

Scheme and Syllabus
of
B. TECH.
ELECTRICAL ENGINEERING
(As per NCrF)

By

Skill Department of Green Technology
Skill Faculty of Engineering & Technology



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Dr. Prof. R.S. Rathore
Dean (Academics)

Scheme of Semester I to Semester II

SEMESTER-I																
Course Code	Course Name	Credits				Hrs				Marks						
		Theory(T)			Practical(P)			Total								
		L	T	P	TO	L	T	P	TO	I	E	TO	I	E	TO	(T+P)
23UPHY01 23UPHY02	Applied Physics	1.5	0.5	1	3	45	15	30	90	15	35	50	35	15	50	100
23UCSE01 23UCSE02	Programming with C	2	0	2	4	60	0	60	120	15	35	50	35	15	50	100
23UELE01 23UELE02	Basic Electrical and Electronics Engineering	2	0	2	4	60	0	60	120	15	35	50	35	15	50	100
23UENG01 23UENG02	Professional Communication	2	0	1	3	60	0	30	90	15	35	50	35	15	50	100
23UMTH01	Engineering Mathematics-I	1.5	0.5	0	2	45	15	0	60	30	70	100	0	0	0	100
23UMEE01	Engineering Skills Practices-I	0	0	4	4	0	0	120	120	0	0	0	70	30	100	100
Total		9	1	10	20	270	30	300	600	90	210	300	210	90	300	600

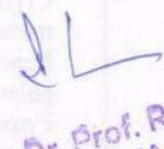
SEMESTER-II																
Course Code	Course Name	Credits				Hrs				Marks						
		Theory(T)			Practical(P)			Total								
		L	T	P	TO	L	T	P	TO	I	E	TO	I	E	TO	(T+P)
23UCHM01 23UCHM02	Applied Chemistry	1.5	0.5	1	3	45	15	30	90	15	35	50	35	15	50	100
23UMEE02	Basics of Mechanical Science	2	0	0	2	60	0	0	60	30	70	100	0	0	0	100
23UMEE03	Engineering Mechanics	2	0	0	2	60	0	0	60	30	70	100	0	0	0	100
23UMTH02	Engineering Mathematics-II	2	0.5	0	2.5	60	15	0	75	30	70	100	0	0	0	100
23UMEE04	Engineering Graphics and Design	0	0	4	4	0	0	120	120	0	0	0	70	30	100	100
23UECE01 23UECE02	Electronic Devices and Circuits	1.5	0	1	2.5	45	0	30	75	15	35	50	35	15	50	100
23UMEE05	Engineering Skills Practices-II	0	0	4	4	0	0	120	120	0	0	0	70	30	100	100
Total		9	1	10	20	270	30	300	600	120	280	400	210	90	300	700

Note: The scheme and syllabus of First Year is common to programs B.Tech (Electrical Engineering) and B.Tech (Mechanical and Smart Manufacturing)

Sl. No.	Course Name	Level	Mode	Duration	Approval Date
1	Engineering Mathematics-I	B.Tech	Regular	3	01-03-2023
2	Engineering Physics-I	B.Tech	Regular	3	01-03-2023
3	Engineering Chemistry-I	B.Tech	Regular	3	01-03-2023
4	Engineering Drawing	B.Tech	Regular	3	01-03-2023
5	Engineering Computer Graphics	B.Tech	Regular	3	01-03-2023
6	Engineering Fundamentals of Mechanical Engineering	B.Tech	Regular	3	01-03-2023
7	Engineering Fundamentals of Electrical Engineering	B.Tech	Regular	3	01-03-2023
8	Engineering Fundamentals of Smart Manufacturing	B.Tech	Regular	3	01-03-2023

SYLLABUS
FIRST YEAR (SEMESTER-I)
B.Tech (Electrical Engineering)
and
B.Tech (Mechanical and Smart Manufacturing)
(Academic Session: 2023-2024 onwards)



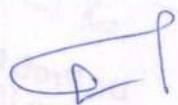


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Course Title	Applied Physics	Course No	23UPHY01 23UPHY02			
Specialization	Basic Sciences	Structure (LTPC)	1.5	0.5	1	3
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFASH	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	The objective of the course is to strengthen the fundamentals of physics and then build an interface of theoretical concepts with their industrial/engineering applications					
Course Outcome:	<p>By the end of this course, the student will be able to:</p> <p>CO1. Understand and apply the basics principles of electromagnetics.</p> <p>CO2. Apply the acquired knowledge of physics in designing communication devices.</p> <p>CO3. Understand and apply the basic phenomenon of quantum mechanics.</p> <p>CO4. Understand the elementary concepts of materials.</p> <p>CO5. Apply the acquired knowledge in understanding and designing the new age technology.</p>					
Contents of the course	<p>Unit I: Electromagnetic Wave Series and Parallel RC, LC, RL and LCR circuits, vector analysis, curvilinear coordinate system, Introduction of Electromagnetics, Eddy Current and electromagnetic braking system, Maxwell's equations, wave propagations in different (free space, dielectric, conducting and Plasma) mediums, Poynting vector.</p> <p>Unit II: Electromagnetic Waves in Communication Polarization, Boundary conditions, reflection and refraction of plane waves. Amplitude, Frequency and Phase modulation, Transmission Line and Smith chart, Transverse electric (TE), Transverse magnetic (TM) and Transverse electromagnetic (TEM) modes, Rectangular Waveguide.</p> <p>Unit III: Wave Nature of Particles Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law; Wave-particle duality, wave function; commutators and Heisenberg's uncertainty principle; Matrix representation, Dirac's bra and ket notations; related examples like Young's double slit experiment, Photoelectric effect. Elementary concepts of Quantum Computing: Superposition, Entanglement and Qubit.</p> <p>Unit IV: Basics Physics for Mechatronics Crystal Structure, concepts of reciprocal lattice and Brillouin zones; Smart materials such as shape memory alloys, Dielectrics and electrical polarization, Depolarization field, Clausius-Mossotti relation; Drude model, electronic polarization and its mechanisms, Dielectric breakdown; Piezoelectricity, Pyroelectricity and Ferroelectricity; piezoelectric measurement with the help of a photonic sensor</p> <p>Unit V: Application of Nanotechnology in Mechatronics</p>					

	Nanomaterials, types of nanomaterials, properties of nanomaterials; Single electron phenomenon, Quantum transport of electrons, Electrical conductance through a single atom, nanowire, nanotubes; Single electron transistor; Nanomechanical oscillators using beams and atoms, Scanning probe microscopy.
Textbook	<ol style="list-style-type: none"> 1. David Griffiths, Introduction to Electrodynamics 2. Nouredine Zettili, Quantum Mechanics: Concepts and Applications 3. William D. Callister Jr., David G. Rethwisch, Materials Science and Engineering: An Introduction
References	<ol style="list-style-type: none"> 1. S. P. Taneja, Introduction to electromagnetic theory 2. T.V.S. Arun Murthy, Electromagnetic Fields (Theory and Problems) 3. Ashok Das and Adrian C. Melissinos, Quantum Mechanics: A Modern Introduction 4. H.C. Verma, Quantum Physics 5. David J. Griffiths, Introduction to Quantum Mechanics
Laboratory Content	<p>List of Experiments</p> <ol style="list-style-type: none"> 1. RC, LC, RL and LCR circuits <ol style="list-style-type: none"> a. Series and Parallel RC, LC, RL and LCR circuits b. Resonance in Series and Parallel RC, LC, RL and LCR circuits 2. The magnetic field from the Helmholtz coil <ol style="list-style-type: none"> a. Variation of the magnetic field due to a circular current-carrying coil on an axial point b. Determination of Helmholtz Coil radius c. Verification of Superposition principle using Helmholtz coil 3. Experiments on electromagnetic induction and electromagnetic braking <ol style="list-style-type: none"> a. Study of the electromotive force (EMF) induced as a function of the velocity of the magnet. b. Study of the charge delivered due to induction. c. Study of electromagnetic (EM) damping. 4. Oil drop experiment <ol style="list-style-type: none"> a. Measurement of the terminal velocity of the drop. b. Determine the charge on a drop. 5. Cathode ray experiment <ol style="list-style-type: none"> a. Study of Lorentz force in a vacuum tube b. Measurement of specific charge (e/me) in a vacuum tube 6. Experimental Verification of the Heisenberg Uncertainty Principle 7. Determine the wavelength of He-Ne Laser using a double slit experiment. 8. Photoelectric effect <ol style="list-style-type: none"> a. Determine Planck's constant and Work function b. Verify the inverse square law of radiation 9. Electron Spin Resonance (ESR) Spectrometer Experiment <ol style="list-style-type: none"> a. Determine magnetic field as a function of frequency b. Determine Lande's g-factor for free electrons 10. P-E loop tracer: Piezoelectric measurement with the help of a photonic sensor 11. Scanning Probe/Tunneling Microscopy <p>Note: Minimum 8 Experiments to be performed</p>

Course Title	Programming with C	Course No	23UCSE01 23UCSE02			
Specialization	Engineering Science	Structure (LTPC)	2	0	2	4
Offered for	UG	Status	Core ✓		Elective	
Faculty	SFET	Type	New ✓		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	<ul style="list-style-type: none"> To acquire problem solving skills To be able to develop flowcharts To understand structured programming concepts To be able to write programs in C Language 					
Course Outcome:	<p>After completion of the course, the student will be able:</p> <p>CO1: To understand and apply the fundamental concepts of computer systems, number systems, and the C programming language for creating and executing programs</p> <p>CO2: To use control statements and functions in C programming to implement logic, make decisions, and perform repetitive tasks</p> <p>CO3: To effectively utilize arrays in C programming to store and manipulate multiple values of the same data type, enabling efficient data organization and retrieval for various applications.</p> <p>CO4: To comprehend the concept of strings and pointers and apply the relevant manipulation functions</p> <p>CO5: To utilize structures to define and manipulate complex data types, and file input/output operations.</p>					
Contents of the course	<p>Unit I: Introduction to Computers and C Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, 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.</p> <p>Unit II: Control statements, and functions 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 Goto 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.</p> <p>Unit III: Arrays 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.</p>					

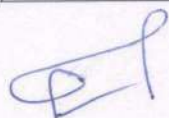
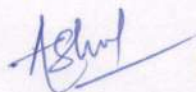



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	<p>Unit IV: Pointers and Strings</p> <p>Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command- line Arguments.</p> <p>Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.</p> <p>Unit V: Structures and I/O</p> <p>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.</p> <p>Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.</p>
Textbook	<ol style="list-style-type: none"> 1. B.A. Forouzan and R.F. Gilberg, "A Structured Programming Approach in C", Cengage Learning, 2007
References	<ol style="list-style-type: none"> 1. Kernighan BW and Ritchie DM, "The C Programming Language", 2nd Edition, Prentice Hall of India, 2006. 2. Rajaraman V, "The Fundamentals of Computer", 4th Edition, Prentice-Hall of India, 2006. 3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill. 4. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
Laboratory Content	<p>List of Experiments</p> <ol style="list-style-type: none"> 1. Finding the maximum and minimum of given set of numbers 2. Finding Roots of a Quadratic Equation 3. Sin x and Cos x values using series expansion 4. Conversion of Binary to Decimal, Octal, Hexa and Vice versa 5. Generating a Pascal triangle and Pyramid of numbers 6. Recursion: Factorial, Fibonacci, GCD 7. Matrix addition and multiplication using arrays 8. Bubble Sort, Selection Sort 9. Programs on Linear Search and Binary Search using recursive and non-recursive procedures. 10. Functions for string manipulations 11. Finding the No. of characters, words and lines of given text file 12. File Handling programs. <p>Note: Minimum 8 Experiments to be performed</p>

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Course Title	Basic Electrical and Electronics Engineering	Course No	23UELE01 23UELE02			
Specialization	Engineering Science	Structure (LTPC)	2	0	2	4
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFET	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	The objective of this course is to provide students with a fundamental understanding of electrical and electronics principles, circuits, machines, semiconductor devices and their applications, energy generation and distribution, as well as troubleshooting and safety practices.					
Course Outcome:	After completion of the course, the student will be able to: CO1: Apply fundamental electrical concepts to analyze and solve DC circuit problems. CO2: Apply fundamental electrical concepts to analyze and solve AC circuit problems. CO3: Comprehend the principles and working of electrical machines and transformers. CO4: Understand the characteristics and applications of semiconductor devices and logic gates. CO5: Analyze and interpret electrical energy generation, distribution systems and diagnose & rectify electrical faults while ensuring safety.					
Contents of the course	<p>UNIT I: DC Circuit Analysis Fundamentals of Electric Circuits: Charge, Current, Resistance, Voltage, Ohm's Law, Kirchhoff's Laws, Ideal DC voltage and current sources, Electric Power and sign convention, open circuit voltage, short circuit current, voltage division rule, current division rule, Practical DC voltage and current sources, Source Transformation</p> <p>UNIT II: AC Circuit Analysis AC Networks: Energy storage elements-Inductance and Capacitor, Generation of sinusoidal emf, phasor representation of alternating quantities, Average and RMS values, Peak Factor, Form Factor, AC circuit analysis through: Purely resistive, inductive & capacitive circuit, RL, RC and RLC circuit, Active Power, Reactive Power, Apparent Power, Power Factor, Impedance, Admittance, Resonance in series and parallel RLC circuit, Star and Delta connection in three phase system, voltage and current relations in star and delta connections</p> <p>UNIT III: Electrical Machines and Transformers Transformer: Principle of Operation, Concept of Ideal Transformer, EMF Equation, Voltage transformation ratio and current ratio, Classification: Core Type and Shell Type DC Machines: Principle and Construction of DC Generator, EMF equation of DC generator, Types of DC generators: Separately and Self-Excited, DC Motors: Types and Applications Three phase Induction Motor: Principle of operation, slip, applications</p> <p>UNIT IV: Semiconductors and its Applications Semiconductor materials: Intrinsic and Extrinsic, n-type and p-type semiconductor, p-n junction, p-n junction diode, forward bias and reverse bias, V-I characteristics of</p>					

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	<p>diode, Zener Diode, Digital logic states, Logic gates, Universal gates</p> <p>UNIT V: Electrical Energy Generation, Distribution and Safety Power generation and power plants, Transmission and distribution systems, Electrical substations and switchgear, Power factor correction, Energy meters and energy management</p> <p>Troubleshooting techniques for electrical systems, Safety procedures and precautions in electrical work, Protection devices (Fuse, MCB) and grounding systems, Electrical codes and regulations, Introduction to electrical maintenance and repair.</p>
Textbook	<ol style="list-style-type: none"> Principles and applications of Electrical Engineering by Giorgio Rizzoni, McGraw Hill Education "Electric Circuits" by James W. Nilsson and Susan A. Riedel, Pearson "Electric Machinery Fundamentals" by Stephen J. Chapman "Semiconductor Physics and Devices" by Donald A. Neamen "Electrical Power Systems: Design and Analysis" by Mohamed E. El-Hawary "Electrical Safety Handbook" by John Cadick and Mary Capelli-Schellpfeffer E. Hughes, "Electrical and Electronics Technology", Pearson, 2010. S. Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI Publications. J.B. Gupta, "Text book of Basic Electrical and Electronics Engineering", S.K.Kataria Publications D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
References	<ol style="list-style-type: none"> V.D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010. Hughes Edward, Electrical & Electronic Technology, Pearson Education, 2007. Alexander. C. K. & Mathew. N. O. Sadiku, Fundamentals of Electrical circuits, Tata McGraw Hill, 2008. P.S. Bhimbhara, "Electrical Machinery" Khanna Publishers Milmann & Halkias, "Integrated Electronics" TMH M. Morris Mano, "Digital Logic and Computer Design" Pearson
Laboratory Content	<p><u>List of Experiments</u></p> <ol style="list-style-type: none"> Introduction of tools, electrical materials and abbreviations To verify Ohm's Law using a DC circuit. To study and verify Kirchhoff's Laws using a DC circuit. To measure resistances using various methods: color coding and multimeter. To verify series and parallel combinations of resistors. To study running and reversing and working principle of Single-Phase Induction Motor To determine the turn ratio of the transformer To study voltage-current characteristics of a diode in forward and reverse bias condition. To measure input resistance, output resistance and current gain of a PNP/NPN transistor in common collector configuration. To construct and test logic gates using basic digital ICs (AND, OR, NOT gates). To troubleshoot electrical circuits: identification and rectification of faults

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	<p>12. To wire up a circuit in conduit system two lamps and a socket out let each controlled independently.</p> <p>13. To wire up a circuit in conduit system one lamp controlled by two switches (stair case wiring) from different places.</p> <p>Note: Minimum 8 Experiments to be performed</p>
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Course Title	Professional Communication	Course No	23UENG01 23UENG02			
Specialization	Humanities	Structure (LTPC)	2	0	1	3
Offered for	UG	Status	Core ✓		Elective	
Faculty	SFASH	Type	New ✓		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	To develop effective writing and comprehension skills for diverse professional needs to make the learners employable					
Course Outcome:	At the end of the course, the student will be able to: CO1: Make discrete and effective use of vocabulary in diverse professional communication situations. CO2: Understand the basics of writing in English and use the same in writing and comprehension. CO3: Identify and correct errors in writing and enhance their overall writing accuracy CO4: Write grammatically correct drafts and identify grammatical errors. CO5: Demonstrate proficiency in comprehension and writing well-structured and cohesive essays					
Contents of the course	<p>Unit I: Vocabulary Building The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.</p> <p>Unit II: Basic Writing Skills Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely</p> <p>Unit III: Identifying Common Errors in Writing Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés</p> <p>Unit IV: Nature and Style of sensible Writing Describing, Defining, Classifying, Providing examples or evidence, Writing, introduction and conclusion</p> <p>Unit V: Writing Practices Comprehension, Précis Writing and Essay Writing</p>					
Textbook	<ol style="list-style-type: none"> 1. Practical English Usage. Michael Swan. OUP. 1995. 2. Remedial English Grammar. F.T. Wood. Macmillan. 2007 3. On Writing Well. William Zinsser. Harper Resource Book. 2001 4. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press 					

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References	<ol style="list-style-type: none"> 1. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006. 2. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
Laboratory Content	<p>Oral Communication (This involves interactive practice sessions in Language Lab)</p> <ol style="list-style-type: none"> 1. Listening Comprehension 2. Pronunciation, Intonation, Stress and Rhythm 3. Common Everyday Situations: Conversations and Dialogues 4. Communication at Workplace 5. Interviews 6. Formal Presentations

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Course Title	Engineering Mathematics-I	Course No	23UMTH01			
Specialization	Basic Sciences	Structure (LTPC)	1.5	0.5	0	2
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFASH	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student. To impart basic knowledge on complex numbers, series, basics of calculus, linear algebra and matrices.					
Course Outcome:	<p>At the end of the course, the student will be able to:</p> <p>CO1. Apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions. Explain the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.</p> <p>CO2. Discuss the tool of power series and Fourier series for learning advanced Engineering Mathematics.</p> <p>CO3. Explain the tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing with engineering problems.</p> <p>CO4. Students should be able to apply linear algebra techniques to solve engineering problems.</p> <p>CO5. Illustrate the mathematical tools needed in evaluating matrices and linear equations.</p>					
Contents of the course	<p>Unit I: Calculus Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.</p> <p>Unit II: Sequences and Series Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.</p> <p>UNIT III: Complex Variables Real and complex numbers, basic properties and geometry. Cauchy-Riemann equations, Analytic functions, Harmonic functions, Derivatives of analytic functions, Contour integrals, Taylor's, Maclaurin's, Laurent's series. Zeros and poles, Cauchy Residue Theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.</p> <p>Unit IV: Linear Algebra Vector spaces, Subspaces, basis and dimension, linear transformations, representation of transformations by Matrices, linear functionals, transpose of linear transformations, canonical forms. Linear functionals and adjoints, Bilinear forms, symmetric bilinear forms, skew symmetric bilinear forms.</p>					

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	<p>Unit V: Matrices Linear Systems of Equations; Linear Independence; Determinants; Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.</p>
Textbook	<ol style="list-style-type: none"> 1. Reena Garg, Engineering Mathematics - I, Khanna Book Publishing Company, 2020. 2. B.S Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010. 3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008. 4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 5. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 6. R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th edition, McGraw Hill, 1990.
Reference Books	<ol style="list-style-type: none"> 1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005. 4. Reena Garg and Chandrika Prasad, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2020.

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Course Title	Engineering Skill Practices-I	Course No	23UMEE01			
Specialization	Engineering Science	Structure (LTPC)	0	0	4	4
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFET	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	<ul style="list-style-type: none"> The objective of this course is to give an exposure on the basic practices followed in the domain of mechanical engineering focusing on welding, measurements, metrology and manufacturing processes. The exercises will train the students to acquire skills which are very essential for the engineers through hands-on sessions. 					
Course Outcomes	<p>At the end of the course, the student will be able to:</p> <p>CO1: Acquire basic knowledge about difference among various welding techniques, perform gas welding and cutting</p> <p>CO2: Develop skills in electric arc and resistance welding</p> <p>CO3: Understand basic manufacturing processes and metrology</p> <p>CO4: Understand concepts of electrical installation and importance of personal protection equipments</p> <p>CO5: Differentiate between earthing, bonding and grounding schemes</p>					
Contents of the course	<p>Experiments will be framed to train the students in following common engineering practices:</p> <p>Unit I: Introduction and Gas Welding Introduction and classification of welding processes, welding terms (terminology), welding positions, joints and filler metals. Gas welding and Gas cutting: Principle, Oxyacetylene welding equipment, Flame cutting. Specimen preparation and making of lap joint, butt joint. T-joint with Oxyacetylene gas welding.</p> <p>Unit II: Electric Arc and Resistance Welding Electric arc welding: Principle, equipments, types-MIG, TIG, submerged arc and others, Welding electrodes, classification and selection of electrodes, welding arc and its characteristics, arc stability, arc blow. Resistance welding- principle and their types i.e. spot, seam, projection, upset and flash. Welding Defects, their causes and remedies. Brazing and soldering. Making of lap, Butt, T-joints etc. with electric arc welding, Study of MIG and TIG welding equipment and making a weld joint by this process, study of resistance welding processes and prepare a spot-welded joint.</p>					

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	<p>Unit III: Basic manufacturing processes and Metrology Fitting – Drilling & tapping – Material joining processes Specimen preparation and Fitting: Square joint, V joint, half round joint, dovetail joint Metrology Introduction to Metrology, Need for Inspection, Accuracy and Precision, Objectives of Metrology and Measurements, General Measurement Concepts, Calibration of Measuring Instruments, Errors in Measurements, Methods of Measurement</p> <p>Unit IV: Electrical Installations Personal Protection Equipment: Long-sleeved blue coat, safety shoes, helmet with integral visor, general safety rules, safety rules of working with electrical equipment, Hand tools, Types of wires and cables: Labeling of wires, residential wiring cables, electrical conduit: Electrical metal conduits, non-metal conduits, cable trays, raceways, Experiments related to Switch and a lamp, Switch and a socket, switch and two lamps, switch and two sockets, two lamps controlled using a two-way switch, wiring an impulse relay, wiring a mechanical timer, wiring a programmable timer, wiring a distribution panel</p> <p>Unit V: Earthing, Grounding Schemes and Protective Equipments Earthing: How earthing is done, types of earthing, advantages, Bonding, Grounding, Comparison between grounding, earthing and bonding, Fuse: Working, Selection and Characteristics Experiments related to demonstration of earthing and grounding of electrical systems</p>
Textbook	<ol style="list-style-type: none"> 1. Engineering Metrology and Measurements By N.V. Raghavendra and L. Krishnamurthy (Oxford University Press) 2. S. K. Choudhry and Hajra, "Elements of Workshop Technology (Vol. I Manufacturing Processes)", Media Promoters and Publishers Pvt. Ltd., 2008. 3. B.S. Raghuwanshi, "A Course in Workshop Technology (Vol. I, Manufacturing Processes)", Dhanpat Rai and Sons, New Delhi, 2015.
References	<ol style="list-style-type: none"> 1. Chapman. W. A. J., Workshop Technology, Part 1 & 2, Taylor & Francis. 2. R. K. Jain, "Workshop Technology Vol I & II", Khanna Publishers, New Delhi, First Edition, 2021. 3. P. N. Rao, "Manufacturing Technology Volume –I", Tata McGraw Hill, Delhi, Fifth Edition, 2019.

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SYLLABUS
FIRST YEAR (SEMESTER-II)
B.Tech (Electrical Engineering)
and
B.Tech (Mechanical and Smart Manufacturing)
(Academic Session: 2023-2024 onwards)




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Course Title	Applied Chemistry	Course No. :	23UCHM01 23UCHM02			
Specialization	Basic Sciences	Structure (LTPC)	1.5	0.5	1	3
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFASH	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	Technology is being increasingly based on the electronic, atomic and molecular level modifications. An understanding of the principles of Applied Chemistry will develop scientific attitude in the budding engineers to understand the physical and chemical properties of the available materials for engineering applications as well as an ability to design new and effective materials. The course will provide the basic knowledge of applied chemistry which is highly essential for advancement of various technologies.					
Course Outcome:	<p>By the end of this course, the student will be able to:</p> <p>CO1. Understand the Basic thermodynamics and mechanism of Reaction</p> <p>CO2. Understanding and Analyze of chemical systems, including their phenomena at the atomic and molecular;</p> <p>CO3. Understand and apply the acquired Knowledge of various engineering materials, Corrosion & Protective Coatings</p> <p>CO4. Apply the knowledge of energy materials for device fabrication</p> <p>CO5. Understand the concept of analytical and spectroscopic Methods and their applications to characterize engineered materials.</p>					
Contents of the course	<p>Unit-I: Chemical dynamics and Reaction Mechanism Basics of rate laws; Complex reactions: consecutive and parallel reactions; Temperature dependence of reaction rates; Reaction mechanisms: steady-state approximation, Kinetic and thermodynamic Control, pre-equilibria, unimolecular reactions; Catalysis.</p> <p>Unit-II: Atomic and Molecular Structure Schrödinger equation, the hydrogen atom; The chemical bond: simplest molecules H^{2+} and H^2; Vibration of diatomics: harmonic oscillator and Morse potential; Crystal field theory and Applications of crystal field theory.</p> <p>Unit-III: Engineering Chemicals, Corrosion & Protective Coatings Inorganic Materials: Metals and Alloys, Ceramics and Composites, Organic Materials including Polymers, Metal Organic Framework. Introduction about various types of corrosions, mechanism of corrosion, passivity, factors influencing corrosion, Metallic coatings: Inorganic coatings (Chemical dip, anodised oxide), Organic coatings (Paints, Varnishes, Enamels, Special paints); Electroplating.</p>					

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	<p>Unit-IV: Fuels, Lubricants, Hydrogen generation and Batteries Classification of various types of fuels, Calorific values, Comparison between solid, liquid and gaseous fuels, Calorific value of gaseous fuel, Bomb calorimeter, Calculation of calorific value of a fuel by Bomb calorimeter, Lubricant and its function, classification of lubricants, Mechanism of lubrication, Greases or Semi-Solid lubricants, Lubricating emulsions. Different routes of hydrogen generation: electrolysis versus reforming for hydrogen production, solar hydrogen. Battery and its types, lead acid battery, Nickel-metal hydride (Ni-MH) rechargeable batteries, lithium-ion rechargeable batteries, liquid-redox rechargeable batteries.</p> <p>Unit-V: Structural elucidation of engineering materials Lambert-Beer's Law, Principles and applications of U. V. Visible Spectroscopy, IR spectroscopy: principles and application to simple molecules, Nuclear Magnetic Resonance Spectroscopy and its applications, MRI.</p>
Textbook	<ol style="list-style-type: none"> 1. Physical Chemistry, by P. W. Atkins 2. Chemical kinetics, by Keith J Laidler 3. Chemistry: Principles and Applications, by M. J. Sienko and A. Plane 4. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore 5. University chemistry, by B. H. Mahan 6. Quantum Chemistry by Donald A. McQuarrie 7. Fuel cell Fundamentals, John Wiley and sons, Willey 8. Electrochemical Methods: Fundamentals and Applications, by Allen J. Bard, Larry R. Faulkner, Henry S. White 9. Introduction to spectroscopy D.L. Pavia 10. Spectroscopic methods in organic chemistry by Williams & Fleming 11. Tomorrow's Energy – Hydrogen Fuel Cells and the Prospects for Cleaner Planet, Peter Hoffman, MIT
References	<ol style="list-style-type: none"> 1. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala. 2. Spectroscopy (Vol-4) by K.L. Kapoor 3. Hydrogen – A fuel for Automatic Engines, Prashukumar G P, ISTE 4. Fuel cells: Principles and Applications, Viswanathan B and AuliceScibioh, University Press 5. Fuel Cells: Theory and Applications, Hart A B and Womack G J, Chapman and Hall 6. A Text Book of Engineering Chemistry, Shashi Chawla, 7. "Engineering Chemistry" by A. Mallick 8. Engineering Chemistry by R. Devi, V. R. Reddy and Rath, Cengage learning 9. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, 10. Vogel's text book of practical organic chemistry 5th edition 11. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications. 12. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd..
Laboratory Content	<p>List of Experiments</p> <ol style="list-style-type: none"> 1. Determination of the rate constant of a reaction 2. Models of potential energy surfaces 3. Chemical oscillations- Iodine clock reaction <p>Lubricants:</p>

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	<ol style="list-style-type: none"> 4. Estimation of acid value of given lubricant oil. 5. Measurement of Viscosity of lubricant oil using Ostwald's Viscometer. 6. Determination of surface tension of the liquid <p>Corrosion:</p> <ol style="list-style-type: none"> 7. Determine the corrosion rate of mild steel in the presence and absence of inhibitor. 8. Determination of cell constant and conductance of solutions 9. Potentiometry - determination of redox potentials and EMFs 10. Chemical analysis of a salt <p>Virtual lab experiments</p> <ol style="list-style-type: none"> 11. Construction of Fuel cell and its working. 12. Smart materials for Biomedical applications 13. Batteries for electric vehicles. 14. Functioning of solar cells and their applications. 15. Instrumentation and working principles of infra-red (IR) spectroscopy <ul style="list-style-type: none"> • using salt plates • of solutions 16. Evaluation of simple ¹H NMR spectra of selected chemical. 17. Identification of unknown components using spectroscopic techniques 18. Determination of the molar mass of simple compounds using mass spectroscopy <p>Note: Minimum 8 Experiments to be performed</p>
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	<p>Unit III: Second Law of Thermodynamics Limitations of First law of thermodynamics, concept of Kelvin Plank and Clausius statements of the Second law and their equivalence and their application to Refrigerator, Heat Pump and Heat Engine. Thermodynamic temperature scale, Efficiency and philosophy of Carnot cycle and its consequences, Carnot Engine and Carnot theorem; Carnot refrigerator, Heat Pump and Heat Engines. Clausius theorem; Clausius inequality; concept of entropy, principle of increase in entropy, representation of various processes on T-S coordinates and change in entropy for different processes, concept of entropy.</p> <p>Unit IV: Gas Power Cycles Air-standard efficiency, Nomenclature of Piston-Cylinder arrangement w.r.t. swept volume; clearance volume, compression ratio and mean effective pressure; Analysis and philosophy of Air-Standard Cycles i.e. Otto Cycle, Diesel Cycle and Dual Cycle; their compression ratio, mean effective pressure, power output and Efficiency; Comparison between the three Cycles.</p> <p>Unit V: Refrigeration and Air Conditioning Introduction to refrigeration, methods of refrigeration, Refrigeration cycles: carnot cycle of refrigeration (ideal cycle), Bell-Coleman cycle of refrigeration, their COP, Vapour compression system, Vapour Absorption System Psychrometry: Definition, Composition of air, Daltons law of partial pressure, Gas and Vapour mixture, Dry and Wet bulb temperature, Wet bulb depression, Dew point, Dew point depression, Saturated air, Specific humidity, Degree of saturation, Relative humidity, Absolute humidity</p>
Textbook	<ol style="list-style-type: none"> 1. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons. 2. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd 3. V. Ganeshan, Internal Combustion Engines, Tata McGRaw Hill.
References	<ol style="list-style-type: none"> 1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons. 2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India

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Course Title	Basics of Mechanical Science	Course No. :	23UMEE02			
Specialization	Engineering Science	Structure (LTPE)	2	0	0	2
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFET	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Applied Physics	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	The objective of this course is to give an exposure the basic concepts of thermodynamics, power cycles and internal combustion engines					
Course Outcome:	<p>By the end of this course, the student will be able to:</p> <p>CO1: Understand the basic thermodynamics and mechanism of reaction</p> <p>CO2: Understanding of first law of thermodynamics and the work done for the different flow processes</p> <p>CO3: Understand the second law of thermodynamics and entropy</p> <p>CO4: Acquire the knowledge about the air standard efficiency calculation for air standard cycle.</p> <p>CO5: Understand the basic concepts of refrigeration and air conditioning</p>					
Contents of the course	<p>Unit I: Introduction to Basic Concepts Thermodynamics, Concept of thermodynamic System, thermodynamic equilibrium, Boundary and Surroundings, Open, Closed and Isolated Systems. Property, state, path, process and cycle, point functions and path functions, Phase and pure substances, Equation of State, reversible, Quasi-static and irreversible processes, Energy and its forms, Energy transfer across the System boundaries. Types of work transfer, heat and work; sign conventions for heat and work interaction, Concept of temperature and heat, microscopic and macroscopic approach, Concept of continuum, Zeroth law of thermodynamics. Concept of thermal equilibrium and principles of thermometry. Ideal gas and characteristic gas equation.</p> <p>Unit II: First Law of Thermodynamics Concept of First law of thermodynamics, essence and corollaries of First law; internal energy and enthalpy, analysis of non flow and flow processes for an ideal gas for constant volume (isochoric), constant pressure (isobaric), constant temperature (isothermal), adiabatic and polytropic processes. Changes in various properties, work done and heat exchange during these processes, free expansion and throttling process and its applications in Engineering processes; Steady Flow Energy Equation and its application to various thermodynamic systems.</p>					

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Course Title	Engineering Mechanics	Course No. :	23UMEE03			
Specialization	Engineering Science	Structure (LTPC)	2	0	0	2
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFET	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Nil	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objective:	The objective of this course is to give an exposure on the basic of mechanics and understanding about the concepts of force, moment, friction, simple machines and dynamics.					
Course Outcome:	By the end of this course, the student will be able to: CO1: Understand and compute the force, moment & their application CO2: Understand the concept of friction and its applications. CO3: Determine location of center of gravity and moment of inertia of geometric sections CO4: Understand the working concepts of simple lifting machines CO5: Understand the principle of dynamics					
Contents of the course	<p>Unit I: Basic Principles and Structures Basic principles: Equivalent force system, Equations of equilibrium, Free body diagram, Reaction, Static indeterminacy. Structures: Difference between trusses, frames and beams, Assumptions followed in the analysis of structures, 2D truss, Method of joints, Method of section, Frame, Simple beam, types of loading and supports, Shear Force and bending Moment diagram in beams, Relation among load, shear force and bending moment.</p> <p>Unit II: Friction Dry friction; Description and applications of friction in wedges, thrust bearing (disk friction), belt, screw, journal bearing (Axle friction); Rolling resistance.</p> <p>Unit III: Simple Machines Definition of simple machine, velocity ratio of simple and compound gear train, explain simple & compound lifting machine, define M.A, V.R. & Efficiency & State the relation between them, State Law of Machine, Reversibility of Machine, Self-Locking Machine. Study of simple machines – simple axle & wheel, single purchase crab winch & double purchase crab winch, Worm & Worm Wheel, Screw Jack.</p> <p>Unit IV: Center of Gravity and Moment of Inertia First and second moment of area, Radius of gyration, Parallel axis theorem, Product of inertia, Rotation of axes and principal moment of inertia, Moment of inertia of simple and composite bodies. Mass moment of inertia.</p>					

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	<p>Unit V: Dynamics</p> <p>Kinematics & Kinetics, Principles of Dynamics, Newton's Laws of Motion, Motion of Particle acted upon by a constant force, Equations of motion, DeAlembert's Principle.</p> <p>Work, Power, Energy & its Engineering Applications, Kinetic & Potential energy& its applications</p> <p>Momentum & impulse, conservation of energy & linear momentum, collision of elastic bodies, and Coefficient of Restitution.</p>
Textbook	<ol style="list-style-type: none"> 1. Timoshenko and Young, Engineering Mechanics, 3rd Ed., McGraw Hill Publishers, 2006. 2. R. C. Hibbler, Engineering Mechanics, Vols. I and II, Pearson Press, 2002. 3. Sadhu Singh, "Engg Mechanics", Khanna Publishers
References	<ol style="list-style-type: none"> 1. J. L. Meriam and L. G. Kraige, Engineering Mechanics, Vol. I – Statics, Vol. II – Dynamics, 5th Ed., John Wiley, 2002. 2. I. H. Shames, Engineering Mechanics: Statics and Dynamics, 4th Ed., PHI, 2002. 3. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol. I - Statics, Vol. II – Dynamics, 3rd Ed., Tata McGraw Hill, 2000.



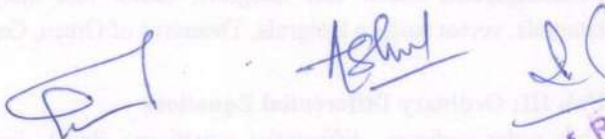


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Course Title	Engineering Mathematics-II	Course No. :	23UMTH02			
Specialization	Basic Sciences	Structure (LTPC)	2	0.5	0	2.5
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFASH	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Engineering Mathematics-I	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objectives	The objective of this course is to familiarize the prospective engineers with techniques in multivariable calculus, differential equations and statistics.					
Course Outcomes	<p>At the end of the course, the student will be able to:</p> <p>CO1: Deal with functions of several variables that are essential in most branches of engineering.</p> <p>CO2: Acquainted with mathematical tools needed in evaluating multiple integrals and their usage.</p> <p>CO3: Categories the effective mathematical tools for the solutions of ordinary differential equations that model physical processes.</p> <p>CO4: Categories the effective mathematical tools for the solutions of partial differential equations that model physical processes.</p> <p>CO5: Will be able to understand the applications of Laplace and Fourier transform</p>					
Contents of the course	<p>Unit I: Multivariable Calculus (Differentiation) Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.</p> <p>Unit II: Multivariable Calculus (Integration) Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.</p> <p>Unit III: Ordinary Differential Equations First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.</p>					

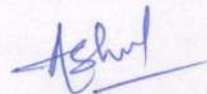
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	<p>Unit IV: Partial Differential Equations First order partial differential equations, solutions of first order linear and non-linear PDEs. Solution to homogeneous and non - homogeneous linear partial differential equations second and higher order by complementary function and particular integral method, Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries. System of differential equations, Laplace transforms to solve differential equations, transfer functions, impulse functions, frequency response.</p> <p>Unit V: Fourier And Laplace Transform Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications</p>
Textbook	<ol style="list-style-type: none"> 1. Reena Garg and Chandrika Prasad, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2020. 2. B.S Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010. 3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008 4. I. N. Sneddon, Elements of Partial Differential Equations, Dover Publications, 2006. 5. A. D. Poularikas, The Transforms and Applications Handbook, CRC Press, 1996. 6. A. Papoulis and S.U. Pillai, Probability Random Variables and Stochastic Processes, 4th Ed., McGraw-Hill, 2002.
References	<ol style="list-style-type: none"> 1. L. Garcia, Probability and Random Processes for Electrical Engineering, 2nd Ed., Addison-Wesley, 1993. 2. P.Z. Peebles, Probability, Random Variables and Random Signal Principles, 4th Ed., McGraw Hill, 2000. 3. H. Stark and J.W. Woods, Probability and Random Processes with Applications to Signal Processing, Prentice Hall, 2002. 4. K. L. Chung and F. AitSahlia, Elementary Probability Theory with Stochastic Processes 5. Introduction to Mathematical Finance, 4th Ed., Springer-Verlag, 2003.



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Course Title	Engineering Graphics and Design	Course No. :	23UMEE04			
Specialization	Engineering Science	Structure (LTPC)	0	0	4	4
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFET	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	NIL	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objectives	<ul style="list-style-type: none"> • Introduction to engineering design and its place in society • Exposure to the visual aspects of engineering design • Exposure to engineering graphics standards • Exposure to solid modelling • Exposure to computer-aided geometric design 					
Course Outcomes	<p>At the end of the course, the student will be able to:</p> <p>CO1. Recall the basics of engineering drawing and projection</p> <p>CO2. Understand different types of projections</p> <p>CO3. Differentiate between different types of projection and its applications</p> <p>CO4. Understand application of isometric projection</p> <p>CO5. Familiarize with the 2D and 3D projections of various figure</p>					
Contents of the course	<p>Unit I: Introduction of Engineering Drawing Introduction of Engineering Drawing (01 Sheet): Scope and Importance of Engineering Drawing; Drawing instruments and their uses; Indian standards for drawing. Sheet layout, technical lettering and conventions for lines and materials. Introduction to general principles of dimensioning. Scales: plain diagonal and vernier.</p> <p>Unit II: Projection and Projection of Lines Projection (02 Sheets): Principles of Projection; Introduction to planes of projection (reference planes) and auxiliary planes. Projection of point in all the four quadrants, calculation of shortest distance. Projection of lines(01 Sheet): Projection of lines in different quadrants according to its orientation/position with horizontal, vertical and profile plane; true and apparent lengths; traces of lines; finding out the true length and true inclinations of the line inclined to both the reference planes using rotating line method and rotating trapezoidal plane method.</p> <p>Unit III: Projection of Planes and Solids Projection of Planes (02 Sheets): Projections of plane surfaces-triangle, square, rectangle, pentagon, hexagon and circular planes in different positions when plane is parallel to one of the reference planes, inclined to one of the reference planes and perpendicular to other and inclined to both reference planes. Projection of Solids (02 Sheets): Solids and their classification; right and oblique solids, projections of right regular- prisms, pyramids, cylinders and cones</p>					

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	<p>in different positions when their axis is parallel to one of the reference planes, inclined to one or both of the reference planes.</p> <p>Unit IV: Sections of Solids and Development of Solids Sections of Solids (02 Sheets): Introduction to sectioning and its importance; methods of sectioning, apparent shape and true shape of sections of right regular prisms, pyramids, cylinders and cones resting on horizontal plane on their base. Development of Surfaces (02 Sheets): Development of lateral surface of right regular prism, pyramid, cylinder and cone resting on their base on horizontal plane with their frustum and truncation.</p> <p>Unit V: Isometric and Orthographic Projection Isometric Projection (02 Sheets): Introduction, isometric scale, isometric projection of simple plane figures, isometric projection of cube, square block, right regular prisms, pyramids, cylinders and cones and their combinations. Orthographic Projection (02 Sheets): Orthographic projections of simple solids from the given 3D/isometric view. AUTOCAD (05 Exercises): Management of screen menus commands, Introduction to drawing entities Co-ordinate systems: Cartesian, polar and relative coordinates, drawing limits, units of measurement and scale, Layering: organizing and maintaining the integrity of drawings, Design of prototype drawings as templates, Editing/modifying drawing entities: selection of objects, object snap modes, editing commands, Dimensioning: use of annotations, dimension types, properties and placement, adding text to drawing.</p> <p>Note: Minimum 12 sheets may be prepared covering all the topics.</p>
Textbook	<ol style="list-style-type: none"> 1. Rhodes R.S, Cook L.B; Basic Engineering Drawing, 1st Edition, Pitman Publishers, 2. Rana B.C and Shah M.B, Engineering Drawing and computer graphics, 2nd Edition, Pearson Education India Publishers. (2009). 3. Jolhe D.A; Engineering Drawing: With an Introduction to AutoCAD, 2nd Edition, Tata McGraw Hill (2007)
References	<ol style="list-style-type: none"> 1. Ostrowsky. O; Engineering Drawing with CAD application 2nd Edition, Routledge Publishers 2007. 2. Aggarwal B; Engineering Drawing, 1st Edition, Tata McGraw Hill Publications, 2008. 3. Gill P.S; Engineering Drawing ,5th Edition, S.K. Kataria and Sons Publications, 2011. 4. Dhawan R. K; Engineering Drawing, 7th Edition, S. Chand and Sons Publishers. 5. Bhatt N.D; Engineering Drawing, 50th Edition, Charotar Publication, 2011.




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Course Title	Electronic Devices and Circuits	Course No. :	23UECE01 23UECE02			
Specialization	Professional Core	Structure (LTPC)	1.5	0	1	2.5
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFET	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Basic Electrical and Electronics Engineering	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objectives	To introduce to the students the fundamental concepts of electronic devices and circuits for engineering applications					
Course Outcomes	<p>By the end of this course, the student will be able to:</p> <p>CO1: To analyze and design diode circuits by understanding the behavior of diodes</p> <p>CO2: Understand the principle of operation of bipolar junction transistors (BJTs) and analyze their behavior in different configurations</p> <p>CO3: Analyze and interpret the volt-ampere characteristic curve of a JFET, including its various regions of operation</p> <p>CO4: Design and analyze small signal BJT amplifier circuits</p> <p>CO5: Understand and analyze the small-signal model of FET amplifiers, including both JFET and MOSFET amplifiers.</p>					
Contents of the course	<p>Unit I: Diode and Applications Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times. Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers, Tunnel diode, Varactor diode, Zener diode as voltage regulator</p> <p>Unit II: Bipolar Junction Transistor Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes</p> <p>Unit III: Junction Field Effect Transistor Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor, UJT</p>					

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	<p>Unit IV: Analysis and Design of Small Signal Low Frequency BJT Amplifiers</p> <p>Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h- parameters in CE, CB and CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier</p> <p>Unit V: FET Amplifiers</p> <p>Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic Concepts of MOS Amplifiers</p>
Textbook	<ol style="list-style-type: none"> 1. Electronic Devices and Circuits- Jacob Millman, McGraw Hill Education 2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson.
References	<ol style="list-style-type: none"> 1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press 2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford. 3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mithiki S. Prakash Rao, 2Ed., 2008, Mc Graw Hill.
Laboratory Content	<p><u>List of Experiments</u></p> <ol style="list-style-type: none"> 1. To study the current-voltage (I-V) characteristics of a diode and determine its forward and reverse bias regions 2. To design and analyze a half-wave rectifier circuit and calculate its ripple factor and efficiency 3. To design and analyze a full-wave rectifier circuit and calculate its ripple factor and efficiency 4. To study operation of Zener diode as voltage regulator 5. To study the effect of load resistance and source resistance on operation of an amplifier 6. To study the operation of single-stage and multi-stage RC-Coupled (Common Emitter) Amplifier 7. To plot the frequency response of RC-coupled amplifier 8. To calculate A_v, A_i, R_o and R_i of CE RC-Coupled amplifier with potential divider biasing 9. To study the characteristics of N-channel and P-channel MOSFET (MATLAB/Trainer Kit) 10. To study the characteristics of N-channel and P-channel JFET (MATLAB/Trainer Kit) <p>Note: Minimum 8 Experiments to be performed</p>




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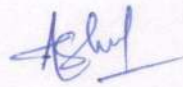
Course Title	Engineering Skills Practices-II	Course No. :	23UMEE05			
Specialization	Engineering Science	Structure (LTPC)	0	0	4	4
Offered for	UG	Status	Core <input checked="" type="checkbox"/>		Elective	
Faculty	SFET	Type	New <input checked="" type="checkbox"/>		Modification	
Pre-requisite	Engineering Skills Practice-I	To take effect from	2023-2024			
Submission date	07-07-2023	Date of approval by BoS	07-07-2023			
Course Objectives	<ul style="list-style-type: none"> • Introduction to different manufacturing methods in different fields of engineering • Practical Exposure to some of the advanced and latest manufacturing techniques being employed in the industry 					
Course Outcomes	<p>At the end of the course, the student will be able to:</p> <p>CO1: Acquire basic knowledge about Lathe machine and its operations CO2: Prepare machine component using milling machine CO3: Acquire knowledge about CNC machines and its operations CO4: Use CNC part programming, sub programming on CNC turning and VMC simulator CO5: Compare and differentiate between wiring and home automation system</p>					
Contents of the course	<p>Experiments will be framed to train the students in following common engineering machining operations:</p> <p>Unit I: Lathe Machine & its operations Lathe & its accessories, Lathe specifications, Lathe cutting tools, speed, feed, depth of cut & machining time, various operations on Lathe, Attachments used on Lathe; Turret & Capstan Lathe, Toolholding devices.</p> <ul style="list-style-type: none"> • Safety Precautions and use of personal protective equipment (PPE), demonstration of tools, equipment, accessories and lathe machines. Specifications of the lathe machine available in the mechanical workshop. • Preparing a machined component/ job (as per the drawing) involving Different types of operation like turning, taper turning, external step turning, thread cutting and knurling which are free from false tool cuts, burrs and sharp edges, conforming to general dimensional tolerance +/-0.05mm. <p>Unit II: Milling Machines & its operations Milling machines (Horizontal, Vertical & Universal milling machine), specifications, accessories, standard & Special attachments milling operations; Indexing, Type of indexing; milling cutters, size, shape & material of milling cutters; numerical related to cutting speed, feed, depth of cut & machining time.</p> <ul style="list-style-type: none"> • Safety Precautions and use of personal protective equipment (PPE), demonstration of tools, equipment, accessories and milling 					

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	<p>machine. Specifications of the milling machine available in the mechanical workshop.</p> <ul style="list-style-type: none"> • Preparing a machine component like keyway, production of spur gear teeth/helical Involute gear teeth (as per the drawing) using a milling machine with a side and face cutter, which is free from burrs and sharp edges conforming to general dimensional tolerance +/-0.05mm. <p>Unit III: CNC Machines Basic components of CNC machines, Advantages and Disadvantages of CNC machines, Application of CNC machines, difference between Conventional and CNC machines, NC Machine Tooling, types of tool holding devices-spindle tooling-flexible tooling, work locating and holding devices, basic principles of working holding and location, special devices used in CNC Machines, Automatic Tool Changer in CNC.</p> <ul style="list-style-type: none"> • Safety Precautions and use of personal protective equipment (PPE), demonstration of tools, equipment, accessories and CNC Machines (Turning and VMC). • Specifications of the SIEMENS and FANUC control panels available in the CNC machine lab. <p>Unit IV: Introduction to Part Programming Concepts of part programming, basic terms-Bit, Byte, Character, NC Work, Block, G and M Codes. Type of part programming- Manual Part Programming, Computer Aided Part Programming, Part Programming for different operations : Methods of writing a part program, axis identification, part zero, floating zero and machine zero, part programming of drilling machine, for lathe and milling machine operations. CNC Part programming, sub programming and execution of an operation on CNC lathe and milling machine.</p> <ul style="list-style-type: none"> • CNC Part programming, sub programming and execution of an operation on CNC Turning simulator. • CNC Part programming, sub programming and execution of an operation on VMC simulator. <p>Unit V: Smart Home Devices and Wiring Home automation system, various home automation protocols, comparison between wiring and home automation system, maintenance: servicing and troubleshooting, standards for home automation</p> <p>Experiments related to configuring switch actuator and 2 gang push buttons, configuring blind actuator and 2 gang push buttons, configuring dimming actuator and 2 gang push buttons, configure argus sensor and switch actuator.</p>
Textbook	<ol style="list-style-type: none"> 1. Manufacturing processes (Vol. 2.) by Hazra Chowdhary (Media Promoters & Publishers Pvt. Ltd) 2. Manufacturing Processes by S. Kalpakjian (Pearsons) 3. Workshop Technology (Vol.2) by B.S Raghuvanshi (Dhanpat Rai & Co.) 4. CNC Machines by By B. S. Pabla, M. Adithan(First Edition), New Age International (P) Ltd.

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	5. T. K. Kundra, P. N. Rao and N. K. Tiwari, "Numerical Control and Computer Aided Manufacturing", TMH
References	<ol style="list-style-type: none"> 1. Manufacturing Processes by Myron L. Begeman (John Wiley & Sons) 2. Production Technology by H.M.T. (Tata McGraw-Hill Education) 3. Tilak Raj, "CNC Technology & Programming", Dhanpat Rai publishing Company (P) ltd., N Delhi. <p>Digital Content Links:</p> <ol style="list-style-type: none"> 4. https://www.haascnc.com/content/dam/haascnc/en/service/reference/programming-workbooks/shopnotes---machinist%27s-cnc-reference-guide.pdf 5. https://academy.titansofcnc.com/files/Fundamentals_of_CNC_Machining.pdf 6. https://cache.industry.siemens.com/dl/files/554/74475554/att_56792/v1/PGsl_0313_en_en-US.pdf 7. https://cache.industry.siemens.com/dl/files/233/108869233/att_825441/v1/PG_0805_en.pdf 8. https://www.acemicromatic.net/sites/default/files/2018-02/cnc3.pdf

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