Dr. D. Y. Patil Educational Federation's
Dr. D. Y. Patil College of Engineering and Innovation
APPROVED BY AICTE, RECOGANIZED BY GOVT. OF MAHARASHTRA,
AUTONOMOUS INSTITUTE AFFILIATED TO SAVITRIBAI PHULE PUNE UNIVERSITY
Accredited by NAAC with "A" Grade

ACADEMIC COURSE STRUCTURED

AND

DETAILED SYLLABUS

F. Y. B.Tech.

Computer Engineering (CE),

Artificial Intelligence & Data Science (AI-DS),

Artificial Intelligence & Machine Learning (AI-ML)

B.Tech. 4 YEAR UG COURSE

(Applicable for the batches admitted from AY 2025-2026 at FY)

Dr. D. Y. Patil College of Engineering & Innovation

Survey No. 27/A/1/2C, Varale Campus,
Near Talegaon Railway Station,
Tal. Maval, Dist. Pune 410 507,
Ph: 020 48522561, 565,566
Web Site: https://www.dypcoei.edu.in,
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Vision and Mission of the Institute

Vision of DYPCOEI

To achieve excellence in quality education through value based rapidly changing technologies and create technical Human-Resource with proficiencies of accepting new challenges.

Mission of DYPCOEI

M1: Continuously strive to impart value-based education to elevate the satisfaction level of all stakeholders.

M2: Take dedicated efforts to create competent professionals by effective teaching learning process with passion of lifelong learning attitude.

M3: Our endeavour is to promote and support innovative research, entrepreneurship and development activities through Industry Interaction.

Vision and Mission of the Department

Vision of Department:

To Groom - Motivated, Environment Friendly, Self-esteemed, Creative and Oriented Engineers.

Mission of Department:

To Develop Industry Oriented Manpower to accept the challenges of Globalization by,

M1: Promoting Value Education through motivated trained faculty.

M2: Maintaining Conducive Environment for education at affordable cost.

M3: Promoting Industry Institute Interaction and involving alumni.

Program Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.

PO3: Design / Development of Solutions: Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.

PO4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modelling to complex Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in Multidisciplinary settings.

PO10: Communication Skills: Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.

PO12: Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program – B. Tech. (First Year Engineering)

(Autonomous Curriculum Structure for students admitted from AY 2025-26 at FY)

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical (Lab) per week	1 credit

B. Range of Credits:

Student will become eligible to get Under Graduate (UG) BTech degree in Computer Engineering (CE)/ Artificial Intelligence & Data Science (AI-DS)/ Artificial Intelligence and Machine Learning (AI-ML) after earning **160 credits.** A student will be eligible to get Under **Graduate degree with Honors** or additional **Minor Engineering**, if he/she completes an additional **20 credits from SEM-V to SEM-VIII.**

C. Credit for B.Tech Degree in CE/AI-DS/AI-ML:

Sr. No.	Year	Semester	Credits
1	First Year	I	22
2		II	22
3	Second Year	III	22
4		IV	22
5	Third Year	V	20
6		VI	16
7	Final Year	VII	18
8		VII	18
Total Credits			**160**

D. Structure of B.Tech. Program

Abbreviation	Course Type	Credit
BSC	Basic Science Courses	18
ESC	Engineering Science Courses	19
PCC	Program Core Courses	41
PEC	Program Elective Courses	20
CEP	Community Engagement Project	02
VAC	Value Added Courses	04
IAP	Internship and Project	11
MDM	Multidisciplinary Minor	14
OEC	Open Elective Courses	08
VSE	Vocational and Skill Enhancement Course	06
REM	Research Methodology	03
EMC	Entrepreneurship and Management Courses	04
AEC	Ability Enhancement Course	04
CCC	Co-curricular Courses	04
IKS	Indian Knowledge System	02
		160

Credit Distribution of Various Courses across Eight Semesters:

SEM	Total Marks	BSC	ESC	PCC	PEC	MDM	OEC	VSE	AEC	EMC	IKS	VAC	REM	CEP	IAP	CCC	Total Credit
I	700	9	6	4				1	2								**22**
II	700	9	6	3				1			2					1	**22**
III	700			8		2	4			2		2		2			**20**
IV	700			7		2	2	2	2	2		2			2	1	**22**
V	700			6	8	4	2										**20**
VI	700			4	4	2		2							4	2	**18**
VII	700			6	2	2							4		4		**18**
VIII	700			6	6	2									4		**18**
	5600	**18**	**12**	**44**	**20**	**14**	**8**	**6**	**4**	**4**	**2**	**4**	**4**	**2**	**14**	**4**	**160**

#	**Semester End Examination (SEE)** based on subjective questions.
$	**LAB /Practical or Hands-on/ Activity based Evaluation.**
*	**Comprehensive Continuous Evaluation (CCE)** based on Unit Tests, Home Assignment/Comprehensive, Presentation/Group Discussion/Laboratory Work/Course Project/Viva Voice/Blog Writing/Case Study/Survey/Multiple-Choice Question (MCQ) examination.
@	**For MOOCs:** Assignments marks will be converted on the scale of 60 marks.
%	**For MOOCs:** Score of examination conducted by the respective authority of MOOC or Score of SEE Conducted by Institute will be converted on the scale of 60 marks.

First Year Engineering (Semester –I)											
Sr. No.	Code	Course Title	Teaching Scheme			Credits	Examination scheme				
			Lecture	Tutorial	Practical		CCE*	SEE#	TW$	PR*/OR	Total
1	FYBSC101T	Linear Algebra and Calculus	4	--	--	4	50	50	--	--	100
2	FYBSC102T / FYBSC103T	Modern Engineering Physics / Modern Engineering Chemistry	3	--	--	3	50	50	--	--	100
3	FYESC104T / FYESC105T	Analog & Digital Electronics / Modern Electrical Engineering	2	--	--	2	50	50	--	--	100
4	FYESC106T / FYESC107T	Graphical User Interface / Mechanics for Robotics	2	--	--	2	50	50	--	--	100
5	FYPCC108T	Fundamentals of C Programming	3	--	--	3	50	50	--	--	100
6	FYBSC101W	Linear Algebra and Calculus (Tut)	--	1	--	1	--	--	25	--	25
7	FYBSC102W / FYBSC103W	Modern Engineering Physics (Lab)/ Modern Engineering Chemistry (Lab)	--	--	2	1	--	--	25	--	25
8	FYESC104W / FYESC105W	Analog & Digital Electronics (Lab)/ Modern Electrical Engineering (Lab)	--	--	2	1	--	--	25	--	25
9	FYESC106W / FYESC107W	Graphical User Interface (Lab) / Mechanics for Robotics (Lab)	--	--	2	1	--	--	25	--	25
10	FYEPCC108W	Fundamentals of C Programming (Lab)	--	--	2	1	--	--	25	--	25
11	FYVSE109W / FYVSE110W	Manufacturing Practice Workshop/ Design Thinking & Idea Lab	--	--	2	1	--	--	25	--	25
12	FYAEC111W	Professional Communication Skills	--	2	--	2	--	--	50	--	50
Total			**14**	**3**	**10**	**22**	**250**	**250**	**200**	**--**	**700**

#	**Semester End Examination (SEE)** based on subjective questions.
$	**LAB /Practical or Hands-on/ Activity based Evaluation.**
*	**Comprehensive Continuous Evaluation (CCE)** based on Unit Tests, Home Assignment/Comprehensive, Presentation/Group Discussion/Laboratory Work/Course Project/Viva Voice/Blog Writing/Case Study/Survey/Multiple-Choice Question (MCQ) examination.
@	**For MOOCs:** Assignments marks will be converted on the scale of 60 marks.
%	**For MOOCs:** Score of examination conducted by the respective authority of MOOC or Score of SEE Conducted by Institute will be converted on the scale of 60 marks.

First Year Engineering (Semester –II)											
Sr. No.	Code	Course Title	Teaching Scheme			Credits	Examination scheme				
			Lecture	Tutorial	Practical		CCE*	SEE#	TW$	PR*/OR	Total
1	FYBSC201T	Advanced Engineering Calculus	4	--	--	4	50	50	--	--	100
2	FYBSC103T / FYBSC102T	Modern Engineering Chemistry / Modern Engineering Physics	3	--	--	3	50	50	--	--	100
3	FYESC105T/ FYESC104T	Modern Electrical Engineering / Analog & Digital Electronics	2	--	--	2	50	50	--	--	100
4	FYESC107T / FYESC106T	Mechanics for Robotics / Graphical User Interface	2	--	--	2	50	50	--	--	100
5	FYPCC208T	Object Oriented Programming using C++	2	--	--	2	50	50	--	--	100
6	FYBSC201W	Advanced Engineering Calculus (Tut)	--	1	--	1	--	--	25	--	25
7	FYBSC103W/ FYBSC102W	Modern Engineering Chemistry (Lab) / Modern Engineering Physics (Lab)	--	--	2	1	--	--	25	--	25
8	FYESC105W/ FYESC104W	Modern Electrical Engineering (Lab) / Analog & Digital Electronics (Lab)	--	--	2	1	--	--	25	--	25
9	FYESC107W/ FYESC106W	Mechanics for Robotics (Lab) / Graphical User Interface (Lab)	--	--	2	1	--	--	25	--	25
10	FYPCC208W	Object Oriented Programming using C++ (Lab)	--	--	2	1	--	--	25	--	25
11	FYVSE110W/ FYVSE109W	Design Thinking & Idea Lab / Manufacturing Practice Workshop	--	--	2	1	--	--	25	--	25
12	FYIKS209W	Indian Knowledge System	--	2	--	2	--	--	25	--	25
13	FYCCC210W	Introduction to Co-Curricular Activities	--	--	2	1	--	--	25	--	25
Total			**13**	**3**	**12**	**22**	**250**	**250**	**200**	**--**	**700**

#	**Semester End Examination (SEE)** based on subjective questions.
$	**LAB /Practical or Hands-on/ Activity based Evaluation.**
*	**Comprehensive Continuous Evaluation (CCE)** based on Unit Tests, Home Assignment/Comprehensive, Presentation/Group Discussion/Laboratory Work/Course Project/Viva Voice/Blog Writing/Case Study/Survey/Multiple-Choice Question (MCQ) examination.
@	**For MOOCs:** Assignments marks will be converted on the scale of 60 marks.
%	**For MOOCs:** Score of examination conducted by the respective authority of MOOC or Score of SEE Conducted by Institute will be converted on the scale of 60 marks.

First Year Engineering (2025 Course) Linear Algebra and Calculus			
Course Code	FYBSC101T	**Credit**	04
Contact Hours	04 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Differentiation, Integration, Maxima and Minima, Matrices and Determinants

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1	To develop foundational understanding of linear algebra and calculus concepts and equip students with the analytical skills to apply them to solve basic engineering and mathematical problems.

Course Outcomes	
CO1	To **recall** fundamental concepts of matrices, eigenvalues, calculus theorems, and multivariable functions.
CO2	To **explain** the theoretical concepts of linear transformations, mean value theorems, partial derivatives, and their properties
CO3	To **apply** matrix methods, diagonalization, Fourier series, and partial differentiation techniques to solve engineering and applied mathematics problems.

CO4	To **analyze** the behavior of mathematical models by interpreting eigenvalue problems, Fourier expansions, and partial derivative structures for simplification and transformation in engineering applications.
CO5	To **evaluate** the effectiveness of mathematical techniques such as diagonalization, Taylor series, and optimization with constraints to **formulate and justify** solutions for complex engineering problems.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	2
CO4	3	3	3	3	2	-	-	-	-	1	-	2
CO5	3	3	3	3	2	-	-	-	-	2	2	3

Topics covered:
UNIT-I: Linear Algebra – Matrices & System of Linear Equations (10 Hrs) Rank of a Matrix, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Application to problems in Engineering
UNIT-II: Linear Algebra - Eigen Values, Vectors & Diagonalization (8 Hrs) Eigen Values and Eigen Vectors, Cayley Hamilton theorem, Diagonalization of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformations. Application to problems in Engineering
UNIT-III: Single Variable Calculus (10 Hrs) Rolle's Theorem, Mean Value Theorems, Taylor's and Maclaurin's Series, Indeterminate Forms and L' Hospital's Rule. Fourier series: Full range and Half rage Fourier series, Harmonic analysis, Applications to problems in Engineering
UNIT-IV: Multivariable Calculus – Partial Differentiation (10 Hrs) Introduction to functions of several variables, Limit, Continuity and Partial

Derivatives. Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative and Change of Independent variables
UNIT-V: Applications of Partial Differentiation (10 Hrs) Jacobian and its applications, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers and Applications to problems in Engineering

Learning Resources:

Text Books & Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill)
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication)
3. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)
4. Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education)
5. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning)
6. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson)
7. Applied Mathematics (Vol. I & Vol. II) by P.N.Wartikar and J.N.Wartikar Vidyarthi Griha Prakashan, Pune.
8. Elementary Linear Algebra. by Ron Larson and David C. Falvo (Houghton Mifflin Harcourt Publishing Company)

NPTEL / MOOC Course / YouTube Links:

https://www.youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG

First Year Engineering (2025 Course) Modern Engineering Physics			
Course Code	FYBSC102T	**Credit**	03
Contact Hours	03 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 Marks

Pre-requisites: Bohr's atomic theory, properties of mechanical and electromagnetic waves, Huygens' principle and wave front, interference and polarization of light, wave particle duality, intrinsic and extrinsic semiconductors, basics of magnetism, trigonometry and calculus.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1	To **introduce** foundational concepts of photonics, quantum mechanics, wave optics, solar energy, nanotechnology, and superconductivity, and to **enable** students to **understand** and **apply** modern physics principles to solve engineering and technological problems

Course Outcomes	
CO1	To **recall** fundamental principles of laser operation, quantum mechanics, wave optics, solar cells, nanomaterials, and superconductors.
CO2	To **explain** theoretical concepts such as stimulated emission, Schrodinger's equations, & interference in thin films, Hall effect, quantum confinement &

	Meissner effect.
CO3	To **apply** the principles of quantum physics, optics, and nanoscience to solve numerical problems and analyze engineering systems such as solar panels, optical fibers, SQUIDs, and ultrasonic sensors.
CO4	To **analyze** complex engineering systems such as quantum computing devices, optical communication systems, and solar energy modules by interpreting underlying quantum, optical, and nanoscale phenomena.
CO5	To **evaluate** the feasibility and performance of advanced technologies like SQUIDs, nanodevices, and superconducting systems by assessing the influence of quantum confinement, critical parameters, and tunneling mechanisms.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	2	-	-	-	-	2
CO4	3	3	3	3	3	-	2	-	-	-	-	2
CO5	3	3	3	3	3	2	3	2	-	-	-	3

Topics covered:

UNIT-I: Fundamentals of Photonics (8 Hrs)

Laser: Spontaneous and stimulated emission, population inversion, pumping, active medium & active center, resonant cavity; Characteristics of lasers, CO2 laser: construction and working, Holography (recording, reconstruction, applications), Engineering applications of laser (IT, medical, industry)

Optical fibers: Critical angle, acceptance angle, acceptance cone, numerical aperture, total internal reflection and propagation of laser; Classification of optical fibers: Single mode & multimode, step index & graded index, Attenuation: attenuation coefficient, causes of attenuation; Advantages of optical fiber communication, numerical problems on parameters of optical fiber.

UNIT-II: Quantum Physics (8 Hrs)

de Broglie hypothesis of matter waves, de Broglie wavelength for a particle accelerated by KE "E" and a charged particle accelerated by PD "V", properties of matter waves; Wave function and probability density, mathematical conditions for wave function, problems on de Broglie wavelength; Need and significance of Schrödinger's equations, Schrödinger's time independent and time dependent equations; Energy of a particle enclosed in a rigid box and related numerical problems; Quantum mechanical tunneling, alpha particle decay, principle and applications of STM; Principles of quantum computing: concept of qbit, superposition and entanglement, comparison of classical & quantum computing, potential applications of quantum computing.

UNIT-III: Wave optics (8 Hrs)

Interference in thin film of uniform thickness, conditions of maxima and minima for reflected system; Conditions for maxima and minima for wedge shaped film (qualitative), engineering applications – ARC, determination of optical flatness; Numerical problems on thin film and wedge shaped film; Types of polarization: Unpolarized, Polarized, PPL, CPL and EPL, Malu's law and related numerical problems; Double refraction: geometry of calcite crystal, Huygens' theory; Engineering applications of polarization: LCD, communication & radar, 3D movies (recording, projection)

UNIT-IV: Solar Cell & Ultrasonics (8 Hrs)

Solar cell: principle, working, IV-characteristics, efficiency and fill factor, measures to improve efficiency of solar cell, advantages and applications in environmental sustainability; Hall effect: derivation for Hall voltage and Hall coefficient and related numerical problems.

Ultrasonics: Characteristics and properties of ultrasonic waves, Generation of ultrasonic waves by inverse piezoelectric effect (using transistor); Engineering applications - thickness measurement, flaw detection and related numerical problems.

UNIT-V: Physics of Nanoparticles and Superconductivity (8 Hrs)

Nanoparticles: Quantum confinement and its effect on properties of nanoparticles, synthesis methods - ball milling and Physical Vapor Deposition; Properties of

nanoparticles (optical, electrical, mechanical, magnetic); Applications of nanotechnology: Electronics (GMR effect and its application in read-write head of HDD), automobiles, environmental & energy, medical field (targeted drug delivery). **Superconductivity:** Temperature dependence of resistivity, critical magnetic field, critical current, Meissner effect and perfect diamagnetism; Type I and Type II Superconductors, Numerical problems on critical magnetic field; Formation of Cooper pairs, DC and AC Josephson effect, SQUID: working principle and applications; Engineering applications: electronics - principle of Maglev train

Learning Resources:

Text Books & Reference Books:

1. Engineering Physics by M. N. Avadhanulu
2. Optics, Ajoy Ghatak, Tata Mc Graw Hill
3. Introduction to Solid State Physics, C. Kittel, Wiley and Sons.
4. Quantum Mechanics, A. K. Ghatak, S. Lokanathan, Laxmi Publications.
5. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing.
6. Physics for Scientists and Engineers with Modern Physics, Serway and Jewett, Cengage Publications

NPTEL / MOOC Course / YouTube Links:

1. Lectures by Walter Lewin: https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw

2. Quantum Mechanics Lecture Series by Prof. H. C. Verma: https://www.youtube.com/playlist?list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At

First Year Engineering (2025 Course) Modern Engineering Chemistry			
Course Code	FYBSC103T	**Credit**	03
Contact Hours	03 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Types of titrations, structure property relationship, classification and properties of polymers, electromagnetic radiation, electrochemical series.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1	To **introduce** students to the principles of energy sources, instrumental analysis, engineering materials, water treatment, and corrosion science, and to **equip** them with the knowledge and skills to **understand** and **apply** chemical principles in modern engineering technologies.

Course Outcomes	
CO1	To **recall** the basic concepts related to fuel types, calorific values, polymers, nanomaterials, water hardness, and corrosion types.
CO2	To **explain** instrumental methods like conductometry, pH-metry, UV-visible spectroscopy, and mechanisms of corrosion and water purification techniques.

CO3	To **apply** the principles of calorimetry, hardness analysis, corrosion control, and polymer synthesis in solving numerical and application-based engineering problems.
CO4	To **analyze** the characteristics and interactions of engineering materials, water contaminants, and corrosion mechanisms by interpreting experimental data and chemical behavior in practical applications.
CO5	To **evaluate** appropriate energy sources, water treatment techniques, and corrosion prevention methods for sustainable and efficient engineering practices using instrumental analysis and performance criteria.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	2	-	-	-	-	2
CO4	3	3	3	3	2	-	3	-	-	-	-	3
CO5	3	3	3	3	3	2	3	-	-	-	-	3

Topics covered:

UNIT-I: Energy Sources (6 Hrs)

Introduction (definition, classification of fuel based on chemical reactions and characteristics of an ideal fuel), Calorific value, Higher calorific value and Lower calorific value, Determination of calorific value: Principle, construction and working of Bomb calorimeter and Boy's gas calorimeter and numerical, Solid fuel. Coal: Analysis of Coal-Proximate and Ultimate analysis, numerical, Alternative fuels: Power alcohol and biodiesel. Hydrogen gas as a future fuel. Lithium Ion Battery, construction, working, advantages, applications.

UNIT-II: Instrumental Methods of Analysis (8 Hrs)

Introduction: Types of reference electrode (calomel electrode), indicator electrode (glass electrode), ion selective electrode (solid membrane electrode)

[A] Conductometry: Introduction, conductivity cell, conductometric titrations of

acid versus base with titration curve. (Strong acid- Strong base). Applications of conductometry.

[B] pHmetry: Introduction, standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve and its applications.

[C] UV-Visible Spectroscopy: Introduction, statement of Beer's law and Lambert's law, Electronic transitions in organic molecule, terms involved in UV-visible Spectroscopy. Instrumentation (double beam) and its applications. Numerical: Based on Absorption laws i.e. Molar absorptivity and concentration.

UNIT-III: Advanced Engineering Materials (8 Hrs)

A] Polymers: Introduction, Definition Polymer, Monomer, Functionality of monomers, Classification of polymer (Thermal Behavior-Thermoplastics and Thermosetting).

Specialty polymers: Introduction, preparation, properties and applications of the following polymers: 1. Engineering Thermoplastic: Polycarbonate, 2. Bio-degradable polymers: Poly (hydroxybutyrate-hydroxyvalerate), 3. Conducting Polymer: Polyacetylene.

[B] Nanomaterials: Introduction, classification of nanomaterials based on dimensions (zero dimensional, one-dimensional, two-dimensional and three-dimensional), structure, properties and applications of graphene and carbon nanotubes, quantum dots (semiconductor nanoparticles).

UNIT-IV: Water Technology (8 Hrs)

Impurities in water, hardness of water: Types, Units and Numerical. Determination of hardness (by EDTA method using molarity concept) and alkalinity, numerical. Ill effects of hard water in boilers - priming and foaming, scale and sludge. Water treatment: i) Zeolite method and numerical ii) Demineralization method. Purification of water: Reverse osmosis and Electrodialysis. Modern technique for /of atmospheric water generation.

UNIT-V: Corrosion and its Prevention (6 Hrs)

Introduction, Types of corrosion – Dry and Wet corrosion, mechanism of dry corrosion, nature of oxide films and Pilling-Bedworth's rule, wet corrosion – mechanism: hydrogen evolution and oxygen absorption, Factors influencing rate of corrosion. Methods of corrosion control and prevention: Cathodic Protection

(Sacrificial Anode and Impressed Current), metallic coatings and its types, surface preparation, methods to apply metallic coatings-hot dipping, electroplating. Corrosion Resistant / Anti corrosive paints.

Learning Resources:

Text Books & Reference Books:

1. Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, S. Chand & Company Ltd.
2. Engineering Chemistry by O. G. Palanna, Tata Magraw Hill Education Pvt. Ltd.
3. Textbook of Engineering Chemistry by Dr. Sunita Rattan, S. K. Kataria & Sons Publisher.
4. Basic Concept of Analytical Chemistry, 2ed, S. M. Khopkar, New Age-International Publisher.
5. Instrumental Methods of Chemical Analysis, G. R. Chatwal & S. K. Anand, Himalaya Publishing House.
6. Spectroscopy of organic compounds, 2ed, P. S. Kalsi, New Age-International Ltd., Publisher.
7. Polymer Science, V. R. Gowarikar, N. V. Viswanathan, jayadev Sreedhar, Wiley Eastern Limited.
8. Inorganic Chemistry, 5ed, Shriver and Atkins, Oxford University Press.
9. Fundamentals of Nanotechnology, G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta, CRC press.

NPTEL / MOOC Course / YouTube Links:

https://nptel.ac.in/courses/113104082

First Year Engineering (2025 Course) Analog & Digital Electronics			
Course Code	FYESC104T	**Credit**	02
Contact Hours	02 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Basic Physics and Mathematics, Semiconductor Physics, Digital Electronics, Circuit Theory, Analog Electronics, Sensors and Transducers

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1.	To **introduce** students to the fundamentals of analog and digital electronic components, systems, and devices, and to **enable** them to **understand** and **apply** core principles for designing and analyzing circuits, communication systems, memory architecture, and signal conversions in engineering applications.

Course Outcomes	
CO1	To **recall** fundamental concepts of operational amplifiers, sensors, flip-flops, memory types, and A/D & D/A converters.
CO2	To **explain** the working principles of op-amp circuits, types of sensors, communication models, sequential logic devices, and microcontrollers.

CO3	To **apply** analog and digital electronics techniques to build signal conditioning circuits, design counter-based logic, interface ADCs with microcontrollers, and implement basic automation systems.
CO4	To **analyze** the behavior of analog and digital subsystems including op-amp configurations, counters, and memory architectures for their suitability in designing real-time signal processing and control applications.
CO5	To **evaluate** the performance and integration challenges of analog-digital interfaces, sensor systems, and data acquisition units in embedded and automation solutions.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-	2	2
CO4	3	3	3	3	2	-	-	-	-	-	2	2
CO5	3	2	3	3	3	2	2	-	-	-	2	3

Topics covered:

UNIT-I: Operational Amplifier (6 Hrs)

Operational Amplifier Basics, Operational Amplifier Building Blocks, Inverting, Non-inverting Summing, Differential, Integrator, Differentiator, Op-amp Comparator, Op-amp Monostable, Passive Averager. V to I, I to V convertors, Basic building blocks of Instrumentation Amplifier.

UNIT-II: Sensors and Communication Systems (6 Hrs)

Classification of sensors: Active /Passive Sensors, Selection Criteria/Characteristics of sensor. Motion Sensors (LVDT), Temperature Sensors (Thermocouple, RTD), Mechanical Sensors (Strain Gauge), Biosensors. Block diagram of IoT based Data Acquisition and Automation System.

Communication Systems: Block Diagram, Communication Media: Wired and Wireless, Electromagnetic Spectrum, Cellular concept, Block diagram of GSM system.

UNIT-III: Flip-flops, Counters and Registers (6 Hrs) Flip-flops, Latch and Schmitt Trigger, Counter: Ripple Counter Mod-Tend, Synchronous counters, frequency dividers, Shift Registers: Serial, Parallel, and Universal Shift Register. Application of Counters and Registers in sequential logic design and timer circuits.
UNIT-IV: Memories, Microprocessors and Micro Controller (6 Hrs) Overview of Memory, RAM, ROM, PROM, Computer Bulk Storage Devices, memory organization and operation, application of FIFO and LIFO, Flash Memory, CCD Memory and Applications, Data Bus, Address Bus, Control Bus, Basic Microprocessor and Microcontroller, Architecture and Operations, Assembly Programming.
UNIT-V: AD Convertors (6 Hrs) Digital to analog and Analog to digital Convertors, sample and hold circuit, sampling of signal, specifications of D/A convertor and A/D convertor, Calibration, Types of A/D Convertors, Interfacing of A/D convertor with microprocessor/PC.

Learning Resources:

Text Books & Reference Books:

1. Op-Amps and Linear Integrated Circuits, Ramakant A. Gayakwad, Pearson
2. Electronic Instrumentation by H. S. Kalsi, 3rd Edition, Tata McGraw Hill
3. Modern Electronic Instrumentation and Measurement Techniques, William D. Cooper, PHI Publication.
4. Electronic Instruments and Instrumentation Technology, M.M.S. Anand, PHI Publication
5. Modern Digital Electronics by R. P. Jain, 4th Edition, Tata McGraw Hill
6. Sensors and Transducers by D. Patrnabis, 2nd Edition, PHI
7. Mobile Wireless communication by M. Schwartz, Cambridge University Press.
8. Digital Fundamentals by Thomas. L. Floyd, 11th Edition, Pearson
9. Mobile Communication by J. Schiller, 2nd Edition, Pearson
10. Sensors Handbook, by S. Soloman, 2nd Edition.
11. CMOS Circuit Design, Layout & Simulation, by Baker, 2nd Edition, Wiley IEEE Press

NPTEL / MOOC Course / YouTube Links:

1. https://nptel.ac.in/courses/117103063
2. https://nptel.ac.in/courses/117103064
3. https://archive.nptel.ac.in/courses/106/105/16105166/

First Year Engineering (2025 Course) Modern Electrical Engineering			
Course Code	FYESC105T	**Credit**	02
Contact Hours	02 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Electric charges and fields, Coulomb's laws, Voltage, Potential, Current, Ohms law, Magnetism, EMF, Faraday's Laws, Alternating current, AC Generator, Power.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1.	To **introduce** students to the fundamental concepts of electrical circuits, electromagnetism, AC systems, and electric machines, and to **enable** them to **understand** and **apply** core principles for solving engineering problems involving electrical energy systems and devices.

Course Outcomes	
CO1	To **recall** basic electrical quantities, laws, theorems, and the principles of DC/AC circuits and electrical machines.
CO2	To **explain** electrical phenomena such as magnetic induction, phasor relationships, power factor, and working principles of transformers and motors.

CO3	To **apply** network theorems, phasor algebra, resonance concepts, and machine characteristics to analyze and solve basic electrical engineering problems.
CO4	To **differentiate** and **examine** the behavior of DC and AC electrical circuits, magnetic systems, and electrical machines under various operating conditions using phasor techniques and network analysis.
CO5	To **assess** the performance, efficiency, and application suitability of electrical systems such as transformers, motors, and residential circuits through interpretation of technical parameters and energy usage data.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-	2	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2
CO5	3	2	3	3	3	2	-	-	-	2	3	2

Topics covered:

UNIT-I: Elementary Concepts and DC Circuits (6 Hrs)

Elementary concepts: Resistance, EMF, current, potential difference, Ohm's law. Overview of elementary power system showing stages such as Generation, Transmission, and Distribution of electrical energy.

DC Circuits: Classification of electrical networks, simplifications of networks using series-parallel combinations and star delta transformation technique, Kirchhoff's Laws and their applications for network solutions using loop analysis, Superposition theorem

UNIT-II: Electromagnetism (6 Hrs)

Magnetic Circuit: Concept of flux density, field strength, permeability, MMF, reluctance, their units, and relationships. Simple series magnetic circuit, comparison of electric and magnetic circuit

Electromagnetic Induction: Faradays Laws of electromagnetic induction, Fleming's right-hand rule, statically and dynamically induced emf, self and mutual inductance, coefficient of coupling. Energy stored in magnetic field.

UNIT-III: AC Fundamentals (6 Hrs)

Generation of single-phase sinusoidal voltages and currents, their mathematical and graphical representation, Concept of cycle, period, frequency, instantaneous, peak, average and RMS. values, peak factor and form factor. Phase, Phase difference, lagging, leading in phase quantities and their phasor representation. Rectangular and polar representation of phasor. Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance.

UNIT-IV: AC Circuits (6 Hrs)

Single Phase AC Circuits: Series R-L, R-C and R-L-C circuits, concept of impedance, power factor, phasor diagrams, Voltage, current and power waveforms. Concept of active, reactive and apparent power.

Three Phase AC Circuits: Concept of three-phase AC symmetrical system, phase sequence, balanced and unbalanced load. Voltage, current and power relations in three phase balanced star and delta connected loads. Residential electricity bill calculation

UNIT-V: Introduction to Electric Machines (6 Hrs)

Single Phase Transformer: Construction, working principle, EMF equation, transformation ratio, rating, types, losses, regulation and efficiency at different loading conditions.

Electrical Motors:

a) **Single Phase Induction Motor**: Working principle of single phase Induction motor. Applications of split phase, capacitor start and capacitor run motors.

b) **Three Phase Induction Motor**: Working principle using rotating magnetic field theory, types and applications.

c) **D.C. Motors:** working principle, types, voltage equation, characteristics and Applications.

1. **Stepper Motor**: Working principle, Types and application
2. **BLDC Motor:** Working principle and application

Learning Resources:

Text Books & Reference Books:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 2nd edition 2019.
2. B.L. Theraja,A K Theraja "ABC of Electrical Engineering", S Chand Publications,2012
3. C. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited 5th edition 2024
4. S K Bhattacharya, "Electrical Machines", McGraw Hill Education, 2nd edition, 2008
5. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press, 2nd edition 2018.

NPTEL / MOOC Course / YouTube Links:

1. https://nptel.ac.in/courses/108105112

First Year Engineering (2025 Course) Graphical User Interface			
Course Code	FYESC106T	**Credit**	02
Contact Hours	02 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites:.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1.	To **introduce** students to the fundamental concepts and tools for designing Graphical User Interfaces (GUI) and to **enable** them to **understand** visual programming principles and **apply** GUI development techniques using Python for building user-friendly applications.

Course Outcomes	
CO1	To **recall** basic GUI concepts, design elements, development tools, and components of GUI programming environments.
CO2	To **explain** GUI design principles, widget behaviors, layout managers, and event-driven programming concepts using Tkinter in Python.
CO3	To **apply** GUI development techniques by building interactive applications using Python, handling events, and implementing usability testing.

CO4	To **analyze** the structure and functionality of GUI components and event-handling mechanisms to identify usability issues and improve interface responsiveness in Python-based applications.
CO5	To **evaluate** the effectiveness, usability, and consistency of GUI applications by conducting interface testing and reviewing adherence to standard design principles.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	2	2	2	2
CO4	3	3	3	3	3	-	2		3	2	2	2
CO5	3	3	3	3	3	2	2		2	3	2	3

Topics covered:

UNIT-I: Introduction to GUI and Basic Concepts (6 Hrs)

Definition and need for GUI, Difference between CLI and GUI, History and evolution of GUI, Types of GUI systems (Desktop, Mobile, Web), Elements of GUI: Windows, Icons, Menus, Buttons, Dialog boxes, GUI design principles (simplicity, consistency, feedback)

UNIT-II: GUI Development Tools and Languages (6 Hrs)

Overview of GUI development environments, Introduction to Visual Programming Concepts, Introduction to programming languages used in GUI: Python (Tkinter), Setting up development environment, Introduction to event-driven programming

UNIT-III: GUI Design Using Python – Tkinter (6 Hrs)

Basics of Tkinter module in Python, Creating main window, adding widgets: Labels, Buttons, Entry, Text, Grid and Pack layout managers, Handling user inputs and events (e.g., button clicks), Simple GUI-based calculator/project

UNIT-IV: Menus, Dialog Boxes and Advanced Widgets (6 Hrs)

Creating menus & submenus, Message boxes & pop-up dialogs, Radio buttons, Checkboxes, Frames, Canvas widget for basic drawing, Validation & error handling in

GUI
UNIT-V: GUI Application & Debugging (6 Hrs) Planning a simple GUI application (e.g., login form, registration form, to-do list), Applying design principles learned, GUI testing and debugging basics, User interface evaluation (usability testing basics)

Learning Resources:

Text Books & Reference Books:

1. John M. Carroll – Human-Computer Interaction in the New Millennium – Pearson
2. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale – Human-Computer Interaction – Pearson Education
3. Mark Lutz – Programming Python (Chapters on Tkinter) – O'Reilly
4. Harsh Bhasin – Python for Beginners: A Step-by-Step Guide to GUI Development with Tkinter – BPB Publications

First Year Engineering (2025 Course) Mechanics for Robotics			
Course Code	FYESC107T	**Credit**	02
Contact Hours	02 Hrs/Weeks((L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Basic Calculus, Trigonometry, Geometrical expressions, Laws of motion, Concept of mass, acceleration with Fundamental knowledge of Engineering Mathematics and Physics.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1.	To **introduce** students to the fundamental principles of engineering mechanics and to **enable** them to **understand** and **apply** force systems, equilibrium, friction, truss analysis, and particle dynamics in the context of robotic systems and mechanical design.

Course Outcomes	
CO1	To **recall** basic concepts of force systems, equilibrium, friction, truss elements, and particle motion relevant to mechanical and robotic applications.
CO2	To **explain** the behavior of mechanical systems using principles of statics and dynamics including free-body diagrams, laws of friction, and motion

	characteristics.
CO3	To **apply** mechanical principles to solve engineering problems involving foce resultants, truss analysis, projectile motion, work-energy, and impulse-momentum concepts.
CO4	To **analyze** mechanical systems by interpreting force interactions, support conditions, and frictional effects in robotic structures through free-body diagrams.
CO5	To **evaluate** the efficiency and stability of mechanical motion and energy transfer in robotic applications using dynamic models based on work-energy and impulse-momentum principles.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-	2	2
CO4	3	3	3	3	2	-	-	-	-	2	2	-
CO5	3	3	3	3	3	2	-	-	-	2	-	3

Topics covered:

UNIT-I: Force systems and its resultants (6 Hrs)

Introduction, type of motion, fundamental concepts and principle, force system, resolution and composition of forces, resultant of concurrent force system, moment of a force, Varignon's theorem, resultant of parallel force system, couple and resultant of general force system. Introduction, centroid of basic figures, centroid of composite figure, moment of inertia of simple geometrical figure, parallel axis theorem, perpendicular axis theorem, moment of inertia of composite figure.

UNIT-II: Equilibrium (6 Hrs)

Introduction, free body diagram, equilibrium of coplanar forces, equilibrium of two forces, three force principle, equilibrium of concurrent, parallel and general force

system, type of load, type of support, type of beam and support reaction.
UNIT-III: Friction and Trusses (6 Hrs) **Friction**: Introduction, sliding and rolling friction, laws of coulomb friction, coefficient of friction, angle of repose, angle of friction, cone of friction, friction on inclined plane, ladder friction and belt friction. **Trusses:** two force and multi force member, assumption of analysis, analysis of truss, identification of zero force members, method of joint and method of section
UNIT-IV: Kinematics of particle (6 Hrs) Introduction, basic concept, rectilinear motion: motion with uniform acceleration, gravitational acceleration and variable acceleration, curvilinear motion: rectangular components, motion of projectile, normal and tangential components.
UNIT-V: Kinetics of particle (6 Hrs) Introduction, Newton's second law of motion, equation of motion, Newton's law of gravitation, application of Newton's second laws to rectilinear and curvilinear motion, conservative and non-conservative forces, work energy principle, conservation of energy, impulse momentum principle and impact

Learning Resources:

Text Books & Reference Books:

1. Engineering Mechanics, Ferdinand Singer, 3rd edition, Harper and Row
2. Engineering Mechanics (Statics and Dynamics) by Hibbeler R. C., Pearson Education.
3. Engineering Mechanics, S Timoshenko and Young, Tata McGraw Hill Education Pvt. Ltd. New Delhi.
4. Vector Mechanics for Engineers – Statics, Beer and Johnston, Tata McGraw Hill
5. Vector Mechanics for Engineers – Dynamics, Beer and Johnston, Tata McGraw Hill.
6. Engineering Mechanics - Statics and Dynamics, Meriam J. L. and Kraige L.G., John Wiley and Sons.

First Year Engineering (2025 Course) Fundamentals of C Programming			
Course Code	FYPCC108T	**Credit**	03
Contact Hours	03 Hrs/Weeks((L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Basics of Computers, Basic Mathematics

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1.	To **introduce** students to the foundational concepts of structured programming using C and to **enable** them to **understand** syntax, control structures, data handling, and **apply** logical problem-solving techniques using modular and procedural programming.

Course Outcomes	
CO1	To **recall** fundamental programming concepts, syntax, keywords, data types, operators, and structure of C language programs.
CO2	To **explain** the use of control structures, arrays, strings, and functions for structured programming in C.
CO3	To **apply** C programming constructs such as operators, loops, arrays, strings, and user-defined functions to solve basic computational problems.

CO4	To **analyze** the logical flow and modular structure of C programs by interpreting control statements, array handling, and function interactions for efficient problem decomposition.
CO5	To **evaluate** C programs for correctness, efficiency, and maintainability by reviewing function design, recursion, structure usage, and error-handling strategies in real-world coding scenarios.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-	2	2
CO4	3	3	3	3	2	-	-	-	2	2	2	2
CO5	3	3	3	3	2	-	-	-	2	3	2	3

Topics covered:

UNIT-I: Introduction to Program Planning & C Programming (6 Hrs)

Program Design Tools: Art of Programming through Algorithms, Flowcharts.

Overview of C: History and importance C, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Storage Class, Assigning Values to variables, Defining Symbolic Constants, declaring a Variable as Constant, Declaring a Variable as Volatile.

UNIT-II: Operators and Expressions (6 Hrs)

Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators. Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Operator Precedence and Associativity, Mathematical Functions.

UNIT-III: Control Flow (8 Hrs)

Decision Making and Branching: Simple If Statement, If-Else, Else-If, Switch Statement, Go to Statement.

Decision Making and Looping: While Statement, Do-While, For Statement, Break and Continue.
UNIT-IV: Array (8 Hrs) **Arrays:** One Dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One dimensional Arrays, Two –dimensional Arrays, Initialization of Two- dimensional Arrays. **Character Arrays and Strings:** Declaration and Initialization String Variables, Reading Strings from Terminal, Writing Strings to Screen, Putting Strings Together, Comparison of Two Strings, Introduction to String handling Functions.
UNIT-V User Defined Functions (8 Hrs) **User Defined Functions:** Need for User-defined Functions, A Multi-Function Program, Elements of User defined Functions, Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but No Return Values, Arguments with Return values, No Arguments but Returns a Value, Functions that Return Multiple Values, Nesting of Functions, Recursion. **Structures:** What is a Structure? Structure Type Declarations, Structure Declarations, Referencing Structure Members, Referencing Whole Structures, Initialization of Structures.

Learning Resources:

Text Books & Reference Books:

1. Programming in ANSIC, 8e –E. Balagurusamy
2. B. S. Gottfried, Programming with C (Schaum's Outline Series), 2nd ed. McGraw-Hill, 1996.
3. S. C. Kochan, Programming in C, Sams Publishing, 3rd ed. 2004.
4. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2 nd ed. UK: Prentice Hall, 1988.
5. W. Kernighan and B. Pike, The Practice of Programming, UK: Addison-Wesley, 1999
6. H. M. Deitel and P. J. Deitel, C: How to program, 8 th ed. Pearson Education,

2015.

7. P. Prinz & T. Crawford, C in a Nutshell: The Definitive Reference, 2nd ed., O'Reilly Media, 2016.

NPTEL / MOOC Course / YouTube Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs53/preview

First Year Engineering (2025 Course) Linear Algebra and Calculus (Tutorial)			
Course Code	FYBSC101W	**Credit**	01
Contact Hours	01 Hrs/Weeks(T)	**Type of Course**	Tutorial
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Tutorial and Term Work	
1.	Tutorial for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Term work shall consist of five assignments each on unit-I to unit-V and is based on performance and continuous internal assessment.

List of Assignments:

UNIT-I: Linear Algebra – Matrices & System of Linear Equations.

Assignment No.1: Determine the rank of a matrix using elementary operations and understand its significance.

Assignment No.2: Solve systems of linear equations using matrix methods such as Gaussian and Gauss-Jordan elimination.

Assignment No.3: To Identify the given vectors for linear dependence or independence and explain their role in vector spaces.

Assignment No.4: Solve linear transformations and represent them using matrices with respect to different bases.

Assignment No.5: Understand and apply orthogonal transformations and verify orthogonality of matrices.

Assignment No.6: Apply concepts of linear algebra to solve engineering problems involving systems, transformations, and optimizations.

UNIT-II: Linear Algebra - Eigen Values, Vectors & Diagonalization.

Assignment No.1: Find the eigenvalues and corresponding eigenvectors of matrices and explore their applications.

Assignment No.2: Explain the Cayley-Hamilton Theorem and use it to compute powers and inverses of matrices.

Assignment No.3: Diagonalizable matrices using their eigenvalues and eigenvectors and discuss its significance in simplification.

Assignment No.4: Reduce given quadratic forms to canonical form using orthogonal transformations and Articulate their nature.

Assignment No.5: Apply orthogonal transformations to simplify quadratic forms and verify orthogonality conditions.

Assignment No.6: Use eigenvalues, diagonalization, and quadratic forms to solve practical engineering problems.

UNIT-III: Single Variable Calculus

Assignment No.1: Verify and illustrate Rolle's Theorem with appropriate functions, ensuring all necessary conditions are satisfied.

Assignment No 2: State and prove the Mean Value Theorem, and apply it to analyse the behaviour of differentiable functions.

Assignment No.3: Use Taylor's and Maclaurin's series for standard functions and demonstrate their use in function approximation.

Assignment No. 4: Explain periodic functions using full range Fourier series and interpret the role of harmonics in the expansion.

Assignment No.5: Construct half range sine and cosine series for given functions defined on a finite interval.

Assignment No. 6: Apply Fourier techniques to sol harmonic components

UNIT-IV: Multivariable Calculus – Partial Differentiation

Assignment No.1: Study the concepts of limits and continuity of functions, and verify them for different types of functions.

Assignment No.2: Find and interpret partial derivatives of multivariable functions with relevant examples.

Assignment No.3: State Euler's Theorem on homogeneous functions and verify it through examples.

Assignment No.4: Explain the concept of composite functions and determine their derivatives using the chain rule.

Assignment N0. 5 Calculate total derivatives of functions of several variables and understand their significance.

Assignment No. 6: Apply the effect of changing independent variables in functions.

UNIT-V: Applications of Partial Differentiation.

Assignment No.1: Solve Jacobians for given transformations and understand their significance in multivariable calculus.

Assignment No. 2: Use partial derivatives to estimate errors and approximate values of functions involving multiple variables.

Assignment No.3: Determine local maxima and minima of functions of two variables using second derivative tests.

Assignment No.4: Apply Lagrange's method of undetermined multipliers to solve constrained optimization problems.

Assignment No.5: Solve real-world problems using techniques of partial differentiation and optimization.

Assignment No.6: Use the Jacobian in coordinate transformations and in evaluating multiple integrals.

First Year Engineering (2025 Course) Modern Engineering Physics (Lab)			
Course Code	FYBSC102W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Practical and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed in a group of maximum three Students each for all the batches.

List of Laboratory Experiments/Assignments (Any 8 from the given list)

1. An experiment based on Laser: To determine the divergence of a laser beam or to determine diameter of a thin wire or to perform beam profile analysis of a laser beam.
2. An experiment based on optical fiber: To determine the numerical aperture or attenuation coefficient or critical angle of incidence for given a glass slab or any experiment to calculate parameters of optical fiber.
3. Determination of Planck's constant using available experimental setup.
4. Newton's rings - to understand the interference and determine radius of curvature of a given plano-convex lens or determine wavelength of given monochromatic light.
5. An experiment based on diffraction: determination of number of lines per

centimeter on grating surface using normal incidence method or determination of wavelength of laser using transmission grating or to determine wavelength of light using diffraction grating & spectrometer.

6. An experiment based on polarization: To verify cosine square law of Malus Law for plane polarized light or to determine the specific rotation of the given sample with the help of a polarimetry or to determine refractive indices of extraordinary and ordinary rays using double refractive prism.
7. To determine the band gap energy of a semiconductor sample using a PN junction diode.
8. To plot I-V characteristics and determine fill factor and efficiency of a given solar cell.
9. To determine Hall coefficient and charge carrier density of a given semiconductor sample.
10. Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer
11. An experiment based on physical measurements developed using Arduino interface for Hall Effect sensor or Ultrasonic sensor.
12. Study tour / visit to a research laboratory / facility and submit a report.

Note: Apart from the above list, any one experiment related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of eight experiments.

First Year Engineering (2025 Course) Modern Engineering Chemistry (Lab)			
Course Code	FYBSC103W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Practical and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed in a group of maximum three Students each for all the batches.

List of Laboratory Experiments/Assignments (Any 8 from the given list)

1. To determine hardness of water by EDTA method.
2. To determine alkalinity of water.
3. To determine strength of strong acid using pH meter
4. To determine maximum wavelength of absorption of $CuSO_4$/$FeSO_4$/ $KMnO_4$, verify Beer's law and find unknown concentration of given sample.
5. Titration of a mixture of weak acid and strong base using conductometer.
6. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin.
7. To determine molecular weight/radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
8. Proximate analysis of coal

9. To coat copper and zinc on an iron plate using electroplating. 10. Preparation of biodiesel from oil. 11. Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles.
Note: Apart from the above list, any one experiment related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of eight experiments.

First Year Engineering (2025 Course) Analog & Digital Electronics (Lab)			
Course Code	FYESC104W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Practical and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed in a group of maximum three Students each for all the batches.

List of Laboratory Experiments/Assignments (Any 8 from the given list)

1. Electronic Components: Study of Active and Passive components
   a) Resistors (Fixed &Variable), Calculation of resistor value using color code.
   b) Capacitors (Fixed &Variable)
   c) Inductors, Calculation of inductor value using color code.
   d) Switches & Relays
2. Measurements using various measuring instruments:
   a) Setup CRO and function generator for measurement of AC & DC voltages and frequency
   b) Measure Voltage, Resistance using digital Multimeter. Also use Multimeter to check diode, BJT.

3. Test the functionality of logic gates by using Breadboard (IC 7404 7408 7432 7486 7400 7402)
4. Build /Test the functionality of D & T Flip-flop.
5. Build R-2R Resistive network on Breadboard to convert given digital data into analog
6. Linear applications of Op-amp:
    a) Build inverting and non-inverting amplifier using op-amp (Study the data sheet of typical Op-Amp741).
7. Test and verify the truth tables of:
    a) Basic and Universal Gates (Study the datasheet of respective ICs)
    b) Half & Full Adder.
8. Study of transducers/sensor (Any3)
9. Case Study of any one electronics appliances with block diagram, specification etc.
10. To measure output voltage w.r.t. the displacement of the core in the LVDT Kit and find the graphical relation between the two.
11. To study the change in resistance of the RTD Probe depending on the process of temperature.
12. To detect the motion using Motion Sensor.

Note: Apart from the above list, any one experiment related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of eight experiments.

First Year Engineering (2025 Course) Modern Electrical Engineering (Lab)			
Course Code	FYESC105W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Practical and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed in a group of maximum three Students each for all the batches.

List of Laboratory Experiments/Assignments

Case Studies : (Any 2)

1. Case Study: Analysis of a hard drive's read/write head mechanism.
2. Case Study: Analysis of electricity bills for home and small industries, understanding tariff systems.
3. Case Study: Analysis of energy consumption patterns, and energy-saving techniques.

Laboratory Experiments : (Any 6)

1. To study safety precautions while working on electrical systems, handling of various equipment's such as rheostat, multi-meter, ammeters, voltmeters, wattmeter's etc.

2. Study of wiring materials, switch board and different wiring schemes. (Simple wiring & staircase wiring).
3. To verify Kirchhoff's laws experimentally.
4. To verify Superposition theorem experimentally.
5. To determine efficiency and regulation of transformer by using direct loading test experimentally.
6. To Study and Measure the Voltage, Current, Power, and Power Factor in Series RLC Circuit
7. Study of cut view section of single phase/ three phase Induction motor.
8. To measure insulation resistance by using megger

Note: Apart from the above list, any one experiment related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of eight experiments.

First Year Engineering (2025 Course) Graphical User Interface (Lab)			
Course Code	FYESC106W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Practical and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed by individual Students each for all the batches.

List of Laboratory Experiments/Assignments

These practicals are designed using Python with Tkinter to ensure simplicity and accessibility for beginners.

1. Introduction to GUI Window

   Objective: Create a basic GUI window using Tkinter.

   Tasks:

   Display a blank window with title and fixed size

   Add a label widget

2. GUI with Buttons and Labels

   Objective: Create a GUI with interactive buttons and labels.

   Tasks:

   Add buttons that change the text of a label when clicked

Use different button styles and colors

3. Login Form Using GUI

Objective: Create a simple login form GUI.

Tasks:

Use Entry widgets for username and password

Add "Login" and "Reset" buttons

Display success/failure messages

4. GUI-Based Calculator

Objective: Develop a simple calculator with basic operations.

Tasks:

Buttons for digits and operations (+, −, ×, ÷)

Entry display for inputs and result

Clear and equals button functionalities

5. Radio Buttons and Checkboxes

Objective: Understand how to use selection widgets.

Tasks:

Create a GUI for selecting gender using radio buttons

Create a food ordering form using checkboxes

6. Registration Form GUI

Objective: Create a form that captures user information.

Tasks:

Use labels, entry boxes, dropdown menus

Submit button to display entered data

Clear button to reset all fields

7. Menu and Submenu GUI

Objective: Add menu bar with submenus.

Tasks:

File menu with options: New, Open, Exit

Help menu with "About" dialog box

Use of messagebox for confirmation

8. Drawing with Canvas Widget

Objective: Draw shapes using the Canvas widget.

Tasks:

Draw rectangle, circle, and lines

Change colors and size dynamically

9. GUI Application with Multiple Windows

Objective: Demonstrate navigation between GUI windows.

Tasks:

Create a main window with buttons

Open a new window from the main window

Close the new window and return

10. Mini Project – To-Do List / Quiz App

Objective: Combine widgets and logic to build a full mini GUI application.

Tasks: (Choose any one)

To-do list with add, remove, and display tasks

`Simple quiz app with radio buttons and score display

Note: Apart from the above list, any one experiment related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of five assignments.

First Year Engineering (2025 Course) Mechanics for Robotics (Lab)			
Course Code	FYESC107W	**Credit**	01
Contact Hours	02 Hrs/Weeks (P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Practical and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed in a group of maximum three Students each for all the batches.

List of Laboratory Experiments/Assignments (Any 8 from the given list)

Journal consist of the following

A. Compulsory experiments as per following list

1. Verification of the Polygon law of forces
2. To find support reaction of beam
3. To determine coefficient of friction
4. Determination of coefficient of restitution

B. Graphical Solution of the following

1. Equilibrium of concurrent force system
2. Equilibrium of parallel force system
3. Forces in the member of pin jointed truss

C. Assignment on each unit: minimum five example on each unit
Note: Apart from the above list, any one experiment related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of above experiments.

First Year Engineering (2025 Course) Fundamentals of C Programming (Lab)			
Course Code	FYEPCC108W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Practical and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed by individual Students each for all the batches.

List of Laboratory Experiments/Assignments (Any 6 from the given list)

1. To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors.
2. To accept from user the number of Fibonacci numbers to be generated and print the Fibonacci series.
3. To accept an object mass in kilograms and velocity in meters per second and display it's Momentum. Momentum is calculated as $e=mc^2$ where m is the mass of the object and c is its velocity.
4. In array do the following:
    a. Find given element in array
    b. Find Max and Min element

c. Find frequency of given element in array
d. Find Average of elements in Array.

5. Write a C program for employee salary calculation given, Basic, H.R.A. 20 % of Basic and D.A. 150 % of Basic.
6. To accept a student's marks for five subjects, compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinguished. If aggregate is 60>= and <75 then the Grade of first division. If aggregate is 50>= and <60, then the grade is second division. If aggregate is 40>= and <50, then the grade is third division.
7. To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
8. Write a C program that accepts a string from the user and performs the following string operations-
   a. Calculate length of string
   b. String reversal
   c. Equality check of two Strings - Check palindrome & Check substring.
9. Create Structure EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary), and store the data and update the data in structure.
10. Create class STORE to keep track of Products (Product Code, Name and price). Display menu of all products to users. Generate bills as per order

Note: Apart from the above list, Mini Projects related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of above experiments/assignments.

List of Mini Projects :

1. Calculator with basic functions. Add more functionality such as graphic user interface and Complex calculations.
2. Program that simulates rolling dice. When the program runs, it will randomly choose a number between 1 and 6 (Or other integer you prefer). Print that

number. Request user to roll again. Set the min and max number that dice can show. For the average die, that means a minimum of 1 and a maximum of 6.

3. Guess Number: Randomly generate a number unknown to the user. The user needs to guess what that number is. If the user's guess is wrong, the program should return some sort of indication as to how wrong (e.g. the number is too high or too low). If the user guesses correctly, a positive indication should appear. Write functions to check if the user input is an actual number, to see the difference between the inputted number and the randomly generated numbers, and to then compare the numbers.
4. To calculate the salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employees pay professional tax as 2% of total salary. Calculate net salary payable after deductions.

First Year Engineering (2025 Course) Manufacturing Practice Workshop			
Course Code	FYVSE109W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Course Objectives	
1.	To **introduce** students to basic manufacturing processes, workshop tools, and safety practices, and to **enable** them to **understand** and **apply** practical skills in fabrication, advanced machining, CAD modeling, and additive manufacturing.

Course Outcomes	
CO1	To **Identify** the layout, tools, safety devices, and potential hazards in a mechanical workshop environment.
CO2	To **Explain** the function of workshop tools and **describe** the processes involved in basic manufacturing operations like cutting, bending, welding, and drilling.
CO3	To **Develop** a component using conventional workshop tools or modern manufacturing technologies such as CNC or 3D printing and **demonstrate** the sequence of operations using CAD or programming tools.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	2	3	-	-	-	-	-	-
CO2	3	2	2	-	2	2	-	-	-	-	-	-
CO3	3	3	3	2	3	2	2	-	2	2	2	2

Guidelines for Practical and Term Work	
1.	Experiments to be performed in group of four to five students. There should not be any repetition of layout/ jobs/ programs and models. For Experiment No. 1 and 2 students supposed to visit nearby workshop or industry.

List of Laboratory Experiments/Assignments

1. Draw a typical layout of workshop with arrangement of equipment's considering a specific application.
2. Identify and explain the following safety related consideration,
   a) Potential hazards present in workshop
   b) General workshop safety rules and guidelines
   c) List various safety devices used in workshop
   Note : Photo evidences of above are expected in report
3. Develop any Mechanical component using the tools available in the workshop which includes any five of the following operations,
   1) Cutting
   2) Shearing
   3) Bending
   4) Welding
   5) Rivetting
   6) Filing
   7) Drilling
   Note: Product must be usable for Institute of domestic also write a sequence of operation in the report with its production time.

4. Demonstration (construction and operation) of any one advance machine tool such as CNC turn / mill, VMC, plasma arc machining, Laser cutting, CNC wood router etc.
5. Write program on sequence of operations performed to develop any mechanical component using any suitable programming language.
6. Demonstration of simple 3D models using CAD software and print using 3D printer including pre and post processes (Component manufactured should be related to specific branch)

First Year Engineering (2025 Course) Design Thinking & Idea Lab			
Course Code	FYVSE110W	**Credit**	01
Contact Hours	02 Hrs/Weeks((P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Course Objectives	
1.	To **introduce** students to the **principles of design thinking**, emphasizing empathy-driven problem identification, creative ideation, prototyping, and user testing, and to **enable** them to **understand** and **apply** user-centric methods to develop innovative and practical solutions through collaboration and reflection.

Course Outcomes	
CO1	To **Define** the key concepts and stages of the design thinking process including empathy, ideation, prototyping, and evaluation.
CO2	To **Explain** the importance of user-centric design by conducting empathy mapping, user interviews, and applying creativity techniques to generate and select ideas.
CO3	To **Apply** design thinking tools by creating prototypes, conducting user testing, performing analysis using six thinking hats, and effectively communicating design solutions through presentations and collaboration.

CO4	To **analyze** user needs, design feedback, and brainstorming outcomes to refine ideas and improve prototypes through iterative testing and structured thinking methods.
CO5	To **evaluate** the effectiveness of design solutions by assessing usability, user feedback, innovation value, and team collaboration during project implementation and presentation.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	2	2	2	-	2
CO2	2	3	2	-	-	2	-	3	3	3	2	2
CO3	2	3	3	2	2	2	2	3	3	3	3	3
CO4	2	3	3	2	2	2	2	3	3	3	2	3
CO5	3	3	3	2	2	2	3	3	3	3	3	3

Guidelines for Practical and Term Work	
1.	The practical lab is designed to provide students with hands-on experience in applying the theoretical concepts they have learned in the course. The session aims to enhance their understanding, critical thinking, and problem-solving skills. (1 hour for explaining the concept and 1 hour for activity/ assignment / group discussion / brainstorming session).
2.	Incorporating hands-on labs with access to various lab and workshop facilities in the Institute, can enhance the practical aspect of the course and provide students with opportunities to prototype and test their ideas.

List of Laboratory Experiments/Assignments

Introduction to Design Thinking

- Understanding the design thinking process

- Role of empathy and user-centric design
- Practical Lab: Empathy mapping and user interviews
- Assignment 1: Problem identification

Ideation and Creativity

- Techniques for idea generation and brainstorming
- Practical Lab: Brainstorming sessions
- Assignment 2: Idea generation and selection

Prototyping and Testing

- Creating prototypes to validate design concepts
- Practical Lab: Rapid prototyping
- Assignment 3: Prototyping and user testing

Analysis and Evaluation

- Applying the six hats of design thinking
- Practical Lab: Six thinking hats analysis
- Assignment 4: Six hats analysis of a case study

Communication and Collaboration

- Visual communication and storytelling
- Group project and industry collaboration
- Assignment 5: Design project presentation
- Assignment 6: Reflection and lessons learned

Learning Resources:

Text Books & Reference Books:

1. Design Thinking: Understanding How Designers Think and Work by Nigel Cross
2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation" by Tim Brown

3. Design Thinking for Visual Communication" by Ranjan Nayar and Jaidip Subedi
4. The Design of Everyday Things" by Don Norman• "Design Thinking: Creativity and Innovation" by S. Balaram
5. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days" by Jake Knapp
6. Creative Confidence: Unleashing the Creative Potential Within Us All" by Tom Kelley and David Kelley (with a foreword by Ratan Tata)

First Year Engineering (2025 Course) Professional Communication Skills			
Course Code	FYAEC111W	**Credit**	02
Contact Hours	02 Hrs/Weeks(T)	**Type of Course**	Tutorial
Examination Scheme	TW – 50 marks	**Total Marks**	50 marks

Pre-requisites: 12th English - Basic knowledge of Listening, Speaking, Reading, and Writing. (LSRW) skills

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	50

Course Objectives	
1.	To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error feedback.

Course Outcomes	
CO1	To **Recall** fundamental concepts of communication including listening, speaking, reading, and writing skills, along with the formats and types of official correspondence.
CO2	To **Explain** the principles of active listening, workplace communication etiquette, and the process of effective written and oral communication in professional contexts.
CO3	To **Apply** communication strategies by participating in practical activities such as presentations, report writing, interview simulations, and group discussions to enhance fluency and professional communication skills.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	1	2	-	2
CO2	2	2	-	-	-	-	-	2	2	3	2	2
CO3	2	2	2	2	2	-	-	3	3	3	3	3

Topics covered:

Laboratory work should cover the following guideline topics for conduction of Laboratory activities:

UNIT-I Introduction to the Language Lab

a) The Need for a Language Laboratory

b) Tasks in the Lab

c) Writing a Laboratory Notebook

UNIT-II: Active Listening Skills

Basic Listening Skills: Introduction, the process, importance and types of listening, Effective Listening: Principles and Barriers, Guidelines to increase listening,

a) What is Active Listening?

b) Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking

c) Listening in Business Telephony

UNIT-III: Speaking

a) Speaking—Accuracy and Fluency Parameters

b) Pronunciation Guide—Basics of Sound Scripting, Stress, and Intonation

c) Fluency-focussed activities—JAM (Just a Minute), Conversational Role Plays, Speaking using Picture/Audio Visual inputs.

d) Group Discussion: Principles and Practice

e) Giving a Presentation—Learning Presentation Basics and Giving Micro Presentations

f) Activities to enhance listening Speaking Skills: Introducing yourself,

describing a person, place, situation and event, giving instruction, Making inquiries – at a bank, post- office, airport, hospital, reservation.

UNIT-IV: Reading and Writing Skills

Effective Reading: Process, types and reading rate adjustment, Tips for improving reading skills, Reading Comprehension.

Effective Written Communication: Introduction, Importance of written communication, Writing a Book/ small article/ Film Review, Scripting a Short Presentation

Letter Writing: Types, Formats, Official Correspondence: Memo, Notice and Circulars, Agenda and Minutes,

Report Writing: Purpose and Scope of a Report, Fundamental Principles of Report Writing, Project Report Writing, Summer Internship Reports. Sentences Precise writing through meticulous editing, proofreading Writing abstracts and conclusions.

UNIT-V Workplace Communication

Greeting, Welcoming, Dealing with Complaints, Giving Instructions or Directions, Giving Information: About Various Facilities, Distance, Area, Local Specialties Consultation and Solution of Problems, Accepting Praises and Criticism, Apologizing. Fluency and Etiquette, Polite sentences and Words, Use of Persuading words, Intonation and Voice Modulation, Developing

List of Laboratory Experiments/Assignments

Minimum eight practical/ assignments should be performed to cover entire curriculum of the course. The list of practical given below is just a guideline.

1. Speech/Seminar presentation
2. Observation of a recorded seminar and suggestions for improvement.
3. Technical Report Writing and presentation.
4. Role Plays
5. Interview Simulations
6. Reading and Listening Comprehension

7. Group Discussions
8. Resume Building
9. Business Correspondence
10. Cross-Cultural Communication
11. Situational Writing
12. SWOT analysis
13. Public Speaking Exercises
14. Greetings for different occasions.
15. Participation in institute/National level Elocution/Essay/G.D. Competitions

Learning Resources:

Text Books & Reference Books:

1. Developing Communication Skills by Krishna Mohan & Meera Banerji (Macmillan)
2. Business Correspondence and Report Writing, R. C. Sharma & Krishna Mohan (Tata McGraw Hill)
3. Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005.
4. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.
5. Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson)
6. Communication Skills for Technical Students by T.M. Farhatullah (Orient Longman)
7. Written Communication in English by Saran Freeman (Orient Longman)
8. Essential English Grammar (Elementary & Intermediate) Raymond Murphy (CUP)
9. Communication for Business: A Practical Approach by Shirley Tailor (Longman)

First Year Engineering (2025 Course) Advanced Engineering Calculus			
Course Code	FYBSC201T	**Credit**	04
Contact Hours	04 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Integration, Differential Equation, Three-dimensional coordinate systems

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1	To familiarize the students with Advanced techniques of integration, Tracing of curve, Solid geometry, Multiple integrals and their applications, Mathematical modeling of physical systems using differential equations. The aim is to equip them with the concept and tools to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

Course Outcomes	
CO1	To **Recall** fundamental concepts of integral calculus, partial derivatives, and ordinary differential equations including key formulae, functions, and solution techniques.

CO2	To **Explain** the principles of multiple integrals, curve tracing, and applications of differential equations to physical systems and engineering problems.
CO3	To **Apply** methods of integration, partial differentiation, and ordinary differential equations to solve engineering problems related to areas, volumes, moments of inertia, and dynamic physical processes.
CO4	To **examine** engineering scenarios by breaking down complex integrals, curve properties, and differential equations to identify relationships among physical parameters such as area, volume, and motion.
CO5	To **assess** the application of advanced calculus techniques like Beta-Gamma functions, coordinate transformations, and ODE-based modeling to determine the most effective approach for solving real-world engineering problems.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	-	-	2	3
CO4	3	3	3	3	2	-	-	-	-	-	2	3
CO5	3	3	3	3	3	2	-	-	-	2	3	3

Topics covered:

UNIT-I: Integral Calculus (10 Hrs.)

Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign and Error functions.

UNIT-II: Curve Tracing and Solid Geometry (10 Hrs.)

Tracing of Curves – Cartesian, Polar and Parametric curves, Rectification of curves. Cartesian, Spherical polar and Cylindrical coordinate systems, Sphere, Cone and Cylinder.

UNIT-III: Multiple Integrals and Applications (10 Hrs.) Double and Triple integrations, change of order of integration, Applications to find Area, Volume, Mass, Centre of Gravity and Moment of Inertia.
UNIT-IV: First Order Ordinary differential Equation (8 Hrs.) Exact differential equations, Equations reducible to exact form. Linear differential equations, Equations reducible to linear form and Bernoulli's equation
UNIT-V: Applications of Differential Equations (10 Hrs.) Applications of Differential equations to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Rectilinear Motion, Simple Harmonic Motion, One dimensional Conduction of Heat.

Learning Resources:

Text Books & Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
2. Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning).
4. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson).
5. Applied Mathematics (Vol. I and II) by P.N. Wartikar and J.N.Wartikar Vidyarthi Griha Prakashan, Pune.
6. Differential Equations by S. L. Ross (John Wiley and Sons).

NPTEL / MOOC Course / YouTube Links:

https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG

First Year Engineering (2025 Course) Object Oriented Programming using C++			
Course Code	FYPCC208T	**Credit**	02
Contact Hours	02 Hrs/Weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE – 50 marks SEE – 50 marks	**Total Marks**	100 marks

Pre-requisites: Basics of Computers and Fundamentals of Programming Languages

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Comprehensive Continuous Evaluation**	Internal	50
2.	**Semester End Examination**	Internal	50

Course Objectives	
1	To **introduce** students to the fundamentals of object-oriented programming using C++ and to **enable** them to **understand** core programming constructs, conditional logic, data handling, and object-oriented principles, and **apply** them to develop modular and reusable programs.

Course Outcomes	
CO1	To **recall** basic programming elements such as data types, operators, control structures, arrays, and syntax used in C++.
CO2	To **explain** object-oriented principles such as classes, objects, inheritance, and encapsulation, as well as string manipulation and function concepts in C++.

CO3	To **apply** C++ programming concepts including loops, arrays, functions, and OOP features to build simple applications and solve computational problems.
CO4	To **analyze** the structure and behavior of C++ programs by dissecting code involving control statements, arrays, functions, and object-oriented features to understand their interaction and logical flow.
CO5	To **evaluate** and **validate** the effectiveness of C++ programming solutions by testing class designs, function implementations, and object-oriented principles for correctness, reusability, and efficiency.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	2	2	2	3
CO4	3	3	3	3	2	-	-	-	2	2	2	3
CO5	3	3	3	3	3	2	-	-	3	3	3	3

Topics covered:

UNIT-I: Introduction to C++ Programming (6 Hrs)

Program Design Tools: Algorithm, Flowchart and Pseudocode.

Overview of C++: History and Importance Of C++, Features of C++, Applications of C++, Simple C++ Programme, Input and Output Statements C++, Comments, Tokens, Keywords, Variables, Constants, Indentifiers in C++

UNIT-II: Basics Of C++ and Conditional Statements(6Hrs)

Basic Data Types, Operators, Expressions.Types Of Expressions.

Conditional Statement: if Statement, if-else Statement, if else-if ladder Statement, Nested if Statement, Switch Statement

UNIT-III: Looping Statement and Arrays in C++(6Hrs)

Looping Statement: for loop, while loop, Do-while loop, break, continue, Return.

Introduction To Arrays: Array Concept, declaration, Storage representation of array, Initializing Array, Types of Array-(1-D,2-D)
UNIT-IV: Strings in C++(6Hrs) **Basic operations on Strings**: Declaration and Initialization of Strings, String Operations, length, copy, reverse, String built-in-Functions. **Features of OOPS**: Class, Object, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Data hiding
UNIT-V: Functions in C++(6 Hrs) Functions in C++, in-built & User-defined Functions, Function Prototype, Function definition, Calling a Function. **Function Arguments**: Formal and Actual Parameters, Parameters passing in Functions, Call by Value, Call by reference, Passing Arrays to Functions, public and private members, Built in function to check, Get, Set and Delete class attribute, Garbage collection, class methods, Static Method.

Learning Resources:

Text Books & Reference Books:

1. E. Balagurusamy, "Object-Oriented Programming with C++", 7th edition, Mc Graw-Hill Publication, ISBN 10: 9352607996 ISBN 13: 9789352607990
2. Robert Lafore, "Object-Oriented Programming in C++||", fourth edition, Sams Publishing, ISBN:0672323087 (ISBN 13: 9780672323089)
3. L.Astrachan, "Programming with C++", Special Indian edition, Mc Graw-Hill Publication, ISBN-13: 978007063436-7(ISBN 10: 007063436-X)
4. Rajesh K.Shkukla, "Object Oriented Programming in C++", Wiley India Edition, Wiley Precise Textbook, ISBN: 9788126516582

First Year Engineering (2025 Course) Advanced Engineering Calculus (Tutorial)			
Course Code	FYBSC201W	**Credit**	01
Contact Hours	01 Hrs/Weeks(T)	**Type of Course**	Tutorial
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Tutorial and Term Work	
1.	Tutorial for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Term work shall consist of five assignments each on unit-I to unit-V and is based on performance and continuous internal assessment.

List of Assignments:

UNIT-I: Integral Calculus

Assignment No.1: Using the concept of reduction formulae, solve the integrals.

Assignment No.2: Summarize the problems using the definition and properties of the Beta function

Assignment No.3: Use the definition and properties of the Gamma function to solve the following integrals and expressions.

Assignment No.4: Apply the concept of DUIS when limit of integration is constant and variable to find integral function

Assignment No.5: Apply the technique of differentiation under the integral sign to evaluate integrals where the limits of integration are functions of the variable parameter.

Assignment No.6: Solve the following problems involving the error function (erf). Use its definition, properties, and related integral forms to solve definite integrals and applied problems

UNIT-II: Curve Tracing and Solid Geometry

Assignment No.1: Summarize and trace the given Cartesian curves by identifying key features such as intercepts, symmetry, asymptotes, maxima, minima, points of inflection, and intervals of increase or decrease

Assignment No.2: Trace the curve by determining key features such as intercepts, direction of motion, slope at various points, maxima, minima, points of inflection, and any asymptotic behavior.

Assignment No.3: Determine the length of the given curves by applying the formula for rectification. Find the arc length for curves defined in Cartesian, parametric, or polar forms, showing all necessary steps and simplifications clearly.

Assignment No.4: Solve problems involving the conversion between Cartesian, spherical, and cylindrical coordinate systems.

Assignment No. 5: Solve the following problems related to spheres, including finding equations of spheres, calculating surface area and volume

Assignment No.6: Solve the given problems involving cones and cylinders, including finding their equations

UNIT-III:Multiple Integrals and Applications

Assignment No.1: Double Integration

Solve the given double integrals over specified regions.

Assignment No.2: Triple Integration.

Solve the given triple integrals over defined three-dimensional regions. Use suitable coordinate systems and methods to simplify and solve the integrals.

Assignment No.3: To Change the Order of Integration.

Explain the region of integration carefully and demonstrate the benefits of changing the order to simplify computations.

Assignment No.4: Application of Double Integration to Find Area:

Apply double integral to calculate areas, of given geometrical bodies or regions with specified functions.

Assignment No.5: Application of Triple Integration to Find Volume.

Apply triple integral to calculate volumes of given geometrical bodies or regions with specified functions.

Assignment No.6: Centre of Gravity

Determine the centre of gravity (centroid) of given planar or three-dimensional bodies using appropriate integrals.

UNIT-IV:First Order Ordinary differential Equation

Assignment No.1: Solve the given first-order differential equations by identifying their types—whether they are variable separable, homogeneous, or non-homogeneous.

Assignment No.2: Determine whether the given differential equations are exact. If exact, solve them by finding the potential function.

Assignment No.3: Solve the given differential equations to determine if they are non-exact. If so, identify and apply a suitable integrating factor to reduce them to exact form and then solve.

Assignment No.4: Solve the given linear differential equations using the standard form and integrating factor method.

Assignment No.5: Transform the given non-linear differential equations into linear form using appropriate substitutions or algebraic manipulations.

Assignment No.6: Identify the given equations as Bernoulli's differential equations and solve them using the appropriate transformation to linear form. Provide all steps, including substitution, simplification, and final solution.

UNIT-V:Applications of Differential Equations

Assignment No.1: Orthogonal Trajectories

Find the orthogonal trajectories of the given family of curves by forming the differential equation of the family and applying the method of perpendicular slopes.

Assignment No.2: Newton's law of cooling

Apply Newton's Law of Cooling to model and solve temperature decay problems. Use the given data to form and solve first-order differential equations, and interpret the results in real-world contexts.

Assignment No.3: Kirchhoff's law of electrical Circuits

Use Kirchhoff's laws to solve differential equations representing electrical circuits involving resistors, inductors, and capacitors

Assignment No.4: Rectilinear Motion

solve problems involving rectilinear motion using differential equations. Determine displacement, velocity, and acceleration as functions of time under various forces and initial conditions.

Assignment No.5: Simple Harmonic Motion

Solve differential equations representing simple harmonic motion. Summerize motion in terms of amplitude, frequency, and phase, and interpret physical behaviour based on the general solution.

Assignment No.6: One-dimensional Conduction of heat.

Solve the one-dimensional heat conduction equation using appropriate methods. Apply initial and boundary conditions to find temperature distribution over time and space.

First Year Engineering (2025 Course) Object Oriented Programming using C++ (Lab)			
Course Code	FYPCC208W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Guidelines for Tutorial and Term Work	
1.	Practical for the subject shall be engaged in minimum three batches (batch size of 20 students maximum) per division.
2.	Practical shall be performed by individual Students each for all the batches.
3.	The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory Concept in brief, features of tool/framework/language used, Design, test cases, conclusion. Program codes with sample output of all performed assignments are to be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

4.	All students should submit the term work consisting of 14 programming assignments. At least 2 assignments from each unit for Group A. Faculty can select any 4 assignments from Group B.

List of Assignments:

1. Write a program that accepts user input (name, age) and displays a personalized greeting.
2. Create a program that checks if a number is prime and prints all prime numbers up to a given limit.
3. Functions and Recursion

   Write a recursive function to calculate the factorial of a number..
4. Work with arrays and sorting algorithms

   Develop a program that sorts an array of integers using the bubble sort algorithm.studocu.com.
5. Perform operations on strings.

   Create a program that reverses a string without using built-in functions.
6. Object-Oriented Programming (OOP) Concepts.

   Design a class Book with attributes like title, author, and price. Implement member functions to set and display these attributes.
7. File Handling

   Write a program that creates a file, writes user input to it, and then reads the content from the file.
8. Exception Handling

   Develop a program that handles division by zero using try-catch blocks.
9. Data Structures: Linked List

   Create a singly linked list and implement functions to insert and delete nodes.
10. STL (Standard Template Library) Usage

    Write a program that uses a vector to store integers and then sorts them using the sort() function from the STL.

First Year Engineering (2025 Course) Indian Knowledge System			
Course Code	FYIKS209W	**Credit**	02
Contact Hours	02 Hrs/Weeks(T)	**Type of Course**	TUTORIAL
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Course Objective	
1.	To **introduce** students to the diverse and rich heritage of Indian Knowledge Systems (IKS) and to **enable** them to **understand** the philosophical, scientific, linguistic, cultural, and technological contributions of ancient India, and **apply** this knowledge to develop a holistic and value-based outlook toward modern challenges.

Course Outcomes	
CO1	To **Recognize** key concepts and components of ancient Indian knowledge systems including Vedas, Upanishads, philosophies, and scientific contributions.
CO2	To **Interpret** the significance of ancient Indian education, linguistic heritage, arts, architecture, and scientific advancements within historical and cultural contexts.
CO3	To **Construct** presentations and reports to analyze ancient Indian knowledge and demonstrate its relevance and application in modern engineering, science, and culture.

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	2	2	2	-	1	-	2
CO2	2	2	1	-	-	3	3	2	1	2	2	2
CO3	2	2	2	2	2	3	3	3	2	3	3	3

Topics covered:

1. Vedic Period : Vedasand their Significance (1 hour)
2. Upanishads : Philosophy and Knowledge (1 hour)
3. The Six Schools of Indian Philosophy: Overview (1.5hour)
4. Indian Linguistics : Paniniand Sanskrit (1hour)
5. Evolution of Other Indian languages Tamil, Marathi, Hindi etc. (1 hour)
6. Ancient Indian Education System : Gurukul System (1 hour)
7. Ancient Indian Mathematics : Overview and Contributions (1.5 hour)
8. Ancient Indian Astronomy & Astrology : Overview & Contributions (1.5 hours)
9. Charak & Sushrut Samhita, Ayurveda : Principles and Practices (1.5hour)
10. Ancient Indian Architecture : Vastu-Shastra & Temple Architecture (Part1) (1hour)
11. Ancient Indian Architecture : Vastu Shastra and Temple Architecture (Part2)[Duration :1hour]
12. Trade and Commercein Ancient India (1.5hours)
13. Arthashastra (Part1)(1hour)
14. Arthashastra (Part2)(1hour)
15. Ancient Indian Art and Culture (Part1)
16. Ancient Indian Art and Culture (Part2)-Duration :1Hour
17. Ancient Indian Music and Dance (Part1)(1hour)
18. Ancient Indian Music and Dance(Part2)(1hour)
19. Ancient Indian Farming Practices(1hour)
20. Ancient Indian Craftsmanship (Part1)(1hour)
21. Ancient Indian Craftsmanship (Part2)(1hour)

22. Ancient Indian Warfare and Weaponry (1.5hour)
23. Ancient Indian Engineering and Technology (1.5hour)
24. Ancient Indian Religions : Hinduism, Buddhism, Jainism, Sikhism : Teachings and Philosophies (1.5hours)
25. Ancient Indian Knowledge Systems : Global Influence (1hours)
26. Review and Conclusion (1hour)

List of Assignments for Term Work

Note: Students have to complete all the Assignments and two activities from the following given list.

Assignment 1: Students should search for literature and create a presentation on a specific key date or event in Indian history. They should explain its significance and how it contributed to Indian knowledge systems.

- **Learning Outcome**: Enhances research skills and understanding of the historical context.

Assignment 2: Assign groups to compare and contrast the BC/CE dating system with other historical dating systems from different cultures.

- **Learning Outcome:** Promotes critical thinking and cross-cultural understanding.

Assignment 3: Students should study and create presentations or reports on significant scientific inventions or discoveries from ancient India.

- **Learning Outcome:** Develops research and presentation skills while enhancing knowledge of Indian scientific achievements

Assignment 4: Ask students to work in groups to research and present on ancient Indian contributions to metallurgy and materials science. They can also create simple experiments to demonstrate metallurgical processes.

- **Learning Outcome:** Enhances research and experimentation skills while deepening understanding of materials science.

Assignment 5: Assign students to choose a modern engineering project in India

that incorporates sustainability principles. They should analyze the project's design, materials, and environmental impact.

- **Learning Outcome:** Develops critical analysis skills and an understanding of sustainable engineering practices.

Assignment 6: A group of students should present case studies on modern engineering projects that consider cultural and environmental aspects. Discuss how cultural sensitivity is integrated into these projects.

- **Learning Outcome:** Promotes teamwork, presentation skills, and cultural awareness

Assignment 7: Encourage students to propose and discuss how ancient Indian engineering principles could be integrated into a modern construction project. They should consider cultural, environmental, and sustainability aspects.

- **Learning Outcome:** Encourages creative problem-solving and understanding of cultural relevance in engineering.

Activities (At least 4 Activities to be performed)

Activity 1: Organize in-class debate on Mathematics in Indus Valley Civilization.

Activity 2: Organize in-class debate Aryabhata and His Contributions.

Activity 3: Students to submit a report on Innovations in Number Systems & Zero

Activity 4: Aryabhata: The Pioneer of Indian Astronomy.

Activity 5: Rise of Trade Centers and Urbanization.

Activity 6: The Role of Poetry in Ancient Indian Literature.

Case Studies (At least 4 case studies by an individual or group of students)

Case Study 1: The Sun Temple, Konark

Case Study 2: Evolution of Regional Dance Forms

Case Study 3: Training and Discipline in the Military

Case Study 4: Influence on Medicine and Wellness

Case Study 5: Indian Knowledge Systems: Global Influence

Case Study 6: Ancient Indian Sciences

First Year Engineering (2025 Course) Introduction to Co-Curricular Activities			
Course Code	FYCCC210W	**Credit**	01
Contact Hours	02 Hrs/Weeks(P)	**Type of Course**	LAB
Examination Scheme	TW – 25 marks	**Total Marks**	25 marks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	**Term Work**	Internal	25

Course Objectives	
1	To **familiarize** students with diverse co-curricular disciplines, **enable** them to appreciate their significance in personal and social development, and **apply** the acquired skills to enhance self-awareness, creativity, well-being, and societal engagement.

Course Outcomes	
CO1	To **Identify** fundamental concepts, techniques, and practices related to health, wellness, arts, culture, and life skills covered in various co-curricular courses.
CO2	To **Explain** the importance of holistic development through physical fitness, creative expression, cultural participation, and mental well-being activities.
CO3	To **Demonstrate** acquired skills and knowledge by actively participating in selected co-curricular activities to enhance personal growth, social interaction, and overall well-being

CO-PO Mapping Matrix (with Levels: 1 - Low, 2 - Medium, 3 - High)

(POs) → (COs) ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	2	3	2	1	1	-	2
CO2	1	-	-	-	-	3	3	3	2	2	1	3
CO3	1	1	1	-	2	3	3	3	3	3	2	3

Guidelines for Term Work	
1.	Students are required to go through the list of following Co-curricular Courses and select any one of their interests. They will be allocated one course from the list.
2.	Students are required to submit hard copy of a report along with certificate on the activities performed related to topics of opted Co-curricular Course.
3.	Evaluation will be done based on the report of activities submitted by student.
4.	Faculty members will be allotted for mentoring the activities related to Co-curricular Course topic. Faculty members will frame the list activities to be performed by students with the help of experts

Basket of Co-curricular Courses	
1	Health and Wellness
2	Yoga education
3	Meditation
4	Dancing
5	Cultural Activity
6	Basics of Music Composition
7	Physical Fitness
8	Visual Arts
9	Painting
10	Visual Arts

11	Art of Short Film Making / Cinematography / Content Development
12	Fine Arts
13	Applied Arts
14	Performing Arts
15	Self Defense for Women
16	Jeevan Vidya (Work Life Balance)
17	Mentoring of School Children