Scheme of Instructions, Evaluation and Syllabi of

B.E. MECHANICAL ENGINEERING

With effect from Academic Year 2026-27

Estd. 1917

DEPARTMENT OF MECHANICAL ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 007, TS, INDIA

Estd. 1929

INSTITUTION

The University College of Engineering is established in the prestigious Osmania University, Hyderabad in the year 1929 having the distinction of being the 6th oldest Engineering College in the then British India.The college become autonomous in the year 1994. Over the decades, the UCE(A), OU has produced several illustrious alumni who brought laurels to the nation at world forums. The college is offering BE in eight branches viz., AI&ML, BME, CE, CSE, EEE, ECE, ME and Mining Engineering; ME in 22 specializations with majority of them receiving NBA Accreditation. The college offers Ph.D. in all ME specializations. The college has well established laboratories and research facilities and well placed in NIRF Rankings. The faculty members are well qualified and several of them received Best Teacher Award from Government of Telangana state. They are serving as expert members on several professional bodies. The faculty members authored several research publications, text/reference books and extend consultancy services.

Vision

The Vision of the institute is to generate and disseminate knowledge through harmonious blending of science, engineering and technology. To serve the society by developing a modern technology in students heightened intellectual, cultural, ethical and humane sensitivities, fostered a scientific temper and promoting professional and technological expertise.

Mission

- To achieve excellence in Teaching and Research
- To generate, disseminate and preserve knowledge
- To enable empowerment through knowledge and information
- Advancement of knowledge in Engineering, Science and Technology
- Promote learning in free thinking and innovative environment
- Cultivate skills, attitudes to promote knowledge creation
- Rendering socially relevant technical services to the community
- To impart new skills of technology development
- To inculcate entrepreneurial talents and technology appreciation Programs
- Technology transfer and incubation

DEPARTMENT

The Department of Mechanical Engineering, established in 1939 at the University College of Engineering, Osmania University, offers UG, PG, and Ph.D. programs, admitting 60 UG students annually, with PG specializations in Production Engineering, Turbomachinery, and Automation & Robotics. Supported by grants from UGC, MHRD, AICTE, and TEQIP, the department emphasizes industry-oriented education and research through experienced faculty and a modern curriculum. Key focus areas include Additive Manufacturing, Robotics, CFD, FEM, CAD/CAM, Renewable Energy, Composite Materials, and Artificial Intelligence, preparing students for careers in industry, research, and higher studies. The UG program is NBA-accredited for the next three years, reflecting its commitment to quality and continuous improvement

Vision

To generate and disseminate knowledge in Mechanical Engineering and nurture professional, technical and scientific temper for serving the needs of the industry, research organizations and society..

Mission

- Create technically competent mechanical engineers to suit the changing needs of global industry and society.
- To cultivate skills, attitudes to promote knowledge creation and technology development.
- Interact with prominent educational institutions and R&D organizations for enhancing teaching, research and consultancy services.

Program Educational Objectives (PEO):

PEO1: To provide the requisite fundamentals of varied subjects related to Mechanical Engineering to conceive, plan, model, design, construct, maintain and improve systems to enhance human comfort.

PEO2: To provide knowledge of experimental, computational, analytical, simulation tools and techniques require to address the challenges in Mechanical Engineering and other allied fields.

PEO3: To provide knowledge for applying Mechanical Engineering Fundamentals to design and implement cost effective systems in manufacturing.

PEO4: To provide effective communication skills, creative methods, ethics and continuous learning techniques to fulfill their professional requirements and societal needs.

PROGRAM OUTCOMES (POs)

POs	Engineering Graduates will be able to:
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineeringproblems.
PO2	**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.
PO3	**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.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis ofthe information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities withan understanding of the limitations.
PO6	**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 tothe professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and needfor sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10	**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.
PO11	**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 andleader in a team, to manage projects and in multidisciplinary environments.
PO12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
PROGRAM SPECIFIC OUTCOMES (PSOs) Engineering Graduates will be able to:	
PSO1	Apply the principles of collaborative and multi-disciplinary approach for solving problems
PSO2	Able to interact with industry and R&D institutions leading to start-ups/ budding entrepreneurs

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Mechanical Engineering) w.e.f. AY 2026 2027

I – Semester

S. No.	Course Code No.	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	MC100HS	Induction Program	3 weeks							
2	BS101MT	Matrices and Calculus	3	0	-	3	3	40	60	3
3	BS101CH	Engineering Chemistry	3	0	-	3	3	40	60	3
4	HS101EG	Communicative English	3	0	-	3	3	40	60	3
5	ES101ME	*Engineering Mechanics – Statics*	3	0	-	3	3	40	60	3
6	ES102ME	Engineering Drawing - I	-	-	6	6	3	40	60	3
Practical's										
7	BS151CH	Engineering Chemistry Lab	-	-	3	3	3	25	50	1.5
8	HS151EG	Communicative English Lab	-	-	3	3	3	25	50	1.5
9	ES152ME	Workshop Practice	-	-	6	6	3	25	50	3
		Total	**12**	**0**	**18**	**30**	**24**	**275**	**450**	**21**

Note: In I-Semester (**ES152ME**)**Workshop Practice (3 Credits - 6hours per week])** is offered by Mechanical Engineering Department to **BE(Mech/Civil/BME/Mining)**

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Mechanical Engineering) w.e.f. AY 2026-2027

II – Semester

S. No	Course Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	BS201MT	Differential Equations and Fourier Series	3	0	-	3	3	40	60	3
2	BS201PH	Engineering Physics	3	0	-	3	3	40	60	3
3	ES201CS	Programming for Problem Solving	3	0	-	3	3	40	60	3
4	ES201ME	*Engineering Mechanics – Dynamics*	3	0	-	3	3	40	60	3
5	ES201EE	Basic Electrical Engineering	3	0	-	3	3	40	60	3
Practical's										
6	ES202 ME	Engineering Drawing - II	2	-	4	6	3	25	50	4
6	BS251PH	Engineering Physics Lab	-	-	3	3	3	25	50	1.5
7	ES251CS	Programming for Problem Solving Lab	-	-	3	3	3	25	50	1.5
8	ES251EE	Basic Electrical Engineering Lab	-	-	3	3	3	25	50	1.5
		Total	**17**	**0**	**13**	**30**	**27**	**300**	**500**	**23.5**

Note: In II-Semester (**ES252ME**) **Workshop Practice (3 Credits [6hours per week])** is offered by Mechanical Engineering Department to **BE(CSE/ECE/EEE/AIML)**

B.E. MECHANICAL ENGINEERING

I SEMESTER

SYLLABUS

BS 101 MT	MATRICES AND CALCULUS					Course Type Core/PF/FE
Pre-requisite: Mathematical Knowledge of 12th	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**	**Credits**
	L	**T**	**P**		**CIE** / **SEE**	
	3	**-**	**-**		**40** / **60**	**3**

Course Objectives: The course is taught with the objectives of enabling the student to:

- To study Matrices as vector spaces, subspaces, linear transformation and its use in solving system of linear equations.
- To study Eigenvalue problems, Diagonalizable Matrices and Quadratic Forms.
- To introduce the concepts of Functions of Several Variables and its Applications.
- To introduce the concepts of Multiple Integrals and its Applications.
- To study Vector Differential and Integral Calculus

Course Outcomes: On completion of this course, the student will be able to:

1. Find vector spaces and subspaces and solutions of system of linear equations.
2. Solve Eigenvalue problems, Similar & Diagonalizable Matrices and Canonical Form of Quadratic Forms
3. Find the maximum and minimum values of multiple variable functions.
4. Use the knowledge of Multiple Integrals in finding the area and volume of any region bounded by given curves
5. Apply the knowledge of Vector Calculus to find line, surface and volume integrals.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	-	1	-	-	2	2	1
CO2	3	2	1	2	2	2	-	-	1	-	-	2	2	1
CO3	3	2	2	3	2	2	-	-	1	-	-	2	3	1
CO4	3	2	1	1	1	2	-	-	1	-	-	2	2	1
CO5	3	2	2	3	1	2	-	-	1	-	-	2	3	1

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT - I

Matrices and Vector Spaces: Vector Spaces, Subspaces, Linear Independence of Vectors, Dimension and Basis, Linear Transformation, Solution of General linear System of Equations, Elementary row and Column Operations, Echelon form of a Matrix, Gauss Elimination Method for Non – Homogeneous Systems, Homogeneous System of Linear Equations.

UNIT - II

Eigenvalue Problems: Eigenvalues and Eigenvectors, Cayley - Hamilton theorem (without Proof), Similar and Diagonalizable Matrices, Special Matrices, Quadratic Forms, Canonical Form of a Quadratic Form.

UNIT - III

Functions of Several Real Variables: Introduction, Functions of Two Variables, Limits, Continuity, Partial Derivatives, Total Differential and Differentiability,

Derivatives of Composite and Implicit Functions, Higher Order Partial Derivatives, Homogeneous functions, Taylor's Theorem (without Proof), Maximum and Minimum Values of Function, Lagrange's Method of Multipliers.

UNIT - IV

Multiple Integrals: Double Integrals, Evaluation of double integrals by two successive integrations, Application of double integrals, Triple Integrals, Application of triple integrals, Evaluation of triple integrals Change of Variables in Integrals.

UNIT - V

Vector Differential and Integral Calculus: Gradient of a Scalar Field and Directional Derivative, Divergence and Curl of a Vector Field, Line Integrals, Line Integrals Independent of the Path and Green's Theorem (without Proof), Surface Integral, Divergence Theorem of Gauss and Stoke's Theorem (without Proof).

Suggested Reading:

1. R. K. Jain & S. R. K. Iyengar, Advance Engineering Mathematics, Narosa Publications, 5th Edition 2016, (Fifteenth Reprint 2026).
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley publications, 11th Edition, 2025.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 45th Edition, 2024(Reprint 2025).
4. N.P. Bali and M. Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 11th Edition, 2025.
5. H. K. Dass and Er. Rajnish Varma, Higher Engineering Mathematics, S. Chand Publications 3rd Revised Edition 2014(Reprint 2025).

e-resources: https://onlinecourses.nptel.ac.in/e-learning/noc26_ma133

With effect from Academic Year 2026-27

BS 101 CH	ENGINEERING CHEMISTRY						CourseType Core/PF/FE
Prerequisite if any: Mathematical Knowledge of 12th/ Intermediate level	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**		**Credits**
	L	**T**	**P**		**CIE**	**SEE**	
	3	-	-	**3**	**40 Marks**	**60Marks**	**3**

Course Objectives:

- To understand the fundamentals and principles of water chemistry relevant to Engineering chemistry.
- To acquire the knowledge of polymers used for industrial purposes with various applications.
- Interpret spectroscopic data for structural elucidation of molecules.
- Analyze the spontaneity and equilibrium of chemical reactions.
- Apply knowledge of batteries and nanomataerials to aid in engineering and technical applications.

Course Outcomes:

1. Attains knowledge about the disadvantages of hard water for domestic and industrial purposes. Also teaches the techniques of softening of hard water and treatment of water for drinking purpose. Gains knowledge in causes of corrosion and its prevention.
2. Analyze the basic methods of reaction of organic molecules and study their properties.
3. Distinguishes the ranges of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
4. Rationalize bulk properties and processes using thermodynamic considerations.
5. Apply the knowledge of basic fundamentals of nanoparticles to design nanosystems in every field.

Course Articulation Matrix:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**
CO2	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**
CO3	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**
CO4	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**
CO5	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**

UNIT-I
Water Chemistry and Corrosion:

Water chemistry: Hardness of water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Water softening by Ion exchange and Reverse Osmosis methods. Boiler troubles-scales and sludges formation-causes, effects and prevention. Numerical problems.
Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by Chlorination.

Corrosion-causes and its effects. Types of corrosion-Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion and its types. Factors influencing rate of corrosion.
Corrosion control methods: Cathodic protection methods- Sacrificial anodic and impressed current cathodic protection methods. Surface coating methods: Hot dipping-Galvanizing and Tinning.

UNIT-II

Reaction Mechanism and Polymers:
Reaction Mechanism: Introduction - Addition, Substitution and Elimination reactions. Addition to C=C and C=O, Nucleophilic substitution in aliphatic system: SN^1 and SN^2 mechanism, Elimination reactions: E^1 and E^2 mechanism
Polymers: Introduction, Classification of polymers -Plastics, Fibres and Elastomers.
Preparation, properties and engineering applications of the following polymers:
Plastics: PVC and Bakelite
Fibers: Nylon 6:6, and Dacron.
Elastomers: Buna-S and Butyl Rubber.
Conducting polymers: Introduction. Mechanism of conduction in polymers. Intrinsic conducting polymers: Poly-acetylene and poly-aniline. Applications of conducting polymers. Biodegradable polymers, Applications of polymers in concrete materials – Epoxy resins.

UNIT-III
Molecular Structures and Spectroscopy:
Molecular Orbital Theory. Linear Combination of Atomic Orbital's (LCAO). Molecular Orbital energy level diagrams of diatomic molecules-O_2, N_2 and NO.
Description of Electromagnetic spectrum.
Principles of UV-Visible Spectroscopy: Statement of Beer-Lambert Law. Chromophores and Auxochromes. Absorption and intensity shifts: Bathochromic, Hypsochromic, Hyper chromic and Hypo chromic shifts with one example each. Principle and applications of UV Sensors.
IR Spectroscopy: Principle of IR Spectroscopy.IR active and IR inactive molecules (two examples each). Types of vibrational bands, Degrees of Freedom for linear and non linear molecule, Principle and applications of IR Sensors.

NMR Spectroscopy: Principle of ^{1}H-NMR Spectroscopy. Multiplicity, Chemical Shift. Example-Ethyl chloride, Principle and Applications of MRI.

UNIT-IV
Thermodynamics and Electro Chemistry:
Thermodynamics: Terminology of Thermodynamics, thermodynamic processes, Work done in Reversible isothermal and adiabatic processes, efficiency of heat engine by Carnot cycle, concept of entropy, physical significance of entropy, Work function, Gibbs free energy and their significance, variation of free energy with temperature and pressure, criteria of spontaneity in terms of entropy and free energy-Numericals.
Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells, cell-notation, cell reaction and cell potentials. Types of electrodes-Calomel, and Glass electrode. Determination of P^H of a solution by using Quinhydrone electrode. Thermodynamics of emf of cells-Nernst equation and its derivation. Application of Nernst equation & Numericals.
Principles and applications of Conductometric titrations.

UNIT-V
Energy Sources and Nanomaterials:
Batteries: Primary batteries-Zn carbon battery. Secondary batteries-Pb- Acid battery and Ni-Cd battery. Lithium-ion batteries- advantages and applications.

Fuel cells: Concept of fuel cells and their advantages. Construction and working of H_2-O_2 and methanol-Oxygen fuel cells.

Solar cells: Concept of solar energy conversion, photovoltaic cells.

Nanomaterials: Introduction. Properties of nanomaterials. Synthesis of nanomaterials-Top down, Bottom up approach and Sol-gel method. Applications of nanomaterials.

Suggested Readings:

1. Jain & Jain, *Engineering chemistry*, Dhanpat Rai publishing Co., 17 th Edition.
2. Shashi Chawla, Text book of Engineering chemistry. Danpat rai & Co.
3. Arun Bahl and BS Bahl, *A text book of Organic Chemistry*, S. Chand Co. Ltd., S. Chand Publishing, 2017.
4. Robert Silverstein spectrometric identifications of organic compounds, Journal of Chemical Education, ACS Publications.
5. L.D.S. Yadav, Organic Spectroscopy. Springer nature-2005.
6. Y.R. Sharma Elementary organic spectroscopy, S. Chand Publications

HS 101 EG	COMMUNICATIVE ENGLISH						Course Type: Core
Prerequisite: English proficiency above B1 level as per the CEFR for languages.	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives: The course is taught with the objectives of enabling the student to:

- To develop students' listening, speaking, reading. and writing (LSRW) skills for academic and professional co1nmunjcation.
- To enhance vocabulary, grammar, and language accuracy for effective expression.
- To improve comprehension and critical thinking through prose, poetry, biographies, and professional ethics.
- To equip students with technical and professional writing skills such as report writing. email writing. presentations, and resume writing.
- To enable students to communicate confidently and ethically in professional and social environments.

Course Outcomes:
After successful completion of the course, students will be able to:

1. Demonstrate effective listening, speaking, reading, and writing skills in academic and professional contexts.
2. Apply appropriate vocabulary, grammar. and language structures to communicate accurately and fluently.
3. Analyze literary and non-literary texts lo develop comprehension. critical thinking, and interpretation skills.
4. Prepare professional documents such as reports. emails, letters, resumes, and presentations using appropriate formats and conventions.
5. Demonstrate ethical communication practices and interpersonal skills required for teamwork and professional success.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	3	3	-	2	1	1
CO2	3	2	-	-	-	-	-	-	2	3	-	2	1	2
CO3	2	3	-	-	-	-	-	2	2	2	-	3	2	1
CO4	2	2	-	-	1	-	-	-	2	3	-	2	2	3
CO5	-	2	-	-	-	2	-	3	3	3	-	2	1	2

Unit - I
Prose: Silent Crisis: *Martha C Nussbaum*
Listening: What is Listening; Process of Listening; Importance of Listening
Speaking: Importance of Communication. Types of Communication (Non-verbal and Verbal)
Reading: Importance of Reading
Writing: Features of Writing Composition: Cohesions. Coherence. Precision and Clarity)

Vocabulary and Grammar: Homonyms: Homophones; Homographs: Punctuation; Sentence Structure (Simple, Compound, Complex)

Unit - II
Poem: Where the mind is without fear: *Rabindranath Tagore*
Listening: Types of listening, Non-verbal and verbal signs of active listening
Speaking: Types of communication II (oral, written, visual)
Reading: Reading skills–skimming, scanning
Writing: Discourse markers and linking words, Paragraph writing and Precis writing
Vocabulary and Grammar: Root words: prefix and suffix, Synonyms, Antonyms, Idioms & Phrasal Verbs; Concord.

Unit - III
Biography: Homi J. Bhabha: *Enakhi Chatterji*
Listening: Effective listening: Principles and techniques
Speaking: Styles of communication (formal, informal, semiformal), Channels of communication (Vertical, Horizontal, Interpersonal, Grapevine)
Reading: Intensive and extensive reading
Writing: Essay writing, Report Writing
Vocabulary and Grammar: Words often confused; Tenses

Unit - IV
Poem: A world made by Atoms: *Margaret Cavendish*
Listening: Barriers to effective listening
Speaking: Barriers to Communication, Johari Window
Reading: SQ3R method
Writing: Letter writing, Resume Writing, Email Etiquette, Etiquette for WhatsApp/other messaging services
Vocabulary and Grammar: One-word substitutes; Active and Passive voice; Reported Speech.

Unit - V
Prose: Professional Ethics
Listening: Note-taking; Critical Listening Exercises
Speaking: Speaking to communicate effectively; Proverb expansion through JAM
Reading: Critical and Inferential reading passages
Writing: Creative Writing
Vocabulary and Grammar: Technical Vocabulary, Common errors: correct use of prepositions and articles, avoiding ambiguity, misplaced modifiers, avoiding redundancy

Suggested Reading:

1. Ashraf, M. Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2006.
2. *Language and Life: A Skills Approach*. Orient Blackswan, 2018.
3. Raman, Meenakshi, and Sangeetha Sharma. *Technical Communication: Principles and Practice*. 2nd ed., Oxford University Press, 2011.
4. Swan, Michael. *Practical English Usage*. Oxford University Press, 1995.
5. Vijaya, B. *Communicative English and Employability Skills*. Orient Blackswan, 2026.

ES101ME	ENGINEERING MECHANICS – Statics						Course Type: Core
Pre-requisite: Basic knowledge of inter physics	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives: The course is taught with the objectives of enabling the student to:

1 To understand the resolution of forces, equilibrium and compatibility conditions of static loads
2 To Visualize and able to find the force systems
3 To determine the various forces in the members, and analyze the sections using various methods
4 To obtain friction and various concepts of friction
5 To be able to find centroid, and moment of Inertia for various regular and irregular bodies

Course Outcomes: After completion of this course, the students will be able to:

1 A basic understanding of the laws and principles of mechanics.
2 The ability to draw Free Body Diagram and label the reactions on it.
3 The ability to analyze and solve simple problems in mechanics.
4 The ability to analyze and find area moment of inertia.
5 An understanding of the assumptions and limitations of the approaches used

Course Articulation Matrix:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PS O1	PS O2
CO1	3	3	2	1	-	-	-	-	-	-	-	-	1	-
CO2	3	3	2	1	-	-	-	-	-	-	-	-	1	-
CO3	3	3	2	1	-	-	-	-	-	-	-	-	1	-
CO4	3	3	2	1	-	-	-	-	-	-	-	-	1	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-	1	-

Unit – I

Introductory Concepts.
Force Systems: Resultant coplanar concurrent forces, Components of forces in space, moment of force and its applications. Couples and Resultant of Force Systems, Wrench.

Unit – II
Equilibrium of Force Systems: Free body diagrams. Equations of Equilibrium. Equilibrium of planar systems and Spatial Systems.

Unit – III
Analysis of structures: Analysis of trusses by Method of Joints and Method of Sections. Analysis of Frames by Method of Members

Unit – IV

Friction: Laws of friction. Application to simple systems. Connected systems and Belt friction. Types of friction – limiting friction, static and dynamic frictions, motion of bodies – wedge, screw, screw-jack.

UNIT – V

Centroid and Moment of Inertia: Centroids for lines, Area and Composite areas. Theorems of Pappus. Moment of Inertia for areas, Composite areas. Polar moment of inertia. Radius of gyration. Transfer theorem, moment of inertia of composite figures, product of inertia, transfer formula for product of inertia.

Suggested Readings

1 Vijay Kumar Reddy, K., J. Suresh Kumar, (2010). Singer's Engineering Mechanics Statics and Dynamics, 3rd Ed., BS Publications.
2 Bhavikatti S S. (2019). *Engineering Mechanics*, 7th Edition, New Age International.
3 Hibbeler R C. (2017). *Engineering Mechanics Statics and Dynamics*, Pearson.
4 Timoshenko S et al. (2017). *Engineering Mechanics*, 5th Edition, McGraw-Hill.
5 *Merium, J.L., L.G. Kraige, J.N. Bolton, (2020). Engineering Mechanics Statics and Dynamics,* 9th Edition, Wiley India

e-Resources: https://nptel.ac.in/courses/112103108

ES 102 ME	ENGINEERING DRAWING - I						Course Type: Core
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	6	3	40	60	3

Corse Objectives: The course is taught with the objectives of enabling the student to

1. Introduce the fundamentals of engineering graphics and BIS standards/conventions used in engineering drawing.
2. Develop skill in the use of drawing instruments, lettering, dimensioning, and scales for accurate graphical representation.
3. Provide understanding of orthographic projection principles and the projection of points, lines, planes, and solids.
4. Develop spatial visualization ability to represent three-dimensional objects in two-dimensional views.
5. Enable students to draw sectional views of solids and understand the true shape of sections.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Apply BIS standards and conventions in engineering drawing, including lines, lettering, dimensioning, and scales.
CO2: Explain the principles and systems of orthographic projection with respect to the observer, object, and reference planes.
CO3: Construct projections of points, lines, planes, and solids in different positions with respect to the reference planes.
CO4: Draw sectional views of solids and determine the true shape of sections.
CO5: Develop and present complete engineering drawings of simple objects using the principles of orthographic projection and sectioning.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	2	___	___	___	1	1	1	1	1	1
CO2	3	1	2	1	2	___	___	___	1	1	1	1	1	1
CO3	3	1	2	1	2	___	___	___	1	1	1	1	1	1
CO4	3	1	2	1	2	___	___	___	1	1	1	1	1	1
CO5	3	1	2	1	2	___	___	___	1	1	1	1	1	1

Unit 1:

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering.

Scales – Plain, Diagonal and Vernier Scales. **Orthographic Projection:** Principles of Orthographic projection, Four Systems of Orthographic Projection. **Projection of Points:** Projections of points when they are situated in different quadrants.

Unit II

Projections of Lines: Projections of a line parallel to one of the reference planes and inclined to the other, line inclined to both the reference planes, Traces.

Unit III

Projections of Planes: Projections of a plane perpendicular to one of the reference planes and inclined to the other, Oblique planes.

Unit IV

Projections of Solids: Projections of solids whose axis is parallel to one of the reference planes and inclined to the other, axis inclined to both the planes.

Unit V

Section of Solids: Sectional planes, Sectional views - Prism, pyramid, cylinder and cone, true shape of the section.

Suggested Reading:

1. Bhatt N.D., Panchal V.M.& Ingle P.R.,(2014), Engineering Drawing, Charotar Publishing House
2. Shah,M.B. & RanaB.C.(2008),Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B.& Agrawal C. M.(2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers (Corresponding set of) CAD Software Theory and User Manuals
5. Sham Tickoo (2015), AutoCAD 2015 for Engineers and Designers, Dreamtech Press

BS 151 CH	**ENGINEERING CHEMISTRY LABORATORY**					**Course Type Core/PF/FE**
Prerequisite if any: Mathematical Knowledge of 12th/Intermediate level	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**	**Credits**
	L	**T**	**P**		**CIE** / **SEE**	
	3	-	-	**3**	**25Marks** / **50 Marks**	**1.5**

Course Objectives:

- To know the quality standards of potable water for health-based limits.
- To perform the routine synthesis of commonly used drug in the laboratory.
- Apply electrochemical principles in conductivity, Electrode potentials and verification of Beer' s law.
- To Evaluate Iron content from Iron ores.
- To Synthesize an extensively used polymer in industry.

Course Outcomes

The chemistry laboratory course use consists of experiments illustrating the principle of chemistry relevant to the study of science and engineering. The students will learn to:

1. Estimate hardness of Water in various water samples.
2. Synthesize a small molecule drug.
3. Measure of conductance of solutions and electrode potentials .
4. Analysis of Iron content in Iron ore.
5. Understand the principles and mechanism of polymerization reaction.

Course Articulation Matrix:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	1	1
CO2	**2**	**3**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**2**	1	1
CO3	**2**	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	1	1
CO4	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**2**	1	1
CO5	**3**	**2**	**1**	**1**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	1	1

6.

List of Experiments:-

I) Water analysis.

1) Determination of Total hardness of water by EDTA method.
2) Determination of Permanent hardness of water by EDTA method.

II) Synthesis of a drug molecule:

3) Synthesis of Aspirin.

III) Colorimetry:

4) Verification of Beers law and Estimation of the given permanganate.
5) Verification of Beers law and Estimation of the given $CuSO_4$.

IV) Conductance measurements:

6) Determination of cell constant.

7) Estimation of HCl and CH_3COOH by conductometric titration.

V) Potentiometric Measurements:

8) Estimation of HCl by potentiometric titration.

9) Estimation of ferrous iron by potentiometric titration.

VI) Extraction of Iron From Hematite:

10) Determination of Iron in Hematite.

VII) Synthesis of Polymer:

11) Preparation of phenol-Formaldehyde Resin.

References:

1. Senior Practical Physical Chemistry, B.D.Khosla, A.Gulati and V.Garg (R.Chand&Co., Delhi)

2. An Introduction to Practical Chemistry,K.K.Sharma and D.S.Sharma (Vikaspublishing, N.Delhi)

HS 151 EG	COMMUNICATIVE ENGLISH LABORATORY						Course Type Core/PF/FE
Prerequisite: English proficiency above B1 level asper the CEFR for languages.	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	2		25	50	1.5

Course Objectives: The course is taught with the objectives of enabling the student to:

- To develop learners' pronunciation skills through an understanding of the English sound system, stress, and intonation.
- To enhance contextual and collaborative communication skills for academic, social, and workplace settings.
- To improve fluency, confidence, and interpersonal communication through interactive language activities.
- To develop employability skills required for interviews, group discussions, presentations, and professional interactions.
- To foster effective communication, teamwork, and lifelong learning skills necessary for career growth

Course Outcomes: On completion of this course, the student will be able to :

1. Demonstrate correct pronunciation using the English sound system, stress patterns, and intonation in spoken communication
2. Communicate effectively in various contexts using appropriate verbal and non-verbal communication skills.
3. Participate actively in collaborative communication activities, demonstrating teamwork and interpersonal skills.
4. Apply employability communication skills in interviews, group discussions, presentations, and workplace interactions.
5. Exhibit confidence, professionalism, and ethical communication practices for lifelong learning and career development.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	2	3	-	2	1	1
CO2	-	1	-	-	-	-	-	1	2	3	-	2	1	2
CO3	-	-	-	-	-	-	-	1	3	3	-	2	1	2
CO4	-	1	-	-	-	1	-	2	2	3	-	2	2	2
CO5	-	-	-	-	-	2	-	3	3	3	-	3	2	2

Unit I English Sound System

a. Sounds of English
b. Vowels
c. Consonants
d. Using Dictionary to decode Phonetic Transcription
e. Transcription exercise with the help of CALL (Computer Aided Language Lab)

Unit II Stress and Intonation

a. Syllable
b. Word-Stress and its importance
c. Intonation-Falling and Rising tone

d. Listening comprehension: Listening to various accents & Listening practice and exercises

Unit III Contextual Conversation Skills

a. JAM
b. Picture Perception
c. Public Speaking
d. Role plays: Use of dialogues in various situations like Social, Formal, Academic and Professional contexts.

Unit IV Collaborative Communication

a. Group discussion forms and techniques
b. Mock GDs
c. Factual GDs and Controversial GDs
d. Abstract GDs and Case Studies
e. Debate: Form, techniques, topics for mock debates in class

Unit V Employability Communication

a. Presentation Skills
b. Presentations with emphasis on visual aids and body language,
c. Interview Skills: Techniques
d. Frequently asked Interview Questions
e. Mock interviews, Simulator Technique

Prescribed Textbook

Vijaya, B. *Communicative English and Employability Skills*. Orient Blackswan, 2026.

Suggested Readings

1. Kumar, E. Suresh, and P. Sreehari. *A Handbook for English Language Laboratories*. Cambridge University Press, 2014.
2. Balasubramanian, T. *A Textbook of English Phonetics for Indian Students*. Macmillan, 2008.
3. Sethi, J., et al. *A Practical Course in English Pronunciation*. Prentice Hall of India, 2005.
4. Prasad, Hari Mohan. *How to Prepare for Group Discussions and Interviews*. Tata McGraw-Hill, 2006.
5. *English for Engineers and Technologists*. Combined ed., vols. 1–2, Orient Blackswan, 2010.

Software:

1. Sky Pronunciation Suite
2. K-van Software
3. Study Skills
4. English Pronunciation Dictionary –CAL

ES 152 ME	WORKSHOP PRACTICE						Course Type Core
Prerequisite: ----	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	6	3	25	50	3

Course Objectives: The course is taught with the objectives of enabling the student to:

- To train students for identifying, selecting, and use proper tools
- To impart practical, hands-on skills in basic manufacturing processes and fabrication across multiple trades.
- To instill a safety-first mindset regarding shop floor operations in an industrial environment
- To learn the fundamentals of house wiring which is used in daily life
- To measure mechanical dimensions accurately using standard instruments like Vernier calipers and understand the working of modern manufacturing equipment.

Course Outcomes: On completion of this course, the student will be able to:

1. Identify and select tools appropriate for specific manufacturing, assembly, and fabrication tasks across various engineering trades.
2. Fabricate physical products by applying hands-on skills in basic manufacturing and fabrication processes like carpentry, fitting, welding, foundry and other trades
3. Practice industrial safety by adhering to shop floor regulations, recognizing potential hazards, and using personal protective equipment.
4. Understand how individual trades work together to manufacture and assemble a complete engineering product and visualize the working of modern manufacturing equipment
5. Perform precise measurements on machined or fabricated components using standard metrology instruments like Vernier calipers and gauges

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	2	-	-	-	2	1	-	2	1	-
CO2	2	-	2	-	2	-	-	-	3	1	-	2	1	-
CO3	1	-	-	-	-	3	2	2	2	1	-	2	1	-
CO4	2	1	2	-	2	-	1	-	3	2	1	2	1	-
CO5	2	1	-	2	3	-	-	-	2	1	-	1	1	-

LIST OF EXPERIMENTS:

1. **Carpentry shop:**
   a) Making of a cross-lap joint with Wood
   b) Making of End Lap / Tee Lap Joint with wood

2. **Fitting shop**
   a) Making of a step cut with a mild steel flat
   b) Making of semicircular and V-cut with a mild steel flat

3. **Sheet metal shop**
   a) Making of Funnel with GI Sheet
   b) Making of a rectangular box with GI Sheet

4. **House wiring**
   a) Making of Cleat wiring
   b) Making of casing wiring

5. **Welding shop**
   a) Making of Butt joint using Arc Welding
   b) Making of a Lap Joint using Arc Welding

6. **Machine shop**
   a) Making of Step turning on MS cylindrical rod
   b) Making of Taper turning on MS cylindrical rod

7. **Foundry shop**
   a) Preparation of casting using a single-piece pattern
   b) Preparation of casting using a core pattern.

8. **Smithy shop**
   a) Forging of a square-shaped peg from a cylindrical workpiece
   b) Forging of square shape L- bend peg from a cylindrical workpiece

9. **Demo of advanced manufacturing equipment**
   CNC Machine / Injection Molding / FDM 3D Printer

Note: Minimum six trades should be conducted.

Suggested Reading:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., *Elements of Workshop Technology*, Vol. I (2008) and Vol. II (2010), Media Promoters and Publishers Pvt. Ltd., Mumbai.

With effect from Academic Year 2026-27

B.E. MECHANICAL ENGINEERING

II SEMESTER

SYLLABUS

BS 201 MT	DIFFERENTIAL EQUATIONS AND FOURIER SERIES						Course Type Core/PF/FE
Prerequisite: Mathematical Knowledge of 12th/ Intermediate level	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-		40	60	3

Course Objectives:

- To study the ordinary differential equations of first order.
- To study the linear ordinary differential equations of second and higher order with variable and constant coefficients.
- To apply general methodology to solve linear first order and second order partial differential equations.
- To learn about expansion of functions by Fourier series.
- To study the classification of second order partial differential equations and solve them by using separation of variables methods.

Course Outcomes: After completion of this course, the students will be able to:

1. Find the solutions of ordinary differential equations of first order.
2. Find the solutions of linear ordinary differential equations of second and higher order with variable and constant coefficients.
3. Find the solutions of first and second order PDE.
4. Obtain the Fourier series for a given function.
5. Find solutions of the heat equation, wave equation, and the Laplace equation subject to boundary conditions.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	-	1	-	-	2	3	1
CO2	3	2	1	2	2	2	-	-	1	-	-	2	3	1
CO3	3	2	2	3	2	2	-	-	1	-	-	2	3	1
CO4	3	2	1	1	1	2	-	-	1	-	-	2	3	1
CO5	3	2	2	3	1	2	-	-	1	-	-	2	3	2

UNIT - I

Ordinary Differential Equations of First Order: Exact First Order Differential Equations, Integrating Factors, Linear First Order Equations, Bernoulli Equation, Application of Differential quations of First Order –Newton's Law of Cooling, Rate of Decay of Radioactive Materials.

UNIT - II

Linear Differential Equations: Introduction, Solutions of Linear Differential Equations, Linear Independence and Dependence, Methods for Solution of Linear Equations, Differential Operator $\boldsymbol{D}$, Solutions of Second and Higher Order Linear Homogeneous Equations with Constants Coefficients, Method of Reduction of Order for Variable Coefficient Linear Homogeneous Second Order Equations, Solutions of Non- Homogeneous Linear Equations, Method of Variation of Parameters, Solution of Euler – Cauchy Equation, Operator Methods for Finding Particular Integrals Case $\boldsymbol{r(x) = e^{\alpha x}}$, Case $\boldsymbol{r(x) = \cos(\alpha x)\ or\ \sin(\alpha x)}$, Case $\boldsymbol{r(x) = x^{\alpha}, \alpha > 0}$ and integer.

UNIT - III

Partial Differential Equations: Introduction, Formation of First and Second Order Equations, Solution of First Order Equations, Lagrange's Equation, Higher Order Linear Equations with Constant Coefficients.

UNIT - IV

Fourier series: Introduction, Fourier series, Fourier series Expansions of Even and Odd functions, Convergence of Fourier series, Fourier Half - Range Series.

UNIT - V

Application of Fourier series: Classification of Linear Second Order Partial Differential Equations, Separation of Variables Method (Fourier Method) Fourier series Solution of the Heat Equation, Fourier series Solution of the Wave Equation, Fourier series solution of the Laplace Equation.

Suggested Reading:

1. R. K. Jain & S. R. K. Iyengar, Advance Engineering Mathematics, Narosa Publications, 5th Edition 2016 (Fifteenth Reprint 2026).
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley publications, 11thEdition, 2025.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 45th Edition, 2024(Reprint 2025).
4. N.P. Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications, 11th Edition, 2025.
5. H. K. Dass and Er. Rajnish Varma, Higher Engineering Mathematics, S. Chand Publications 3rd Revised Edition 2014(Reprint 2025).

e-resources: https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma98

BS 201 PH	ENGINEERING PHYSICS						Course Type Core/PF/FE
Pre-requisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-		40	60	3

Course Objectives:

- To understand the fundamental laws of electromagnetism and how they lead static and time-varying electric and magnetic fields and to apply wave theory to optical phenomena, such as interference, diffraction, and polarization
- To appraise significance of stimulated emission and laser light production. Subsequently propagation of light through optical fibers.
- To make student understand the formation of energy bands and classification of the solids based on the band theory and to sensitize the students towards nanomaterials.
- To understand the different types Magnetic materials and Dielectric materials with their origin of evolution.
- To understand Schrodinger's wave equation and its applications and to understand the concept of superconductors.

Course Outcomes: After completion of this course, the students will be able to:

1. Know how electric and magnetic fields lead the behavior of electromagnetic wave. It bridges classical physics and modern optics, empowering learners to analyze complex electromagnetic systems and waves optics.
2. Understand the construction and working of different laser systems and apply them to propagate light through optical fiber cable as cutting edge application.
3. Understand the semiconducting materials and their properties, operating electronic devices, and applying them in circuits and also equips students with the fundamental principles, how materials behave at the nanoscale and how these unique physical, chemical, and biological properties differ from bulk materials.
4. Understand the fundamental physics behind how materials interact with electric and magnetic fields.
5. Unrich and understand the implications of matter waves in quantum mechanics evolution and to equip students with the theoretical skills to analyze, and apply materials that conduct electricity with zero resistance and expel magnetic fields.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2	3	-	-	-	-	-	3	2	1
CO2	3	2	3	2	3	3	-	-	-	-	-	3	3	1
CO3	3	2	3	2	3	3	-	-	-	-	-	3	3	1
CO4	3	2	1	2	1	3	-	-	-	-	-	3	2	1
CO5	3	2	3	2	3	3	-	-	-	-	-	3	2	2

UNIT-I

Modern Optics: Interference – Newton's Rings by reflected light – Experimental arrangement – Types of diffraction – Diffraction due to single slit - Diffraction due to double slit (qualitative)- diffraction grating (Conditions of maxima and minima) – Polarization – Malus law – Double refraction – Nicol's Prism. – Optical activity and polarimeter.

Electro Magnetic Theory: Basic laws of electricity and magnetism – Derivation of Maxwell's equations in integral and differential forms - Conduction and displacement current – modification of Ampere's law - Equation of plane wave in free space – Poynting theorem.

UNIT-II

Lasers: Characteristics of lasers – Absorption of radiation, spontaneous and stimulated emission of radiation - Einstein's coefficients and their relation - Population inversion– Types of lasers - Ruby laser, Helium-Neon laser and semiconductor laser – state of art applications of lasers.

Fiber Optics: Construction of an optical fiber – Propagation of light through an optical fiber - Acceptance angle - Numerical aperture – Types of optical fibers (Based on number of modes and refractive index profile) – Fiber drawing process (double crucible method) - Applications of optical fibers

UNIT-III

Quantum Mechanics: Schrödinger's time independent and time dependent wave equation – Physical significance of wave function – Particle in 1-D box – Wave function, Probability function – Quantum states – Introduction to quantum technology and applications.

Semiconductor Physics: Classification of materials based on band theory - Kronig-Penney model (qualitative treatment) - Energy band formation in solids - Intrinsic and Extrinsic semiconductors - Concept of a hole - Carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode, Light Emitting Diode and their I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.

UNIT-IV

Dielectric Materials: Dielectrics - Types of polarizations – Electronic, Ionic, Orientational and Space charge polarizations – Expression for Electronic polarizability - Frequency and temperature dependence of dielectric polarizations - Determination of dielectric constant by capacitance Bridge method - Ferro electricity - Barium Titanate – Piezo electricity – Super capacitor.

Nanomaterials: Introduction - Properties of materials at reduced size - Surface to volume ratio – Quantum confinement effect – Classification of nanomaterials - Preparation of nanomaterials: bottom–up methods (e.g., Sol Gel method and Chemical Vapor Deposition method), Top-down methods (e.g., Ball milling method) - Basic ideas of carbon nanotubes – Applications of nanomaterials and their health hazards.

UNIT-V

Magnetic Materials: Origin of magnetism (Orbital and Spin magnetic moments) - Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials –

Weiss molecular field theory of ferromagnetism - Magnetic domains - Hysteresis curve - Soft and hard magnetic materials – Ferrites: Applications of ferrites.

Superconductivity: Introduction - General properties of super conductors - Meissner effect - Type I and Type II superconductors - BCS theory (qualitative) – Introduction to High T_c superconductors - Applications of superconductors

Suggested Reading:

1. M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
2. C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.
3. R.K. Gour and S.L. Gupta – Engg. Physics, Dhanpat Rai Publications
4. B.K. Pandey and S.Chaturvedi – Engineering Physics, Cengage Learning.
5. A.K Bhandhopadhya - Nano Materials, New Age International.

ES 201 CS	PROGRAMMING FOR PROBLEM SOLVING						Course Type: Core
Pre-requisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives: The course is taught with the objectives of enabling the student to:

1 To introduce the basic concepts of Computing environment, number systems and flowcharts
2 To familiarize the basic constructs of C language – data types, operators and expressions
3 To understand modular and structured programming constructs in C
4 To learn the usage of structured data types and memory management using pointers
5 To learn the concepts of data handling using files

Course Outcomes: On completion of this course, the student will be able to:

1. Explain various functional components in computing environment
2. Develop algorithmic solutions to problems and draw the flow charts
3. Explain and use basic constructs of C in writing simple programs
4. Use standard library functions in C and develop modular programs using user defined functions and structured data types
5. Use files and file handling for applications.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	1	-	-	-	1	-	1	-	2	1
CO2	3	3	2	-	1	-	-	-	1	-	1	-	3	1
CO3	3	2	2	-	2	-	-	-	-	-	1	-	3	1
CO4	3	3	3	1	2	-	-	-	1	-	1	-	3	2
CO5	2	2	3	1	3	-	-	-	1	-	1	-	3	2

Unit - I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.

Number Systems: Binary, Octal, Decimal, And Hexadecimal.

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

Unit - II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Go to statements

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing.

Recursion- Recursive Functions.

Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers

Unit - III

Preprocessors: Preprocessor Commands

Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two-Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

Unit - IV

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L -value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions

Unit - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self-Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C"* , Cengage Learning, 2007.
2. Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
3. Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.
4. Dromey "*How to Solve it By Computer*, Pearson education, 2006.

With effect from Academic Year 2026-27

ES 201 ME	ENGINEERING MECHANICS – DYNAMICS						Course Type: Core
Prerequisite: Basic knowledge of intermediate physics	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives: The course is taught with the objectives of enabling the student to:

1 Understand the mass moment of inertia analysis for the different bodies.
2 Know the Kinematics of particles and bodys.
3 Know basic concepts of dynamic loads, their behavior, analysis and motion bodies
4 Determine the work energy principles and impulse momentum theory.
5 Understand the Basics of Vibrations

Course Outcomes: On completion of this course, the student will be able to:

1 An understanding of the analysis of distributed loads.
2 Acknowledge of internal forces and moments in members.
3 An ability to calculate mass moments of inertia.
4 A knowledge of kinematic and kinetic analyses and energy and momentum methods for particles and systems of particles.
5 Knowledge of kinematic and kinetic analyses and energy and momentum methods for rigid bodies.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	1	-	-	-	-	-	2	01	-
CO2	3	3	2	1	-	1	-	-	-	-	-	-	01	-
CO3	3	3	2	1	-	1	-	-	-	-	-	-	01	-
CO4	3	3	2	2	-	1	-	-	-	-	-	1	01	-
CO5	3	3	2	2	-	1	-	-	-	-	-	2	01	-

Unit - I

Centre of Gravity and Moment of Inertia : Centre of gravity and Moment of inertia of masses, Radius of gyration, Transfer formula for mass moment of Inertia, MoI of Composite bodies.

Virtual work : Basic concepts and principles of virtual work method and its applications.

Unit - II

Kinematics : Rectilinear motion, curvilinear motion. Velocity and Acceleration. Projectiles. Types of rigid body motion and its analysis in a plane.

Unit - III

Kinetics : D' Alemberts Principle, Motion of mass center. Analysis as a particle. Analysis as a rigid body in translation, Force motion. Fixed axis rotation. Rolling bodies.Plane motion.

Unit - IV

Work-Energy: Principle of work-energy and it's application to translation, Particle motion and connected systems. Fixed axis rotation and plane motion.

Unit - V

Impulse Momentum : Linear impulse momentum. Conservation of momentum. Elastic impact. Plane motion.

Mechanical Vibrations: Definition, concepts, simple harmonic motion, vibrations, simple pendulum, compound pendulum.

Suggested Reading:

1. Vijay Kumar Reddy, K., J. Suresh Kumar, (2010). Singer's Engineering Mechanics Statics and Dynamics, 3rd Ed., BS Publications
2. Bhavikatti S S. (2019). *Engineering Mechanics*, 7th Edition, New Age International.
3. Hibbeler R C. (2017). *Engineering Mechanics Statics and Dynamics*, Pearson.
4. *Merium, J.L., L.G. Kraige, J.N. Bolton, (2020). Engineering Mechanics Statics and Dynamics,* 9th Edition, Wiley India
5. Timoshenko S et al. (2017). *Engineering Mechanics*, 5th Edition, McGraw-Hill
6. Singer F L. (1975). *Engineering Mechanics Statics and Dynamics*, 3rd Edition, Harper Collins International Edition.

ES201EE	Basic Electrical Engineering						Course Type Core
Prerequisite :	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives: The course is taught with the objectives of enabling the student:

1 To understand the fundamentals of DC electrical circuits.
2 To understand the fundamentals of AC electrical circuits
3 To understand the working principles of Transformers
4 To understand the working principles of DC motor and DC generator
5 To understand working principles of protection devices used in electrical circuits

Course Outcomes: On completion of this course, the student will be able to:

1. Analyze the performance of simple electrical circuits & Apply different theorems to solve complicated electrical circuits to obtain the current, voltage and power. and AC excitations.
2. Analyze the performance of simple electrical circuits exciting with DC
3. Understand the working principles of Transformers and AC Motors
4. Understand the main components, characteristics, applications of different DC and AC electrical machines used in industry.
5. Understand the importance of protective devices and their rating used in electrical circuits. Obtain the overall understanding of basic electrical circuits and appliances required for any industry.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	2	-	-	1	-	-	-	-	-	-	2	3
CO4	3	2	2	-	-	2	-	-	-	-	-	-	2	3
CO5	3	2	1	-	-	2	-	-	-	-	-	-	2	3

Unit - I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Ohm`s Law, KCL and KVL, series, parallel circuits, analysis of simple circuits with dc excitation. Thevenin`s, Norton`s & Superposition Theorems

Unit - II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit - III

Transformers: Electromagnetic induction, Faradays laws, statically induced EMF, EMF equation, ideal and practical transformer, OC & SC tests , losses and efficiency, Auto-transformer and three-phase transformer connections. **AC Motors**: Induction Motors and BLDC Motors,Principle of operation ,Advantages and Applications.

Unit - IV

DC Generators: Dynamically induced emf, construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications

DC Motors: Principle of working, Torque expression, Types of DC Motors, characteristics, applications.

Unit - V

Electrical Installations : Components of LT Switchgear: Switch, Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing & types of Earthing. Elementary calculations for energy consumption, power factor improvement by capacitors.

Suggested Reading:

1 J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.
2 J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications, 2010
3 Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Electrical Engineering" Tata McGraw Hill, Publications, 2009
4 Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Wesley Longman Inc., 1995.
5. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda,"Basic Electrical Engineering" Tata McGraw Hill, Publications, 2009

ES 202 ME	ENGINEERING DRAWING - II						Course Type: Core
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	2	-	4	3	25	50	4

Corse Objectives: The course is taught with the objectives of enabling the student to

1. Develop the ability to construct the development of surfaces of regular solids using standard engineering drawing principles.
2. Provide understanding of the intersection of surfaces of simple solids such as prisms, cylinders, pyramids, and cones.
3. Develop visualization and conversion skills between orthographic and isometric views of engineering objects.
4. Introduce students to computer-aided drafting and 3D modelling using AutoCAD for the preparation of engineering drawings.
5. Enable students to model engineering components and assemblies and present them in standard 2D and 3D forms.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Construct the development of surfaces of regular solids such as prisms, pyramids, cylinders, and cones.
CO2: Draw the intersection of surfaces of simple solids such as prisms, cylinders, pyramids, and cones.
CO3: Construct isometric views from orthographic views and convert isometric views into orthographic views.
CO4: Prepare 2D drawings and 3D models of engineering objects in a CAD environment using AutoCAD.
CO5: Execute a simple team-based design project involving modelling and presentation of engineering components and assemblies.

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Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	2				1	1	1	1	1	1
CO2	3	1	2	1	2				1	1	1	1	1	1
CO3	3	1	2	1	2				1	1	1	1	1	1
CO4	3	1	2	1	2				1	1	1	1	1	1
CO5	3	1	2	1	2				1	1	1	1	1	1

Unit 1:

Development of Surfaces: parallel line development, Radial line development, Development of surfaces for Prisms, Cylinders, Pyramids and Cones.

Auto-CAD practice: Introduction to Auto-CAD, DRAW tools, MODIFY tools, TEXT, DIMENSION,

PROPERTIES tool bar, Standard Tool bar, LAYERS

Unit II

Intersection of Surfaces: line method and cutting plane method- Intersection of prisms, prisms and pyramids, cylinders, cylinders and prisms, cylinder and cone

Unit III

Isometric views: Isometric axis, Isometric Planes, Isometric scale, Isometric projection, Isometric views – simple objects.

Reading a Drawing, transformation of projections: Conversion of isometric Views to Orthographic Views.

Unit IV

3D modelling using Auto CAD

Modeling of parts and assemblies. Parametric and non- parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models.

Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling. Plotting drawings and template drawings.

Unit V

Demonstration of a simple team design project: Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels

Suggested Readings:

1. Bhatt N.D., Panchal V.M.& Ingle P.R.,(2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B.& RanaB.C.(2008),Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B.& Agrawal C. M.(2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers (Corresponding set of) CAD Software Theory and User Manuals
5. Sham Tickoo (2015), AutoCAD 2015 for Engineers and Designers, Dreamtech Press

BS 251 PH	ENGINEERING PHYSICS LABORATORY						Course Type Core
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	3	3	25	50	1.5

Course Objectives: The course is taught with the objectives of enabling the student

1. To provide practical, experimental verification of fundamental physics concepts learned in lectures.
2. To familiarize students with the operation, calibration, and maintenance of modern laboratory equipment and electronic measuring devices such as Four probe setups, Hall effect setup, polarimeters, diodes, lasers, spectrometers, and multimeters.
3. To develop analytical and critical thinking skills. Students learn how to accurately record observations, perform graphical data analysis, apply experimental statistics, and estimate % of error and measurement precision.
4. To estimate and evaluate the physical properties of engineering materials and components (e.g., determining energy gap in semiconductors, magnetic hysteresis or dielectric constants).
5. To train students in the proper execution and documentation of scientific inquiry. This involves constructing proper experimental setups, drawing valid conclusions from collected data, and accurately maintaining laboratory records.

Course Outcomes: At the end of the course, the student will be able to:

1. Students learn to correlate theoretical physics concepts with real-world observations.
2. Students able to design experimental setups, conduct measurements, and compare your practical findings with theoretical models or calculations.
3. Students will gain expertise in handling advanced lab instruments (e.g., spectrometers, four-probe setups, and lasers etc.). This includes an understanding of instrument sensitivity, targeted accuracy, and error analysis.
4. This course trains the students in meticulous data recording, graphical representation, and logical deduction.
5. Students learn to identify discrepancies between expected and measured values and draw evidence-based conclusions.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	1
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	1
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	1
CO4	3	3	2	1	3	1	-	-	-	-	-	-	3	2
CO5	3	1	-	-	-	-	-	-	-	-	-	-	3	2

List of Experiments:

1. To Estimate Radius of curvature of given lens by forming Newton's rings.
2. To determine specific rotatory power of a given solution by using Laurent's Half shade polarimeter.

3. To determine the wavelength of prominent spectral lines of mercury vapour lamp by plane diffraction grating with the help of spectrometer by using Normal Incidence Method.
4. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT)/Barium Titanate ($BaTiO_3$).
5. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron), and find out (a) Coercivity, (b) Retentivity and (c) Hysteresis loss.
6. To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.
7. To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.
8. To study V-I characteristics of Light Emitting Diode.
9. Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.
10. To calculate the Numerical aperture (NA), acceptance angle of a given optical fibre.
11. Determination of wavelength of LASER using diffraction grating.
12. To determine the constants of A, B and α of given Thermistor.

Suggested Reading:

1. M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
2. C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.
3. R.K. Gour and S.L. Gupta Engg. Physics, Dhanpat Rai Publications.
4. B.K. Pandey and S.Chaturvedi Engineering Physics, Cengage Learning.
5. A.K Bhandhopadhya - Nano Materials, New Age International.
6. S.K. Sharma, et al., Hand book of Material Characterization Springer.

ES 251 CS	PROGRAMMING FOR PROBLEM SOLVING LAB						Course Type Core
Prerequisite :	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	3	3	25	50	1.5

Course Objectives: The course is taught with the objectives of enabling the student to:

1. To use tools available under LINUX for C programming
2. To gain hands-on experience on basic constructs of C programming
3. To formulate problems and implement algorithmic solutions in C
4. To write modular programs in C using structure programming techniques and data files.
5. To gain hands-on experience in using Python Programming constructs.

Course Outcomes: On completion of this course, the student will be able to:

1. Write, compile and debug C programs in Linux environment
2. Write simple programs using control structures, user defined functions and data manipulation using arrays
3. Use standard C library functions to develop modular programs in C
4. Write basic Python Programs, using conceptual understanding of Programming.
5. Create Programs, solutions for any problem statements with Programmatic, logic based approach.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2		3						1	1	2	1
CO2	3	3	2		2						1	1	2	1
CO3	3	2	3		2	1					1	2	3	1
CO4	3	3	3	2	2						1	1	3	2
CO5	3	3	3	2	2						1	2	3	2

List of Programs:

1. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
4. Sin x and Cos x values using series expansion
5. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
6. Generating a Pascal triangle and Pyramid of numbers
7. Recursion: Factorial, Fibonacci, GCD
8. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9. Reversing an array ,removal of duplicates from array

10. Matrix addition , multiplication and transpose of a square matrix .using functions
11. Bubble Sort, Selection Sort ,
12. Programs on Linear Search and Binary Search using recursion and iteration
13. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc
14. Writing simple programs for strings without using string functions.
15. Finding the No. of characters, words and lines of given text file
16. File handling programs : student memo printing
17. Create linked list, traverse a linked list, insert a node, delete a node, reversing list.
18. Python Basics and Input/Output
    a) Print "Hello, Engineering Students!"
    b) Read two integers and display their sum, difference, product, quotient, and remainder.
    c) Calculate the area and circumference of a circle.
    d) Swap two numbers (with and without a temporary variable).
    e) Convert temperature from Celsius to Fahrenheit.
    f) Calculate simple and compound interest.
19. Develop programs using conditional statements.
    a) Find the largest of three numbers.
    b) Check whether a year is a leap year.
    c) Determine whether a number is positive, negative, or zero.
    d) Check whether a number is even or odd.
    e) Display grades based on marks using if-elif ladder.
    f) Develop a menu-driven calculator using if-elif.
20. Develop programs using loops
    a) Print multiplication table of a given number.
    b) Generate first N Fibonacci numbers.
    c) Find factorial of a number.
    d) Check whether a number is prime.
    e) Reverse a given integer.
    f) Display Armstrong numbers between 1 and 1000.
21. Develop modular Python programs using functions.
    a) Write a function to find the maximum of two numbers.
    b) Write a function to calculate factorial using recursion.
    c) Write a function to check palindrome.
    d) Write a function to compute GCD of two numbers.
    e) Write a function to determine whether a number is prime.
    f) Create a menu-driven mathematical calculator using functions
22. Lists & Tuples - Perform operations on Python collections.
    a) Read N numbers into a list and find the largest and smallest.
    b) Compute average and median of list elements.

c) Remove duplicate elements from a list.
d) Sort a list in ascending and descending order.
e) Search an element using linear search.
f) Count frequency of each element in a list.

23. Develop programs using dictionaries.

a) Create a student dictionary containing Roll Number, Name, Branch, and CGPA.
b) Count frequency of characters in a string.
c) Count frequency of words in a paragraph.
d) Create a telephone directory using a dictionary.
e) Implement a simple student record management system using dictionaries.
f) Find the student with the highest marks from a dictionary of student names and marks.

Suggested Reading:

1 B.A. Forouzan and R.F. Gilberg, "A Structured Programming Approach in C" , Cengage Learning, 2007
2 Kernighan BW and Ritchie DM, "The C Programming Language", 2nd Edition, Prentice Hall of India, 2006.
3 Rajaraman V, "The Fundamentals of Computer", 4th Edition, Prentice-Hall of India, 2006.
4 Dromey "How to Solve it By Computer , Pearson education, 2006

ES251EE	Basic Electrical Engineering Lab						Course Type Core
Prerequisite :	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	3	3	25	50	3

Course Objectives:

The course is taught with the objectives of enabling the student to:

1 To understand the fundamentals of DC and AC electrical circuits.

2. To Analyze the balanced three phase circuits to obtain the current, voltage and power.

3. To understand the working principles of Transformers and three phase transformer connections

4 To understand the working and performance characteristics of DC Motors

5 To understand the Magnetization characteristics of DC Generators

Course Outcomes:

On completion of this course, the student will be able to :

CO-1 Get an exposure to common electrical components and their ratings.

CO-2 To Make electrical connections by wires of appropriate ratings.

CO-3 Understand the usage of common electrical measuring instruments.

CO-4 Analyze the performance of AC and DC circuits with appropriate operating conditions.

CO-5 Understand the basic operation ahd characteristics of transformers and electrical machines.

Course Articulation Matrix:

Course Outcome	Program Outcome													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 3	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 4	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	3	3

List of Laboratory Experiments/Demonstrations:

Demonstration: Basic safety and precautions - Introduction and use of measuring instruments, characteristics of machines: DC machine, and three phase transformer connections.

1. Verification of Kirchhoff's Laws
2. Verification of Thevenin's & Norton's Theorems
3. Verification of superposition Theorem
4. Sinusoidal steady state response of series R-L-C circuits-impedance calculation and verification
5. Open Circuit &Short Circuit Test on single phase Transformer
6. Steady-state and transient time-response of R-C circuit to a step change in voltage
7. Load test on single phase transformer: Measurement of primary and secondary voltages, currents and power
8. Three-phase Transformer: Star and Delta connections. Voltage and current relationship
9. Performance Characteristics of DC-Shunt Motor
10. Magnetization curve of a separately excited DC Generator

Suggested Readings:

1 J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.

2 J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications, 2010

3 V.N.Mittle,Aravind Mittal "Basic Electrical Engineering" *Tata Mc.Graw Hill Publicationss* second edition2007.

4 Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Wesley Longman Inc., 1995.

5. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda,"Basic Electrical Engineering" Tata McGraw Hill, Publications, 2009