NEP 2020 Compliant Curriculum Structure

First Year (B.Tech.) with effect from AY. 2025-26

Semester - I			Teaching Scheme (Hours/Week)			Credits				Examination / Evaluation Scheme and Marks					
										CCE [40]					
Course Type	Course Code	Course Title	L	T	P	L	T	P	Total	CCE 1 [Class Test] [20]	CCE 2 [20]	ESE [60]	TW	PR / OR	Total
BSC	ES-BSC-F001	Linear Algebra and Differential Calculus	3	1		3	1		4	20	20	60	25		125
	ES-BSC-F002/ ES-BSC-F004	Physics for Engineers / Advanced Chemical Technology	3			3			3	20	20	60			100
	ES-BSC-F003/ ES-BSC-F005	Physics for Engineers Lab / Advanced Chemical Technology Lab			2			1	1					25	25
ESC	ES-ESC-F006 / ES-ESC-007	Engineering Graphics / Engineering Mechanics and Sustainable Built Environment	2		2	2		1	3	20	20	60	25		125
	ES-ESC-F008 / ES-ESC-F010	Basic Electrical Engineering / Basic Electronics Engineering	2			2			2	20	20	60			100
	ES-ESC-F009 / ES-ESC-F011	Basic Electrical Engineering Lab / Basic Electronics Engineering Lab			2			1	1					25	25
	ES-ESC-F012	Introduction to Procedural Programming Language in C	2		2	1		1	2	10	10	30		25	75
VSEC	ES-VSE-F013 / ES-VSE-F014	Professional and Interpersonal Skills / Workshop Technology	1		2	1		1	2				50		50
IKS / AES	ES- IKS -F015 / ES-AES-F016	Indian Knowledge System / Design Thinking and Idea Lab		2			2		2				50		50
CC	ES-CCC-F017	Liberal Learning Course - I	1		2	1		1	2				25		25
AC	ES-AC-F018	Induction							0						
			14	3	12	13	3	6	**22**						
			29							**90**	**90**	**270**	**175**	**75**	**700**

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Semester - II			Teaching Scheme (Hours/Week)			Credits				Examination / Evaluation Scheme and Marks					
										CCE [40]					
Course Type	Course Code	Course Title	L	T	P	L	T	P	Total	CCE 1 [Class Test] [20]	CCE 2 [20]	ESE [60]	TW	PR / OR	Total
BSC	ES-BSC-F019	Advanced Calculus	3	1		3	1		4	20	20	60	25		125
	ES-BSC-F002/ ES-BSC-F004	Physics for Engineers / Advanced Chemical Technology	3			3			3	20	20	60			100
	ES-BSC-F003/ ES-BSC-F005	Physics for Engineers Lab / Advanced Chemical Technology Lab			2			1	1					25	25
ESC PCC	ES-ESC-F006 / ES-ESC-007	Engineering Graphics / Engineering Mechanics and Sustainable Built Environment	2		2	2		1	3	20	20	60	25		125
	ES-ESC-F008 / ES-ESC-F010	Basic Electrical Engineering / Basic Electronics Engineering	2			2			2	20	20	60			100
	ES ESC F009 / ES-ESC-F011	Basic Electrical Engineering Lab / Basic Electronics Engineering Lab			2			1	1					25	25
	ES-PCC-F020	Programming and Problem Solving	2		2	1		1	2	10	10	30		25	75
VSEC	ES-VSE-F013 / ES-VSE-F014	Professional and Interpersonal Skills / Workshop Technology	1		2	1		1	2				50		50
IKS / AES	ES- IKS -F015 /ES-AES-F016	Indian Knowledge System / Design Thinking and Idea Lab		2			2		2				50		50
CC	ES-CCC-F021	Liberal Learning Course - II	1		2	1		1	2				25		25
AC	ES-AC-F022	Induction							0						
			14	3	12	13	3	6	**22**						
			29							**90**	**90**	**270**	**175**	**75**	**700**

L=Lecture, P=Practical, **CCE** = Continuous and Comprehensive Evaluation, **PR/OR**= Practical/Oral
T= Tutorial, **TW**= Term work, **ESE** = End Semester Examination,

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NEP 2020 Compliant Curriculum Structure
First Year (B.Tech) with effect from AY. 2025-26

Course Code: ES-BSC-F001		**Course Name: Linear Algebra and Differential Calculus**
Teaching Scheme: **Lectures :** 3 Hrs./Week **Tutorial:** 1 Hrs./Week	**Credit Scheme:** TH: 3 PR: 1	**Examination Scheme:** **Comprehensive Continuous Evaluation (CCE):** 40 Marks **Term work:** 25 Marks **End-Semester Examination:** 60 Marks **Total:** 125 Marks

COURSE PREREQUISITES: Functions, domain, codomain, limits, continuity, formation of differential equation, variable separation method, Basic Differential Calculus, gradient, Matrix algebra, determinant and its properties.

COURSE OBJECTIVE: The objective of this course is to

1) To provide first-year engineering students with a solid understanding of differential calculus and its engineering applications.
2) To develop proficiency in Linear Algebra, exploring its practical applications in solving real-world engineering problems.

COURSE OUTCOME: After successful completion of the course, students will be able to:

- **BSC-CO-F001.1: analyze** Rolle's Theorem and Mean Value Theorem, Taylor's theorem and their applications.
- **BSC-CO-F001.2: evaluate** methods of solving the first order differential equations. **Apply** the concepts of first order differential equation, **to solve** the physical systems.
- **BSC-CO-F001.3: analyze** the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
- **BSC-CO-F001.4: Model, interpret** linear systems and solve.
- **BSC-CO-F001.5: Compute & apply** the knowledge of eigen values & eigenvectors in Engineering applications.

COURSE CONTENTS

UNIT-I	**Mean Value Theorems and Applications**	**8 Hours**

Roll's Theorem, Mean Value Theorems, Taylor's Series expansion, Maclaurine's series expansion. Applications in Approximation. Self-Study: Maxima-Minima of Functions, Increasing- Decreasing Nature of Functions.

UNIT-II	First Order Differential Equations and Applications	8 Hours
Exact Differential Equation, Integrating Factors, Linear differential Equations, Equations reducible to Linear form. Applications: Electrical Circuits, Orthogonal Trajectories, Optimization of step size in gradient descent method. Self-Study: Newton's Law of Cooling.		
UNIT-III	**Fourier Series**	**8 Hours**
Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis, Applications to problems in Engineering. Self-Study: Verification of Dirichlet conditions.		
UNIT-IV	**Linear Algebra-I**	**2 Hours**
Elementary operations and Echelon form,Rank of matrix, System of linear equations, Gauss-Jordan Elimination, Linear dependence, Applications of System of Linear equations. Self-Study: Properties of determinant, inverse, and trace of a matrix.		
UNIT-V	**Linear Algebra-II**	**2 Hours**
Eigen Values and Eigen Vectors of a matrix, Cayley-Hamilton Theorem, Diagonalization of a matrix, Introduction to Quadratic forms. Self-Study: Applications of Eigen values and eigen vectors in image processing.		
LEARNING RESOURCES:		
TEXT BOOKS: **T1 :**Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill) **T2 :** Advance Engineering Mathematics by Dennis G Zill (Jones & Bartlett Publishers)		
REFERENCE BOOKS:		
R1: Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.) **R2**: Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education) **R3**: Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning) **R4**: Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson)		
WEB LINKS AND VIDEO LECTURES (E-RESOURCES)		
1. **NPTEL Course**: https://onlinecourses.nptel.ac.in/noc21_ma58 2. Graphic Calculator: https://www.geogebra.org/		
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)		
1. Flipped Classroom 2. Online Interactive Tool 3. Collaborative and Individual Problem based learning. 4. Quizzes/Assignment		

Course Code: ES-BSC-F002		**Course Name: Physics for Engineers**
Teaching Scheme: **Lectures :** 3 Hrs./Week	**Credit Scheme:** TH: 3	**Examination Scheme:** **CCE:** 40 Marks **End-Semester Examination:** 60 Marks **Total:** 100 Marks

COURSE PREREQUISITES: Basic concepts of Physics, laws of optics and modern Physics.

COURSE OBJECTIVE: The objective of this course is to

To enable learners to connect Physics principles with real-world engineering systems and emerging technologies.

COURSE OUTCOME:

After successful completion of the course, the learner will be able to:

- **BSC-CO-F002.1:** Explain the phenomena of interference in thin films, polarization, and double refraction, and correlate them with applications such as anti-reflection coatings and liquid crystal displays (LCDs).
- **BSC-CO-F002.2:** Introduce students to the basics of quantum mechanics and quantum computing, and their applications in science and technology.
- **BSC-CO-F002.3:** Analyze Fermi level and Fermi energy in semiconductors using Fermi-Dirac statistics and interpret their role in the operation of semiconductor devices.
- **BSC-CO-F002.4:** Describe the working principles of lasers and optical fibers, and apply this knowledge to holography and fiber optic communication.
- **BSC-CO-F002.5:** Interpret the properties of nanoparticles and superconductors, and assess their engineering applications.

COURSE CONTENTS

UNIT-I	**OPTICAL PHYSICS AND PHOTONIC APPLICATIONS**	**08 Hours**

- Interference in Thin Films – Conditions for maxima and minima
- Wedge-Shaped Films – Qualitative analysis
- Engineering Applications interference in optical flatness and Anti-Reflective Coatings (ARC)
- Polarization – Types: Unpolarized, Plane-Polarized (PPL), Circularly Polarized(CPL), Elliptically Polarized (EPL)
- Malus Law and Numerical Problems – Light intensity variations through polarizers
- Double Refraction – Structure of calcite crystal, Huygens' theory
- Engineering Applications of Polarization – LCDs, communication, radar, 3Dmovies
- Numerical Problems on Thin Film Interference and Polarization

UNIT-II	FUNDAMENTALS OF QUANTUM MECHANICS AND EMERGING TECHNOLOGIES	08 Hours

- de Broglie Hypothesis – Matter waves, de Broglie wavelength for particles and numerical
- Wave Function and Probability Density – Physical significance and conditions for valid wave functions
- Schrödinger's Equations – Time-independent and time-dependent forms, significance
- Particle in a Rigid Box – Energy quantization and related numerical problems
- Quantum Mechanical Tunnelling – Principle and applications (alpha decay, STM)
- Basics of Quantum Computing – Qubits, superposition, entanglement, classical Vs quantum computing
- Applications of Quantum Computing – Potential impact on cryptography, AI, and optimization problems

UNIT-III	SEMICONDUCTOR SCIENCE AND OPTOELECTRONIC DEVICES	08 Hours

- Energy Bands in Solids – Valence band, conduction band, and classification of materials
- Fermi Level and Fermi Energy – Concept and temperature dependence
- Intrinsic and Extrinsic Semiconductors – Position of Fermi level, derivation
- PN Junction Diode – Working based on energy bands, biasing effects
- Hall Effect – Derivation of Hall voltage and Hall coefficient, applications
- Solar Cell Physics – Principle, working, IV characteristics, efficiency, and fill factor
- Applications of Solar Cells in Energy Sustainability – Methods to improve efficiency

UNIT-IV	PHOTONICS AND OPTICAL COMMUNICATION	08 Hours

- Principles of Lasers – Spontaneous and stimulated emission, population inversion, pumping
- Laser Construction and Characteristics – CO_2 laser, resonant cavity, active medium
- Holography – Recording and reconstruction of images, applications
- Optical Fibers – Critical angle, numerical aperture, total internal reflection
- Types of Optical Fibers – Single-mode & multimode, step-index & graded-index
- Attenuation in Optical Fibers – Causes, attenuation coefficient, impact on communication
- Advantages of Optical Fiber Communication – Engineering applications and numerical problems

UNIT-V	FUNDAMENTALS OF NANOSCIENCE AND SUPERCONDUCTIVITY	08 Hours

- Nanoparticles and Quantum Confinement – Size dependent properties
- Synthesis of Nanoparticles – Ball milling and Physical Vapor Deposition
- Properties of Nanomaterials – Optical, electrical, mechanical, magnetic
- Applications of Nanotechnology – Electronics (GMR effect), automobiles, environmental sustainability
- Superconductivity –Temperature dependence of resistivity, Meissner effect, Type-I and II superconductors
- Josephson Effects (DC and AC), Cooper Pair Formation – Fundamental principles
- SQUID and Maglev Train Technology – Superconductivity applications in transportation and sensors

LEARNING RESOURCES:

TEXTBOOKS:

T1: Engineering Physics by M. N. Avadhanulu, P. G. Kshirsagar& TVS Arun Murthy, S. Chand Publications.

T2: Engineering Physics, R. K. Gaur and S. L. Gupta, Dhanpat Rai Publications.

REFERENCE BOOKS:

R1: Optics, Ajoy Ghatak, Tata Mc Graw Hill

R2: Quantum Mechanics, A. K. Ghatak, S. Lokanathan, Laxmi Publications

R3: Introduction to Solid State Physics, C. Kittel, Wiley and Sons.

R4: Principles of Physics, Serway and Jewett, Saunders college publishing

R5: Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

- NPTEL
- Phys.org
- The Physics Classroom
- Hyper Physics Concepts (gsu.edu)
- Virtual Labs | Physical Sciences (vlab.co.in)

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

- Flipped Classroom
- Online Interactive Tool
- Collaborative and Individual Problem based learning
- Quizzes/Assignment

Course Code: ES-BSC-F003		**Course Name: Physics for Engineers Lab**
Teaching Scheme: **Practical :** 2 Hrs./Week	**Credit Scheme:** PR : 1	**Examination Scheme:** PR **TW/Practical Evaluation :** 25 Marks

COURSE PREREQUISITES: Basic concepts of Physics, laws of optics and modern physics.

COURSE OBJECTIVE: The objective of this course is to

To enable learners to connect physics principles with real-world engineering systems and emerging technologies.

COURSE OUTCOME:

After successful completion of the course, the learner will be able to:

- **BSC-CO-F003.1:** Explain the phenomena of interference in thin films, polarization, and double refraction, and correlate them with applications such as anti-reflection coatings and liquid crystal displays (LCDs).
- **BSC-CO-F003.2:** Introduce students to the basics of quantum mechanics and quantum computing, and their applications in science and technology.
- **BSC-CO-F003.3:**Analyze Fermi level and Fermi energy in semiconductors using Fermi-Dirac statistics and interpret their role in the operation of semiconductor devices.
- **BSC-CO-F003.4:** Describe the working principles of lasers and optical fibers, and apply this knowledge to holography and fiber optic communication.
- **BSC-CO-F003.5:** Interpret the properties of nanoparticles and superconductors, and assess their engineering applications.

LIST OF LABORATORY EXPERIMENTS/ASSIGNMENTS (ANY 8 FROM THE GIVEN LIST)

1) **Newton's Rings:** Determine radius of curvature of a plano-convex lens or wavelength of monochromatic light.
2) **Polarization:** Verify Malus' law; determine specific rotation using polarimeter; determine refractive indices using double refracting prism.
3) **Planck's Constant:** Determine Planck's constant using the available setup.
4) **Band Gap Energy:** Determine band gap energy of a semiconductor using PN junction diode.
5) **Solar Cell:** Plot I-V characteristics; determine fill factor and efficiency.
6) **Hall Effect:** Determine Hall coefficient and charge carrier density of a semiconductor.
7) **Ultrasonics:** Determine velocity of ultrasonic waves and compressibility of a liquid using ultrasonic interferometer.
8) **Laser:** Determine beam divergence, diameter of thin wire, or perform beam profile analysis.
9) **Diffraction:** Determine grating lines/cm (normal incidence), or wavelength using transmission grating or spectrometer.
10) **Optical Fiber:** Determine numerical aperture, attenuation coefficient, or critical angle of incidence.
11) **Arduino Interface:** Physical measurement experiment using Arduino (e.g., Hall or ultrasonic sensor).
12) **Study Report:** Study tour/visit to a research lab or facility and report submission.

LEARNING RESOURCES:

TEXTBOOKS:

T1: Engineering Physics by M. N. Avadhanulu, P. G. Kshirsagar& TVS Arun Murthy, S. Chand Publications.

T2: Engineering Physics, R. K. Gaur and S. L. Gupta, Dhanpat Rai Publications.

REFERENCE BOOKS:

R1: Optics, Ajoy Ghatak, Tata Mc Graw Hill

R2: Quantum Mechanics, A. K. Ghatak, S. Lokanathan, Laxmi Publications

R3: Introduction to Solid State Physics, C. Kittel, Wiley and Sons.

R4: Principles of Physics, Serway and Jewett, Saunders college publishing

R5: Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

- NPTEL
- Phys.org
- The Physics Classroom
- Hyper Physics Concepts (gsu.edu)
- Virtual Labs | Physical Sciences (vlab.co.in)

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

- Flipped Classroom
- Online Interactive Tool
- Collaborative and Individual Problem based learning
- Quizzes/Assignment

Course Code: ES-BSC-F004 **Course Name: Advanced Chemical Technology**

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Lectures : 3 Hrs./Week	TH: 3	**CCE :** 40 Marks **End-Semester Examination:** 60 Marks **Total:** 100 Marks

COURSE PREREQUISITES: Basic concepts of chemistry, types of titrations, structure property relationship and classification of polymers, Balancing of the various types of reactions, natural sources of fuel, electrochemical series.

COURSE OBJECTIVE: The objective of this course is

To enlighten the students about traditional and advanced water quality analysis techniques, structure and properties of specialty polymers and nanomaterials. To compare conventional and alternative fuels. Identify corrosion mechanisms and prevention methods.

COURSE OUTCOME: After successful completion of the course, students will be able to:

1) **BSC-CO-F004.1: Understand** the practical approaches and traditional and modern techniques required to effectively monitor water quality.
2) **BSC-CO-F004.2: Comprehend** the structure and properties of advanced engineering materials for various technological applications.
3) **BSC-CO-F004.3: Apply** and utilizethe fundamentalsof nanomaterials,their structure and properties in engineering and technology.
4) **BSC-CO-F004.4: Analyze** different types of conventional and alternative fuels.
5) **BSC-CO-F004.5: Explain** causes of corrosion and apply methods for minimizing corrosion.

COURSE CONTENTS

UNIT-I	**Water treatment and softening technology**	8 Hours

Impurities in water, Types of hardness of water. Determination of hardness (by EDTA method using molarity concept and alkalinity, numerical.

Water treatment: i) Zeolite method and numerical ii) Demineralization method. Purification of water: Reverse osmosis and Electrodialysis.

Modern technique of atmospheric water generation by dew point and heat exchanger method. Key Benefits and challenges of Integrating AIML and IoT into Water Engineering.

UNIT-II	**Specialty polymers**	8 Hours

Polymers: Introduction, Definition Polymer, Monomer, Functionality of monomers, Degree of polymerization, Molecular weight of polymer, numerical Classification of polymer on the basis of Thermal Behaviour-Thermoplastics and Thermosetting.

Specialty polymers: Introduction, preparation, properties and applications of the following polymers: 1. Polycarbonate, 2. Poly (hydroxyl butyrate hydroxyl valerate), 3. Poly acetylene, 4. Polystyrene, 5. PVC 6. Polymer composites

UNIT-III	**Nanomaterials**	8 Hours

Introduction, classification of nanomaterials based on dimensions (zero dimensional, one-dimensional, two-dimensional and three-dimensional), structure, properties and applications of Diamond, graphene sheet, carbon nanotubes, quantum dots (semiconductor nanoparticles)

UNIT-IV	Energy sources and battery technology	8 Hours

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: Proximate Analysis, Alternative fuels: Power alcohol and biodiesel. Hydrogen gas as a future fuel. Types of fuel cell: H_2-O_2 and Biochemical. Lithium Ion Battery, construction, working, advantages, applications.

UNIT-V	Corrosion and its Prevention	8 Hours

Types of corrosion: Introduction, 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.

Corrosion control and prevention methods: Cathodic Protection by sacrificial anode method, Anodic protection, metallic coatings and its types, surface preparation, methods to apply metallic coatings-hot dipping (galvanizing, tinning), electroplating. Factors affecting electroplating. Corrosion Resistant / Anti corrosive paints

LEARNING RESOURCES:

TEXT BOOKS:

T1 : Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, S. Chand & Company Ltd. **T2 :** Engineering Chemistry by O. G. Palanna, Tata Magraw Hill Education Pvt. Ltd.

T3 : Textbook of Engineering Chemistry by Dr.Sunita Rattan, S. K. Kataria& Sons Publisher

REFERENCE BOOKS:

R1 : Water Technology: An Introduction for Environmental Scientists and Engineers, 3rd,N. F. Gray, IWA Publishing

R2: Polymer Science, V. R. Gowarikar, N. V. Viswanathan, jayadevSreedhar, Wiley Eastern Limited.

R3 : Fundamentals of Nanotechnology, G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta, CRC press.

R4 : An Introduction to the Study of Fuel, Fj Brislee, Sagwan Press

R5 : Foundations Of Corrosion Science And Engineering, K.S. Ghosh, Eastern Economy Edition, PHI

R6 : Basic Concept of Analytical Chemistry, 2ed, S. M. Khopkar, New Age-International Publisher.

R7 : Spectroscopy of organic compounds, 2ed, P. S. Kalsi, New Age International Ltd., Publisher.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)
1. **https://nptel.ac.in/courses/113104082**
2. https://www.classroomchemistry.com
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)
1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Course Code: ES-BSC-F005	**Course Name: Advanced Chemical Technology Lab**

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 2 Hrs./Week	PR : 1	**TW/Practical Evaluation :** 25 Marks

COURSE PREREQUISITES: Basic concepts of chemistry, types of titrations, structure property relationship and classification of polymers, Balancing of the various types of reactions, natural sources of fuel, electrochemical series.

COURSE OBJECTIVE:The objective of this course is

1. To apply and understand appropriate analytical and electro analytical techniques to comprehend practical engineering chemistry.
2. To understand and demonstrate need of sustainable solutions in societal and environmental issues trough experimental skills.

COURSE OUTCOME:After successful completion of the course, students will be able to:

1) **BSC-CO-F005.**1: Understand the practical approaches required to monitor hardness and alkalinity of water.
2) **BSC-CO-F005.**2: Analysis of chemical moieties by appropriate electro analytical techniques like pH metry, conductometry and colorimetry.
3) **BSC-CO-F005.**3: Demonstrate the synthesis, structure and properties of advanced polymeric materials for various applications.
4) **BSC-CO-F005.**4: Apply basic concepts and various steps involved in proximate analysis of coal.
5) **BSC-CO-F008.**5: Identify the mechanism and causes of rate of corrosion.

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. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin.
5. Proximate analysis of coal.
6. Preparation of biodiesel from oil.
7. To coat copper and zinc on an iron plate using electroplating.
8. Study of rate of corrosion in different concentration of acid on iron.
9. To determine electrochemical equivalent of copper using copper plate.
10. Titration of a mixture of weak acid and strong acid with strong base using conductometer.
11. To determine maximum wavelength of absorption of CuSO4/FeSO4/ KMnO4, verify Beer's law and find unknown concentration of given sample.
12. Case study – Chemical research and technology
LEARNING RESOURCES:
REFERENCE BOOKS:
1. Laboratory Manual on Engineering Chemistry, 3 rd ed. Dr.Sudha Rani, S.K.Bashin
2. Practical Handbook of Engineering Chemistry, Dr.Sonali S. Chine, Dr.Manoj R. Sonawane, Dr. Vilas B. Gade
3. Practical Engineering Chemistry,Dr. S. S. Dara
WEB LINKS AND VIDEO LECTURES (E-RESOURCES)
1. Virtual Labs (vlab.co.in)

CourseCode:ES-ESC-F006		**Course Name: Engineering Graphics**
Teaching Scheme: **Lectures :** 2 Hrs./Week **Practical:**2 Hrs/week	**Credit Scheme:** TH: 2 PR: 1	**Examination Scheme:** **CCE Examination:** 40 Marks **End-Semester Examination:** 60 Marks **TW**:25 Marks **Total:** 125 Marks

COURSE PREREQUISITES:

- Basic Geometric Shapes
- Fundamentals of Geometrical Measurements (linear and angular), including Construction Techniques
- Deviation of Lines, Circles, and Polygons
- Coordinate Geometry

COURSE OBJECTIVE: The objective of this course is to

This course is designed to develop student's ability to visualize physical objects and accurately represent the monpaper for clear communication in engineering contexts. It emphasizes improving manual drawing techniques, refining the ability to interpret drawings, and building a solid understanding of object

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

ESC-CO-F006.1: Understand the basics of Engineering Graphics, the fundamental principles of geometric construction, and apply projection methods to create drawings for points and lines.

ESC-CO-F006.2: Utilize various types of projections and methods to accurately prepare drawings for planes.

ESC-CO-F006.3: Use the concept of orthographic projection to draw multiple 2D views that help visualize the physical state of an object.

ESC-CO-F006.4: Leverage visualization skills to generate isometric projections from given orthographic views

ESC-CO-F006.5 : Create the development of the lateral surface of solids.

COURSE CONTENTS

UNIT-I	PROJECTION OF STRAIGHT LINES	6Hours

Basic Geometry constructions, Dimensioning, Lettering, Sheet Sizes, Scales, Line types, construction of polygon, Drawing conventions.

Theory of projection - Projection of points in all possible quadrants. Projection of line when parallel to both the reference planes, Projections of lines when it is perpendicular to one of the reference planes, when line is inclined to one and parallel to other reference plane, Line inclined to both reference planes (first angle projection only).

UNIT-II	PROJECTION OF PLANES	6 Hours

Introduction, Projection of plane when plane is Parallel to one and perpendicular to other, Projection of plane when plane is inclined to one plane and perpendicular to other Projections of planes when it is inclined to both reference planes.

UNIT-III	ORTHOGRAPHIC PROJECTION	6 Hours

Introduction to orthographic projection, principle of projection, Methods of projection, Sectional orthographic projection, Orthographic projection of machine components

UNIT-IV	ISOMETRIC PROJECTION	6 Hours

Introduction, Isometric projection, Isometric views, Isometric scale, Isometric projection of circle, sphere, isometric projection of robotic and automobile components.

UNIT-V	DEVELOPMENT OF LATERAL SURFACES	6 Hours

Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut section of cone, pyramid, prism etc

LIST OF ASSIGNMENT

Assignment problems should be drawn on **A2 size drawing sheets**

1. Draw two problems on the projection of lines.
2. Draw two problems on the projection of planes.
3. Draw two problems on orthographic projections
4. Draw two problems on isometric projections
5. Draw two problems on the development of lateral surfaces.

TERM WORK

- Practical for batches shall be engaged with minimum three batches
- Term work is calculated on the basis of given assignments

GUIDELINES FOR PRACTICAL CONDUCTION

- Some Application oriented Numerical can be given to students
- Emphasis is given on Line work to meet Industry standard

LEARNING RESOURCES:

TEXT BOOKS:

T1: Bhatt, N. D., & Panchal, V. M. (2016). Engineering Drawing. Charotar Publication, Anand, India.

T2: Venugopal, K. (2015). Engineering and Graphics. New Age International, New Delhi.

T3: Jolhe, D. A. (2015). Engineering Drawing with Introduction to AutoCAD. Tata McGraw-Hill, New Delhi.

T4 : Rathnam, K. (2018). A First Course in Engineering Drawing. Springer Nature Singapore Pte. Ltd, Singapore.

T5 : Agrawal, B., & Agrawal, C. M. (2012). Engineering Graphics. TMH Publication.

REFERENCE BOOKS:

R1: Bhatt, N. D. (2018). Machine Drawing. Charotar Publishing House, Anand, India.

R2: Dhawan, R. K. (2000). A Textbook of Engineering Drawing. S. Chand, New Delhi.

R3: Madsen, D. P., & Madsen, D. A. (2016). Engineering Drawing and Design. Delmar Publishers Inc., USA.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. NPTEL
2. Coursera – Engineering Graphics by Georgia Tech
3. MIT Open Course Ware – Introduction to Engineering Graphics
4. Udemy – Engineering Graphics for Beginner

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning
4. Quizzes/Assignment

Course Code: ES-ESC-F007		**Course Name: Engineering Mechanics & Sustainable Built Environment**
Teaching Scheme: Lectures : 2 Hrs./Week **Practical:**2 Hrs/week	**Credit Scheme:** TH: 2 PR: 1	**Examination Scheme:** **CCE Examination:** 40 Marks **End-Semester Examination:** 60 Marks **TW**:25 Marks **Total:** 125 Marks

COURSE PREREQUISITES: Basic calculus, trigonometry, geometrical expression, laws of motion, concept of mass, acceleration, with fundamental knowledge of engineering mathematics and physics.

COURSE OBJECTIVE: The objectives of this course is to make students to learn basics of engineering Mechanics concepts and its application to the real-world problems, solve problems involving Forces, loads and Moments and know their applications in allied subjects and to learn basics of Building planning

COURSE OUTCOME: After successful completion of the course, students will be able to:

- **ESC-CO-F007.1:** Demonstrate principles of statics to determine the resultant of a force system.
- **ESC-CO-F007.2:** Analyze various structures by using principles of equilibrium.
- **ESC-CO-F007.3:** Analyze rectilinear and curvilinear motion of particle.
- **ESC-CO-F007.4** Apply Newton's second law, work energy and impulse momentum principles for particles.
- **ESC-CO-F007.5:** Outline principles of building planning and guidelines for its development.

COURSE CONTENTS

UNIT-I	**FORCE SYSTEM**	**6 Hours**

Introduction and principles of statics, system of forces, coplanar force system: resolution and composition of a force, resultant of general force system, triangle law, parallelogram law and polygon law, moment of a force, couple, equilibrium of a force system, Varignon's theorem, free body diagram, application of sine rule

UNIT-II	**ANALYSIS OF STRUCTURES**	**6 Hours**

Beam: Types of beams - simply supported beam, fixed beam, cantilever beam, compound beam, overhanging beam, types of supports-roller, hinge/pin, fixed support, types of loads: point load, uniformly distributed load, uniformly varying load, support reactions.

Truss: Types of trusses, analysis of pin-jointed truss by method of joint and method of section, difference between truss and frame, applications of beams, frames and trusses

UNIT-III	**KINEMATICS OF PARTICLE**	**6 Hours**

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-IV	KINETICS OF PARTICLE	6 Hours

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 Kinetics of particle and impact.

UNIT-V	BUILDING PLANNING AND SUATAINABLE DESIGN	6 Hours

Overview of natural and built-up environment, Role of environmental engineers in the society, principles of building planning, building by laws, concept of carpet area, set back distances and FSI. Human population growth and its Impact on environment. Need of sustainable building design, Rainwater harvesting, concept of green building and ecofriendly materials.

LIST OF LABORATORY EXPERIMENTS/ASSIGNMENTS

1. Verification of the polygon law of forces.
2. To find support reaction of beam.
3. To determine co efficient of friction.
4. Determination of coefficient of restitution.
5. Graphical solution of concurrent force system and parallel force system
6. Assignment on each unit : minimum four example on each unit

LEARNING RESOURCES:

TEXT BOOKS:

T1 : Engineering Mechanics, Ferdinand Singer, 3rd edition, Harper and Row

T2 : Engineering Mechanics (Statics and Dynamics) by Hibbeler R. C., Pearson Education

T3 : Environmental Studies by Dr.J.P.Sharma

REFERENCE BOOKS:

R1 : Engineering Mechanics, S Timoshanko and Young, Tata McGraw Hill Education Pvt. Ltd. New Delhi

R2 : Vector Mechanics for Engineers – Statics, Beer and Johnston, Tata McGraw Hill

R3 : Vector Mechanics for Engineers – Dynamics, Beer and Johnston, Tata McGraw Hill

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)
1. NPTEL Course on "Engineering Mechanics- Statics and Dynamics"
https://onlinecourses.nptel.ac.in/noc24_me02/preview
2. NPTEL Course on "Kinematics of Mechanisms and Machines"
https://onlinecourses.nptel.ac.in/noc24_me44/preview
3. NPTEL Course on "Robotics: Basics and Selected Advanced Topics"
https://onlinecourses.nptel.ac.in/noc24_me23/preview
4. NPTEL Course on "Robotics and Control: Theory and Practice"
https://onlinecourses.nptel.ac.in/noc24_me18/preview
5. https://www.youtube.com/watch?v=XyZPfi_pd5k
6. https://www.youtube.com/playlist?list=PL245ANWBOJxbNQSnxeyKiK7HHszLoj0Mo
7. https://www.youtube.com/playlist?list=PL245ANWBOJxagbiQHZ0WxfFOYa3dW5E4M
8. https://onlinecourses.nptel.ac.in/noc23_ge17/preview
9. www.nptel.ac.in
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)
1. Flipped Classroom/ surprise test/OBT
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment
5. Field Visit

Course Code: ES-ESC-F008		**Course Name: Basic Electrical Engineering**
Teaching Scheme: **Lectures :** 2 Hrs./Week	**Credit Scheme:** TH: 2	**Examination Scheme:** **CCE:**40 Marks **End-Semester Examination:** 60 Marks **Total:** 100 Marks

COURSE PREREQUISITES: Electric charges and fields, Coulomb's laws, Voltage, Current, Power, Ohms law, Magnetism, Faraday's Laws.

COURSE OBJECTIVES: The objective of this course is:

To provide fundamental understanding of electrical engineering by introducing concepts such as resistance, current, EMF, AC/DC circuits, electromagnetism and electrostatics. To analyse electrical circuits using network theorems, magnetic and electrostatic principles. To study the working of transformers and applications of various electric machines. The course also introduces three-phase systems and offers a basic overview of electric vehicles to bridge traditional and modern applications of electrical engineering.

COURSE OUTCOMES: After successful completion of the course, the learner will be able to:

- **ESC-CO-F008.1** Apply basic electrical concepts and network theorems to analyze DC circuits and explain the structure of a typical power system comprising generation, transmission and distribution stages.
- **ESC-CO-F008.2:** Differentiate between electromagnetism and electrostatics and apply related laws to analyse magnetic circuits and capacitor behaviour in electric circuits.
- **ESC-CO-F008.3:** Analyze single-phase AC circuits using phasor and waveform representations and calculate impedance, power factor, active, reactive and apparent power.
- **ESC-CO-F008.4:** Understand the operation of three-phase AC systems and single-phase transformers. Analyse voltage, current and power relations in balanced loads and transformer performance under various loading conditions.
- **ESC-CO-F008.5:** Compare the construction, working principle and applications of various types of DC motors, single-phase induction motors and explain the basic structure of electric vehicles using a block diagram approach.

COURSE CONTENTS

UNIT-I	**Elementary Concepts and DC Circuits**	**6 Hours**

Elementary concepts: Resistance, EMF, current, potential difference and 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, Simplification of networks using series-parallel combinations and Star-delta transformation, Kirchhoff's Laws, Superposition theorem, Thevenin's Theorem.

UNIT-II	Electromagnetism & Electrostatics	6 Hours
Magnetic Circuit: Concept of flux density, field strength, permeability, MMF and reluctance. Faradays Laws of electromagnetic induction, Fleming's right-hand rule, Statically and dynamically induced EMF, Self and mutual inductance, Energy stored in magnetic field. **Electrostatics:** Concept of Electric flux density, electric field strength and permittivity. Working of a capacitor, Capacitors in series and parallel, Energy stored in capacitor, Charging and discharging of capacitors and their time constant.		
UNIT-III	**AC fundamentals & Single-Phase AC Circuits**	**6 Hours**
AC fundamentals: Generation of single-phase sinusoidal voltages and currents, mathematical and graphical representation, Concept of cycle, period, frequency, instantaneous, peak, average and RMS values, peak factor and form factor. **Single-Phase AC Circuits:** Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance, 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. Resonance in series RLC circuits.		
UNIT-IV	**Three Phase AC Circuits & Single-Phase transformers**	**6 Hours**
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 along with phasor diagrams. **Single-Phase transformers:** Construction, working principle and various types of transformers. Study of EMF equation, transformation ratio and transformer rating. Determining various losses, voltage regulation and efficiency of transformers, Applications of transformers.		
UNIT-V	**Introduction to Electric Machines and Electric Vehicles**	**6 Hours**
D.C. motors: Construction, working principle and various types of DC motors. Study of voltage and current equations, characteristics and applications. **Single-Phase induction motor:** Construction, working principle and various types of single-phase induction motors. Study of phasor diagrams and applications. **Introduction to Electric Vehicles:** Overview and block diagram approach to electric vehicles.		
LEARNING RESOURCES:		
TEXT BOOKS: **T1.** B.L. Theraja, A. K. Theraja "ABC of Electrical Engineering", S Chand Publications, 2012 **T2.** D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 2nd edition 2019.		
REFERENCE BOOKS: **R1:** C. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited, 5th edition 2024 **R2:** S. K. Bhattacharya, "Electrical Machines", McGraw Hill Education, 2nd edition, 2008 **R3:** T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press, 2nd edition 2018.		

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

e-Books: https://www.schandpublishing.com/books/tech-professional/electrical-engineeringelectronics/abc-electrical-engineering/9788121939096/

MOOC / NPTEL/YouTube Links: https://nptel.ac.in/courses/108105112

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Course Code: ES-ESC-F009 **Course Name: Basic Electrical Engineering Lab**

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical : 2 Hrs./Week	PR : 1	**Practical Evaluation:** 25 Marks

COURSE PREREQUISITES: Voltage, Current, Power, Ohms law, Magnetism, AC fundamentals

COURSE OBJECTIVE: The objective of this course is:

To study safety precautions while working on electrical systems, single-phase series RLC circuits, three-phase star and delta connections, efficiency of a single-phase transformer

COURSE OUTCOMES: After successful completion of the course, the learner will be able to:

- **ESC-CO-F009.1:** To study various types of electrical protection equipment used for safety and study various measuring instruments.
- **ESC-CO-F009.2:** To verify Kirchhoff's voltage law and superposition theorem
- **ESC-CO-F009.3:** To analyze relation of voltage and current of series RLC circuit with the help of phasor diagrams
- **ESC-CO-F009.4:** To analyze relations of line voltage and phase voltage in balanced star and delta connected loads
- **ESC-CO-F009.5:** To conduct load test on a transformer and determine its efficiency and voltage regulation.

LIST OF LABORATORY EXPERIMENTS/ASSIGNMENTS (ANY 8 FROM THE GIVEN LIST)

1) To study safety precautions while working on electrical systems, handling of various equipment such as rheostat, multi meter, ammeters, voltmeters, wattmeter etc.
2) Study of wiring materials, switch board and different wiring schemes. (Simple wiring & staircase wiring).
3) To verify Kirchhoff's laws and Superposition theorem experimentally
4) To verify Thevenin theorem experimentally
5) To determine efficiency and regulation of transformer by using direct loading test experimentally
6) To study RLC series circuit
7) To verify the relation between phase and line quantities in three phase balanced star delta connections of load experimentally
8) Study of cut view section of single phase/three phase Induction motor.
9) To study of Single-Phase LT electricity bill

Guidelines for Student's Lab Journal

The students Lab Journal should contain following related to every experiment –

1. Title of the experiment
2. Objective
3. Apparatus with their detailed specifications
4. Brief theory related to the experiment
5. Connection diagram /circuit diagram
6. Observation table
7. Sample calculations for one/two reading
8. Result table
9. Graph and Conclusions.

Guidelines for Laboratory Assessment

1. Continuous assessment of laboratory work is to be done based on overall performance and Laboratory performance of student.
2. Each Laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.
3. Suggested parameters for overall assessment as well as each Laboratory assignment include timely completion, performance, efficiency, punctuality, and neatness.

LEARNING RESOURCES:

TEXT BOOKS:

T1. B.L. Theraja,A. K.Theraja "ABC of Electrical Engineering", S Chand Publications,2012

T2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 2nd edition 2019.

REFERENCE BOOKS:

R1: C. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited 5th edition 2024

R2: S K Bhattacharya, "Electrical Machines", McGraw Hill Education, 2nd edition, 2008

R3: T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press, 2nd edition 2018.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

e-Books: https://www.schandpublishing.com/books/tech-professional/electrical-engineeringelectronics/abc-electrical-engineering/9788121939096/

MOOC / NPTEL/YouTube Links: https://nptel.ac.in/courses/108105112

Course Code: ES-ESC-F10		**Course Name: Basic Electronics Engineering**
Teaching Scheme: **Lectures:**2Hrs/Week **Practical:** 2 Hrs/Week	**Credit Scheme:** TH: 2 PR : 1	**Examination Scheme:** **CCE** : 40 Marks **End-Semester Examination:** 60 Marks **Total:** 100 Marks

COURSE PREREQUISITES: Basic concepts of Physics and Mathematics, Semiconductor Physics, Digital Electronics , Sensors .

COURSE OBJECTIVE: The objective of this course is to

This course is designed to provide students with a solid understanding of basic electronic components like diodes and special-purpose diodes, BJTs, MOSFET, Operational Amplifiers which are key to amplifying and processing signals. The course introduces digital logic gates and digital circuits designing also explore microprocessors and microcontrollers. Students will gain knowledge about communication systems, networking, and the role of sensors. The course will provide a strong foundation in Electronics for preparing students for Electronics Practical applications.

COURSE OUTCOME: After successful completion of the course, students will be able to:

1) **ESC-CO-F010.1 :** Know about the working of P-N Junction diode and its application as rectifier & switch, basics of LED & Photodiode
2) **ESC-CO-F010.2 :** Understand the working of BJT, functioning of OP –Amp
3) **ESC-CO-F010.3 :** Learn logic gates & realization of the digital circuits
4) **ESC-CO-F010.4 :** Understand basic communication and wireless communication with Networking
5) **ESC-CO-F010.5 :** To provide students with the basic understanding about functioning of sensors, characteristics of the sensors, different types and advances in the area of sensors

COURSE CONTENTS

UNIT-I	**FUNDAMENTALS OF ELECTRONICS**	**6 Hours**

Impact of Electronics ,Current trends in Electronics Introduction to Active and Passive components, Formation of PN junctions, working, V-I characteristics in forward and reverse bias, Diode as Switch, LED, Photo diode, Application of Diode: Half wave rectifier, Full wave Rectifier Centre tap, Full wave Rectifier Bridge type with regulator IC 78XX and 79XX.

UNIT-II	TRANSISTOR TECHNOLOGY AND OPERATIONAL AMPLIFIER	6 Hours
Introduction to Transistors, types, Structure of NPN and PNP Transistors, BJT Configurations CB, CC, CE ,Input and Output characteristics of CE configuration, Single Stage BJT Amplifier , BJT as switch MOSFET Construction and types in detail , Comparison of BJT and MOSFET Operational Amplifier: Functional block diagram of operational amplifier, Ideal & practical values of performance parameters, Op-amp applications: Inverting, Non-inverting amplifier with examples		
UNIT-III	**DIGITAL ELECTRONICS**	**6 Hours**
Number System: Introduction of Binary, Decimal, Octal, Hexadecimal, Conversion into different number system, Binary addition , Basic and Universal Gates, Symbols, Truth tables, logic expressions Logic simplification using K- map, half and full adder design, SR, JK, T & D Flip Flops. Introduction to Microprocessor and Microcontroller Only block diagram , Digital IC design flow		
UNIT-IV	**ELECTRONICS COMMUNICATION & NETWORKING**	**6 Hours**
Elements of Communication system, Concept of Modulation, Need of Modulation, demodulation, Electromagnetic Spectrum, Cellular communication, Comparison 1G, 2G, 3G, 4G, 5G and Cellular system, GSM architecture in detail. Introduction to computer networks Types of networks: LAN, MAN, WAN, Wireless networks, Switching, Internet, Network topology: point to point, Star, Ring, Bus, Mesh, Tree, Daisy Chain, Hybrid.		
UNIT-V	**SENSOR**	**6 Hours**
Sensor Definition, Classification, Active /Passive Sensors, Selection Criteria, Characteristics of sensor Motion Sensors (LVDT), Temperature Sensors :Thermocouple, RTD, Thermistor, Mechanical Sensors (Strain Gauge), Biosensors, Soil moisture sensors Block diagram of IoT based Data Acquisition and Automation		

LEARNING RESOURCES:
TEXT BOOKS:
T1: Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson M. H. Rashid
T2: Modern Digital Electronics" by R.P. Jain, 4th Edition, Tata McGraw Hill R.P. Jain
T3: Electronics Communication Systems" by Kennedy&Davis,4th Edition, Tata McGraw Hill
T4: Mobile Wireless communication" by M. Schwartz, Cambridge University Press M. Schwartz
T5: Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson India, 2012
T6: Sensors and Transducers by D. Patrnabis, 2nd Edition, PHI
REFERENCE BOOKS:
R1: Digital Fundamentals by Thomas. L. Floyd, 11th Edition, Pearson Thomas. L. Floyd
R2: Mobile Communication by J. Schiller, 2nd Edition, Pearson J. Schiller
R3: Morris Mano, Digital Design", 4th edition
R4: Kurose, Ross, Computer Networking a Top Down Approach Featuring the Internet, Pearson
R5 : Sensors Handbook, by S. Soloman, 2nd
WEB LINKS AND VIDEO LECTURES (E-RESOURCES)
1. https://nptel.ac.in/courses/117103063
2. https://nptel.ac.in/courses/117103064
3. https://archive.nptel.ac.in/courses/106/105/106105166/
4. https://archive.nptel.ac.in/courses/106/105/106105166/
5. Basic Electronics Classroom
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)
1. Collaborative learning.
2. Online Interactive Tool
3. Flipped Classroom
4. Quizzes/Assignment

Course Code: ES-ESC-F011		**Course Name:** Basic Electronics Engineering Lab
Teaching Scheme: **Practical:** 2 Hrs/Week	**Credit Scheme:** PR : 1	**Examination Scheme:** PR **Practical Evaluation:** 25 Marks **Total:** 25 Marks

COURSE PREREQUISITES: Basic concepts of Physics and Mathematics, Semiconductor Physics, Digital Electronics .

COURSE OBJECTIVE: The objective of this course is to

1) **ESC-CO-F011.1 :** Know about the working of P-N Junction diode and its application as rectifier & switch, basics of LED & Photodiode
2) **ESC-CO-F011.1 :** Understand the working of BJT, functioning of OP –Amp
3) **ESC-CO-F011.1 :** Learn logic gates & realization of the digital circuits
4) **ESC-CO-F011.1 :** Understand basic communication and wireless communication with Networking
5) **ESC-CO-F011.1 :** To provide students with the basic understanding about functioning of sensors, characteristics of the sensors, different types and advances in the area of sensors

COURSE OUTCOME:After learning the course, students will be able to perform:

1) Demonstrate the working of different Electronic components, measuring instruments.
2) Build, test and troubleshoot various Analog circuits
3) Build, test and troubleshoot various Analog circuits
4) Understand basic communication and wireless communication with Networking
5) Build and test application using Sensor (Simulation Based)

List of Experiments: (Any 8)

1. Study & testing of Active and Passive components such as Resistors, Inductors, Capacitors Switches
2. Hands on practice with Basic Electronics Laboratory Instruments (CRO, DSO, Function Generator, DC Regulated Power Supply)
3. Plot V-I Characteristics of P-N Junction Diode
4. Build and test HWR and DC Regulated Power supply (Using BWR)
5. Simulation of single stage BJT Common Emitter Amplifier using any simulation software
6. Linear applications of Op-amp: Build inverting and non-inverting amplifier using op-amp
7. Test and verify the truth tables of:
    a. Basic and Universal Gates (Study the datasheet of respective ICs)
    b. Half & Full Adder
8. Build and test any application using Sensor (Simulation Based)
9. Study of communication network using any modulation technique.
10. Case Study of any one electronics appliances with block diagram, specification etc
11. Additionally, Introduction to Multisim software and simulation of circuit using Multisim software

LEARNING RESOURCES:

TEXT BOOKS:

T1: Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson M. H. Rashid

T2: Modern Digital Electronics" by R.P. Jain, 4th Edition, Tata McGraw Hill R.P. Jain

T3: Electronics Communication Systems" by Kennedy&Davis,4th Edition, Tata McGraw Hill

T4: Mobile Wireless communication" by M. Schwartz, Cambridge University Press M. Schwartz

T5: Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson India, 2012

T6: Sensors and Transducers by D. Patrnabis, 2nd Edition, PHI

REFERENCE BOOKS:

R1: Digital Fundamentals by Thomas. L. Floyd, 11th Edition, Pearson Thomas. L. Floyd

R2: Mobile Communication by J. Schiller, 2nd Edition, Pearson J. Schiller

R3: M Morris Mano, Digital Design", 4th edition

R4: Kurose, Ross, Computer Networking a Top Down Approach Featuring the Internet, Pearson

R5 : Sensors Handbook, by S. Soloman, 2nd Edition

Course Code: ES-ESC-F012	**Course Name: Introduction to Procedural Programming Language in C**	
Teaching Scheme: **Lectures :** 1 Hrs./Week **Practical :** 2 Hrs./Week	**Credit Scheme:** TH: 1 PR : 1	**Examination Scheme:** **CCE** : 20 Marks **End-Semester Examination**: 30 Marks **Practical** : 25 Marks **Total**: 75 Marks

COURSE PREREQUISITES: Basics of Computers , Basic Mathematics

COURSE OBJECTIVE: The objective of this course is to

1) To understand basic C programming concepts, operators, and expressions, apply control flow structures, and use algorithms to solve simple computational problems.
2) To understand and apply array, pointer, and string operations for efficient data handling and manipulation in programming.
3) To understand and implement functions and structures in C programming for reusable, and organized code development.

COURSE OUTCOME: After successful completion of the course, students will be able to:

ESC-CO-F012.1: To understand C programming basics and apply control flow and algorithms to solve simple problems.

ESC-CO-F012.2: To Understand and apply arrays, pointers, and strings for effective data manipulation.

ESC-CO-F012.3: To Understand and use functions and structures for efficient and organized C programming

COURSE CONTENTS

UNIT-I	**Introduction to C Programming and Planning**	**5 Hours**

Art of Programming through Algorithms, Flowcharts. Importance of C, C Tokens: Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Storage Class.

Operators and types: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Precedence of Arithmetic Operators, Operator Precedence and Associativity, Mathematical Functions.

Decision making and looping: Simple If Statement, If-Else, Else-If, Switch Statement, Go_to Statement

Decision making and branching: While Statement, Do-While, for Statement, Break and Continue, Applications.

UNIT-II	**Arrays, Pointers and String Operations**	**5 Hours**

Arrays; One Dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One Dimensional Array, Two Dimensional Arrays, Declaration of Two-dimensional Arrays, Initialization of Two Dimensional Array

Pointers: Pointer Arithmetic in C with Examples, Pointer Applications, Difference between Arrays and Pointers

Declaration and Initialization of String Variables, Reading Strings from Terminal, Writing Strings to Screen, Putting Strings Together, Comparison of Two Strings, Introduction to String Handling Functions

UNIT-III	Functions and Structures	5 Hours

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.

Structure: What is a Structure? Structure Type Declarations, Structure Declarations, Referencing Structure Members, Referencing Whole Structures, Initialization of Structures.

List of Laboratory Experiments / Assignments

1) To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) cube root of number e)check for prime, f) factorial of number g) 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 its Momentum. Momentum is calculated as P=MV where M is the mass of the object and V is its velocity.
4) In array do the following:
   i Find given element in array
   ii Find Max and Min element
   iii Find frequency of given element in array
   iv 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-i. Calculate length of string ii.S tring reversal iii. Equality check of two Strings iii. Check palindrome iv. 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.

LEARNING RESOURCES:

TEXT BOOKS:

T1. ProgramminginANSIC,8e–E.Balagurusamy

T2. Let Us C: Authentic guide to C programming language - [19 ed.] 9355512767

REFERENCE BOOKS:

1. B.S.Gottfried, Programming with C (Schaum's Outline Series), 2nded.McGraw-Hill, 1996.
2. S.C.Kochan, Programming in C, Sams Publishing, 3rded. 2004.
3. B.W.Kernighan and D.M.Ritchie,The C Programming Language, 2nded.UK:Prentice Hall, 1988.
4. W.Kernighan and B. Pike,The Practice of Programming, UK: Addison-Wesley, 1999
5. H.M. Deiteland P.J. Deitel, C: How to program, 8th ed. Pearson Education, 2015.
6. P.Prinz&T.Crawford,CinaNutshell:TheDefinitiveReference,2nded.,O'ReillyMedia,2016

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://studylib.net/doc/25796931/programming-in-ansic--8e---balagurusamy
2. https://archive.nptel.ac.in/courses/106/104/106104128/
3. https://www.youtube.com/watch?v=JpN0GTJOxTk

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of prologue, Certificate, table of contents, and hand written 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.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of students. Each lab assignment assessment will assign grade /marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include-timely completion, performance, innovation, efficient codes, punctuality and neatness.

Course Code: ES-VSE-F013	**Course Name: Professional and Interpersonal Skills**	
Teaching Scheme: **Lectures :** 1 Hr/Week **Practical :** 2 Hrs/Week	**Credit Scheme:** TH: 1 PR : 1	**Examination Scheme:** **Term Work:**50 Marks **Total:** 50 Marks

COURSE PREREQUISITES:

1. *Formal Pre-requisites* – NONE. This is an introductory course meant to give students an exposure to professional skills, irrespective of their discipline or previous knowledge.
2. *Desirable Knowledge* - Students are expected to have
   a. Basic English comprehension (reading & speaking)
   b. Openness to participate in interactive sessions

   Willingness for self-reflection and peer feedback

COURSE OBJECTIVE: The objectives of this course are:

VSE-CEO-F013.1: Understand and apply principles of verbal, non-verbal, and interpersonal communication in real-life scenarios.

VSE-CEO-F013.2: Develop self-awareness through reflection, goal setting, and time/stress management strategies.

VSE-CEO-F013.3: Demonstrate collaborative abilities and professionalism in teams and group discussions.

VSE-CEO-F013.4: Exhibit workplace readiness through etiquette, problem-solving, resilience, and career planning.

COURSE OUTCOME: After successful completion of the course, students will be able to:

- **VSE-CO-F013.1:** Communicate effectively using verbal and non-verbal forms in academic and professional settings.
- **VSE-CO-F013.2:** Reflect on personal strengths and challenges to set achievable academic and career goals.
- **VSE-CO-F013.3:** Participate effectively in group activities and demonstrate collaboration and leadership.
- **VSE-CO-F013.4:** Apply professional etiquette and time/stress management strategies in workplace settings.
- **VSE-CO-F013.5:** Demonstrate adaptability, critical thinking, and lifelong learning mindset for professional growth.

COURSE CONTENTS		
UNIT-I	**SELF-AWARENESS AND INTRAPERSONAL COMMUNICATION (Week 1 & 2) : CO1, CO2, CO3**	**6 Hours**
Lecture 1	**Communication Process:CO1** What is Human Communication | Styles of communication | Elements of Communication | Barriers in Communication	**BT - Understand** Level 2 Define, Explain, Identify
Lecture 2	**Self-Awareness, SWOC, Goals & Motivation: CO2, CO3** Understanding self through SWOC | Setting SMART goals | Long-term vs. Short-term career goals	**BT –Analyze** Level 4 Reflect , Evaluate, Categorize
Practical 1	**Self-Introduction + SWOC Worksheet: CO1, CO2** Each student presents a 1–2 min self-introduction Completes a written SWOC analysis	**BT – Apply** (Level 3) Articulate, Present, Demonstrate
Practical 2	**Peer Interview + Goal Sharing: CO2, CO3** Students pair up to interview one another Introduce their peer to the class Share and justify personal goals	**BT - Analyze** (Level 4) Summarize, Evaluate, Reflect
UNIT-II	**VERBAL, NON-VERBAL & INTERPERSONAL COMMUNICATION (Week 3 & 4) : CO1, CO3**	**6 Hours**
Lecture 1	**Introduction to Non-Verbal Communication: CO1** Body language | Eye Contact | Gestures | Posture | Facial Expressions |Tone | Silence	**BT – Understand** Level 2 Identify, Illustrate, Interpret
Lecture 2	**Interpersonal Skills and Emotional Intelligence: CO3** Interpersonal Relationships | Empathy | Active Listening | Managing |Emotions | Feedback	**BT – Understand** Level 2 Explain, Recognize, Describe

Practical 1	**Verbal & Non-Verbal Communication Activity: CO1** Students act out situations focusing on voice, tone, gestures Role-play based on emotional expressions (e.g., apologizing, appreciation)	**BT – Apply** Level 3 DemonstrateAct, Perform
Practical 2	**Active Listening & Empathy Practice** Listen to a short talk/interview (e.g., TED Talk) Summarize content and provide empathetic feedback in pairs	**BT – Analyze** Level 4 Listen, Reflect, Respond
UNIT-III	**GROUP COMMUNICATION & TEAM DYNAMICS (Week 5 & 6) : CO2, CO3, CO4**	**6 Hours**
Lecture 1	**Group Communication & Team Roles: CO2, CO3** Types of group communication | Stages of team formation | Roles in teams	**BT – Understand** Level 2 Explain, Identify, Distinguish
Lecture 2	**Leadership & Collaboration: CO3, CO4** Leadership styles | Conflict resolution | Building group consensus	**BT – Analyze** Level 4 Compare, Evaluate, Reflect
Practical 1	**Group Discussion Practice: CO2, CO3** Students participate in mock group discussions on general/current topics Peer and instructor feedback provided	**BT – Analyze** Level 4 Justify, Express, Argue
Practical 2	**Team Activity – The Marshmallow/Tower Challenge: CO2, CO3** Students work in groups to complete a time-bound design challenge	**BT – Apply** Level 3 Collaborate, Construct, Perform
UNIT-IV	**PROFESSIONAL ETIQUETTE, WRITING & WORKPLACE CONDUCT (WEEK 7 & 8) : CO4, CO4, CO5**	**6 Hours**
Lecture 1	**Workplace Etiquette: CO4, CO5** Grooming, punctuality, behaviour in formal settings | Netiquette and online professional behaviour	**BT – Understand** Level 2 Identify, Describe, Explain
Lecture 2	**Professional Writing: CO1, CO4** Email writing etiquette | Report structure and clarity | Tone, grammar, and formatting	**BT – Apply** Level 3 Draft, Format, Construct
Practical 1	**Email & Report Writing: CO1, CO4** Students draft a formal email and short workplace report based on prompts Peer review and feedback	**BT – Apply** Level 3 Write, Format, Review

Practical 2	**Digital & Workplace Etiquette Role-play: CO4, CO5** Role-play common workplace situations (e.g., receiving feedback, handling conflict) Identify best practices	**BT – Analyze** Level 4 Demonstrate Evaluate, Practice
UNIT-V	**CAREER READINESS, PUBLIC SPEAKING & LIFELONG LEARNING (WEEK 9 & 10) : CO4, CO5**	**6 Hours**
Lecture 1	**Resume Writing & Interview Readiness: CO4, CO5** Components of an effective resume | Common interview questions | Do's and Don'ts	**BT – Apply** Level 3 Draft, Prepare, Adopt
Lecture 2	**Lifelong Learning & Handling Failures: CO5** Growth mindset | Reflecting on failure as feedback | Learning agility	**BT – Analyze** Level 4 Reflect, Evaluate, Internalize
Practical 1	**Extempore Speaking: CO4** Topic-based impromptu speeches (1–2 minutes) Peer and instructor feedback	**BT – Apply** Level 3 Speak, Express, Organize
Practical 2	**Mock Interview + Presentation Practice: CO4, CO5** Students face short mock interviews and/or deliver mini presentations Identify best practices	**BT – Analyze** Level 4 Demonstrate Present, Respond

LIST OF LABORATORY EXPERIMENTS/ASSIGNMENTS (ANY 8 FROM THE GIVEN LIST)

Sr. No.	Title of Practical / Activity	Description	Mapped CO(s)
1	Self-Introduction	Students prepare and present a formal self-introduction.	CO1
2	SWOC Analysis & Goal Setting	Students analyze their strengths, weaknesses, opportunities, challenges and set personal goals.	CO2, CO3
3	Verbal & Non-Verbal Communication Role-play	Pairs/groups role-play scenarios with emphasis on voice, tone, body language, and gestures.	CO1

4	Active Listening and Empathy Practice	Listening to short audio/video clips followed by reflection and peer response.	CO3
5	Team Activity – Arshmal low / Tower Challenge	Students work in teams on a hands-on problem-solving challenge.	CO2, CO3
6	Group Discussion Simulation	Practice structured GDs with feedback on participation, clarity, and argumentation.	CO3, CO4
7	Email & Report Writing	Drafting formal emails and short professional reports with peer review.	CO1, CO4
8	Professional Etiquette Role-play	Workplace scenario simulations focusing on digital, verbal, and behavioural etiquette.	CO4, CO5
9	Extempore Speaking	Topic-based impromptu speaking sessions with evaluation of delivery and clarity.	CO4
10	Mock Interview and Final Presentation	Students participate in short mock interviews or give a formal presentation on a given topic.	CO4, CO5

LEARNING RESOURCES:

TEXT BOOKS:

T1: Soft Skills: Enhancing Employability and Career Growth - Meenakshi Raman & Sangeeta Sharma, McGraw Hill Education

T2:Personality Development and Soft Skills - Barun K. Mitra, Oxford University Press

REFERENCE BOOKS:

R1: Effective Technical Communication - M. Ashraf Rizvi, McGraw Hill Education

R2:Business Communication - P.D. Chaturvedi & MukeshC haturvedi, Pearson Education

R3:The Ace of Soft Skills - Gopalaswamy Ramesh & Mahadevan Ramesh, Pearson Education

R4:Developing Soft Skills - Krishna Mohan & Meera Banerji, Macmillan Publishers India

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

NPTEL Course – Soft Skills Development
https://nptel.ac.in/courses/109/105/109105122/ **By: IIT Kharagpur**

SWAYAM – Self-Awareness and Self-Motivation Module
https://nptel.ac.in/courses/109/104/109104107/ **By: IIT Madras / UGC**

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Verbal / Non-verbal Role Play
2. Group Discussion Simulation
3. Extempore Speaking
4. Presentation Skills
5. Team Activity

Course Code: ES-VSE-F014	**Course Name: Workshop Technology**	
Teaching Scheme: **Lectures :** 1 Hrs./Week **Practical :** 2 Hrs./Week	**Credit Scheme:** TH: 1 PR : 1	**Examination Scheme:** **TW/ Practical Evaluation:** 50 Marks **Total:** 50 Marks

COURSE PREREQUISITES:

- Engineering Drawing / Technical Drawing
- Material Science (basic level)
- Safety Awareness (Fundamental)

COURSE OBJECTIVE:

The aim is to provide a comprehensive understanding of machine tools and manufacturing processes, focusing on both theoretical knowledge and practical skills. This includes introducing the fundamental concepts of various manufacturing techniques and their applications in industrial settings. Additionally, the program emphasizes hands-on experience, enabling learners to develop proficiency in using hand tools, power tools and machine tools within manufacturing and assembly workshops.

COURSE OUTCOME: After successful completion of the course, students will be able to:

VSE-CO-F014.1: Workshop Layout and Machinery Understanding

VSE-CO-F014.2: workshop safety awareness and Application

VSE-CO-F014.3: Proficiency in cutting Techniques

VSE-CO-F014.4: Advanced Computerized Machine Tools

VSE-CO-F014.5 : Application of 3D Printing Technology

COURSE CONTENTS

UNIT-I	**UNIT-I**	**UNIT-I**
Function and Role of Shafts, Axle, keys in Power transmission, Power transmission Drives: Belt drives, Chain drives and Gear drives		
UNIT-II	**UNIT-II**	**UNIT-II**
Manufacturing processes and their application: Casting, Forging, Sheet metal working Welding, Brazing and Soldering.		
UNIT-III	**UNIT-III**	**UNIT-III**
Basic working Principle of Lathe Machine and its Operations, Drilling Machine and Grinding Machine		

UNIT-IV	ENGINEERING MECHANISMS AND THEIR APPLICATION IN DOMESTIC APPLIANCES	3Hours

Working of Refrigerator, Electric Geyser, Electric Iron, Water cooler, Kitchen chimney, Water cooler

LIST OF LABORATORY EXPERIMENTS/ASSIGNMENTS

1. Case Study on Workshop Accidents
2. Carpentry/Welding/Fitting Job
3. Demonstration of Lathe Machine Operations
4. Demonstration of Forging Techniques
5. Mantling and Dismantling of Household Equipment (Electric iron, Mixer etc..)
6. Demonstration of 3D Printing

LEARNING RESOURCES:

TEXT BOOKS:

T1 H.S. Bawa, Workshop Practice, Tata McGraw Hill Education.

T2: S.K. Hajra Choudhary, Nirjhar Roy, Elements of Workshop Technology: Vol. 1 & 2, Media Promoters and Publishers Pvt. Ltd., 15th Edition, 2012.

REFERENCE BOOKS:

R1: Mikell P. Groover, Introduction to Manufacturing Processes, Wiley Publications.

R2: John K. C., Mechanical Workshop Practice, Prentice Hall Publications, New Delhi..

R3: Chua Chee Kai, Leong Kah Fai, 3D Printing and Additive Manufacturing: Principles & Applications, 4th Edition, World Scientific, 2015.

R4: M. P. Groover, Automation, Production Systems & Computer-Integrated Manufacturing, Pearson India, 2nd Edition, 2007.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. NPTEL
2. MIT Open Course Ware: Manufacturing Processes and Systems

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Course Code: ES-IKS-F015	**Course Name: Indian Knowledge System**	
Teaching Scheme: **Tutorial :** 2 Hrs./Week	**Credit Scheme: 02**	**Examination Scheme:** Term Work: 50 Marks

COURSE OBJECTIVE: The objective of this course is to

Explore students to the foundational concepts of Indian knowledge systems and its significance and contributions to metallurgy, materials science, ancient mathematics, architectural techniques, philosophical systems and various art culture in ancient India.

COURSE OUTCOME: After successful completion of the course, students will be able to:

- **IKS-CO-F015.1 -** Understand the significance and historical context of Indian knowledge systems.
- **IKS-CO-F015.2 -** Comprehend Indian philosophical concepts, scientific achievements, and their interplay.
- **IKS-CO-F015.3-** Recognize the role of engineering in ancient India and its impact on architecture and materials.
- **IKS-CO-F015.4-** Apply ancient Indian engineering principles in modern practices while considering cultural and environmental aspects.

COURSE CONTENTS

UNIT-I	**Philosophy and Culture**	**15 Hours**

Ved and Vedang, Upanishdas, Evolution of civilization in ancient India, Evolution of Indian Languages, Evolution of regional music and dance forms

UNIT-II	**Science and Engineering**	**15 Hours**

Architecture and planning, Metallurgy, Material Science, Ayurveda, Astronomy and ancient economy.

LEARNING RESOURCES:

TEXT BOOKS:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavanan R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.

2. Dharampal (2021), "Indian Science and Technology in the Eighteenth Century", ISBN10:8175310936.

3. Indian Knowledge System of Materials in Science and Technology, Dr. Satish Pal Singh Rajput, et.al. Walnut Publication

4. Indian Knowledge Systems, Vol. 2, Kapil Kapoor, D. K. Printworld publisher

REFERENCE BOOKS:

R1 : Kapil Kapoor, Avadhesh Kumar Singh.(2005), "Indian Knowledge Systems", (Vol.1 and Vol.2), ISBN-10:9788124603369.

R2 : Indian Knowledge Systems - A Comprehensive Analysis Of Various Contexts, Dr. ShashikantAwasthi, Shashwat Publication

R3 : Scientific Basis Of Indian Knowledge System, Saroj Sharma(Ed.),Bal Krishna Rai, Sunita Joshi Kathuria (Co-Ed.), Shipra Publications

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

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

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Presentations
2. Debate
3. Quizzes
4. Assignment

CourseCode:ES-AES-F016	**Course Name: Design Thinking and Idea Lab**	
Teaching Scheme: **Tutorial:**2Hrs./Week	**Credit Scheme:** TU :2	**Examination Scheme:** **TermWork:**50 Marks **Total Marks:**50Marks

COURSEPREREQUISITES: Basic Problem Solving Skills

COURSE OBJECTIVE: The objective of this course is to equip students with a comprehensive understanding of design thinking methodologies, enabling them to identify and address user-centered problems through iterative processes. such as empathizing, defining, ideating, prototyping, and testing. It fosters creativity and innovation by introducing techniques for idea generation and highlighting the role of these skills in organizational and real-world contexts. By integrating collaborative projects and industry-relevant challenges, the courses prepare students to Tackle complex design problems with confidence and creativity.

COURSE OUTCOME: After successful completion of the course, students will be able to:

AES-CO-F016.1 : Apply design thinking methodologies to identify, define, and solve user-centered problems through structured stages of empathy, ideation, prototyping, and testing.

AES-CO-F016.2 : Generate innovative solutions using brainstorming techniques and creativity tools while distinguishing between creativity and innovation in real-world contexts.

AES-CO-F016.3: Develop and refine prototypes to validate design concepts, incorporating iterative feedback and user testing to enhance functionality and usability.

AES-CO-F016.4 :Evaluate design solutions critically using analytical frameworks such as the Six Thinking Hats to assess feasibility, desirability, and viability.

AES-CO-F016.5 : Communicate design processes and outcomes effectively through visual storytelling, structured documentation, and persuasive presentations to diverse audiences.

COURSE CONTENTS

UNIT-I	**INTRODUCTION TO DESIGN THINKING**	**Week1-2**
Overview of design thinking methodology and its importance, Empathize, Define, Ideate, Prototype, Test, apply iterative design thinking steps to solve problem. Activity1:-Problem Identification		
UNIT-II	**INNOVATION AND CREATIVITY**	**Week3-4**
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Techniques for idea generation and brainstorming Activity2:Idea generation ands election		
UNIT-III	**PROTOTYPING AND TESTING**	**Week5-6**
What is Prototype? Understanding necessity of making prototypes by building the prototypes for pre-selected Engineering problem, Testing, Creating prototypes to validate design concepts Activity3:Prototyping and user testing		
UNIT-IV	**ANALYSISAND EVALUATION**	**Week7-8**
The Six Thinking Hat, Understanding the Six Thinking Hat, Applying the six hats of design thinking Activity4:Six hats analysis of a case study		

UNIT-V	COMMUNICATION, DOCUMENTATION AND PRESENTATION	Week9-10

Visual communication and storytelling, Create detailed documentation for design processes and prototypes and prepared and presented design solutions to panels or audiences

Activity5:- Final Presentation

LEARNING RESOURCES:

TEXT BOOKS:

T1.DesignThinking: Understanding How Designers Think and Work by Nigel Cross

T2.Change by Design: How Design Thinking Trans forms Organizations and Inspires Innovation by Tim Brown

T3.Design Thinking for Visual Communication by Ranjan Nayar and Jaidip Subedi

REFERENCE BOOKS:

Reference Books:

R1.The Design of Everyday Things " by Don Norman" Design Thinking : Creativity and Innovation" by S. Balaram

R2.Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days by Jake Knapp

R3.Creative Confidence: Unleashing the Creative Potential Within Us All by Tom Kelley

And David Kelley (with a foreword by RatanTata)

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

NPTEL

Course Code: ES-CCC-F017	**Course Name: Liberal Learning Course-I**	
Teaching Scheme: **Lecture :** 1Hrs./Week **Practical :** 2 Hrs./Week	**Credit Scheme: 02**	**Examination Scheme:** Term Work: 25 Marks

COURSE OBJECTIVE:

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. Experts from respective course will conduct classes on campus/Online through activities, discussions, presentations, and lecture methods. 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.

Evaluation will be done based on the report of activities submitted by student. 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 in respective course. Selecting co-curricular courses that align with your interests and goals can significantly enrich your educational journey. Remember to maintain a balance and choose courses that you are genuinely excited about. This approach will help you gain the most from your co-curricular activities.

COURSE OUTCOME: After successful completion of the course, students will be able to:

CCC-CO-F017.1 : Identify and select a co-curricular course that aligns with personal interests and academic goals ,demonstrating self-awareness and informed decision making

CCC-CO-F017.2 : Participate actively in expert- led sessions and collaborative activities to gain foundational knowledge and hands on experience in the selected domain

CCC-CO-F017.3 : Develop and present a structured report summarizing learning experiences, skill enhancement and insights gained showcasing effective communication and reflective abilities.

BASKET OF CO-CURRICULAR COURSES :

1. Health and Wellness
2. Yoga education
3. Meditation
4. Dancing
5. Cultural Activities

Here are some tips and ideas to help you choose the right courses :

1) **Consider Your Interests and Hobbies :**
Think about what you enjoy doing in your free time or what activities you have always wanted to try. Co-curricular courses can be a great opportunity to pursue passions outside your major.

2) **Explore Different Fields** :
Choosing courses from different areas can provide a well-rounded experience. For instance, you might pick one course related to arts, another in sports, and a third in community service.

3) **Balance Your Schedule:**
Ensure that the co-curricular courses fit well with your academic schedule and personal commitments. Avoid overloading yourself, as these courses should enhance your experience, not add undue stress.

4) **Look at Course Benefits** :
Some co-curricular courses offer skills that can be beneficial in your future career or personal development. For example, leadership training, public speaking, or project management.

5) **Consult with Advisors or Seniors** Talking to academic advisors, professors, or senior students can give you insights into which courses are popular, have good instructors, or offer valuable experiences.

CourseCode:ES-AC-F018 / ES-AC-F022	**Course Name: Induction Program**

Course Outcome: After successful completion of the course:

1) **AC-CO-F018/022.1:** Students will adapt smoothly to the institutional environment, embracing its values, culture, and expectations.
2) **AC-CO-F018/022.2:** Students will actively participate in student clubs and community services, understanding the role of NSS and other associations.
3) **AC-CO-F018/022.3:** Students will improve their physical health and fitness through regular engagement in exercise, yoga and sports activities.
4) **AC-CO-F018/022.4:** Students will develop emotional stability and demonstrate core universal human values in their behavior and interactions.
5) **AC-CO-F018/022.5:** Students will understand the importance of a ragging-free campus and commit to maintaining a safe and inclusive environment.
6) **AC-CO-F018/022.6:** Students will cultivate social awareness regarding community, sustainability, and environmental issues, along with a strong sense of motivation and belonging.

COURSE CONTENTS

1	**Orientation Sessions on Institutional Resources and Academic Support**

Welcome Address by the Head of Department (HOD) – Engineering Sciences: HOD, Engineering Sciences will highlight the First year activities and give the academic schedule for the year 2025-26 for planning and better academic performance of students.

Departmental HODs – Introduction and Overview: All departmental HODs will introduce their respective faculties to the students, highlights the respective programs in the institute. They also will discuss effective use of computer facilities and IT resources. etc.

Address by the Training and Placement Officer: The Training and Placement Officer (TPO) will provide a comprehensive overview of all the training and placement activities conducted by the institute.

Address by the Librarian: The Librarian will introduce students to the institute's library facilities, resources, and services. The address will cover the layout of the library, procedures for accessing books, journals, e-resources, and digital libraries.

2	**Student Clubs and Community Services**
Student Association Introduction: (FESA/ CESA / ITSA / EESA):A student association is specifically designed to welcome new students by senior students, and representatives of different clubs from student support within the campus community to familiarizing them with its policies, processes and activities promoting social interaction and a sense of belonging. **NSS Introduction Session:**A National Service Scheme (NSS) session for students aims to introduce new students to the NSS, its objectives, and how it fosters character development and social responsibility through community service. It also provides a platform to introduce them to various NSS activities and initiatives **Visit to campus:**A campus visit helps new students familiarize themselves with the institution's environment, rules, resources, and culture.	
3	**Physical Health, Nutrition, and Wellness Orientation**
Physical Health and Related Activities: (Yoga/ Sports/ other exercise):Although this module is intended to help understand the basic principles to remain healthy and fit and practice them through a healthy routine which includes exercise, games etc., Yoga training to the students by the Yoga instructors and the students were asked to practice them in daily basis. **Dietary counselling by Nutritionist:**In this session, a qualified nutritionist will provide students with essential guidance on healthy eating habits and balanced nutrition. The counselling will cover the importance of a well-rounded diet in maintaining physical and mental well-being, especially for students facing academic pressures and lifestyle changes. Topics such as meal planning, portion control, hydration, managing stress-related eating, and choosing nutritious food on a budget will be discussed. **Medical Check-up:**This session will involve various health assessments and screenings to identify any potential health issues and provide guidance for maintaining good health.	
4	**Universal Human Values and Inner Well-being**
Session on Universal Human Values: This session for students focuses on teaching core ethical principles like honesty, compassion, respect, responsibility, social conduct, harmony through interactive activities and discussions. Students will learn to understand and apply these values to lead fulfilling lives and contribute positively to society. **Hurtfulness session:** A Hurtfulness session can be a valuable addition to a student induction program, offering techniques to reduce stress, improve focus, and cultivate inner peace.	
5	**Anti-ragging session**
Anti-ragging session is crucial component for aiming to create a safe and inclusive campus environment by educating students about the dangers and consequences of ragging, inform students about anti-ragging policies, legal ramifications, and reporting procedures.	
6	**Field Visit to Nearby Community**
A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.	

Course Code: ES-BSC-F019	**Course Name: Advance Calculus**	
Teaching Scheme: **Lectures :**3 Hrs./Week	**Credit Scheme:** TH: 3	**Examination Scheme:** **CCE:** 40 Marks **End-Semester Examination:** 60 Marks **Total:** 100 Marks

COURSE PREREQUISITES: Differential Calculus, Integral Calculus of one variable

COURSE OBJECTIVE: The objective of this course is to

1. To equip students with foundational concepts of partial derivatives and their applications to solve complex multi-variable problems.
2. To enable students to analyse systems in engineering and applied sciences by developing a strong understanding of geometry of curves in space and multiple integration techniques.

COURSE OUTCOME: After successful completion of the course, students will be able to:

- **BSC-CO-F019.1**: **calculate** partial derivatives, and the gradient of a function, and **analyse** their properties to solve multi-variable problems.
- **BSC-CO-F019.2**: **evaluate** the Jacobian of implicit functions, analyse functional dependencies, and **apply** these concepts to errors and approximation problems.
- **BSC-CO-F019.3**:**evaluate** the Beta and Gamma functions, derive and utilize reduction formulae, **implement** the technique of differentiation under the integral sign.
- **BSC-CO-F019.4**: **apply** the concepts of Cartesian and Polar coordinate systems, **trace** curves in Cartesian, Polar, and Parametric forms, and **calculate** arc lengths.
- **BSC-CO-F019.5**: **evaluate** multiple integration of curves in space in cartesian and polar form and apply these techniques to solve problems of finding area, volume, centre of gravity, moment of inertia.

COURSE CONTENTS

UNIT-I	**Partial Differentiation**	**8 Hours**
Function of several variables, Partial derivative, Implicit Function, Composite Functions, Euler's Theorem and its applications. Self-Study: Continuity and differentiability of multivariate functions		
UNIT-II	**Applications of Partial Derivative**	**8 Hours**
Jacobian, Jacobian of Implicit function, Functional Dependency, Maxima-Minima, Lagrange Multiplier Method, Applications in Errors and Approximation, Applications in Optimization Techniques. Self-Study: Application of Lagrange's method in Computational Optimization Problem		
UNIT-III	**Integral Calculus**	**8 Hours**
Reduction Formulae, Gama-Beta Functions, Differentiation under Integral Sign, Error function and its applications. Self-Study: Application of gamma, beta function.		

UNIT-IV	Curve Tracing	8 Hours
Basic geometry of functions and input space, Tracing Cartesian, Parametric, Polar form of equations, Rectification of curves in 2D. Self-Study: Plotting of various 2D, 3D curves using Geogebra		
UNIT-V	**Multiple Integration and Applications**	**8 Hours**
Double Integration in Cartesian and Polar form, Triple Integration in Cartesian and Polar form, Change of Order of integration, Area of a region, Volume of a Solid, Centre of Gravity. Self-Study: Moment of Inertia.		

LEARNING RESOURCES:

TEXT BOOKS:

T1 : Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill)

T2 : Advance Engineering Mathematics by Dennis G Zill (Jones & Bartlett Publishers)

REFERENCE BOOKS:

R1: Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)

R2: Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education)

R3: Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning)

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. **NPTEL Course**: https://onlinecourses.swayam2.ac.in/cec21_ma05/preview
2. Geogebra Applets: https://www.geogebra.org/

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Course Code: ES-PCC-F020		**Course Name: Programming and Problem Solving**
Teaching Scheme: **Lectures :** 1 Hrs./Week **Practical :** 2 Hrs./Week	**Credit Scheme:** TH: 1 PR : 1	**Examination Scheme:** **CCE** : 20 Marks **End-Semester Examination**: 30 Marks **Practical** : 25 Marks **Total**: 75 Marks

COURSE PREREQUISITES: Introduction to Procedural Programming Languages

COURSE OBJECTIVE: The objective of this course is to

1) Understand the Fundamental Concepts of Programming Languages
2) Understand the advance data types and their key operations for effective data manipulation.
3) Understanding of file handling, object-oriented programming principles, and error handling techniques in Python for developing robust applications.

COURSE OUTCOME: After successful completion of the course, students will be able to:

PCC-CO-F020.1: Apply problem-solving skills and Python basics to create simple programs.

PCC-CO-F020.2: Write Python code that **manages and manipulates collections** of data efficiently.

PCC-CO-F020.3: Use built-in Python features to **handle data, files, errors**, and lay the foundation for **further learning** in data science.

COURSE CONTENTS

UNIT-I	**Python Programming and Problem Solving**	**5 Hours**

General Problem Solving Concepts- Problem solving in everyday life, problem solving with computers, difficulties with problem solving, problem solving aspects, problem-solving approach: Top down design.
Basics of Python Programming: Features of Python, History and Future of Python, Programming Paradigm, Applications of Python Languages. Input and Output, Variables, Keywords, Data Types
Conditional Statements:if, if-Else, If-elif-else.
Basic loop Structures/Iterative statements: while loop, for loop, Nested loops, break, continue, pass, else statement used with loops.
Functions in Python: Need for functions, definition, call, Built-In Functions, User Defined Functions, Recursive Functions Defining a Functions.

UNIT-II	**Data structures in python**	**5 Hours**

Lists: Defining list, accessing value in list, deleting values in list, updating list. Basic list operations, built-in list functions.
Tuples: accessing value in tuples, deleting values in tuples, updating tuples. Basic tuple operations, built-in tuple functions.
Sets: accessing value in Set, deleting values in Sets, updating Sets. Basic Sets operations, built-in Sets functions.
Dictionaries: accessing value in Dictionaries, deleting values in Dictionaries, updating Dictionaries. Basic Dictionaries operations, built-in Dictionaries functions.
Strings and Operations: concatenation, appending, multiplication and slicing. Strings formatting operator, built in string methods and functions. Slice operation, ord() and chr() functions, in and not in operators, comparing strings, Iterating strings
Arrays and Operations: accessing elements by index, slicing, appending, inserting, updating, and deleting elements, reversing.

UNIT-III	File Handling and Advanced Python	5 Hours

Files: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files, File Positions, Renaming and deleting files.
Fundamentals of Object oriented programming: classes, objects, methods
Features: inheritance, polymorphism, data abstraction and encapsulation.
Class method and self-argument, __init__() method, class variables and object variables, __del__() method,
Errors and Exception Handling: Introduction to Errors and Exceptions, handling exceptions.

List of Laboratory Experiments / Assignments

1	A) Write a program to find the maximum of three numbers using conditional logic. Highlight the use of input, processing, and output. B) Write a program that prints all even numbers between two user-input numbers. C) Write a loop that prints numbers from 1 to 10, but stops if the number is 5.
2	Write a Python program that calculates the monthly electricity bill based on user input for units consumed, using a fixed rate per unit and slab-based billing system.
3	Write a Python program to accept marks from the user and assign a grade based on the following criteria: Marks >= 90: Grade A, Marks >= 80 and < 90: Grade B, Marks >= 70 and < 80: Grade C, Marks >= 60 and < 70: Grade D, Marks >= 50 and < 60: Grade E, Marks < 50: Grade F
4	A) Write a Python program that defines a list of student names and performs various list operations using functions. The operations should include: append (), insert (), remove (), sort (), and reverse (). B) Write a Python program to create two sets and perform union, intersection, and difference operations. Display the result of each operation.
5	A) Write a function to unpack a tuple containing personal details (name, age, city, email) and return individual values. Display each value after unpacking. B) Write a function that accepts a string and applies built-in string methods: upper (), lower (), find (), replace (), and split (). Display the results of each operation
6	Write a program to perform the following operations on an array: append an element, insert an element at a specific index, update a value at a given index, and delete an element by index. Display the array after each operation.
7	A) Program that counts the number of tabs, space and newline character in a file. B) To copy contents of one file to another. While copying a) all full stops are to be replaced with commas b) lower case are to be replaced with upper case c) upper case are to be replaced with lower case d) Make title case
8	A) Write a program to create a class 'Book' with members, title, author, publisher, and ISBN number. The functions of the class should read and display the data. B) Create a Python class named Student with attributes such as name and age. Define methods to accept student details and display them. Create multiple Student objects and use the methods to input and display each student's information.

9	Write a Python program to create a class Student that shows the following: • Use of _init___ () to initialize student details and _del___ () to show when an object is deleted. • Difference between class variables (shared) and object variables (unique to each object). • Use of public and private members, and how to access them. Create multiple Student objects and display their details to demonstrate these concepts.
10	Students should frame assignments from Mechanical Engineering, Civil Engineering, Electrical Engineering application domains. A) write a program to solve electrical network (KVL/KCL) using python. B) A concentrated load of 1000KN is applied at the ground surface. Write a program to compute the vertical pressure (i) at a depth of 4m below the load, (ii) at a distance of 3m at the same depth. Use Boussinesq's equation. C) On a certain planet a correctly calibrated spring balance shows the weight of a body 12 N, the mass of which is 4.893 kg. Write a program to find the value of gravity on this planet.

LEARNING RESOURCES:

TEXT BOOKS:

T1: Reema Thareja,"Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6
T2:"Core Python Programming", Dreamtech Press; Second edition ISBN-10:938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

REFERENCE BOOKS:

R1 : Romano Fabrizio , "Learning Python", Packt Publishing Limited, ISBN: 9781783551712,1783551712
R2: Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978-0132492645
R2 : Martin C. Brown, "The Complete Reference : Python", McGraw Hill Education Private Limited, Forth Edition. ISBN: 10. 9789387572942, 13. 978-9387572942

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. NPTEL Course: https://nptel.ac.in/courses/106106145
2. https://www.tutorialspoint.com/python/index.htm
3.https://www.w3schools.com/python/default.asp
4. Virtual Labs: https://python-iitk.vlabs.ac.in/

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning
4. Quizzes/Assignment

Guidelines for Student's Lab Journal
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
Guidelines for Lab /TW Assessment
Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Course Code: ES-CCC-F021	**Course Name: Liberal Learning Course-II**	
Teaching Scheme: **Lecture :** 1Hrs./Week **Practical :** 2 Hrs./Week	**Credit Scheme: 02**	**Examination Scheme:** Term Work: 25 Marks

COURSE OBJECTIVE:

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. Experts from respective course will conduct classes on campus/Online through activities, discussions, presentations, and lecture methods. 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. Evaluation will be done based on the report of activities submitted by student. 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 in respective course. Selecting co-curricular courses that align with your interests and goals can significantly enrich your educational journey. Remember to maintain a balance and choose courses that you are genuinely excited about. This approach will help you gain the most from your co-curricular activities.

COURSE OUTCOME: After successful completion of the course, students will be able to:

CCC-CO-F021.1 : Identify and select a co-curricular course that aligns with personal interests and academic goals, demonstrating self-awareness and informed decision making

CCC-CO-F021.2 : Participate actively in expert- led sessions and collaborative activities to gain foundational knowledge and hands on experience in the selected domain

CCC-CO-F021.3: Develop and present a structured report summarizing learning experiences, skill enhancement and insights gained showcasing effective communication and reflective abilities.

BASKET OF CO-CURRICULAR COURSES :

1. Sports
2. NSS
3. Performing Arts Dancing
4. Basics of Music Composition
5. Art of Short Film Making / Cinematography

HERE ARE SOME TIPS AND IDEAS TO HELP YOU CHOOSE THE RIGHT COURSES :

1) **Consider Your Interests and Hobbies :**
Think about what you enjoy doing in your free time or what activities you have always wanted to try. Co-curricular courses can be a great opportunity to pursue passions outside your major.

2) **Explore Different Fields** :
Choosing courses from different areas can provide a well-rounded experience. For instance, you might pick one course related to arts, another in sports, and a third in community service.

3) **Balance Your Schedule:**
Ensure that the co-curricular courses fit well with your academic schedule and personal commitments. Avoid overloading yourself, as these courses should enhance your experience, not add undue stress.

4) **Look at Course Benefits** :
Some co-curricular courses offer skills that can be beneficial in your future career or personal development. For example, leadership training, public speaking, or project management.

5) **Consult with Advisors or Seniors** Talking to academic advisors, professors, or senior students can give you insights into which courses are popular, have good instructors, or offer valuable experiences.

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