SEMESTER –I

Sl No.	Course Code	Course Title	Hours Per Week			Total Credits
			Lecture	Tutorial	Practical	
1.	100101	Communication Skills	3	0	0	3
2.	100102	Engineering Mathematics-I	3	0	0	3
3.	100104	Engineering Physics	3	0	0	3
4.	100105	Introduction to AI	3	0	0	3
5.	100106	Basic Electrical Engineering	3	0	0	3
6.	100101P	Communication Skills Lab	0	0	2	1
7.	100104P	Engineering Physics Lab	0	0	2	1
8.	100106P	Basic Electrical Engineering Lab	0	0	2	1
9.	100112P	Programming for Problem Solving Lab	0	0	2	1
10.	100113P	Sports/Yoga/NCC/NSS	0	0	2	1
TOTAL						20

GROUP-B:

1. Electrical Engineering
2. Electrical and Electronics Engineering
3. Electronics and Communication Engineering
4. Electronics and Communication Engineering(Advance Communication Technology)
5. Electronics Engineering(VLSI Design & Technology)
6. Electronics and Instrumentation Engineering

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code- 100101 **Communication Skills** **3 0 0 3**

Course Outcomes (COs)	Course Outcome Statements
CO1	Use vocabulary accurately in professional communication.
CO2	Construct grammatically correct and effective sentences.
CO3	Deliver presentations confidently with appropriate body language.
CO4	Prepare well-structured professional documents
CO5	Interpret literary and unseen texts effectively.

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
CO1	*TSO 1a.* Structure sentences by selecting appropriate vocabulary. *TSO 1b.* Assess the nature of word formation *TSO 1c.* Create new words with prefixes and suffixes ensuring root words *TSO 1d.* Use expressions in English. *TSO 1e.* Distinguish abbreviations and acronyms for clarity and appropriateness in formal and informal communication	**Unit- 1.0: Vocabulary Enrichment (8 hrs)** 1.1 Technical Vocabulary Development 1.2 Nature of Word Formation 1.3 Root Word and Morpheme, Prefix, and Suffix 1.4 Foreign Expressions in English 1.5 Synonyms and Antonyms, Homophones and Homographs, Abbreviations and Acronyms
CO2	*TSO 2a.* Use the concept of the fundamental Grammar and its uses in communication. *TSO 2b.* Apply articles and prepositions to construct correct sentences. *TSO 2c.* Develop complex sentences *TSO 2d.* Apply tense and voice for correct sentences *TSO 2e.* Distinguish redundancies and clichés to avoid unnecessary repetition.	**Unit- 2.0: Basics of English Grammar (10 hrs)** 2.1 Parts of Speech, 2.2 Articles, Prepositions 2.3 Subject Verb Agreement, 2.4 Phrase and Clause 2.5 Formation of Questions using Primary Auxiliaries, Modals, and Wh-Words. 2.6 Tenses, Voice 2.7 Redundancies/Clichés
CO3	*TSO 3a.* Apply analytical and persuasive writing techniques *TSO 3b.* Record accurate proceedings, decisions and action points *TSO 3c.* Incorporate the purpose of internal communication *TSO 3d.* Prepare a professional resume/CV highlighting skills and experience	**Unit- 3.0: Technical Communication (8 hrs)** 3.1 Communication: Role and Relevance, 3.2 Process / Steps, Types: formal and informal/verbal and non-verbal (Kinesics, Chronemics, Proxemics, Haptics, Vocalics/Paralanguage 3.3 Barriers to Communication: 3.4 Pattern/channels of communication

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
	TSO 3e. Develop the ability to write coherent and well-structured essays	3.5 7C's, for effective communication
CO4	*TSO 4a.* Apply analytical and persuasive writing techniques *TSO 4b.* Record accurate proceedings, decisions and action points *TSO 4c.* Develop internal communication process in an organization *TSO 4d.* Prepare a professional resume *TSO 4e.* Write coherent and well-structured essays	**Unit- 4.0: Techniques of Professional Writing (8 hrs)** 4.1 Letter Writing (formal/informal/ cover letter/application) 4.2 Report Writing, Proposal, Notice, Agenda, and Minutes of Meeting 4.3 Memorandum 4.4 Bio-Data/Resume/Curriculum Vitae 4.5 Essay Writing, Email Writing
CO5	*TSO 5a.* Explain the literary text *TSO 5b.* Illustrate central ideas and messages *TSO 5c.* Interpret the text effectively *TSO 5d.* Illustrate unfamiliar texts effectively	**Unit- 5.0: Comprehension and Interpretation Skills (8 hrs)** 5.1 If (Poem) by Rudyard Kipling 5.2 Of Studies (Essay) by Sir Francis Bacon 5.3 India: Our Motherland (Essay) by Swami Vivekananda 5.4 A Devoted Son (Story) by Anita Desai 5.5 Unseen/Untaught passage

Text / References: -

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Communicative English for Engineers and Professionals	Nitin Bhatnagar, Mamta Bhatnagar	Publisher: Pearson Education Edition: 1st Edition, Year: 2010 ISBN: 978-8131724323
2.	Oxford Communicative English	Oxford University Press	Edition: Latest Revised Edition Year: 2014, ISBN: 978-0198076018
3.	Technical Communication: Principles and Practice	Meenakshi Raman, Sangeeta Sharma	Edition: 3rd Edition Year: 2015 ISBN: 978-0199452132
4.	Communication Skills in English	Dr. Anjana Tiwari	Khanna Publishers, New Delhi
5.	Business Communication	Dr. Nishith Rajaram Dubey, Anupam Singh	Indra Publishing House, 2023 ISBN-978-93-93577-69-6
6.	Employability Skills	Dr. Nishith Rajaram Dubey, Anupam Singh	Indra Publishing House, 2023 ISBN

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
			978-93-93577-68-9
7.	Essential English Grammar in Use	Raymond Murphy	Cambridge University Press

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code- 100102 **Engineering Mathematics- I** **3 0 0 3**

Course Outcomes (COs)	Course Outcome Statements
CO1	Apply the concept of Linear/ Matrix algebra to solve given engineering problems.
CO2	Demonstrate the ability to solve engineering problems based on the application of derivatives.
CO3	Solve the given optimization problems by using the concept of partial derivatives.
CO4	Evaluate the given multiple integrals in different coordinate systems to solve complex engineering problems.
CO5	Apply the concept of vector calculus to solve the given engineering problems.

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
CO1	*TSO 1a.* Find the rank of a given Matrix by using various methods. *TSO 1b.* Test the Consistency of a given system of simultaneous linear equations representing an engineering situation. *TSO 1c.* Apply Cayley-Hamilton Theorem to find the integral powers of a given matrix. *TSO 1d.* Test the nature of the transformed matrix of a given homogeneous quadratic polynomial.	**Unit- 1.0: Basic Linear Algebra (8 hrs)** 1.1 Elementary transformations and Rank of Matrix, Rank by using Echelon and Normal form of Matrices. Linear dependence & independence of vectors in R^n space 1.2 Consistency of System of Linear Equations 1.3 Eigenvalues & Eigenvectors, Cayley-Hamilton Theorem. 1.4 Similarity of Matrices & Diagonalization of Square Matrices. Quadratic Form, Canonical Form of Matrices.
CO2	*TSO 2a.* Find the nth order derivatives of given functions representing an engineering situation. *TSO 2b.* Apply the Mean Value Theorem to determine the nature of the tangent of given curves under certain conditions. *TSO 2c.* Evaluate limits of given functions applying L' Hopital Rule. *TSO 2d.* Find the Curvature of a given curve representing an engineering situation.	**Unit- 2.0: Differential Calculus: Single Variable (8 hrs)** 2.1 Higher order derivatives; Successive differentiation and Leibnitz's Theorem 2.2 Mean Value Theorems (Rolle's; Lagrange's; Cauchy) 2.3 Indeterminate Forms; L' Hopital Rule 2.4 Tangents & Normal of Algebraic & Polar Curves, Curvature
CO3	*TSO 3a.* Apply Euler's theorem on homogeneous functions of m independent variables of degree n.	**Unit- 3.0: Differential Calculus: Several Variables (9 hrs)** 3.1 Partial differentiations; Euler's theorems

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
	TSO 3b. Test the differentiability of a given function of several variables. *TSO 3c.* Apply Taylor's Theorem to expand a function representing an engineering situation in the nhd. of a given point. *TSO 3d.* Optimize a given function by applying Lagrange's Multiplier Method for given engineering problems.	3.2 Limit, Continuity and differentiability of functions of Several Variables 3.3 Taylor's theorem with various forms of remainders, Maclaurin's theorem and related problems 3.4 Maxima & Minima for functions of several variables; Lagrange's Multiplier Method
CO4	*TSO 4a.* Evaluate the given definite integral using Leibnitz's rule. *TSO 4b.* Find the area of the given plane figure by using double integration. *TSO 4c.* Find the Volume of the given 3-D figure by using triple integration. *TSO 4d.* Evaluate given improper integrals by using Beta & Gamma functions.	**Unit- 4.0: Integral Calculus (9 hrs)** 4.1 Differentiation under the integral sign; Leibnitz's rule 4.2 Double integral; Change the order of integration; Evaluation of double integration by changing it into polar co-ordinates 4.3 Triple Integral; Evaluation of Triple integral by changing to Spherical Polar co-ordinates & Cylindrical polar co-ordinates 4.4 Beta; Gamma; Elliptic integral; Relation between Beta & Gamma functions, General Properties and related problems.
CO5	*TSO 5a.* Find the divergence and curl of a given vector point function representing a physical quantity *TSO 5b.* Apply Stroke's theorem to convert given line integral into surface integral. *TSO 5c.* Apply Gauss' theorem to convert given surface integral into volume integral.	**Unit- 5.0: Vector Calculus (8 hrs)** 5.1 Scalar and vector valued functions; Concepts of gradient, divergence and curl and their geometrical and physical significance; tangent plane; directional derivative; 5.2 Line, surface and volume integrals - Statement of Green's, Stokes' and Gauss divergence theorems - verification and evaluation of vector integrals using them.

Text / References: -

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers, 44 Ed. ISBN No:9788174091154
2.	Higher Engineering Mathematics	B. V. Ramana	Tata McGraw Hill New Delhi, 11th Ed, 2010, ISBN-13-978-0070634190
3.	Advanced Engineering Mathematics	Erwing Kreyszig	John Wiley & Sons, 10th Ed, ISBN-978-0470-15836-5
4.	A Textbook of Engineering Mathematics	N. P. Bali & Dr. Manish Goyal	University Science Press, 13th Ed, ISBN-978-93-83828-63-0
5.	Understanding Engineering Mathematics	John Bird	Routledge; First Edition ISBN 9780415662840

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code- 100104 **Engineering Physics** **3 0 0 3**

Course Outcomes (COs)	Course Outcome Statements
CO1	Apply the concepts of wave optics phenomena in various engineering fields.
CO2	Apply the concepts of laser operation and fibre optic propagation in engineering applications
CO3	Apply the concepts of electromagnetics in engineering applications.
CO4	Utilize semiconductor devices, based on their I-V characteristics, for various engineering applications.
CO5	Apply the principles of Quantum mechanics to analyse quantum phenomena in engineering systems.

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
CO1	*TSO 1a.* Explain the phenomenon of interference of light by division of amplitude of light waves. *TSO 1b.* Find the wavelength of a given monochromatic light source using an interference experiment. *TSO 1c.* Find the wavelength of a given light source by using an n-slit Fraunhofer diffraction pattern. *TSO 1d.* Determine the resolving power of a given optical instrument by using the Rayleigh criteria *TSO 1e.* Analyze the polarization of a given light source.	**Unit- 1.0: Wave Optics (8 hrs)** 1.1 Interference, Division of amplitude, Newton's Ring experiment, Michelson interferometer. 1.2 Diffraction, Fraunhofer diffraction, Single and double slit, & Circular aperture 1.3 Diffraction, Grating, 1.4 Rayleigh criterion, resolving power of telescope. 1.5 Polarization, double-refracting crystal, Nicol prism.
CO2	*TSO 2a.* Differentiate between ordinary and laser light sources. *TSO 2b.* Derive the relations between Einstein A & B coefficients. *TSO 2c.* Explain the construction and working of the given laser with application. *TSO 2d.* Explain the Propagation mechanism of light in optical fiber and its application. *TSO 2e.* Differentiate between different types of optical fiber	**Unit- 2.0: Lasers and Optical Fiber (8 hrs)** 2.1 Characteristics of laser light, Einstein's A & B coefficients, Population inversion, pumping mechanism, Optical resonator 2.2 Ruby laser, He-Ne laser, and Semiconductor laser 2.3 Structure of optical fiber, Basic principles (TIR, Acceptance angle and Numerical Aperture), Types of optical fibers. 2.4 Propagation mechanism of light in fiber, Attenuation in optical fibers.

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
	TSO 2f. Explain the use of Lasers and Fiber optic Sensors in communications, medical, defense, and Industries	2.5 Applications of optical fibres, Fibre optic sensors
CO3	*TSO 3a.* Interpret the role of dielectric constant in modifying the electric field inside a material. *TSO 3b.* Apply Gauss's Law in dielectric media to solve problems involving electric field in capacitors. *TSO 3c.* Classify magnetic materials as dia, para, and ferromagnetic based on their response to an external magnetic field *TSO 3d.* Explain Maxwell's equations in integral form with its physical significance. *TSO 3e.* Calculate the magnitude and direction of Poynting vector for a given EM wave and interpret energy transport per unit area.	**Unit- 3.0**: **Electromagnetism & Propagation of Waves (8 hrs)** 3.1 Electric fields, Gauss' Law, Dielectrics and Capacitors. 3.2 Magnetic fields & Magnetic Materials. 3.3 Maxwell's Equations. 3.4 Electromagnetic waves & Poynting Theorem
CO4	*TSO 4a.* Explain the need and requirement for Quantum Mechanics *TSO 4b.* Implement the idea of the De-Broglie hypothesis and uncertainty principle for solving problems *TSO 4c.* Explain the concept of wave functions with physical significance. *TSO 4d.* Solve the fundamental governing equations of quantum mechanics to determine the evolution of quantum systems. *TSO 4e.* Calculate the quantized energy levels and normalized wave functions for a particle confined in a one-dimensional infinite potential well. *TSO 4f.* Analyze the phenomenon of quantum tunneling to explain how particles penetrate classically forbidden energy barriers	**Unit- 4.0: Quantum Mechanics (8 hrs)** 4.1 Introduction to Quantum Mechanics. 4.2 De-Broglie hypothesis, Heisenberg uncertainty principle 4.3 Wave function and its characteristics 4.4 Schrödinger's equation (time-dependent and independent) 4.5 Particle in a box, Energy Eigen values and Eigen functions 4.6 Potential barrier and Tunneling
CO5	*TSO 5a.* Compare the band structures of metals, insulators and semiconductors to explain the differences in their electrical behavior.	**Unit- 5.0: Semiconductors & Nano-materials (10 hrs)** 5.1 Introduction, Types of materials (metal, semiconductor and insulator)

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
	TSO 5b. Distinguish between drift and diffusion current density to solve problems involving carrier transport in semiconductors. *TSO 5c.* Analyze the significance of Hall coefficient in identifying n-type and p-type semiconductors. *TSO 5d.* Evaluate the suitability of solar cells as renewable energy conversion devices in engineering systems. *TSO 5e.* Explain the properties of nanomaterials with applications. *TSO 5f.* Classify various nanomaterials on the basis of confinement.	5.2 Intrinsic and extrinsic semiconductors, P-type and N-type semiconductors, Diffusion, Drift and Fermi level 5.3 Photodiode, P-N junction transistor, LED 5.4 Hall effect 5.5 Solar cell and its characteristics. 5.6 Introduction to nanoscience& nanotechnology, the significance of nanoscale 5.7 Unique Properties: Comparison of bulk and nanomaterials, large surface-to-volume ratio, change in band gap, and optical/electrical/mechanical properties at the nanoscale. 5.8 Classification of Nanostructured Materials: 0D (Quantum Dot), 1D (Nanowire

Text / References: -

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Optics	Ajay Ghatak	Mcgraw Hill Education,2012, 5th Edition, ISBN-10: 1259004340
2.	Principles of Lasers	O.svelto	Springer Science &Business Media,2010, 5th Ed, ISBN-10: 1441913017
3.	Introduction to electrodynamics	David J. Griffiths	Pearson Education Cambridge University Press, 2023, 5th Edition, ISBN-10: 1009397729
4.	Principles of Electronic Materials and Devices	S.O. Kasap	McGraw Hill Education, Third Edition, 2006, ISBN-10: 0073104647
5.	Semiconductor Physics and Devices	Donald A. Neuman	McGraw-Hill Education, Fourth Edition, 2011, ISBN-10: 0073529583
6.	Introduction to Quantum Mechanics	David J. Griffiths	Pearson Education Cambridge University Press, 2016, 2nd Edition, ISBN-10: 1107179866
7.	Nanotechnology: Principles and Practices.	Sulabha K. Kulkarni	Springer Nature, Third Edition,2014, ISBN-10: 3319091700
8.	Concepts of Engineering Physics	S.K. Roy	Novelty Publication, 1st Edition, 2016-17
9.	Concepts of Engineering Physics	Kumari Mamta and Raj Kumar Singh	CRC Press-Taylor and Francis, United Kingdom, 1st Edition, ISBN 9781041191834

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
10	Physics Practical for Engineers	S.K. Roy	Novelty Publication, 1st Edition, 2018

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code-100106 **Basics of Electrical Engineering** **3 0 0 3**

Course Outcomes (COs)	Course Outcome Statements
CO1	Analyse DC circuits using fundamental circuit laws to determine voltage, current, power, and energy.
CO2	Analyse AC circuits using phasor representation, impedance, resonance, and power factor and modern power system concepts
CO3	Apply magnetic circuit concepts for Electrical equipment and machines
CO4	Assess the operational behaviour of a single-phase transformers to justify their selection for voltage control in everyday power systems.
CO5	Assess the operational behaviour of AC/DC and special electrical machines to justify their selection for industrial applications.

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
CO1	*TSO 1a.* Define basic electrical quantities: charge, current, voltage, resistance, inductance, capacitance and EMF. *TSO 1b.* Apply Ohm's Law to simple resistive circuits *TSO 1c.* Analyze effect of temperature on resistance *TSO 1d.* Apply Kirchhoff's Laws in circuit analysis *TSO 1e.* Solve DC networks to determine power and energy.	**Unit- 1.0: Electrical fundamentals and DC Circuits (8 hrs)** 1.1 Concept of Charge, Current, Voltage, Resistance, Inductance and Capacitance, EMF 1.2 Ohm's Law and Kirchhoff's Current and Voltage Laws 1.3 Effect of Temperature on Resistance 1.4 Resistor, Inductor & Capacitor: Properties and Applications 1.5 Series, parallel and series parallel resistor circuits, 1.6 Current and Voltage Divider Rules 1.7 Star-Delta and Delta-star transformations
CO2	*TSO 2a.* Represent sinusoidal quantities using phasors. *TSO 2b.* Calculate impedance of R, L, C, RL, RC and RLC circuits. *TSO 2c.* Analyze series and parallel resonance; determine resonant frequency, Q-factor, and bandwidth. *TSO 2d.* Calculate real, reactive, apparent power and power factor. *TSO 2e.* Explain the benefits of improving power factor	**Unit- 2.0: AC Circuits (10 hrs)** 2.1 Generation of sinusoidal EMF; Peak, RMS, average values; form factor; Wave and phasor representation 2.2 Impedance of R, L, C circuits; RL, RC, RLC series and parallel circuits; series and parallel resonance. 2.3 Power in AC circuits: Active, reactive, apparent power 2.4 Power factor - Unity, lag, lead, Power factor improvement, advantages 2.5 Harmonics, source and its impact

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
	TSO 2f. Explain the source of harmonics and its impact. *TSO 2g.* Explain the need and advantages *TSO 2h.* of three-phase systems *TSO 2i.* Evaluate line and phase relationships in balanced systems *TSO 2j.* Measure and compute three-phase power in balanced circuits	2.6 Three-phase systems, concept need and advantages 2.7 Single Phase vs Three Phase System (Advantages), Phase sequence 2.8 Balanced and unbalanced supply and load and line-phase relationships 2.9 Voltage, Current relationship and power in Star and Delta connections 2.10 Power in balanced three phase circuits
CO3	*TSO 3a.* Define various terms related to magnetic circuits *TSO 3b.* Explain the basic properties of the given Magnetic materials. *TSO 3c.* Interpret the B-H curve and hysteresis loop of the given material. *TSO 3d.* Analyze analogy with electric circuits *TSO 3e.* Evaluate magnetic losses *TSO 3f.* Perform magnetic circuit calculations *TSO 3g.* Explain the principles of electromagnetic induction with the help of Faraday's laws *TSO 3h.* and concepts of self and mutual inductance. *TSO 3i.* Justify the application of Fleming's Right-hand rule and Fleming's Left-hand rule to DC Generator and DC motor	**Unit- 3.0: Magnetic Circuits and Electromagnetic induction (10 hrs)** 3.1 Magnetic circuits - Magnetic Flux, Magnetic intensity, Flux Density(B), Magnetomotive Force (MMF) 3.2 Reluctance, Permeability, simple numerical 3.3 Analogy between Electric and Magnetic circuits 3.4 Basic Properties of Magnetic materials 3.5 Magnetic Circuits with DC Excitation 3.6 Magnetic Leakage 3.7 B-H Curve 3.8 Hysteresis and Eddy Current Losses 3.9 Magnetic Circuit Calculations 3.10 Electromagnetic induction - Faradays Laws, Fleming's right hand and left-hand Rules, 3.11 Statically and dynamically induced EMF; Concepts of self-inductance, mutual inductance and coefficient of coupling; Energy stored in magnetic fields.
CO4	*TSO 4a.* Describe the construction, working principle of a single-phase transformer. *TSO 4b.* Evaluate transformer performance using load test *TSO 4c.* Differentiate between power and distribution transformer *TSO 4d.* List the special purpose transformer and their uses.	**Unit- 4.0: Transformer (8 hrs)** 4.1 Transformer - Construction, principle of operation, Single phase v/s three phase transformer 4.2 Emf equation 4.3 Transformer performance – Load test -Voltage regulation, losses and efficiency. 4.4 Single phase v/s 3 phase transformer and its uses 4.5 Special purpose transformers- Introduction and applications only- Audio transformer, Radio Frequency (RF) Transformer, Intermediate Frequency (IF) transformer, Pulse transformer,

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
		Isolation transformer, Impedance matching transformer
CO5	*TSO 5a.* Describe the parts and materials used in a DC machine. *TSO 5b.* Justify the use of different DC motors for a specific application *TSO 5c.* Explain concept of rotating magnetic field, slip and need of starters for three-phase induction motors. *TSO 5d.* Describe the starting methods of a single-phase induction motor. *TSO 5e.* Describe the construction, working and applications of a given special electrical machine.	**Unit- 5.0: Electrical and Special Purpose Machines (6 hrs)** 5.1 DC machines: construction, EMF equation, types of DC Motor and applications, need of DC motor starter 5.2 AC machines: Three-phase induction motor construction, working, types, slip, need of starter, DOL, star-delta starter 5.3 Construction, working principle of single-phase induction motors, Starting methods 5.4 Construction, working and applications of - (i) BLDC motor (ii) Servo motor (iii) Stepper motor (iv) Switched Reluctance motor (v) Universal motor (vi) Coreless motor

Text / References: -

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Basic Electrical and Electronics Engineering	Vinoth Kumar K., Saravanakumar R., Jegathesan V., Kowsalya M., Mahesh M.	Wiley India, New Delhi, 2nd Ed., 2022, ISBN: 978-9354643194
2.	Fundamentals of Electrical and Electronics Engineering (with Lab Manual)	Susan S. Mathew and Saji T. Chacko	Khanna Book Publishing Co., 2021, ISBN: 978-9391505592
3.	Basic Electrical Engineering	V. Mittle, Arvind Mittle	McGraw Hill Education, 2017 ISBN: 978-0070593572
4.	Basic Electrical Engineering	D.C. Kulshreshtha	Tata McGraw-Hill, 3rd Ed., 2019, ISBN: 978-0070083929
5.	Basic Electrical and Electronics Engineering	D.P. Kothari & I.J. Nagrath	Tata McGraw Hill, 2nd Ed., 2020 ISBN: 978-9389811247
6.	Principles of Electrical Engineering	V.K. Mehta and Rohit Mehta	S. Chand & Co., 2nd Ed., 2018,

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
			ISBN: 978-8121924870
7.	Basic Electrical and Electronics Engineering	M.S. Sukhija, T. K. Nagsarkar	Oxford University press,2012 ISBN: 978-0198081807
8.	A Course in Electrical and Electronic Measurements and Instrumentation	A.K. Sawhney and Puneet Sawhney	Dhanpat Rai & Co., 19th Ed., 2018, ISBN: 978-8177001006
9.	Basic Electrical Engineering.	C.L. Wadhwa	New Age International, 2007 ISBN-10: 9788122421521 ISBN-13: 978-8122421521
10.	Textbook of Electrical Technology – Volume I	B.L. Theraja& A.K Theraja,	S. Chand Publication, 2022, 23 edition, ISBN-10: 8121924405 ISBN-13: 978-8121924405
11.	Textbook of Electrical Technology AC and DC Machines –Volume II	B.L. Theraja& A.K Theraja,	S. Chand Publication,2025 ISBN 10:9355018258 ISBN 13:9789355018250

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code-100105 **Introduction to AI** **3 0 0 3**

Course Outcomes (COs)	Course Outcome Statements
CO1	Explain the foundational concepts of Artificial Intelligence, including its inception, intelligent agents, and types of task environments.
CO2	Trace uninformed, informed, local, and adversarial search strategies for solving AI problems.
CO3	Perform manual logical inference using propositional and predicate logic by considering the methods of knowledge representation
CO4	Apply probabilistic reasoning and basic fuzzy-logic concepts to handle uncertainty in AI systems.
CO5	analyze the foundational machine learning paradigms underlying the design and implementation of AI-based systems.

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
CO1	*TSO 1a.* Explain the evolution and foundational philosophies of AI. *TSO 1b.* Describe the structure and functioning of intelligent agents using the PEAS framework. *TSO 1c.* Classify task environments based on their properties. *TSO 1d.* Differentiate between types of agents based on their internal architecture. *TSO 1e.* Outline AI application domains across engineering disciplines.	**Unit- 1.0: Introduction to Artificial Intelligence (8 hrs)** 1.1 What is AI? History and evolution of AI 1.2 Foundations of AI: philosophy, mathematics, and cognitive-science influences 1.3 Intelligent agents: agent–environment interaction, PEAS (Performance measure, Environment, Actuators, and Sensors) description 1.4 Types of environments (observable, deterministic, episodic, static, discrete, single/multi-agent) 1.5 Types of agents: simple reflex, model-based, goal-based, utility-based, learning agents 1.6 Overview of AI application domains across engineering disciplines
CO2	*TSO 2a.* Represent a given real-world problem as a state-space search problem. *TSO 2b.* Trace uninformed search strategies manually and compare their complexity. *TSO 2c.* Trace informed search strategies using suitable heuristic functions. *TSO 2d.* Verify the admissibility and	**Unit- 2.0: Problem Solving by Search (9 hrs)** 2.1 Problem formulation and state-space representation 2.2 Uninformed search: BFS, DFS, Uniform Cost Search, Depth-Limited and Iterative Deepening Search 2.3 Informed (heuristic) search: Greedy Best-First Search, A* algorithm

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
	consistency of a given heuristic. *TSO 2e.* Illustrate local search techniques for simple optimisation problems. *TSO 2f.* Trace adversarial search with alpha-beta pruning for a two-player game. *TSO 2g.* Illustrate simple Constraint Satisfaction Problems (CSPs).	2.4 Heuristic function design and admissibility/consistency 2.5 Local search algorithms: Hill Climbing, Simulated Annealing (concept) 2.6 Adversarial search: Minimax algorithm, Alpha-Beta pruning 2.7 Constraint Satisfaction Problems (CSP): concept, backtracking (overview)
CO3	*TSO 3a.* Represent simple real-world facts using propositional and predicate logic. *TSO 3b.* Apply resolution manually to perform logical inference. *TSO 3c.* Trace forward and backward chaining to derive conclusions from a knowledge base. *TSO 3d.* Represent structured knowledge using semantic networks and frames. *TSO 3e.* Outline the design of a simple rule-based (production) system for a given domain.	**Unit- 3.0: Knowledge Representation and Reasoning (8 hrs)** 3.1 Knowledge representation issues; propositional logic — syntax and semantics 3.2 Inference in propositional logic: resolution 3.3 First-order predicate logic — syntax, quantifiers (concept) 3.4 Inference in first-order logic: forward chaining, backward chaining, resolution (concept) 3.5 Structured knowledge representation: semantic networks, frames 3.6 Rule-based (production) systems
CO4	*TSO 4a.* Explain the need for probabilistic reasoning in AI. *TSO 4b.* Apply Bayes' theorem to compute conditional probabilities in AI problems. *TSO 4c.* Construct a simple Bayesian network for a given scenario. *TSO 4d.* Explain the basic principles of fuzzy logic and fuzzy-set operations.	**Unit- 4.0: Reasoning Under Uncertainty (7 hrs)** 4.1 Sources of uncertainty; review of basic probability theory 4.2 Bayes' theorem and its application to AI reasoning 4.3 Bayesian networks: representation and manual inference (overview) 4.4 Introduction to fuzzy logic and fuzzy sets 4.5 Certainty factors and rule-based uncertainty (overview)
CO5, CO6	*TSO 5a.* Differentiate between supervised, unsupervised, and reinforcement learning paradigms. *TSO 5b.* Describe the working principle of basic regression, classification, and clustering techniques. *TSO 5c.* Describe the basic structure of a perceptron and an artificial neural network. *TSO 5d.* Describe applications of AI in	**Unit- 5.0: Introduction to Machine Learning and AI Applications (10 hrs)** 5.1 Machine learning paradigms: supervised, unsupervised, reinforcement learning (concept) 5.2 Overview of regression and classification concepts (linear regression, k-NN, decision trees) 5.3 Overview of clustering concept (k-means) 5.4 Introduction to artificial neural networks: perceptron, basic architecture (concept)

Mapped CO(s) Number	Relevant Major Theory Session Outcomes (TSOs)	Relevant Units/ Body of Knowledge (BoK)
	natural language processing, computer vision, and expert systems. *TSO 5e.* Identify ethical, bias-related, and societal implications of AI deployment. *TSO 5f.* Relate AI applications to sustainable development goals and multidisciplinary engineering contexts.	5.5 Overview of Natural Language Processing (NLP): concept and applications 5.6 Overview of Computer Vision: concept and applications 5.7 Expert systems: architecture and applications 5.8 Robotics and AI: overview of intelligent robotic systems 5.9 Ethics, bias, and responsible AI; societal impact; AI and Sustainable Development Goals (SDGs)

Text / References:-

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson; 4th Ed., 2020. ISBN: 978-0134610993
2.	AI for everyone	Saptarsi Goswami, Amit Kumar Das, Amlan Chakrabarti	Pearson Education: SBN-10 : 9361591754, ISBN-13: 978-9361591754
3.	Introduction to Artificial Intelligence and Expert Systems	Dan W. Patterson	PHI Learning; 2015. ISBN: 978-8120307775
4.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B. Nair	McGraw-Hill; 3rd Ed., 2017. ISBN: 978-1259029420
5.	Artificial Intelligence - A Modern Approach	Dilip Narayan Sahu, Kishore Kumar Dash, Abahy Kolhe, Agilandeswari Devarajan	ISBN-10: 9355151446 ISBN-13: 978-9355151445
6.	Machine Learning Essentials	Dhairya Parikh	Vibrant Publishers: ISBN-10: 1636513778, ISBN-13: 978-1636513775

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code-100101P **Communication Skills Lab** **0 0 2 1**

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO1 CO2 CO4	*LSO 1.1* Integrate all four skills (LSRW) for effective communication *LSO 1.2* Improve accuracy, fluency, and clarity in English usage *LSO 1.3* Develop practical communication competence.	**LE- 1 Skills of Communication (LSRW)** • Listening to audio/video lectures and summarizing, Reading comprehension with group discussion. • Role play on workplace Scenarios, Story/narrative reconstruction from audio input • Group presentations based on reading materials, note-taking, and report writing from lectures
CO1 CO2	*LSO 2.1* Demonstrate effective interpersonal communication *LSO 2.2* Participate in academic activities like presentations and group discussions *LSO 2.3* Communicate effectively across different environments	**LE- 2 Introduction: Social, Academic, and Professional** • Self-introduction and introducing others. • Face-to-face conversation practice. • Role plays (workplace interactions, daily situations) • Group presentations, Group discussion, and practice • Debate and panel discussion, Seminar presentation with Q&A • Situational communication (office, social, academic contexts)
CO3	*LSO 3.1* Recognize audience, context, and Objective of a presentation *LSO 3.2* Deploy appropriate body language, gestures, and eye contact *LSO 3.3* Utilize tools like slides, charts and visuals effectively	**LE- 3 Oral Presentation** ➢ Oral presentation: Audience • Selection, Presentation Techniques ➢ Posture, gesture, and stage presence • Facial expressions • Eye contact techniques ➢ Basics of slide design • Text vs visuals, • Using an image and icon, • Slide timing and pacing, • Common slide mistakes
CO1 CO3	*LSO 4.1* Demonstrate the role of an anchor and speaker in events	**LE- 4 Anchoring and Addressing** ➢ Role of an anchor vs speaker • Types of anchoring

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
	LSO 4.2 Introduce speakers, guests, and events effectively *LSO 4.3* Apply body language, gestures, and eye contact effectively	• Event flow management ➢ Formal vs. informal introduction • Avoiding common mistakes • Building audience interest ➢ Emotional connection, • Voice modulation • Movement on stage • Managing nervous habits.
CO2 CO4	*LSO 5.1* Comprehend the expectations of interviewers and candidates *LSO 5.2* Prepare answers to relevant questions *LSO 5.3* Demonstrate active listening during the interview *LSO 5.4* Apply proper greetings and etiquette	**LE- 5 Interview** ➢ Interviews: Types, • Employer vs candidate • Common interview mistakes • SWOT Analysis ➢ Structuring clear and concise answers • Avoiding memorized/robotic answers. ➢ Listening to questions cautiously • Non-verbal listening cues (nodding, eye contact), • Avoiding interruptions ➢ First impressions in interviews, • Professional greetings (verbal + non-verbal)
CO2 CO4	*LSO 6.1* The purpose and types of group discussions *LSO 6.2* Perform in different roles such as initiator, participant, and moderator *LSO 6.3* Analyze topics from multiple perspectives	**LE- 6 Group Discussion** ➢ GD: types • (academic, professional, selection-based) • Do's and Don'ts in GD ➢ Role of initiator • Role of participant • Role of moderator/leader • Managing interruptions, • Handling conflicts and disagreements ➢ Structuring arguments logically, • Supporting points with examples/data.
CO1 CO2	*LSO 7.1* Differentiate between debate, seminar, symposium, and conference	**LE- 7 Debate, Seminar, Symposium, Conference**

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO3 CO4 CO5	*LSO 7.2* Respond to other speakers' viewpoints *LSO 7.3* Apply basic research techniques on assigned topics	➢ Debate • Seminar, • Symposium, • Conference. ➢ Paraphrasing and summarizing • Avoiding interruptions • Constructive feedback techniques • Identifying reliable sources (websites, journals, reports), • Note-taking and organizing information, • Plagiarism • Converting research into speaking points, • Using data/examples
CO1 CO2 CO5	*LSO 8.1* Generate creative and original ideas on unfamiliar topics *LSO 8.2* Use imagination effectively in communication *LSO 8.3* Express ideas clearly and logically within a short time	**LE- 8 Just A Minute Technique with Out of the Box Thinking** ➢ Techniques for Idea Generation • Brainstorming, • Mind mapping • SCAMPER technique (Substitute, Combine, Adapt, Modify, put to other use, Eliminate, Reverse) ➢ Storytelling • Creating mental images through words • Emotional connection and expression ➢ Speaking within time limits • Organizing thoughts quickly,
CO5	*LSO 9.1* Apply basic concepts of phonetics and pronunciation *LSO 9.2* Use the International \ Phonetic Alphabet (IPA) symbols *LSO 9.3* Improve clarity and accuracy in pronunciation	**LE- 9 Sounds, Intonation, and IPA** ➢ Phonetics • Sounds: Vowels and consonants, • Syllables and word stress • Common pronunciation errors influenced by mother tongue) ➢ IPA symbols for English sounds, • IPA for vowels (short, long, diphthongs), • IPA for consonants, using a dictionary with IPA Stress marks in IPA

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
		➢ Word stress and sentence stress, • Commonly mispronounced words, • Rhythm and fluency • Self-correction techniques,
CO3 CO5	*LSO 10.1* Identify the purpose of role play, peer learning, and group activities *LSO 10.2* Adapt communication style based on roles and situations *LSO 10.3* Develop creative thinking and problem-solving skills	**LE- 10 Activities: Role Play, Peer Activities, and Group Activities** • Role Play • Group Activities ➢ Role-Based Communication • Situational Communication • Tone, language, and • Behaviour adjustment, • Verbal and non-verbal • adaptation, ➢ Problem-solving • Creative thinking techniques • Decision-making • Evaluating multiple • solutions, • Real-life problem • Innovation and idea • generation.

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code- 100104P **Engineering Physics Lab** **0 0 2 1**

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO1&CO2	*LSO 1.1* Measure the wavelength of a given light source using a plane diffraction grating	LE- 1 Diffraction Grating.
CO1	*LSO 2.1* Measure the wavelength of given monochromatic light source using Newton's Ring Experiment *LSO 2.2* Measure the radius of curvature of the given plano-convex lens using Newton's Ring Experiment.	LE- 2 Newton's Ring Experiment
CO1	*LSO 3.1* Determine the resolving power of a given telescope	LE- 3 Resolving Power of Telescope
CO1	*LSO 4.1* Determine the specific rotation of cane sugar solution using a polarimeter	LE- 4 Polarimeter
CO2	*LSO 5.1* Determine the Numerical Aperture of given optical fiber	LE- 5 Numerical Aperture Optical Fiber (Virtual Lab)
CO3	*LSO 6.1* Measure the dielectric constant of given dielectric materials	LE- 6 Dielectric Constant
CO4	*LSO 7.1* Determine the value of Planck's constant using a photocell.	LE- 7 Measurement of Plank's Constant
CO4	*LSO 8.1* Determine the wavelength of a given electron beam.	LE- 8 LE-8 Stern-Gerlach Experiment (Virtual Lab)
CO5	*LSO 9.1* Determines the I-V characteristic of a given p-n junction diode	LE- 9 p-n junction
CO5	*LSO 10.1* Determine hole and electron density in given semiconductor	LE- 10 Hall effect experiment
CO5	*LSO 11.1* Use four-probe method to determine the resistivity of the given semiconductor material	LE- 11 Energy Band Gap Measurement
CO5	*LSO 12.1* Demonstrate the change in absorption of light on changing size of nanoparticle	LE- 12 Changing nanoparticle size alters light absorption.

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code-100106P **Basic Electrical Engineering Lab** **0 0 2 1**

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO1	*LSO 1.1* Measure voltage, current, and resistance using standard instruments. *LSO 1.2* Apply color code to identify resistor values. *LSO 1.3* Compare expected with measured values.	LE- 1 Measurement of various electrical parameters
CO1	*LSO 2.1* Verify ohm's law in a nonlinear circuit	LE- 2 Verification of ohm's law in a nonlinear circuit
CO1	*LSO 3.1* Apply KVL to a series circuit and verify the sum of voltage drops equals applied voltage. *LSO 3.2* Apply KCL to a parallel circuit and verify the sum of branch currents equals total current.	LE- 3 Verification of Kirchhoff's Current Law and Voltage Law
CO2	*LSO 4.1* Measure average value, peak value and RMS value of AC waveform. *LSO 4.2* Measure time and frequency of AC waveform using CRO	LE- 4 Measurement of AC signal parameters
CO2	*LSO 5.1* Measure impedance, current, and power factor in a series RL and RC circuit.	LE- 5 Measurement of impedance, current, and power factor
CO2	*LSO 6.1* Measure power and determine pf in a circuit connected to a resistive and inductive load *LSO 6.2* Differentiate between the power and PF obtained in resistive and inductive circuit	LE- 6 Measurement of power and power factor in a single-phase ac series in a - (i) Resistive circuit (ii) Inductive circuit.
CO2	*LSO 7.1* Connecting different types of lamps *LSO 7.2* Observe the power consumption and energy saved due to LED lamp	LE- 7 Energy efficient lamp - Measurement of power consumption of an Incandescent lamp, fluorescent lamp (tube light) and a LED light of same rating.
CO2	*LSO 8.1* Make a star and delta connection to measure line and phase voltage in a 3 phase AC circuit.	LE- 8 Line and Phase voltage measurement of star - delta connection circuit in a 3 phase AC circuit
CO4	*LSO 9.1* Determine the voltage ratio and polarity of a given single-phase transformer *LSO 9.1* Interpret the results.	LE- 9 Determination of (i) Voltage ratio (ii) Polarity of a single-phase Transformer
CO4	*LSO 10.1* Identify the correct specification autotransformer to be used according to load current	LE- 10 Autotransformer specification
CO4	*LSO 11.1* Vary input supply voltage using a single-phase transformer *LSO 11.4* Vary input ac supply voltage using a single-phase autotransformer.	LE- 11 Variation of input supply voltage using a single-phase autotransformer

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO4	*LSO 12.1* Identify a transformer by its ratings. *LSO 12.2* Determine the voltage ratio and polarity of a given single-phase transformer. *LSO 12.3* Measure primary and secondary voltages under no-load and load conditions.	LE- 12 Determination of the voltage ratio and polarity of a single-phase transformer.
CO4	*LSO 13.1* Determine losses, efficiency and voltage regulation of a single-phase transformer *LSO 13.2* Interpret the results	LE- 13 Determination of the performance of a single-phase transformer by direct load test
CO4	*LSO 14.1* Determine losses, efficiency and voltage regulation of a single-phase transformer using OC and SC test *LSO 14.2* Interpret the results	LE- 14 Determination of the performance of a single-phase transformer OC and SC test
CO5	*LSO 15.1* Identify the parts of a three-phase induction motor *LSO 15.2* Operate a three-phase induction motor using DOL starter.	LE- 15 Operation of induction motor and starter.
CO5	*LSO 16.1* Demonstrate the cut section model of a given type of motor Determine efficiency under varying load.	LE- 16 Demonstration of cut-out sections of machines: DC machine, three phase induction machine, Single phase induction machine and synchronous machine.
CO5	*LSO 17.1* Change the phase sequence of a given 3 phase induction motor. *LSO 17.2* Observe the reversal of direction of the motor	LE- 17 Reverse the direction of a given three phase induction motor by reversing the Phase sequence
CO5	*LSO 18.1* Identify different parts of a single-phase induction motor *LSO 18.2* Reverse the direction of rotation of a single-phase induction motor of a ceiling fan, single phase induction motor and universal motor.	LE- 18 Identification of different parts of a single-phase induction motor and reversing the direction of rotation

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code-100112P **Programming for Problem Solving Lab** **0 0 2 1**

Course Outcomes (COs)	Course Outcome Statements
CO1	Develop basic C programs to solve the given problems by developing algorithms.
CO2	Implement structured programming constructs to solve computational problems in C.
CO3	Apply advanced memory and data management techniques to design efficient C programs.
CO4	Design object-oriented C++ programs using foundational Object-Oriented Programming (OOP) principles.
CO5	Apply advanced Object-Oriented Programming (OOP) concepts to build robust software solutions.

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO1, CO2	*LSO 1.1* Construct flowcharts to represent the algorithmic steps for solving given problems. *LSO 1.2* Apply type casting and data types to ensure accurate numerical results. *LSO 1.3* Apply standard input/output functions to interact with users in C programs.	LE- 1 **Algorithmic Logic & Basic I/O** • Write a C program to calculate the area of various geometrical shapes (circle, triangle, rectangle) using appropriate data types and type casting, accompanied by a flowchart.
CO1, CO2	*LSO 2.1* Implement conditional statements for decision making. *LSO 2.2* Use switch-case statements to implement multiway branching.	LE- 2 **Decision Making Systems** • Develop a Student Grading and Classification System using an if-else ladder and a switch-case to handle marks for grading and classify eligible fee waivers by category.
CO1, C02	*LSO 3.1* Apply iterative logic to solve numerical computation problems. *LSO 3.2* Formulate looping methods to generate sequential patterns.	**LE- 3 Iterative Problem Solving** • Develop a C program to perform the following tasks by using while and for loops: i) Find all prime numbers between 1 and N ii) Generate the Fibonacci sequence for the value of N.
CO2	*LSO 4.1* Implement a single-dimensional array for the given problem.	**LE- 4 1-D Array Operations** • Write a C program **to:** i) Find the maximum/ minimum element using Linear Search ii) Calculate the average of elements in a 1-D array.

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO2	*LSO 5.1* Perform operations on multi-dimensional array.	**LE- 5 Matrix Manipulation (2-D Arrays)** • Write a C program to perform the following tasks: i) Matrix Multiplication ii) Find the transpose of a matrix using 2-D arrays
CO2, CO3	*LSO 6.1* Apply pointer arithmetic to traverse and manipulate the string elements. *LSO 6.2* Design a string reversal algorithm using pointer-based swapping logic.	**LE- 6 Pointer Arithmetic & Strings** • Write a C program to perform the following tasks without using pointer arithmetic: i) Reverse a string ii) Count vowels/consonants of the given string using pointers
CO2, CO3	*LSO 7.1* Develop iterative and recursive functions to solve mathematical problems. *LSO 7.2* Evaluate the time and space complexity of different functional methods.	**LE- 7 Recursion vs. Iteration** • Write a C program to perform the following tasks by using both iterative and recursive functions to compare logic flow: i) Find the factorial value for the given number ii) Find the Greatest Common Divisor (GCD)
CO2, CO3	*LSO 8.1* Use call-by-value and call-by-reference mechanisms. *LSO 8.2* Implement swap operations using pointers.	**LE- 8 Parameter Passing Mechanisms** • Develop a C program that swaps two values and updates an array using both Call by Value and Call by Reference.
CO2, CO3	*LSO 9.1* Construct hierarchical data models using structures to manage the related features simultaneously. *LSO 9.2* Implement unions to optimize memory usage for mutually exclusive data members. *LSO 9.3* Analyze the memory occupation of structures and unions using the size of operator.	**LE- 9 User-Defined Data Types** • Create an "Employee Payroll System" using Structures and Unions in C to store employee details and compare memory allocation between them.
CO3	*LSO 10.1* Create structured records into external text files. *LSO 10.2* Use file reading operations to retrieve the stored data. *LSO 10.3* Display the stored data on the console. *LSO 10.3* Design search logic to extract specific file records based on keywords.	**LE- 10 File Handling Operations** • Write a program to create a text file and perform the following tasks: i) Write student records ii) Read the student records and display records
CO4	*LSO 11.1* Construct a class to encapsulate the data using private access specifiers.	LE- 11 **Classes, Objects & Encapsulation**

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
	LSO 11.2 Implement public member functions to define controlled interfaces for interacting with internal object states. *LSO 11.3* Instantiate multiple objects to demonstrate independent state management within the given class framework.	• Design a Bank Account class with private data members for balance and public member functions for deposit, withdraw, and display.
CO4	*LSO 12.1* Use multiple constructors to initialize objects with different types of data values. *LSO 12.2* Apply dynamic memory allocation within constructors. *LSO 12.3* Apply destructors to deallocate the memory automatically.	**LE- 12 Constructors & Memory Management** • Implement a String class that utilizes Constructors (Default, Parameterized, and Copy) and a Destructor to manage the memory dynamically.
CO4	*LSO 13.1* Implement static data members to maintain a shared state across all instances. *LSO 13.2* Use static member functions to access class members independently. *LSO* 13.*3* Create friend functions to permit controlled access to private data members.	**LE- 13 Static Members & Friend Functions** • Develop a program that uses a static member to track the number of objects created and a friend function to compare private data of two different classes.
CO5	*LSO 14.1* Implement inheritance concepts.	**LE- 14 Implementation of Inheritances** • Write a C++ program to demonstrate the various arithmetic operations using the following different inheritance concepts: i) Single Inheritance ii) Multiple Inheritance iii) Multilevel Inheritance iv) Hierarchical Inheritance v) Hybrid/virtual Inheritance
CO5	*LSO 15.1* Design abstract classes containing pure virtual functions to establish mandatory interfaces. *LSO 15.2* Apply function overloading to perform arithmetic operations. *LSO 15.3* Use operator overloading to redefine standard arithmetic symbols on complex number objects.	**LE- 15 Polymorphism & Abstract Classes** • Write C++ programs to demonstrate the following: i) Create an Abstract Class Shape with a pure virtual function draw (). ii) Find the area of the shape using function overloading. iii) Perform the addition of two complex numbers using operator overloading.
CO5	*LSO 16.1* Implement try-catch blocks to handle runtime errors.	**LE- 16 Robust Error Management**

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
	LSO 16.2 Utilize the throw mechanism to signal specific error conditions. *LSO 16.3* Design resilient error-handling logic to prevent invalid data entry.	• Write a C++ program to demonstrate the exception handling process using try, catch, and throw blocks to handle exceptions such as "Division by Zero" or "Negative Stock Input."
CO5	*LSO 17.1* Write function templates and class templates for generic algorithms.	**LE- 17 Template Implementation** • Write a C++ program using template functions and class templates: a function to find the max of two values, and a class template like pair to store values of any data type.

B.Tech (1st Semester) **GROUP-B** **Batch-2026-30**

Course Code- 100113P **Sports/Yoga/NCC/NSS** **0 0 2 1**

Course Outcomes (COs)	Course Outcome Statements
CO1	Apply the principles of health, physical fitness, nutrition, sports, and healthy lifestyle practices for enhancing personal well-being and professional effectiveness.
CO2	Perform fundamental yogic postures, breathing techniques (Pranayama), and yogic principles for improving flexibility, posture, and physical fitness
CO3	Apply meditation and relaxation techniques to improve concentration, emotional balance, stress management, and mental well-being.
CO4	Participate effectively in sports and recreational activities while demonstrating teamwork, leadership, sportsmanship, ethics, and discipline and develop a personal lifelong fitness and wellness programme

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
CO1	*LSO 1.1* Measure and interpret personal health and fitness indicators *LSO 1.2* Follow safe exercise practices	LE- 1 Assessment of Body Mass Index (BMI), resting heart rate and physical fitness parameters
	LSO 1.3 Physical fitness tests (Sit-and-Reach, Push-up, Sit-up, Shuttle Run, Standing Broad Jump)	LE- 2 Evaluate Flexibility using standard fitness tests.
		LE- 3 Evaluate Endurance using standard fitness tests.
		LE- 4 Evaluate muscular strength using standard fitness tests.
		LE- 5 Evaluate agility using standard fitness tests.
	LSO 1.4 Perform warm-up and stretching exercises safely before and after physical activity	LE- 6 Practice of warm-up, stretching and cool-down exercises
	LSO 1.5 Prepare individual weekly fitness and nutrition plan	LE- 7 Develop a simple fitness and healthy lifestyle plan based on personal fitness assessment.
CO2	*LSO 2.1* Perform standing yoga postures with correct posture and balance.	LE- 8 Perform Standing Asanas (Tadasana, Trikonasana, Vrikshasana
	LSO 2.2 Demonstrate sitting and relaxation postures to improve flexibility and digestion.	LE- 9 Perform Sitting Asanas (Vajrasana, Paschimottanasana, Pavanamuktasana)
	LSO 2.3 Perform prone postures for strengthening the back and improving spinal flexibility.	LE- 10 Practice of Prone Asanas (Bhujangasana, Shalabhasana, Makarasana

Mapped CO(s) Number	Practical/ Lab Session Outcomes (LSOs)	Laboratory Experiment/ Practical Titles
	LSO 2.4 Perform breathing techniques to improve respiratory efficiency and concentration	LE- 11Practice of Pranayama (Deep Breathing, Anulom-Vilom, Bhramari and Kapalbhati)
CO3	*LSO 3.1* Perform mindfulness meditation to improve attention and concentration.	LE- 12 Practice of Mindfulness Meditation
	LSO 3.2 Perform breath awareness and chanting techniques for mental relaxation.	LE- 13 Practice of Om Chanting and Breath Awareness Meditation
	LSO 3.3 Apply relaxation techniques to reduce stress and improve mental calmness.	LE- 14 Practice of Shavasana and Guided Relaxation (Yoga Nidra)
	LSO 3.4 Monitor personal stress levels and evaluate the benefits of regular meditation practice.	LE- 15 Daily Meditation Log and Stress Self-Assessment
CO4	*LSO 4.1* Practice and demonstrate basic athletic skills with proper techniques	LE- 16 Practice fundamental skills in Athletics (Sprint, Relay, Long Jump or Throw Events)
	LSO 4.2 Practice and demonstrate basic game skills, teamwork and communication during play	LE- 17 Practice fundamental skills in one Team Game (Volleyball, Football, Basketball, Cricket or Kho-Kho)
	LSO 4.3 Apply the basic rules of games and demonstrate leadership and fair play.	LE- 18 Officiating and Conduct of Mini Sports Competition
	LSO 4.4 Design and implement a personal fitness programme for lifelong health and wellness.	LE- 19 Preparation and presentation of a Personal Lifelong Fitness and Wellness Programme including Stress Management Practices