the estimation of iron, Conductometric sensors; its application in the estimation of weak acid.

Self-study: IR and UV- Visible spectroscopy. **7 Hours**

Unit-II

Batteries: Introduction, classification of batteries. Components, construction, working and applications of modern batteries; Na-ion battery, solid state battery (Li-polymer battery) and flow battery (Vanadium redox flow battery).

Fuel Cells: Introduction, construction, working and applications of methanol–oxygen and solid oxide fuel cell (SOFC).

Solar Energy: Introduction, importance of solar PV cell, construction and working of solar PV cell, advantages and disadvantages.

Self-study: Li-ion battery, H_2-O_2 fuel cell **8 Hours**

Unit-III

Corrosion Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration. Corrosion control - galvanization, anodization and sacrificial anode method. Corrosion Penetration Rate (CPR) - Introduction and numerical problems.

E-waste Management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling. Extraction of copper and gold from e-waste.

Self-study: Recycling of PCB and battery components. **8 Hours**

Unit-IV

Nanomaterials: Introduction, size dependent properties of nanomaterials (Surface area, Catalytic, Conducting), preparation of nanomaterials by sol-gel and hydrothermal method with example. Introduction, properties and applications - Nanofibers, Nanophotonics, Nanosensors.

Display Systems: Liquid crystals (LC's) - Introduction, classification, properties

and application in Liquid Crystal Displays (LCD's). Properties and application of Organic Light Emitting Diodes (OLED's) and Quantum Light emitting diodes (QLED's).

Perovskite Materials: Introduction, properties and applications in optoelectronic devices.

Self-study Properties & electrochemical applications of carbon nano tubes and graphene. **8 Hours**

Unit-V

Conductors and Insulators: Introduction, principle with examples.

Semiconductors: Introduction, production of electronic grade silicon- Czochralski process (CZ) and Float Zone (FZ) methods.

Polymers: Introduction, Molecular weight - Number average, Weight average and numerical problems. Conducting polymers – synthesis and conducting mechanism of polyacetylene. Preparation, properties and commercial applications of graphene oxide.

PCB: Electroless plating – Introduction, Electroless plating of copper in the manufacture of double-sided PCB.

Self-study: Technological importance of metal finishing and distinction between electroplating and electroless plating. **8 Hours**

PRACTICAL MODULE

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polyurethane

A2. Determination of strength of an acid in Pb-acid battery.

A3. Synthesis of iron oxide nanoparticles

A4. Electroplating of copper on metallic objects.

B – Exercise (compulsorily any 4 to be conducted):

B1.Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$

B3. Determination of pKa of vinegar using pH sensor (Glass electrode)

B4. Determination of rate of corrosion of mild steel by weight loss method

B5.Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method

C4. Estimation of calcium present in cement solution by EDTA method.

C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1. Estimation of metal in e-waste by optical sensors.

D2. Electroless plating of Nickle on Copper

D3. Determination of glucose by electrochemical sensors

D4. Synthesis of polyaniline and its conductivity measurement

Reference Books:

1. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.
2. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
3. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
4. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
5. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
6. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
7. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell , 2012.
8. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020.
9. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021.
10. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16th Edition.
11. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
12. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.

22CED23	COMPUTER AIDED ENGINEERING DRAWING	(2-0-2)3

Contact Hours: 39

Course Learning Objectives (CLOs):

To understand the basic principles and conventions of engineering drawing, to use drawing as a communication mode, to generate pictorial views using CAD software, to understand the development of surfaces, to visualize engineering components.

Course outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos(1-12)/ PSOs (1,2)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Draw and communicate the objects with definite shape and dimensions	1,5,10	2,12	6,8,9
CO-2	Recognize and Draw the shape and size of objects through different views	1,5,10	2,12	6,8,9
CO-3	Develop the lateral surfaces of the object	1,5,10	2,12	6,8,9
CO-4	Create a Drawing views using CAD software.	1,2,5,10	--	6,7,9,12
CO-5	Identify the inter disciplinary engineering components or systems through its graphical representation.	1,5,10	2,12	9

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3	2.6	--	--	3	1	1	1	1	3	--	1.7	--	--

Pre-requisites: Differentiation of function, Integration of function, Statistical averages

Contents:

Unit-I

Introduction: for CIE only

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, poly lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections: Orthographic projections of points in 1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only).

Orthographic projections of planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (Placed in First quadrant only using change of position method).

Application on projections of Lines & Planes (For CIE only) **11 Hours**

Unit-II

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Solids Resting on HP only): Prisms &Pyramid (triangle, square, rectangle, pentagon, hexagon), Cylinders, Cones, Cubes & Tetrahedron. Projections of Frustum of cone and pyramids (For practice only, not for CIE and SEE). **8 Hours**

Unit-III

Isometric Projections:

Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. Conversion of simple isometric drawings into orthographic views. Problems on applications of Isometric projections of simple objects / engineering components. Introduction to drawing views using 3D environment (For CIE only).

8 Hours

Unit-IV

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays. Problems on applications of development of lateral surfaces of transition pieces connecting circular duct and rectangular duct (For CIE Only) **6 Hours**

Unit-V

Multidisciplinary Applications & Practice (For CIE Only):

Free hand Sketching: True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc Drawing Simple Mechanisms; Bicycles, Tricycles, Gear trains, Ratchets, two-wheeler cart & Four-wheeler carts to dimensions etc. Electric Wiring and lighting diagrams; Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software.

Basic Building Drawing; Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or suitable software, Electronics Engineering Drawings- Like, Simple Electronics Circuit Drawings, practice on layers concept. Graphs & Charts: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software. **6 Hours**

Reference Books

1. S.N. Lal, & T Madhusudhan: EngineeringVisulisation,1st Edition,Cengage, Publication
2. Parthasarathy N.S., VelaMurali, Engineering Drawing, Oxford University Press, 2015.

3. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint2005.
4. Chris Schroder, Printed Circuit Board Design usingAutoCAD, Newnes, 1997.
5. K S Sai Ram Design of steel structures, Third Edition by Pearson
6. Nainan p kurian Design of foundation systems, Narosa publications
7. AS Pabla, Electrical power distribution, 6th edition, Tata McGraw hill
8. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.
9. K. R. Gopala krishna, & Sudhir Gopala krishna: Textbook Of Computer Aided Engineering Drawing, 39th Edition, Subash Stores,Bangalore,2017

22ESC242 Introduction To Electrical Engineering (3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs):

To explain the laws used in the analysis of DC and AC circuits. To explain the behavior of circuit elements in single-phase circuits. To explain the construction and operation of transformers, DC generators and motors and induction motors. To introduce concepts of circuit protecting devices and earthing. To explain electric power generation, transmission and distribution, electricity billing, equipment and personal safety measures.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12)/ PSOs (13,14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Understand the concepts of various energy sources and electric circuits.	1	2	3,5,6,7, 8,12
CO-2	Apply the basic electrical laws to solve circuits.	1,2	3	4,5,6,12
CO-3	Discuss the construction and operation of various electrical machines.	1	2	3,4,5,6, 7,8,12
CO-4	Identify suitable electrical machine for practical implementation.	1	2,3	4,6,7,8, 12
CO-5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures	1	3,6	2,5,7,8, 11,12

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	3	2	1.8	1	1	1	1	1	-	-	-	1

Pre-requisites: Differentiation of function, Integration of function, Statistical averages

Contents:

Unit-I

Introduction: Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach.

Power Generation: Hydel, Nuclear, Solar & wind power generation (Block Diagram approach).

DC Circuits: Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical. **7 Hours**

Unit-II

A.C. Fundamentals: Equation of AC voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions). Voltage and current relationship with phasor diagrams in R, L and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. (Simple Numerical).

Three Phase Circuits: Generation of Three phase AC quantity, advantages and limitations; star and delta connection, relationship between line and phase quantities (excluding proof). **8 Hours**

Unit-III

DC Machines:-DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple numerical.

DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only). Applications of DC motors. Simple numerical. **8 Hours**

Unit-IV

Transformers: Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and simple numerical.

Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip

and its significance simple numerical. **8 Hours**

Unit-V

Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of load.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock. **8 Hours**

Reference Books:

1) Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2) A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.
3) Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
4) Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
5) Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

22PLC25B Introduction to Python Programming (2:0:2:0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

- Learn the syntax and semantics of the Python programming language.
- Illustrate the process of structuring the data using lists, tuples
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object-Oriented Programming concepts in Python.

Course Outcomes (COs):

Description of the Course Outcome:	**Mapping to POs (1-12)**		
At the end of the course the student will be able to:	**Substantial Level (3)**	**Moderate Level (2)**	**Slight Level (1)**

CO-1	Demonstrate proficiency in handling Loops and creation of functions.	-	1	2
CO-2	Identify the methods to create and manipulate lists, tuples and dictionaries.	1	2	-
CO-3	Develop programs for string manipulation and file operations	-	5	3
CO-4	Demonstrate the different modules in organization of files and different exceptions in debugging	-	1	2
CO-5	Interpret the concepts of Object-Oriented Programming as used in Python.	2	3	-

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	1.75	1.5	-	2.0	-	-	-	-	-	-	-	-	-

Pre-requisites: C-programming

Contents:

Unit-I

Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program.

Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys. Exit ().

Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number

Textbook 1: Chapters 1 – 3 **8 Hours**

Unit-II

Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References,

Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things

Textbook 1: Chapters 4 – 5 **8 Hours**

Unit-III

Manipulating Strings: Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup

Reading and Writing Files: Files and File Paths, the OS.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the print. format () Function, Project: Generating Random Quiz Files, Project: Multi clipboard,

Textbook 1: Chapters 6, 8 **8 Hours**

Unit-IV

Organizing Files: The shutil Module, walking a Directory Tree, Compressing Files with the zip file Module, Project: Renaming Files with American-Style Dates to European-Style Dates, Project: Backing Up a Folder into a ZIP File

Debugging: Raising Exceptions, Getting the Trace back as a String, Assertions, Logging, and IDLE‟s Debugger.

Textbook 1: Chapters 9-10 **8 Hours**

Unit-V

Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, copying.

Classes and functions: Time, Pure functions, Modifiers, Prototyping versus planning.

Classes and methods: Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The str method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation

Textbook 2: Chapters 15 – 17 **7 Hours**

Reference Books:

1) Al Sweigart, **"Automate the Boring Stuff with Python",** 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)

2) (Chapters 1 to 18, except 12) For lambda functions use this link: https://www.learnbyexample.org/python-lambda-function/

3) Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf (Chapters 13, 15, 16, 17, 18) (Download PDF files from the above link)

4) https://www.learnbyexample.org/python/

5) https://www.learnpython.org/

6) https://pythontutor.com/visualize.html#mode=edit

Programming Exercises:

1) Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.
2) Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
3) Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
4) Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).
5) Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
6) Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
7) Develop a program to print 10 most frequently appears words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]
8) Develop a program to sort the contents of a text file and write the sorted contents into

a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].

9) Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.

10) Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.

11) Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.

12) Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use __init__() method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.]

22PWS26	Professional Writing Skills in English	(1-0-0) 1

Contact Hours: 13

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- To Identify the Common Errors in Writing and Speaking of English.
- To achieve better technical writing and Presentation skills for employment.
- To read technical proposals properly and make them to write good technical reports.
- To acquire Employment and Workplace communication skills.
- To learn about Techniques of Information Transfer through presentation in different level.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12) / PSOs (13-16)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Identify** the Common Errors in Writing and Speaking.		10	
CO-2	**Achieve** better technical writing and Presentation skills.		10	
CO-3	**Read** Technical proposals properly and write standard technical reports.	10		
CO-4	**Acquire** Employment and Workplace communication skills.		10	
CO-5	**Learn** Effective Presentation Skills	10		

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level										2.4						

Pre-requisites: None

Course Contents:

Unit-I

Identifying Common Errors in Written and Spoken English: Verb Phrase and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Words Confused / Misused, errors identification. **2 Hours**

Unit-II

Nature and Style of sensible writing: Punctuation marks, Paragraph Writing, Writing Articles, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Correction of Errors.

2 Hours

Unit-III

Technical Reading and Writing Practices: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error & Sentence Improvement, Cloze Test and Theme Detection Exercises. **3 Hours**

Unit-IV

Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. TED talks, Reading

Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. and effective resume writing, Emails, Blog Writing and Memos. **3 Hours**

.

Unit-V

Professional Communication at Workplace: Agenda, Minutes of Meeting, Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Intra and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills. **3 Hours.**

Reference Books:

1. "Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022.
2. "Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].
3. English for Engineers by N.P. Sudharshana and C.Savitha, Cambridge University Press – 2018.
4. Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
5. Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
6. High School English Grammar & Composition by Wren and Martin, S Chandh& Company Ltd – 2015.
7. Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private
8. Rogers, C., Farson, R. E. Active Listening. Gordon Training Inc., www.gordontraining.com/free-workplace- articles/active listening/, Extract from 1957 article
9. Wood, Frederick. A Remedial English Grammar for Foreign Students. Macmillan Education, India, 1990.
10. Yadugiri, M A. Making Sense of English - A Textbook of Sounds, Words and Grammar, Viva Books, 2020.

22ICO27	Indian Constitution	(1:0:0)1

Contact Hours: 13

Course Learning Objectives (CLOs):

The course **INDIAN CONSTITUTION (22ICO17/27)** will enable the students,

- To know about the basic structure of Indian Constitution.
- To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's)

of our constitution.

- To know about our Union Government, political structure & codes, procedures.
- To know the State Executive & Elections system of India.
- To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Course outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to Pos (1-12)/ PSOs (1,2)**		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Analyse the basic structure of Indian Constitution.	8		6,7
CO-2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.	8		6,7
CO-3	Know about our Union Government, political structure & codes, procedures.	8		6,7
CO-4	Understand our State Executive & Elections system of India.	8		6,7
CO-5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.	8		6,7

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level						1	1	3						

Course Contents:

Unit-1

Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly. **3 Hours**

Unit-2

Salient features of Indian Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations indifferent Complex Situations. Buiding. **3 Hours**

Unit-3

Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive Parliamentary System, Union Executive–President, Prime Minister, Union Cabinet.

3 Hours

Unit-4

Parliament Lsand RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism. **2 Hours**

Unit-5

State Executive and Governer, CM, State Cabinet, Legislature-VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions. **2 Hours**

Reference Books:

1. "Constitution of India" (for Competitive Exams)- Published by Naidhruva Edutech Learning Solutions, Bengaluru.–2022.
2. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice–Hall, 2008.
3. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and etal: published by Cengage Learning India, Latest Edition–2019.
4. "The Constitution of India" by Merunandan KB: published by Merugu Publication, Second Edition, Bengaluru.
5. "Samvidhana Odu"- for Students & Youths by Justice H N Nagamohan Dhas, Sahayana, kerekon.
6. M.Govindarajan, S. Natarajan, V.S. Senthilkumar, "Engineering Ethics", Prentice–Hall,2004.

22SFH28	Scientific Foundations of Health	(1-0-0) 1

Contact Hours: 13

Course Learning Objectives (CLOs):

To know about Health and wellness (and its Beliefs) & its balance for positive mindset .To Build the healthy life styles for good health for their better future. To Create a Healthy and caring relationship to meet the requirements of good / social / positive life. To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future. To Prevent and fight against harmful diseases for good health through positive mindset.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13,14)		
		Substantial Level(3)	Moderate Level(2)	Slight Level(1)
CO-1	To **understand** and analyse about Health and wellness (and its Beliefs) & It's balance for positive mindset.	9,12		
CO-2	**Develop** the healthy lifestyles for good health for their better future.	9,12		
CO-3	**Build** a Healthy and caring relationships to meet the requirements of good / social / positive life.	9,12		
CO-4	To **learn** about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.	9,12		
CO-5	**Prevent** and **fight** against harmful diseases for good health through positive mindset.	9,12		

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	-	-	-	-	-	-	-	-	3	-	-	3	-	-

Contents:

Unit-1

Good Health & It's balance for positive mind set: Health -Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behaviour, Health & Society, Health & family, Health & Personality, Psychological disorders-Methods to improve good psychological health, Changing health habits for good health. **3 Hours**

Unit-2

Building of healthy lifestyles for better future: Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries. **3 Hours**

Unit-3

Creation of Healthy and caring relationships: Building communication skills, Friends and friendship - Education, the value of relationship and communication skills, Relationships for Better or worsening of life, understanding of basic instincts of life

(more than a biology), changing health behaviours through social engineering.

3 Hours

Unit-4

Avoiding risks and harmful habits: Characteristics of health compromising behaviours, Recognizing and avoiding of addictions, How addiction develops, Types of addictions, influencing factors of addictions, Differences between addictive people and non-addictive people & their behaviours. Effects of addictions: how to recovery from addictions. **2 Hours**

Unit-5

Preventing & fighting against diseases for good health: How to protect from different types of infections, How to reduce risks for good health, reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life, Health & Wellness of youth: a challenge for upcoming future, Measuring of health & wealth status.

2 Hours

Reference Books:

1. "Scientific Foundations of Health" – Study Material Prepared by Dr. L Thimmesha, Published in VTU-University Website.
2. "Scientific Foundations of Health", (ISBN-978-81-955465-6-5) published by Infinite Learning Solutions, Bangalore– 2022.
3. Health Psychology - A Textbook, FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited-Open University Press.
4. Health Psychology (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routl edge 711 Third Avenue, New York, NY 10017.
5. HEALTH PSYCHOLOGY (Ninth Edition) by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited – Open University Press.
6. SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos and other materials /notes.

Scientific Foundations of Health (Health & Wellness) - General Books published for university and colleges references by popular authors and published by there puted publisher.

CIE and SEE Evaluation (from 2024-25 batch)

Courses with LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

Continuous Internal Evaluation (CIE):

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course each of 5marks. Total CTA marks-10
- CIE=40 (from tests)+10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

ASC(IC)/PCC with LTP 2-0-2, 3-0-2 and 2-2-2

Continuous Internal Evaluation (CIE):

Theory CIE component:

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.

Course Teacher Assessment (CTA): Totally based on conduction of experiments as set by the course teacher.

Laboratory component assessment:

- 5 marks: for conduction, regularity, involvement, journal writing, etc. Minimum 75% of attendance is compulsory. If the performance is not satisfactory in laboratory the student shall be detained and required to reregister for the course as a whole whenever offered next.

- 5 marks: Lab Test. A Lab test as per the class time table has to be conducted at the end for50 marks and scale down to 5 marks.
- CIE for integrated course =40 (from IA tests)+10 (from CTA i.e. lab component) =50 marks.
- There will not be any remuneration for Final Lab Test since it is CTA of integrated course.
- Copy of the Marks list to be sent to the concerned course instructor immediately after the completion of test for that batch. Original Marks list to be maintained in the department.
- CIE=40(from tests)+10(from CTA i.e. lab component) =50 marks

Semester End Examination (SEE):

- SEE is conducted for100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

AEC/HSMS/UHV Courses with LTP 1-0-0:
Continuous Internal Evaluation (CIE)

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: MCQ 20 questions
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course etc. each of 5marks. Total CTA marks-10
- CIE=40(from tests)+10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 50 marks of 1 hour duration. There will be 50 MCQs.
- Question Paper pattern for SEE: The question paper will contain 12 MCQ questions drawn from each Unit.
- Students have to answer maximum of 10 questions from each unit.
- All five units are to be answered compulsorily.