AUTONOMY SCHEME
SJCEM : R-25

Sr. No.	Heading	Particulars
1	Title of the Course	**First Year of Technology**
2	Eligibility for Admission	**As per the Institute Examination Ordinance**
3	Theory Passing Marks (IAE / ESE)	**40%**
4	Continuous Assessment (CA) / Oral / Practical	**50%**
5	To be implemented from Academic Year	**With effect from Academic Year: 2025-26**

Preface

University Grant Commission vide Letter No. F. 2–10/2023 (AC–Policy) dated 19th January 2024 conferred the autonomous status to St. John College of Engineering and Management, Village Vevoor, Manor Road, Palghar (East), 401404 affiliated to University of Mumbai for a period of 10 years from the academic year 2024-2025 to 2033-2034 as per clause 7.5 of the UGC (Conferment of Autonomous Status Upon Colleges and Measures for Maintenance of Standards in Autonomous Colleges) Regulations 2023. Designing the curriculum as an autonomous institution raises challenges pertaining to maintaining quality engineering education.

Systematic approach has been adapted in the design and implementation of curriculum with the intent of ensuring quality education catering to the sensitive needs of a learner, society, and industry. The curriculum is aligned with NEP and UGC guidelines as per Government of Maharashtra guidelines for autonomous institutions Government Resolution dated 4th July 2023.

Based on recent recommendations of the GR, holistic curriculum for 2024-28, a "H-Tree Model" of Engineering Education is offered. A unique "H-Tree Model" of Engineering Education Curriculum is followed and curriculum is designed to systematically develop IQ (Intelligence Quotient), PQ (Physical Quotient), EQ (Emotional Quotient), and SQ (Spiritual Quotient) of a learner. This curriculum aims at the development of an all-rounded personality with holistic approach to education in which a learner receives 34% teacher-led learning, 15% peer learning, 26% self-learning, and 25% experiential learning. The curriculum model is outcome based that focuses on learning by doing. Curriculum is designed to provide multiple learning opportunities for students to acquire and demonstrate competencies for rewarding careers. It ensures multiple choices to a leaner acquiring skills through systematic planning. It has 7 verticals aligned to GR recommendations with strong science and mathematics foundation and program core, sequel of electives, multidisciplinary minor courses, humanities & management courses, and sufficient experiential learning through projects and semester-long industry/research internship along with employable skill-based courses. A learner gets an opportunity to acquire skills through NSDC aligned courses during summer vacations. Additional options of choosing from Honors/Double Minor/Honors with Research are also provided to a learner.

The curriculum balances contact hours and total credits of the entire program. The total credits are 172, wherein focus is not only on providing knowledge but also on building skills, attitude and self-learning. Therefore, in the present curriculum, skill-based laboratories, mini-projects, multi-disciplinary projects, and internships are made mandatory across all disciplines of engineering, which will definitely facilitate self-learning of students. The overall credits and approach of curriculum proposed in the scheme and syllabus are in line with AICTE model curriculum. SJCEM: R-25 curriculum will be implemented for First Year of Technology (All Branches) from the academic year 2025-26.

Nomenclature

Abbreviation	Title
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Program Core Courses
PEC	Professional Elective Courses
MDM	Multidisciplinary Minor
OE	Open Elective
SC	Skill Courses
LLC	Liberal Learning Courses
VSEC	Vocational and Skill Enhancement Course
VEC	Value Education Course
SEC	Skill Enhancement Courses
AEC	Ability Enhancement Course
IKS	Indian Knowledge System
CC	Co-curricular Courses

Credit Specification:

- Theory: 1 credit = 15 hrs of teaching
- Lab: 1 Credit = 30 hrs of lab work.
- Workshop Based Activities: 1 Credit = 30 hrs of hands-on activities related to vocation/professional practice/skill based
- Seminar/Group Discussion: 1 Credit = 15 hrs of participation
- Community Engagement Projects: 1 Credit = 30 hrs of contact time along with 15 hrs of activities preparation, report writing, independent reading etc.

Mrs. Dipti S. Lopes
BoS Chairperson

Dr. Kamal Shah
Principal

First Year of Technology

Semester – I and II
(Common to All Branches)

SJCEM : R–25
As per NEP 2020

Effective from Academic Year 2025-26

Subject Code:

Basic Science			
Sr. No.	**Abbreviation**	**Name of the Subject**	**Subject Code**
1	BSC	Engineering Mathematics-I	25FEBS101
2	BSC	Engineering Mathematics-II	25FEBS201
3	BSC	Engineering Physics	25FEBS102
4	BSC	Engineering Chemistry	25FEBS202
Engineering Science			
5	ESC	Engineering Mechanics	25FEES101
6	ESC	Problem Solving Skills using C++	25FEES102
7	ESC	Engineering Graphics (Auto CAD)	25FEES201
8	ESC	Basic of Electrical & Electronics Engineering	25FEES202
Program Core Course			
9	PCC	Object Oriented Programming using JAVA	25FEPCC201
Vocational and Skill Enhancement Courses (VSEC)			
10	SC	Prototype Fabrication and Testing - I	25FELSC101
11	SC	Prototype Fabrication and Testing - II	25FELSC201
Ability Enhancement Course (AEC)			
12	AEC	Basic Communication Skills -I	25FEAEC101
Indian Knowledge System			
13	IKS	Introduction to IKS	25FEIKS201
Co-curricular - Liberal Learning courses			
14	CC	Liberal Learning - I	25FECC101
15	CC	Liberal Learning - II	25FECC201

Department of Applied Sciences and Humanities

First Year
Semester – I
SCHEME: SJCEM R–25
Group A

Course Code	Vertical	Course Name	Contact Hrs			Credit Allotted			Total Credits
			Th	Tut	Pr	Th	Tut	Pr	
25FEBS101	BSC	Engineering Mathematics – I	3	1	0	3	1	0	4
25FEBS102	BSC	Engineering Physics	2	-	2	2	-	1	3
25FEES101	ESC	Engineering Mechanics	3	0	2	3	0	1	4
25FEES102	ESC	Problem Solving Skills using C++	2	0	4	2	0	2	4
25FELSC101	VSEC	Prototype Fabrication and Testing - A	0	0	4	0	0	2	2
25FEAEC101	AEC	Basic Communication Skills -I	1	1	0	1	1	0	2
25FECC101	CC	Liberal Learning – A	0	0	2	0	0	1	1
		Total	11	02	14	11	02	07	20

Course Code	Vertical	Course Name	Evaluation Scheme					
			Theory			Practical		Total
			IAE 1	IAE 2	ESE	CA	OR/PR	
25FEBS101	BSC	Engineering Mathematics – I	20	20	60	25	--	125
25FEBS102	BSC	Engineering Physics	10	10	30	25	--	75
25FEES101	ESC	Engineering Mechanics	20	20	60	25	--	125
25FEES102	ESC	Problem Solving Skills using C++	20	20	60	25	--	125
25FELSC101	VSEC	Prototype Fabrication and Testing - A	--	--	--	25	50	75
25FEAEC101	AEC	Basic Communication Skills -I	10	10	30	25	--	75
25FECC101	CC	Liberal Learning – A	--	--	--	--	25	25
		Total	80	80	240	150	75	625

Applied Sciences and Humanities

First Year
Semester – I
SCHEME: SJCEM R–25
Group B

Course Code	Vertical	Course Name	Contact Hrs			Credit Allotted			Total Credits
			Th	Tut	Pr	Th	Tut	Pr	
25FEBS101	BSC	Engineering Mathematics – I	3	1	0	3	1	0	4
25FEBS202	BSC	Engineering Chemistry	2	-	2	2	-	1	3
25FEES101	ESC	Engineering Mechanics	3	0	2	3	0	1	4
25FEES102	ESC	Problem Solving Skills using C++	2	0	4	2	0	2	4
25FELSC201	VSEC	Prototype Fabrication and testing - B	0	0	4	0	0	2	2
25FEAEC101	AEC	Basic Communication Skills -I	1	1	0	1	1	0	2
25FECC201	CC	Liberal Learning – B	0	0	2	0	0	1	1
		Total	11	02	14	11	02	07	20

Course Code	Vertical	Course Name	Evaluation Scheme					
			Theory			Practical		Total
			IAE 1	IAE 2	ESE	CA	OR/PR	
25FEBS101	BSC	Engineering Mathematics – I	20	20	60	25	--	125
25FEBS202	BSC	Engineering Chemistry	10	10	30	25	--	75
25FEES101	ESC	Engineering Mechanics	20	20	60	25	--	125
25FEES102	ESC	Problem Solving Skills using C++	20	20	60	25	--	125
25FELSC201	VSEC	Prototype Fabrication and testing - B	--	--	--	25	50	75
25FEAEC101	AEC	Basic Communication Skills -I	10	10	30	25	--	75
25FECC201	CC	Liberal Learning – B	--	--	--	--	25	25
		Total	80	80	240	150	75	625

First Year
Semester – II
SCHEME- SJCEM : R–25
Group A

Course Code	Vertical	Course Name	Contact Hrs			Credit Allotted			Total Credits
			Th	Tut	Pr	Th	Tut	Pr	
25FEBS201	BSC	Engineering Mathematics – II	2	1	0	2	1	0	3
25FEBS202	BSC	Engineering Chemistry	2	0	2	2	0	1	3
25FEES201	ESC	Engineering Graphics (AutoCAD)	-	0	4	-	0	2	2
25FEES202	ESC	Basic of Electrical & Electronics Engineering	2	0	2	2	0	1	3
25FEPCC201	PCC	Object Oriented Programming using Java	2	0	4	2	0	2	4
25FELSC201	VSEC	Prototype Fabrication and Testing - B	0	0	4	0	0	2	2
25FEIKS201	IKS	Introduction to IKS	2	0	0	2	0	0	2
25FECC201	CC	Liberal Learning - B	0	0	2	0	0	1	1
		Total	10	01	18	10	1	09	20

Course Code	Vertical	Course Name	Evaluation Scheme					
			Theory			Practical		Total
			IAE 1	IAE 2	ESE	CA	OR/PR	
25FEBS201	BSC	Engineering Mathematics – II	20	20	60	25	--	125
25FEBS202	BSC	Engineering Chemistry	10	10	30	25	--	75
25FEES201	ESC	Engineering Graphics (AutoCAD)	10	10	30	25	--	75
25FEES202	ESC	Basic of Electrical & Electronics Engineering	20	20	60	25	--	125
25FEPCC201	PCC	Object Oriented Programming using Java	20	20	60	25	--	125
25FELSC201	VSEC	Prototype Fabrication and Testing - B	--	--	--	25	50	75
25FEIKS201	IKS	Introduction to IKS	10	10	30	25	--	75
25FECC201	CC	Liberal Learning - B	--	--	--	--	25	25
		Total	90	90	270	175	75	700

First Year
Semester – II
SCHEME- SJCEM : R–25
Group B

Course Code	Vertical	Course Name	Contact Hrs			Credit Allotted			Total Credits
			Th	Tut	Pr	Th	Tut	Pr	
25FEBS201	BSC	Engineering Mathematics – II	2	1	0	2	1	0	3
25FEBS102	BSC	Engineering Physics	2	0	2	2	0	1	3
25FEES201	ESC	Engineering Graphics (AutoCAD)	-	0	4	-	0	2	2
25FEES202	ESC	Basic of Electrical & Electronics Engineering	2	0	2	2	0	1	3
25FEPCC201	PCC	Object Oriented Programming using Java	2	0	4	2	0	2	4
25FELSC101	VSEC	Prototype Fabrication and Testing - A	0	0	4	0	0	2	2
25FEIKS201	IKS	Introduction to IKS	2	0	0	2	0	0	2
25FECC101	CC	Liberal Learning - A	0	0	2	0	0	1	1
		Total	10	01	18	10	1	09	20

Course Code	Vertical	Course Name	Evaluation Scheme					
			Theory			Practical		Total
			IAE 1	IAE 2	ESE	CA	OR/PR	
25FEBS201	BSC	Engineering Mathematics – II	20	20	60	25	--	125
25FEBS102	BSC	Engineering Physics	10	10	30	25	--	75
25FEES201	ESC	Engineering Graphics (AutoCAD)	10	10	30	25	--	75
25FEES202	ESC	Basic of Electrical & Electronics Engineering	20	20	60	25	--	125
25FEPCC201	PCC	Object Oriented Programming using Java	20	20	60	25	--	125
25FELSC101	VSEC	Prototype Fabrication and Testing - A	--	--	--	25	50	75
25FEIKS201	IKS	Introduction to IKS	10	10	30	25	--	75
25FECC101	CC	Liberal Learning - A	--	--	--	--	25	25
		Total	90	90	270	175	75	700

Course Title: Engineering Mathematics-I												
Semester: I			**Term:** Odd				**Course Code:** 25FEBS101					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Practical/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
3	1	--	3	1	--	4	20	20	60	25	--	125

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

The course is aimed to develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.

Course Outcomes:

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

1. Evaluate the rank of a matrix and its application to solve the system of equations.
2. Apply the basic concepts of partial differentiation to compute rate of change of multivariate functions.
3. Find extreme values of a given function.
4. Compute Taylor's, Maclaurin series expansion for function of single variable and evaluating indeterminate forms.
5. Develop the knowledge of calculus to solve problems related to polar curves.
6. Apply numerical methods to solve the engineering problems.

Course Contents:

Module	Contents	Hours	CO
I	**Matrices** Types of Matrices (symmetric, skew- symmetric, Hermitian, Skew Hermitian, Unitary, Orthogonal Matrices and properties of Matrices). Rank of a Matrix using Echelon forms, reduction to normal form, System of homogeneous and non – homogeneous equations, their consistency and solutions , Application of inverse of a matrix to coding theory **Self-Learning Topics:**, cryptography.	8	1
II	**Partial Differentiation-I** Derivative (Overview), Function of several variables, Partial derivatives of first and higher order, Differentiation of composite function, Differentiation of Two variable Implicit Function f (x, y) =0. **Self-Learning Topics:** Total differentials, Euler theorem on Homogeneous functions with three independent variables.	7	2

III	**Partial Differentiation-II** Euler's Theorem on Homogeneous and Non-Homogeneous functions with two independent variables, Jacobians in two and three variables, Maxima and Minima of a function of two independent variables, Lagrange's method of undetermined multipliers with one constraint. **Self-Learning Topics:** Successive differentiation, Leibnitz's Theorem.	8	3
IV	**Expansion of Functions & Indeterminate Forms** Taylor's Theorem (Statement only) and Taylor's series, Maclaurin's series. Expansion of e^x, sin(x), cos(x), tan(x), sinh (x), cosh (x), tanh (x), log (1+x), sin^{-1} (x), cos^{-1}(x), tan^{-1}(x), Indeterminate forms, L- Hospital Rule. Problems (Restricted to 0/0,∞/∞ , 0x∞) **Self-Learning Topics:** Indeterminate forms problems based on ∞-∞, 0^0, 1^∞ .	8	4
V	**Integral Calculus** Integration (Overview), Beta and Gamma functions and its properties, Differentiation under integral sign with constant limits of integration for one parameter. **Self-Learning Topics:** Rectification of Plane Curves in Cartesian, polar and parametric co-ordinates.	6	5
VI	**Numerical Solutions of Algebraic and Transcendental Equations and System of Linear Equations** Solution of algebraic & Transcendental Equations by Newton Raphson method and Regula – Falsi method (without proof), Solution of system of linear algebraic equations: (a) Gauss Jacobi Iteration Method (b) Gauss Seidal Iteration Method. **Self-Learning Topics:** Gauss Elimination, Gauss Jordan Method.	8	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

General Instructions:

1. Batch wise tutorials are to be conducted.
2. Students are encouraged to write at least 06 class tutorials on the entire syllabus.

The distribution of Continuous Assessment marks will be as follows

- **Class Tutorials on entire syllabus**: 15 Marks
- **Assignments**: 5 Marks
- **Attendance (Theory & Practical):** 5 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication, 40th Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 10th Ed.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand publication, 2016 Reprint.

Text Books:

1. Higher Engineering Mathematics, B. V. Ramana, McGraw Hill, 3rd reprint, 2008.
2. A Textbook of Matrices, Shanti Narayan, S. Chand publication, 2009.
3. Elementary Linear Algebra by Stephen Andrilli & David Hecker, Elsevier, 3rd Edition.

Useful Links:

NPTEL playlist of video Lectures (e-Resources):		Module Covered
Matrices	https://www.youtube.com/watch?v=KaLA1cWhQlA&list=PLLy_2iUCG87BLKl8eISe4fHKdE2_j2B_T	I
Multivariate Calculus	https://www.youtube.com/watch?v=XzaeYnZdK5o&list=PLtKWB-wrvn4nA2h8TFxzWL2zy8O9th_fy	II, III, IV, V
Numerical Methods	https://www.youtube.com/watch?v=TWAN_T66Cps&list=PLq-Gm0yRYwTguDcfylj1ZicXxzdZCAr5S	VI
Geogebra, Academo website links (e-Resources):		Module Covered

3D surface plotter	https://www.geogebra.org/3d?lang=en https://academo.org/demos/3d-surface-plotter/?expression=&xRange=&yRange=&resolution=25	III

Course Title: Engineering Mathematics-II												
Semester: II			**Term:** Even				**Course Code:** 25FEBS201					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
2	1	--	2	1	--	3	20	20	60	25	--	125

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

The course is aimed to develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.

Course Outcomes:

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

1. **Analyse** and compute powers and roots of complex numbers using polar and exponential forms.
2. **Classify** the given first order differential equations and apply it to solve them.
3. **Compute** the concepts of Higher Order Linear Differential equations to the engineering problems.
4. **Apply** concepts of Double integral of different coordinate systems to engineering problems like area and volume.
5. **Apply** concepts of triple integral of different coordinate systems to the engineering problems and problems.
6. **Solve** differential equations and integration using numerical methods.

Course Contents:

Module	Contents	Hours	CO
I	**Complex Numbers** D' Moivre's Theorem (Only Statement), Expansion of $sin^n\,\theta$, $cos^n\,\theta$ in terms of sines and cosines of multiples of θ, Powers and Roots of complex number, Hyperbolic Functions. **Self-Learning Topics:** Logarithm of complex numbers. Expansion of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$.	05	1
II	**Differential Equations of First Order and First Degree** Exact differential Equations, Equations reducible to exact form by using integrating factors and Linear Differential equation. Applications of First order and First-degree Differential equations. **Self-Learning Topics:** Bernoulli's Differential equation.	04	2
III	**Linear Differential Equations with Constant Coefficients of Higher Order** Homogeneous and Non-Homogeneous Linear Differential Equation with constant coefficient - General Solution, complementary function, particular	05	3

	integrals of differential equation of the type f (D) y = X where X is e^{ax}, sin (ax+b), cos (ax+b), x^n , e^{ax}v. **Self-Learning Topics:** Method of Variation of parameters.		
IV	**Multiple Integration-I** Double integration-definition, Evaluation of Double Integrals (Cartesian & Polar), Evaluation of double integrals by changing the order of integration (Cartesian), Evaluation of integrals over the given region (Cartesian) **Self-Learning Topics:** Evaluation of double integrals by changing the order of integration in polar form.	06	4
V	**Multiple Integration-II** Application of double integrals to compute Area, Triple integration definition and evaluation (Cartesian and spherical polar coordinates). **Self-Learning Topics:** Triple integration in cylindrical coordinates, Application of triple integral to compute volume.	05	5
VI	**Numerical solution of ordinary differential equations of first order and first degree, and Numerical Integration** Numerical solution of ordinary differential equation using (a) Euler's method (b) Modified Euler method (c) Runge-Kutta fourth order method Numerical integration- by (a) Trapezoidal (b) Simpson's 1/3rd (c) Simpson's 3/8th rule (all without proof). **Self-Learning Topics:** Numerical solution of ODE using Taylor Series Method.	05	6
Total		**30**	

Assessment:

Evaluation Scheme and Assessment:

Internal Assessment Examination:
Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.
End Semester Theory Examination:
The End Semester exam of 60 Marks will be conducted based on the entire syllabus.

Continuous Assessment (CA):
General Instructions:
1. Batch wise tutorials are to be conducted
2. Students are encouraged to write at least 06 class tutorials on the entire syllabus.

The distribution of term work marks will be as follows
• **Class Tutorials on entire syllabus**: 15 Marks
• **Assignments**: 5 Marks

• **Attendance (Theory & Practical):** 5 Marks

Reference Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publication, 40th Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 10th Ed.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand publication, 2016 Reprint.

Text Books:

1. Higher Engineering Mathematics, B. V. Ramana, McGraw Hill, 3rd reprint, 2008.
2. A Textbook of Matrices, Shanti Narayan, S. Chand publication, 2009.
3. Elementary Linear Algebra by Stephen Andrilli & David Hecker, Elsevier, 3rd Edition.
4. SCILAB by Er. Hema Ramachandran & Dr. Achutsankar S. Nair, S Chand Publication, 1st edition 2012.

Online References:

NPTEL playlist of video Lectures (e-Resources):		Module Covered
Polar curves	https://www.youtube.com/watch?v=ixDGaEqWuA0	I, IV, V
Differential Equations	https://www.youtube.com/watch?v=Im242eBqaxw&list=PL1NFrYudrrMpHBoLgJYZU-F_hgV0jmIPr https://www.youtube.com/watch?v=ES741wq3APA&list=PLo2fuKadGpUTmZX6ubb3dIB7zrhs8Eyj8	II, III
Multivariate Calculus	https://www.youtube.com/watch?v=XzaeYnZdK5o&list=PLtKWB-wrvn4nA2h8TFxzWL2zy8O9th_fy	IV, V
Numerical Methods	https://www.youtube.com/watch?v=3rWEcy21sIg&list=PLq-Gm0yRYwTizWtb_xwk0KEMzcoeLbOZq&index=3 https://www.youtube.com/watch?v=DL6ApzLE5CU	VI

Course Title: Engineering Physics												
Semester: I / II			**Term:** Odd / Even				**Course Code:** 25FEBS102					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
2	--	2	2	--	1	3	10	10	30	25	--	75

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

The objective of this course is to

1. Develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.
2. Demonstrate competency and understanding of basic Physics concepts and founding principles of technology.
3. Develop team spirit and experimental skills in Physics.

Course Outcomes:

At the end of the course students will be able to:

1. Illustrate peculiar properties of crystal structure and apply them in crystallography using X-ray diffraction techniques.
2. Interpret the concepts of semiconductor physics and applications of semiconductors in electronic devices.
3. Illustrate the fundamentals of quantum mechanics and its application.
4. Make use of the concept of interference in thin films in measurements, describe the diffraction through slits and its applications.
5. Apply the foundation of laser and fiber optics in development of modern communication technology
6. Assimilate the wide scope of nanotechnology in modern developments and its role in emerging innovating applications.

Module	**Contents**	**Hours**	**COs**
I	**Crystallography** Space lattice, Unit cell and its characteristics, Miller indices; interplanar spacing; X-ray diffraction and Bragg's law; Determination of Crystal structure using Bragg's diffractometer.	4	1

	Self-Learning topics: Simple Cubic, Body Centered Cubic, Face Centered Cubic.		
II	**Semiconductor Physics** Direct & indirect band gap semiconductor; Fermi level; Fermi energy level in intrinsic & extrinsic semiconductors; effect of impurity concentration on fermi level, effect of temperature on fermi level; mobility, current density; Hall Effect; Applications of semiconductors: LED, Introduction to Transistor. Self-Learning topics: P-N junction diode.	6	2
III	**Quantum Mechanics** Photoelectric Effect, de-Broglie hypothesis of matter waves; properties of matter waves; wave packet, phase velocity and group velocity; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non-existence of electron in nucleus; Schrodinger's time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well, Quantum Computing. Self-Learning topics: Dual nature of radiation, Black-body Radiation	6	3
IV	**Wave Optics** Interference by division of amplitude, Interference in thin film of constant thickness due to reflected; origin of colors in thin film; Wedge shaped film; Newton's rings, Applications of interference - Determination of thickness of very thin wire or foil. Self-Learning topics: Reflection and Refraction, Wave front and Huygens's principle.	5	4
V	**Laser and Fiber Optics** Laser: spontaneous emission and stimulated emission; metastable state, population inversion, types of pumping, resonant cavity; Helium Neon laser; Nd:YAG laser, Applications of laser- Holography Fibre optics: Numerical Aperture for step index fibre; critical angle; angle of acceptance; V number; number of modes of propagation; types of optical fibres(S.I. & GRIN), Fibre optic communication system; Self-Learning topics: Total Internal reflection, Absorption, Snell's law.	6	5
VI	**Nanotechnology** Nanomaterials: Properties and applications, Surface to volume ratio; Two main approaches in nanotechnology -Bottom up technique and Top down technique; Tools for characterization of Nanoparticles: Scanning Electron Microscope (SEM), Atomic Force Microscope (AFM). Methods to synthesize Nanomaterials: Ball milling, Sputtering, Solgel. Nano electronics. Self-Learning topics: Scattering of electrons.	3	6

Sr. No.	List of Practical's	CO
1.	Study different characteristics of Diamond, NaCl and HCP crystal structure using crystal model.	1
2.	Draw different planes in a cubic crystal structure using the concept of Miller indices	1
3.	Study of Hall Effect phenomenon.	2
4.	Study of I / V characteristics of semiconductor diode and LED	2
5.	Determination of energy band gap of semiconductor.	2
6.	Determination of Plank's constant using Photo cell.	3
7.	Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.	4
8.	Determination of radius of curvature of a lens using Newton's ring set up.	4
9.	Determination of wavelength using Diffraction grating.	4
10.	Determination of number of lines on the grating surface using LASER Source.	4
11.	Determination of Numerical Aperture of an optical fiber.	5
12.	Charging and discharging characteristics of super capacitor.	
13.	Study of ultrasonic distance meter/ interferometer.	

Note : A judicial mix of minimum 6-8 practical needs to be performed.

Assessment:

Evaluation Scheme and Assessment:

Internal Assessment Examination:
Assessment consists of two class tests, each 10 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.
End Semester Theory Examination:
End Semester exam of 30 Marks will be conducted based on entire syllabus.

Continuous Assessment (CA):
1. Continuous Assessment should consist of 6-8 experiments
2. Total 25 Marks

Experiments/Tutorials: 10 marks

Attendance (Theory & Practical): 05 marks
Assignments: 10 Marks

Reference Books (3 to 5):

1. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand. Revised edition 2014
2. Fundamentals of optics by Jenkins and White, McGrawHill. 4th Edition
3. Introduction to Solid State Physics- C. Kittle, John Wiley& Sons publisher. 7th Edition
4. Concepts of Modern Physics- ArtherBeiser, Tata McGraw Hill. 6th edition
5. Advances In Nano Materials And Applications: History of Nanotechnology From Pre-Historic to Modern Time, Madhuri Sharon, Wiley, USA
6. Optics and lasers: Including Fibers and Integrated Optics, Matt Young, Springer Berlin Heidelberg.

Useful Links (3 to 5 you tube links, MOOCs, blogs, podcast, swayam, reputed journals, research articles tec):

1. https://archive.nptel.ac.in/courses/122/107/122107035/
2. https://archive.nptel.ac.in/courses/108/108/108108122/
3. https://archive.nptel.ac.in/courses/122/106/122106034/
4. https://www.youtube.com/watch?v=hyctIDPRSqY

Course Title: Engineering Chemistry												
Semester: I/II			**Term:** Odd/Even				**Course Code: 25FEBS202**					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
2	--	2	2	--	1	3	10	10	30	25	--	75

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. To understand the applications of several basic concepts in Chemistry.
2. To enable students to have a lifelong learning of various Engineering Materials.

Course Outcomes:

At the end of the course students will be able to:

1. Analyse the quality of water and suggest suitable methods of water treatment.
2. Illustrate the principles of green chemistry and study environmental impact.
3. Identify methods for corrosion control based on basic knowledge of electrochemistry and different types of corrosion as well as factors affecting rate of corrosion.
4. Explain the knowledge of determining the quality of fuel and determine the oxygen requirement for combustion of fuel.
5. Summarise application of modern polymers, alloys and nano materials in the fields of engineering.
6. Understand basic knowledge of spectroscopy and its application.

Course Contents:

Module	Contents	Hours	CO
I	**Water Chemistry: -** BIS values for drinking water, Impurities in water, Hardness of water and their types, Degree of Hardness numericals, Determination of hardness by EDTA method and numericals, Softening process- Ion exchange method, Disinfection of water – chlorination, ozonolysis. Reverse Osmosis, Electrodialysis, Methods to determine extent of water pollution: BOD, COD (Definition, significance, numericals) **Self – Learning Topic:** Zeolite method, Lime-soda water softening method.	**7**	1
II	**Organic Reactions and Green Chemistry-**Introduction and Definition of Green Chemistry, 12 principles of green chemistry. Atom economy numerical, Synthesis of carbaryl, Synthesis of adipic acid, green solvent - Super critical CO_2. **Self – Learning Topic:** Synthesis of Indigo, Ibuprofen.	**3**	2
III	**Corrosion:** Definition - Classification - dry chemical corrosion (Types of oxide films), wet corrosion (H2 evolution & O2 Absorption), Corrosion in PCBs , Solder joints.	**5**	3

	Factors affecting corrosion (Position of metals in galvanic series, purity of metal, area of anode and cathode, pH, temperature, moisture,). Methods to decrease rate of corrosion-Cathodic Protection- Sacrificial anode protection, Impressed current method, Anodic protection method, Metallic coating, Hot dipping - Galvanizing, Tinning. **Self–Learning Topic:** Differential aeration corrosion, Galvanic Corrosion, Pitting, Waterline, intergranular, stress corrosion		
IV	**Fuels and Combustion: - D**efinition, characteristic properties of a good fuel and classification. Calorific value- HCV and LCV, Numerical, Solid fuels – coal (Proximate analysis, Ultimate analysis and Numerical), Combustion calculations for requirement of air quantities for Solid Fuels. Hydrogen as fuel, Green Fuel- Biodiesel. **Self–Learning Topic:** Refining of petroleum, Cracking, Knocking, Octane and Cetane value.	**6**	4
V	**Important Engineering Materials** **Polymers in Engineering: -** Introduction, definition, classification, thermoplastic and thermosetting polymers, Glass transition temperature of Polymers, Compounding of plastics, conducting polymers, Synthesis, properties and uses of PMMA, Kevlar, BUNA S, Advanced polymers in 3D printing for prototyping. **Alloys:** -Definition, Purpose of making alloy, Chart of Classification of alloy, Composition, Properties and uses of some important Alloys-Duralumin, Magnalumin, Brass, Bronze. Shape Memory Alloys **Nanomaterials:** Introduction, types/classification, C60 fullerene (Structure, Applications), CNT (introduction, types, Application) **Self – Learning Topic:** Elastomers, natural and vulcanized rubber.	**7**	5
VI	**Spectroscopic Techniques and Application** Introduction: Electromagnetic spectrum, Characteristics. Spectroscopy: Definition, Principle, Classification and general applications. Flame Photometry: Principle, Instrumentation, working, applications, advantages, and disadvantages. **Self – Learning Topic:** Fluorescence and phosphorescence.	**2**	6

Lab Contents:

SR. NO.	List of Experiments	CO
1	To determine water hardness by EDTA method.	1
2	To determine pH of different solution by using pH meter.	1
3	To determine Chloride content of water by Mohr's method.	1
4	Synthesis of Biodegradable plastic.	2
5	Electroplating of Cu	3
6	Effect of Temperature on the rate of corrosion.	3
7	Determination of moisture content of the coal.	4
8	Preparation of Biodiesel.	4
9	Synthesis of Phenol Formaldehyde.	5
10	Determination percentage of Zn in Brass.	5

11	Estimation of metal in given sample using flame photometry	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 10 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 30 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments (6 to 8): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. Wiley Engineering Chemistry, Wiley India, Wiley India Pvt. Ltd. New Delhi, 2nd Edition 2013.
2. Polymer Science by V. R. Gowariker, N.V. Viswanatha & J. Sreedhar, Wiley-Eastern Ltd, 4th Edition 2021.
3. Corrosion Engineering by M. G. Fontana, Tata McGraw Hill Publishing, 3rd Edition 2017.
4. Nanochemistry by Geoffrey A Ozin and Andre C Arsenault, RSC publishing, 2nd Edition 2008.

Text Books:

1. Engineering Chemistry - Jain & Jain, Dhanpat Rai, 17th Edition 2021-22.

2. Engineering Chemistry – Dara & Dara, S Chand, 1st Edition, reprint 2016.
3. A Text Book of Engineering Chemistry – Shashi Chawla, Dhanpat Rai, 4th Edition, 2016-17.
4. Engineering Chemistry along with lab experiments, R. V. Gadag & A. Nityananda Shetty, I K International Publishing House Pvt Ltd New Delhi, 1st Edition, 2019.

Useful Links:

1. **https://www.youtube.com/watch?v=aVdWqbpbv_Y**
2. **https://www.youtube.com/watch?v=mEXzzlDCkoo**
3. **https://www.youtube.com/watch?v=PwNpav6oauQ**
4. **https://www.youtube.com/watch?v=wRPlBjKFc1I**
5. **https://www.youtube.com/watch?v=J2-tDV8KYEA**
6. **https://www.youtube.com/watch?v=UE7zY9JoVIc**

Course Title: Engineering Mechanics												
Semester: I			**Term:** Odd				**Course Code:** 25FEES101					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
3	--	2	3	--	1	4	20	20	60	25	--	125

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. The purpose of this course is to give a solid foundation for a variety of engineering courses by elaborating on the principles of force and its effects on static and dynamic systems.

Course Outcomes:

1. Analyze the force system and relate it to the Engineering Applications.
2. Construct free body diagram of a coplanar system and calculate the reactions for static equilibrium.
3. Analyze problems related to friction for system containing block, wedge, ladder etc
4. Establish relation between velocity and acceleration of a particle and analyze the motion by plotting the relation
5. Determine Instantaneous centre of rotation (ICR).
6. Apply D'Alembert's principle, Work energy principle, Impulse momentum theorem in the problems based on Kinetics of Particle

Course Contents:

Module	Contents	Hours	COs
I	**System of Coplanar Forces:** Forces in Nature; Introduction to different force systems, Resolution of forces, moment of a force, Varignon's Theorem, Couple of forces, Resultant of a force system. **Self-Learning Topic:** Applications of Resultant in Engineering Structures	7	1
II	**Equilibrium of System of Coplanar Forces:** Condition of equilibrium for concurrent forces, parallel forces and non-concurrent nonparallel general forces and Couples. **Types of support:** Loads, Beams, Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges) **Self-Learning Topic:** Real-Time Monitoring of Loads in Smart Structures	8	2
III	**Friction:** Mechanism of Friction, Laws of Friction, Problems including constraints and friction; Applications on wedge, ladder, and blocks **Self-Learning Topic:** Friction in Mechanical, Electrical, and Bio Devices	6	3
IV	**Kinematics of Particle:** Rectilinear Motion, Motion under gravity, Projectile Motion, **Kinematics of Rigid Bodies:** General Plane Motion, Instantaneous centre of	8	4

	rotation for the velocity of bodies in plane motion, (up to 2 linkage mechanism) **Self-Learning Topic:** Use of Motion Sensors in Robotics / IoT		
V	**Kinetics of particles:** Work energy Principle, Impulse Momentum Principle **Self-Learning Topic:** Energy Transfer in Machines and Devices	7	5
VI	**Analysis of plane trusses:** By using Method of joints and Method of sections. (Excluding pin jointed frames). **Principle of virtual work:** Applications on equilibrium mechanisms, pin jointed frames. **Centroid** for plane Laminas. **Self-Learning Topic:** Truss and Structural Stability in Smart Design (CAD models)	9	6

Lab Contents:

Sr. No.	List of Practical	CO
1	To verify the Lami's Theorem using Lami's theorem apparatus	2
2	Verification of Polygon law of coplanar forces	1
3	To verify the Law of moments using Bell Crank lever apparatus	1
4	Determination of support reactions of a Simply Supported Beam.	2
5	Determination of coefficient of friction using inclined plane	3
6	Determine the range of projectile and the time of flight for the projectile motion.	4
7	Experiment on Impulse Momentum Principle	5
8	Determination of support reactions for Trusses	6
9	Determination of Centroid of Plane Lamina	6
10	Determination of ICR Slider Crank Mechanism	4

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (6-8): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Review of research papers
12. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. Engineering Mechanics by R. C. Hibbeler. Pearson Education; Fourteenth Edition (24 May 2017)
2. Vector Mechanics for Engineers: Statics and Dynamics, McGraw Hill Education; Tenth Edition (1 July 2017)
3. Engineering Mechanics Statics and Dynamics5. Engineering Mechanics by Shaum Series, McGraw Hill Education; First Edition (1 July 2017)
4. Engineering Mechanics by A K Tayal, Fourteenth Edition, Umesh Publication.
5. Engineering Mechanics by Kumar, Fourth Edition, McGraw Hill Education (1 July 2017)
6. Engineering Mechanics (Statics) by Meriam and Kraige, Nineth Edition, Wiley Books (1 January 2017)

Text Books:

1. Engineering Mechanics by N. H. Dubey, McGraw Hill Education (1 July 2017)
2. Engineering Mechanics by T.S. Venkatesh, Nandu Printers & Publishers Pvt. Ltd; 2nd multicolored Edition (1 January 2013)

Useful NPTEL Resources for Engineering Mechanics

1. Fundamentals of Engineering Mechanics
   Instructor: Prof. Ravi Kumar, IIT Roorkee
   Course Code: 112106286
   https://archive.nptel.ac.in/courses/112/106/112106286/
2. Engineering Mechanics
   Instructor: Prof. Ramesh Singh, IIT Bombay
   Course Code: 112106180
   https://archive.nptel.ac.in/courses/112/106/112106180/
3. Engineering Mechanics – Statics and Dynamics
   Instructor: Prof. Biswajit Banerjee, IIT Kanpur
   Course Code: 112103109
   https://archive.nptel.ac.in/courses/112/103/112103109/

Course Title: Problem Solving Using C++												
Semester: I			**Term:** Odd				**Course Code: 25FEES102**					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
2	--	4	2	--	2	3	20	20	60	25	--	125

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. To understand the basic structure, syntax, and data types in C programming.
2. To introduce control flow concepts using conditional and looping statements in C++.
3. To develop programming skills using functions, recursion, arrays, and strings.
4. To learn structures, pointers, and dynamic memory allocation in C++.
5. To implement object-oriented programming concepts using classes and objects.
6. To apply exception handling and file operations for building robust C++ programs.

Course Outcomes:

1. Understand and write simple C programs using data types, operators, and control structures.
2. Apply conditional statements and loops to solve logical problems in C++.
3. Solve problems using functions, recursion, arrays, and string manipulation.
4. Demonstrate the use of structures, pointers, and memory management in programs.
5. Build object-oriented programs using key OOP concepts like inheritance and polymorphism.
6. Develop C++ programs with exception handling, namespaces, and file input/output.

Course Content:

Module	Contents	Hours	COs
I	**Module 1:Fundamentals of C** Introduction to C,Overview and History of C, Setting Up the Development Environment, Basic Syntax and Structure of a C Program, Writing Your First C Program, Data Types and Operators, Primitive Data Types, Constants, and Variables, Type Conversion and Type Casting, Scope and lifetime of variables, Operators: Arithmetic, Relational, Logical, Bitwise, Assignment, Operator Precedence and Associativity	05	1
II	**Module 2: Introduction to C++** Difference between C and C++,Basic Structure of a C++ Program, Control Flow, Conditional Statement (if-else), Loops (while, do-While, for),Switch Case.	05	2
III	**Module 3: Functions and Arrays** Functions & Recursion, Preprocessor Directives (#define, #include, and macros) Single and Multidimensional Arrays, String functions,	05	3
IV	**Module 4: Structures and Pointers** Structures, Nested Structures and Unions, Pointers and References, Understanding Memory Addresses, Pointer Arithmetic, Functions with Pointers, References, Passing by Reference, Dynamic Memory Allocation: new and delete	05	4
V	**Module 5: Object-Oriented Programming** Classes and Objects, Simple programs with Constructors, OOP's 4 pillars: Encapsulation, Inheritance, Polymorphism and Abstraction, Access Specifiers : public, private, protected.	05	5
VI	**Module 6: Exception Handling** Understanding Exceptions, Try, Catch, and Throw Mechanisms, Custom Exception Classes and Handling Multiple Exceptions. Understanding Namespaces, Scope Resolution Operator, Using Standard and User-Defined Namespaces, File Handling.	05	6

Lab Content:

Sr. No.	List of Experiments	CO
1	Write a basic C program to demonstrate arithmetic operations using different data types	1
2	Implement conditional logic to create calculator with menus.	2
3	Use nested loops to print the Pattern's.	2
4	Demonstrate the recursive function and its uses.	3
5	Write a C++ program to demonstrate 1D array manipulation and basic string handling	3
6	Implement pointer operations and dynamic memory allocation in C++	4
7	Use Structure and Union with proper examples.	4
8	Develop a C++ program using classes and objects with constructor and destructor	5
9	Demonstrate function overloading and use of 'this' pointer.	5
10	Implement try-catch blocks and handle multiple exception scenarios in C++	6
11	Demonstrate Files IO in C++ syntax.	6
12	Create a program using namespaces and demonstrate scope resolution operator	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping

11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. The C++ Programming Language
2. C++ Primer (5th Edition)
3. Effective C++

Text Books:

1. Programming in C++
2. Object-Oriented Programming with C++
3. Let Us C++

Useful Links:

1. NPTEL – https://nptel.ac.in/courses/106105151 (Programming in C++)
2. NPTEL – https://nptel.ac.in/courses/106105153 (Object-Oriented Programming)
3. NPTEL–https://nptel.ac.in/courses/10610519 (**Object-Oriented System Development Using UML, Java, and Patterns***(includes C++ concepts)*)

Course Title: Engineering Graphics (Auto CAD)												
Semester: II			**Term:** Even				**Course Code:** 25FEES201					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
--	--	4	1	--	2	3	10	10	30	25	--	75

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. Students should be able to visualize the objects.
2. They should be able to understand and read drawing.
3. To impart and inculcate proper understanding of the theory of projection.
4. They should be able to present the same.

Course Outcomes:

Upon completion of this course students will be able to:

1. Understand the basic drafting skills. Also, will be able to understand and draw various engineering Curves.
2. Visualize, understand and draw the projection of solids.
3. Visualize, understand and draw the orthographic views
4. Visualize, understand and draw the sectional views
5. Read, visualize the given 3D view of an object and draw the respective 2D view of that object.
6. Apply the process of Reverse Engineering and visualize 2D and 3D views

Course Contents:

Module	Contents	Hours	COs
I	**Introduction to Engineering Graphics** Principles of Engineering Graphics and their significance, usage of Drawing instruments, Types of Lines, Dimensioning Systems as per IS conventions. Introduction to plain and diagonal scales. **Engineering Curves** Basic construction of Cycloid, Involutes and Helix. Application of Engineering Curves	1	1
II	**Projection of Solids** Projection with the axis inclined to HP and VP. Application of Projection of Solids	2	2
III	**Orthographic Projections:** - Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method	3	3
IV	**Sectional Orthographic Projections:** - Fundamentals of Sectional orthographic projections. I.S. Full or Half Sectional views of the Simple Machine parts.	3	4

V	**Isometric:** Principles of Isometric projection, Isometric Views, Conversion of Orthographic Views to Isometric Views.	3	5
VI	**Reverse Engineering: -** Introduction, Different Methods, Application of concept of RE and draw Orthographic, sectional, and Isometric views of various machine component.	3	6

Lab Contents:

Sr. No.	List of Practical	CO
1.	AutoCAD Basic Commands, Annotation and application of layers	1
2.	One sheet –Simple problems of Engineering Curves in AutoCAD	1
3.	One sheet –Complex problems of Engineering Curves in AutoCAD	1
4.	One sheet including Projection of Solid in AutoCAD (Two Stage)	2
5.	One sheet including Projection of Solid in AutoCAD (Three Stage)	2
6.	One sheet including Two problems each of Orthographic projection in AutoCAD	3
7.	One sheet including Two problems each of Sectional Orthographic projection in AutoCAD	4
8.	One sheet including Two problems of Simple Isometric projection in AutoCAD	5
9.	One sheet including Two problems of Complex Isometric projection in AutoCAD	5
10.	One sheet representing Orthographic and Isometric view after implementing Reverse engineering process on assigned object	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 10 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 30 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (6-8): 10 marks (All COs / LOs should be covered)
Attendance (Theory & Practical): 05 marks
Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publisher.
2. Prof. Sham Tickoo (Purdue University) & Gaurav Verma, "(CAD Soft Technologies): Auto CAD (For engineers and Designers)", Dreamtech Press NewDelhi
3. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill

Text Books:

1. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd.
2. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd.
3. A text book of Engineering Drawing by N S Parthasarthy, Vela Murali, Oxford Publications, Revised edition
4. A text Bok of Engineering Graphics using AUTO CAD, Sarkar, Rastogi and Kulkarni,Tata McGraw Hills, Revised edition.

Useful Links:

1. NPTEL Course- Engineering Drawing by Prof. P.S. Robi, IIT Guwahati https://nptel.ac.in/courses/112103019
2. NPTEL Course- Engineering Graphics and Design by Professor. Sunil R Kale and Naresh V Datla, IIT, Delhi https://archive.nptel.ac.in/courses/112/102/112102304/

Course Title: Basic Electrical & Electronics Engineering												
Semester: II			**Term:** Even			**Course Code:** 25FEES202						
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
2	--	2	2	--	1	3	20	20	60	25	-	125

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. To provide knowledge on fundamentals of D.C. circuits as well as 1- Φ AC circuits and its applications.
2. To inculcate knowledge on the basic operation and performance of 1-Φ transformer and DC machines.
3. To get an insight of working of various sensors as well as study of logic gates and Boolean Algebra.

Course Outcomes:

On completion of the course, learner will be able to:

1. Apply various network theorems to determine the circuit response / behaviour.
2. Evaluate and Analyse 1-Φ AC circuits and operations of 1-Φ transformer.
3. Illustrate the working principle of DC machine.
4. Analyse the working principles of various sensors.
5. Understand the different number system conversions and various logic gates.
6. Understand SOP, POS form and working of combinational circuits.

Course Contents:

Module	Contents	Hours	COs
I	**DC Circuits:** Kirchoff's current and voltage laws, Mesh analysis, Superposition, Thevenin and Maximum Power Transfer Theorems. **Self-Learning Topics:** Nodal analysis, Star-Delta / Delta-Star Transformations, Norton Theorem.	05	1
II	**AC Circuits:** Single-phase ac series and parallel circuits consisting of RLC representation, real power, reactive power, apparent power, power factor. AC Analysis of series and parallel RLC Circuits with Resonance, Concept of Bandwidth and Q-factor **Transformers:** Construction, working principle, emf equation, ideal and practical transformer **Self-Learning Topics: 3-Phase:** Introduction to three-phase balanced circuits	06	2

III	**DC Machine:** Principle of operation of DC Motors and DC Generators, classification of DC machine, EMF equation of DC machine. **Self-Learning Topics:** Principle of operation of Single-phase and Three-phase induction motor.	04	3
IV	**Sensors:** Actuators and Transducers, Introduction to sensors, Basic sensor types, Sensor characteristics, Physical principles of Sensing Electric Charges, Fields, Potential, Capacitance, Magnetism, Induction, Resistance. **Self-Learning Topics:** Dynamic Models of Sensor Elements**.**	04	4
V	**Number Systems and Logic Gates:** Binary numbers, Number Base Conversion, Octal & Hexadecimal Numbers, Logic Operations, Digital Logic Gates. **Self-Learning Topics:** Complements, Canonical and Standard forms	05	5
VI	**Boolean Algebra and Combinational Logic Design:** Boolean Algebra, De-Morgan's Theorem, SOP and POS representation, K Map up to four variables, Half Adder, Full Adder, Multiplexer and Demultiplexer. **Self-Learning Topics:** Half Subtractor, Full Subtractor.	06	6

Lab Contents:

Sr. No.	List of Practical	CO
1.	To study Mesh analysis.	CO1
2.	To verify Superposition Theorem.	CO1
3.	To verify Thevenin's and maximum power transfer Theorem.	CO1
4.	To study R-L-C series resonance circuit.	CO2
5.	To study R-L-C parallel resonance circuit.	CO2
6.	To study the working of step-up or step-down transformer	CO2
7.	To Study of cut-out section of DC machine.	CO3
8.	To measure output voltage with respect to Displacement of Core on LVDT kit	CO4
9.	To measure Pressure using Strain gauge.	CO4
10.	To Study Number Base Conversion.	CO5
11.	To verify different Logic gates and implement basic gates using Universal Gates.	CO5
12.	To verify Logic equations using Multiplexer IC 74151	CO6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (6 to 8): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
4. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
5. M. Morris Mano, "Digital Logic and Computer Design", PHI Learning, 2008.
6. Jon S. Wilson, "Sensor Technology Handbook", Newnes, 2020.

Text Books:

1. Ravish Singh, "Basic Electrical Engineering Tata McGraw Hill, 2018
2. B. R. Patil, "Basic Electrical Engineering", Oxford Higher Education, 2016.
3. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006
4. D. Patranabis, "Principles of Sensors and Instrumentation" PHI Learning Private Limited, 2016
5. Thomas L Floyd, "Digital Fundamentals", Pearson, 2014.
6. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill Education , 4th Edition , 2009

Useful Links:

1. https://nptel.ac.in/courses/108108076
2. https://nptel.ac.in/courses/108105053
3. https://www.youtube.com/watch?v=Vd2UJiIPbag

Course Title: Object Oriented Programming using Java												
Semester: II			**Term:** Even				**Course Code:** 25FEPCC201					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
2	--	4	2	--	2	4	20	20	60	25	--	125

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. Understand Java Fundamentals: Provide students with a solid foundation in Java programming, including basic syntax, object-oriented principles, and core libraries.
2. Develop Problem-Solving Skills: Cultivate problem-solving skills using Java, enabling students to analyze and implement basic algorithms.
3. Master Linear Data Structures: Introduce linear data structures (arrays, linked lists, stacks, queues) and their applications in solving computational problems.
4. Encourage Coding Best Practices: Instill coding standards, clean code principles, and efficient programming practices.
5. Prepare for Competitive Coding: Introduce competitive programming problems to improve coding speed, accuracy, and efficiency.
6. Enhance Analytical Thinking: Encourage analytical thinking by solving problems and debugging, enhancing logical reasoning and programming efficiency.

Course Outcomes:

On completion of the course, learner will be able to:

1. Understand and Implement Java Syntax and Concepts: Demonstrate knowledge of basic Java syntax, control structures, and object-oriented programming principles.
2. Solve Problems Using Algorithms and Data Structures: Apply algorithms and linear data structures to solve practical and theoretical problems.
3. Design and Analyze Simple Data Structures: Create, manipulate, and analyze data structures like arrays, linked lists, stacks, and queues.
4. Develop Competence in Competitive Coding: Write optimized code to solve basic competitive programming problems within time and space constraints.
5. Employ Best Practices in Java Development: Write well-documented, maintainable, and reusable Java code following coding standards.
6. Debug and Optimize Code: Identify, debug, and optimize code, improving performance through efficient problem-solving techniques.

Course Content:

Module	Contents	Hours	COs
I	**Module 1: Java Fundamentals (10 hours)**	10	1
	Java basics, syntax, and structure		
	Control structures: if-else, loops, switch		
	Introduction to methods and functions		
	Basic Input/Output operations		
	Arrays and string manipulation basics		
II	**Module 2: Object-Oriented Programming (OOP) in Java (10 hours)**	10	2
	OOP concepts: classes, objects, inheritance, encapsulation, polymorphism		
	Constructors, access modifiers		
	Abstract classes and interfaces		
	Static vs. non-static members		
	Introduction to packages		
III	**Module 3: Linear Data Structures (12 hours)**	12	3
	Arrays: single-dimensional and multi-dimensional arrays		
	Linked Lists: singly linked list, doubly linked list, and circular linked list		
	Stacks: implementation, applications, and operations (push, pop, peek)		
	Queues: simple queue, circular queue, and dequeue		
	ArrayList, LinkedList in Java Collections Framework		
IV	**Module 4: Algorithmic Foundations (8 hours)**	08	4
	Sorting algorithms: Bubble sort, selection sort, insertion sort, merge sort		
	Searching algorithms: Linear search, binary search		
V	**Module 5: Analysis of Algorithms (10 hours)**	10	5
	Introduction to recursion		
	Complexity analysis (Big O notation) for basic algorithms		
	Hands-on problem-solving using data structures and algorithms		
VI	**Module 6: Competitive Coding Basics (10 hours)**	10	6
	Introduction to competitive programming platforms (e.g., CodeChef, LeetCode)		
	Time and space complexity constraints in competitive coding		
	Tips for efficient coding and debugging practices		
	Solving basic competitive programming problems (e.g., finding duplicates, finding max/min in an array, etc.)		

Lab Content:

Sr. No.	List of Experiments	CO
1	**Basic Java Program (Hello World & User Input)**	1
	Write a Java program to print "Hello, World!" and take user input for a greeting message.	
	Experiment with data types (int, float, double, char, boolean) by taking user input for each.	

2	**Control Structures and Loops**	1
	Write a program to calculate the factorial of a number using loops.	
	Create a program to find the sum of all even numbers from 1 to n.	
3	**Array Operations**	1
	Write a program to input an array of integers, find the maximum and minimum values, and calculate the average.	
	Implement a program to reverse an array.	
4	**String Manipulation**	1
	Write a Java program to check if a string is a palindrome.	
	Create a program that counts the occurrences of each character in a string.	
5	**Object-Oriented Programming - Class and Objects**	2
	Define a class Student with attributes (name, roll number, and marks in 3 subjects). Write methods to calculate total marks and average marks, and display the details.	
6	**Constructors and Method Overloading**	2
	Implement a class Rectangle with overloaded constructors to calculate area with different inputs (length and breadth or side length for a square).	
	Demonstrate method overloading with a simple calculator class to perform addition, subtraction, and multiplication.	
7	**Inheritance and Polymorphism**	2
	Create a class hierarchy for shapes: base class Shape, derived classes Circle, Rectangle, and Triangle. Implement methods to calculate area and demonstrate polymorphism.	
8	**Exception Handling**	2
	Write a program to handle ArrayIndexOutOfBoundsException and NullPointerException.	
	Create a program that takes two numbers and performs division; handle possible exceptions (like division by zero).	
9	**Arrays as Data Structures**	3
	Implement a program to merge two sorted arrays into a single sorted array.	
	Write a program to find the second largest element in an array.	
10	**Singly Linked List**	3
	Create a simple linked list with operations: insert at the beginning, delete at the beginning, display the list, and search for an element.	
11	**Stack Implementation (Using Array or Linked List)**	3
	Implement a stack with operations: push, pop, peek, and display.	
	Use the stack to check if a given string of parentheses is balanced.	
12	**Queue Implementation (Using Array or Linked List)**	3
	Write a program to implement a queue with operations: enqueue, dequeue, and display.	
	Extend it to a circular queue and demonstrate the wrap-around functionality.	
13	**Sorting Algorithms**	4
	Implement Bubble Sort, Selection Sort, and Insertion Sort on an array. Compare their performance on the same dataset.	
	Sort an array of student objects by marks using Merge Sort.	
14	**Searching Algorithms**	5
	Write a program to implement linear search and binary search.	
	Compare the time taken by both searches for a large dataset.	
15	**Competitive Programming Problems**	6
	Solve a few competitive coding problems, such as:	
	Finding the majority element in an array (an element that appears more than n/2 times).	

	Implementing a simple sliding window to find the maximum sum of k consecutive elements in an array.	
	Generating all possible substrings of a given string.	

Evaluation and Assessment Scheme:

D. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

E. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

F. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)
Attendance (Theory & Practical): 05 marks
Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

12. Assignment
13. Case Study
14. Debate
15. Solution for Social Problems
16. Field Visit
17. Group Project
18. Flipped Classroom
19. Topic Review
20. Quiz
21. Mind Mapping
22. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. Herbert Schildt, "Java: The Complete Reference", McGraw Hill Education, 9th Edition, 2014
2. E. Balguruswamy, "Programming with Java: A Primer", McGraw Hill Education, 5th Edition, 2014

Text Books:

1. Herbert Schildt, "Java: A Beginner's Guide", Prentice Hall, McGraw Hill Education,12th Edition, 2022
2. Cay S. Horstmann, "Core Java Volume II Advanced Features", Prentice Hall, 11th Edition, 2019.

Useful Links:

1. https://nptel.ac.in/courses/106105191
2. https://nptel.ac.in/courses/106105224

Course Title: Prototype Fabrication and Testing- A

Semester: I/II			**Term:** Odd/Even				**Course Code:** 25FELSC101					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Project**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
--	--	4	--	--	2	2	--	--	--	25	50	75

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment
PR: Practical (2 Hrs for learning and practicing skill + 2 Hrs for Project)

Course Objectives:

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and hard labour.
3. To get exposure to interdisciplinary engineering domain.

Course Outcomes:

After successful completion of the course, learner will be able to
CO1: Apply workshop safety rules and demonstrate the use of personal protective equipment (PPE).
CO2: Perform basic operations in carpentry, joining, and plumbing using appropriate tools and techniques.
CO3: Identify and use basic electronic components and fabricate simple circuits on a PCB.
CO4: Operate electronic testing equipment and carry out basic electrical wiring tasks.
CO5: Create a 3D CAD model and demonstrate 3D printing and CNC machine operations.
CO6: Explain the fundamentals of design thinking/ Apply design thinking stages to solve basic engineering problems.

Course Contents:

Module	Contents	Hours	COs
I	**Basic Manufacturing Processes:** Basic Safety, Carpentry, Joining, Plumbing **1. Basic Safety:** Introduces workshop safety rules, use of Personal Protective Equipment (PPE), and safe handling of tools and machinery. Covers fire safety, hazard identification, and emergency response procedures. Emphasizes safety signage, accident prevention methods, and first aid basics. **2. Joining:** Temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners, and fusion technologies **3. Carpentry & Wood Lathe:** Focuses on basic woodworking tools, types of wood, and hand tools used in carpentry. Includes operations like marking,	24	1,2

	sawing, planning, chiseling, and making simple joints (e.g., lap and mortise-tenon) Hands-on practice in preparing basic wooden joints and understanding their applications in furniture and construction. Wood Lathe -Turning, shaping, cutting operations and tool safety. **4. Plumbing:** Introduces pipe materials (PVC, GI, copper), tools, and fittings used in plumbing systems. Demonstrates operations like cutting, threading, bending, and joining of pipes for water supply and drainage. *(3 and 4 will be optional and based on need for projects)*		
II	**Basic Electronic Fabrication and Test Practices:** Basic electronic components, PCB design and fabrication- etching and milling, Electronic testing equipment, Basic electrical wiring	12	3,4
III	**Advanced manufacturing process:** 3D Modelling and Printing- Introduction to 3D printing: methodologies, best practices, material, and model variation. Modelling approaches for ideation and creation. Developing a CAD file (.iges/.step/.dwg) of a 3D model and export it as in .stl file for the purpose of 3D printing. 3D printing through using open-source slicing software. CNC Lathe- Basics of CNC Coding, Demonstration of CNC Lathe	18	5
IV-A Only for Sem.- I	**Basics of Design Thinking:** Definition of Design Thinking, need for Design Thinking, Objective of Design Thinking,	6	6
IV-B Only for Sem.- II	**Basics of Design Thinking:** Stages of Design Thinking Process– Empathize, Define, Ideate, Prototype, Test (explain with case studies)	6	6

Evaluation and Assessment Scheme:

A. Continuous Assessment (CA):

Continuous Assessment should consist of the following:
At least 4 Jobs based on skills: 40 marks (All COs / LOs should be covered)
Attendance: 10 marks

B. Project:

Project: 40 marks (skills learned should be covered)
Attendance: 10 marks

Reference and Text Books:

1. A Textbook of Workshop Technology: Manufacturing Processes, Author: R S Khurmi & J. K. Gupta, S Chand Publishing
2. Workshop Technology (Manufacturing Processes), by S. K. Garg, Laxmi Publications Private Limited; Fourth Edition (1 January 2018)
3. Elements Of Workshop Technology Vol-1and 2, by Choudhury H S K, Media Promoters (1 January 2008)
4. Rapid Prototyping of Digital Systems: SOPC Edition, by James O. Hamblen (Author), Tyson S. Hall, Springer-Verlag New York Inc.; 2008th Edition (31 October 2007)
5. Rapid Prototyping Technology: Selection And Application, By Cooper, Taylor & Francis (1 January 2001)
6. Rapid Prototyping: 3D Printing and Additive Manufacturing Principles and Applications, by Chee Kai & K F Leong Chua, Chua, Chee Kai & K F Leong (1 January 2019)
7. Fab Lab: Revolution Field Manual, by Massimo Menichinelli, Niggli Verlag (2017)
8. Skill Development and Entrepreneurship in India, by Rameshwari Pandya, Ingram short title (2016)
9. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, by Vijay Kumar, Wiley (2012)

Course Title: Prototype Fabrication and Testing- B

Semester: I/II			**Term:** Odd/Even				**Course Code:** 25FELSC201					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Project**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
--	--	4	--	--	2	2	--	--	--	50	50	100

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment
PR: Practical (2 Hrs for learning and practicing skill + 2 Hrs for Project)

Course Objectives:

4. To impart training to help the students develop engineering skill sets.
5. To inculcate respect for physical work and hard labour.
6. To get exposure to interdisciplinary engineering domain.

Course Outcomes:

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

CO1: Apply electrical and fire safety protocols and identify workshop hazards.

CO2: Operate wood lathe machinery and fabricate basic sheet metal components.

CO3: Assemble basic computer hardware components and configure local area networks.

CO4: Demonstrate manufacturing operations using laser cutting, CNC routing, and CNC milling tools.

CO5: Apply learned technical skills to develop a simple working prototype.

CO6: Explain the fundamentals of design thinking/ Apply design thinking stages to solve basic engineering problems.

Course Contents:

Module	Contents	Hours	COs
I	**Basic Manufacturing Processes:** **1.Electrical and Fire Safety:** Introduces electrical and fire safety rules, use of PPE, safety signage, hazard identification, and emergency procedures. **2. Sheet Metal:** Cutting, bending, riveting, and soldering techniques.	24	1,2,5

	3. Electrical Wiring: Basic practice of connecting, installing, and testing electrical circuits, switches, and fittings using standard tools. Builds skills in safe wiring, fault detection, and household electrical maintenance. **4. Fitting:** Basic hand operations like marking, cutting, filing, and assembling metal parts to precise sizes using hand tools. Develops skills in accurate fabrication and safe workshop practices. *(3 and 4 will be optional and based on need for projects)*		
II	**Computer Hardware and Networking:** PC hardware components, assembly, and troubleshooting. Networking fundamentals including cables, switches, and routers. IP addressing, configuration, and LAN setup. Basic network device functions and connectivity. Practical skills in hardware handling and network troubleshooting.	12	3,5
III	**Advanced Manufacturing Processes:** **Laser Cutting:** Setup and safety procedures for laser cutting machines, Execution of cutting jobs with precision and material handling. **CNC Routing:** Introduction to CNC routing and creating toolpaths, Basic operation and programming for routing applications. **CNC Milling:** Fundamentals of CNC milling and G-code programming, Simulation and verification of milling operations before machining.	18	4,5
IV-A Only for Sem.- I	**Basics of Design Thinking:** Definition of Design Thinking, need for Design Thinking, Objective of Design Thinking,	6	6
IV-B Only for Sem.- I	**Basics of Design Thinking:** Stages of Design Thinking Process– Empathize, Define, Ideate, Prototype, Test (explain with case studies)	6	6

Evaluation and Assessment Scheme:

A. Continuous Assessment (CA):

Continuous Assessment should consist of the following:

At least 4 Jobs based on skills: 40 marks (All COs / LOs should be covered)

Attendance: 10 marks

B. Project:

Project: 40 marks (skills learned should be covered)

Attendance: 10 marks

Reference and Text Books:

1. A Textbook of Workshop Technology: Manufacturing Processes, Author: R S Khurmi & J. K. Gupta, S Chand Publishing
2. Workshop Technology (Manufacturing Processes), by S. K. Garg, Laxmi Publications Private Limited; Fourth Edition (1 January 2018)
3. Elements Of Workshop Technology Vol-1and 2, by Choudhury H S K, Media Promoters (1 January 2008)
4. Manufacturing Technology - Volume 1 & 2, by P.N. Rao, Tata McGraw Hill
5. Computer Fundamentals and Networking, by P.K. Sinha, BPB Publications
6. Fundamentals of Computer Hardware and Networking by K.L. James, New Age International Publishers
7. Networking Fundamentals, by G.K. Gupta, Dreamtech Press
8. Data Communication and Networking by Behrouz A. Forouzan, McGraw Hill
9. CNC Machines and Automation, by S.K. Saha, Tata McGraw Hill
10. CNC Machines, Programming, and Applications by P.N. Rao, Tata McGraw Hill
11. Laser Technology and Applications, by R.K. Jain, Khanna Publishers
12. Laser Fundamentals and Applications by J.P. Bhattacharjee, Narosa Publishing House
13. Fab Lab: Revolution Field Manual, by Massimo Menichinelli, Niggli Verlag (2017)
14. Skill Development and Entrepreneurship in India, by Rameshwari Pandya, Ingram short title (2016)
15. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, by Vijay Kumar, Wiley (2012)

Course Title: Basic Communication Skills-I (BCS)												
Semester: I			**Term:** Odd				**Course Code: 25FEAEC101**					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
1	1	--	1	1	--	2	10	10	30	25	--	75

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. To understand fundamental communication skills and enhance exchange of information in day –to-day life and workplace.
2. To apply grammar and vocabulary correctly in Spoken and Written mode.

Course Outcomes:

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

1. Demonstrate effective verbal and non-verbal communication in various personal and professional settings.
2. Enrich their vocabulary and grammar for different communication contexts.
3. Able to clearly express ideas, thoughts, and information in both one-on-one and group settings.
4. Develop strategies to synthesize and communicate complex ideas with clarity and conciseness.
5. Apply grammatically correct sentences and paragraphs in written documents, such as emails, reports, and essays.
6. Apply techniques and improve their reading comprehension skills.

Course Contents:

Module	Contents	Hours	COs
I	**Module 1: Fundamentals of Communication** Importance of Communication Introduction to communication Process and its elements Types of communication: Verbal & Non- Verbal Communication Organizational Communication- Horizontal & Vertical Communication, Upward & Downward Communication, Grapevine Communication Barriers: Linguistic, Psychological, Organizational, Physical, Mechanical, . Overcoming Barriers.	4	1
II	**Module II: Verbal Aptitude on Grammar & Vocabulary <u>Grammar:</u>** 1. Subject-Verb Agreement 2. Types of Sentences: Assertive, Imperative, Interrogative, Exclamatory, Simple, Compound, Complex	3	2

	Vocabulary: Synonyms, Antonyms, Prefixes, Suffixes Homophones, Homonyms, Homographs & Acronyms Collocations, One word Substitution		
III	**Module III: Principles of Effective Communication** Merits and Demerits of Oral/Written Communication. 7Cs of Effective Communication: Completeness, Correctness, Clarity, Conciseness, Courtesy, Consideration, Consciousness	2	3
IV	**Module IV: Developing Speaking Skills** Elements of Speaking Skills: Pronunciation, Fluency, Tone Types of Speech: Welcome Speech, Introductory Speech, Public Speech, Farewell Speech, Vote of Thanks. Tips for enhancing speeches.	2	4
V	**Module V: Writing Skills** Letter Writing: Formats, Parts of a Letter, Permission letter, Leave letter, Apology Letter. Technical Vs Literary Writing Framing Definitions. Describing Technical Objects & Giving instructions Writing User instructions: Note, Warning, Caution, and Danger. Description of a object.	2	5
VI	**Module VI: Reading Comprehension Skills** Unseen Passage Types of Reading Skills: Skimming & Scanning, SQ3R Summary Writing: Point Form Summary	2	6

Tutorial Contents:

Sr. No.	List of Tutorials	CO
1	Introducing yourself to a classmate/Colleague	1
2	Introducing a Guest/Role Model/Celebrity	1
3	Verbal Communication – Word Building	1
4	Process Of Communication -Module 1 (T1)	1
5	Grammar and Vocabulary: Module II (T2)	2
6	Barriers – Based on Psychological & Linguistic Barriers: Case Study -Module III (T3)	1
7	Official Letter Writing (T4) Module 5	5
8	Practice Speech with transcription along with plagiarism report: Module IV (T5)	4
9	Speech Presentation along with plagiarism report (IAT1)	4
10	Revision Test on Verbal & Non-Verbal Communication: Module: 1 (T6)	1
11	Reading Comprehension Skills (T7) Module 6	6
12	Giving Instructions and Describing objects. (T8) Module:5	5
13	7 Cs for Effective Communication Skills	3
14	Standard Abbreviations and Collocations	2
15	Presentation of Welcome Speech/Vote of Thanks	1

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 10 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 30 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (6-8): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. Gadyalji Vaishali K, Communication Skills, Nandu Publications, 2010
2. Rai Urmila & Rai S.M, Business Communication, Himalaya Publishing House, 2007
3. Rai Urmila & Rai S.M, Business Communication, Himalaya Publishing House, 2008
4. Raman Meenakshi & Sharma Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2015
5. Raman Meenakshi & Singh Prakash, Business Communication, Oxford University Press, 2008
6. Luthans Fred, Organizational Behavior An Evidence-Based Approach, McGraw Hill Education Private Limited, 2013
7. Locker O Kitty & Kaczmarek Kyo Stephen, Business Communication Building Critical Skills, McGraw Hill Education Private Limited, 2007
8. Chaturvedi P D & Chaturvedi Mukesh, Business Communication Concepts, Cases and Applications, Pearson Education, 2008

Text Book:

1. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill, 2008

Useful Links:

1. https://youtu.be/v3DiMAPolIs?si=ZPjjut79OM3U0OXE
2. https://youtu.be/6pYSbdGiDYw?si=KM7YhmGk-OWd_XO-
3. https://youtu.be/HxGq1waX9kw?si=mFG4iPAq3GGUCaT1
4. https://youtu.be/8bZGi3yz4qg?si=Lo4Vg4JQz16ei7c-
5. https://youtu.be/BnRub9D5Ch8?si=fKAEKgm-cFTgaNwl
6. https://youtu.be/O-6q-siuMik?si=inJhwHL32BypaUc-
7. https://youtu.be/FI2OKNMWGc4?si=VN0BlFcY9mHVA5PG
8. https://youtu.be/mQLEocJCDtE?si=jvj_-L-GeAKRpVTr
9. https://nptel.ac.in/courses/109/104/109104030/
10. https://www.google.com/url?q=https://swayam.gov.in/nd1_noc20_hs60/pre

Course Title: Introduction to IKS												
Semester: II			**Term:** Even				**Course Code:** 25FEIKS201					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract/ Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
2	--	--	2	--	--	2	10	10	30	25	--	75

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Rationale:

The Indian Knowledge System (IKS) is vital for preserving India's rich cultural heritage, fostering holistic and sustainable practices, and integrating ancient wisdom with modern science to address contemporary challenges and enrich global knowledge.

Course Objectives:

1. To explore and understand the evolution of Indian scientific thought

2. To evaluate the historical and modern educational systems in our country

3. To analyze sustainable practices in in ancient India

4. To know the richness of Indian Arts and Culture

5. To understand the contributions of Indian Scientists and Nobel Laureates

6. To understand the principles of good governance

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

1.Recognize the sources and concepts of the Indian knowledge system
2. Learn about our history of Indian ancient knowledge and its significance in the current scenario.
3. Demonstrate sustainable development in various fields like Science, Technology, agriculture, industry, architecture performing arts, etc.
4. Understand and appreciate the rich heritage that resides in literature
5.Learn about the ancient Bhartiya education system in comparison with the modern era
6. Showcase the multi-dimensional nature of IKS and its importance in modern society

Course Contents:

MODULE	Detailed Contents	Hrs	CO
I	**Introduction to the Indian knowledge system** • Basic knowledge and scope of IKS • IKS in ancient India and modern India, • Bhartiya education system - ancient to modern era, • Sources of Education, Aim of Education, Curriculum, methods of learning, • Educational Institutes, Higher Educational Institutions, • Advantages and Disadvantages of the Gurukul System,	05	2
II	**Development of Scientific Thoughts in Ancient India** • Distinguish between the Gurukul system And the Modern Education System • Development in Science, Technology. Astronomy. Mathematics, and Life Sciences - Life Science. Physiology. Ayurveda, etc.	05	1
III	**Development of Arts & Culture in India** • Introduction to Ancient Architecture (Arts. Forts, Paintings. Sculpture, Temple architecture, etc) • Development in performing arts & culture: Music. Art of singing. Art of dancing. Natyakala Cultural traditions and Folk arts	05	4
IV	**Good Governance in Ancient India** • Introduction to Indian religions • Moral and Ethical Governance • Vishva Kalyan through Vasudhaiva Kutumbkam • Principles of Good Governance about Ramayana, Mahabharat, Artha Sastra and Kautilyan State	05	6
V	**Contribution of Indian Scientist & Nobel Laureates** • Baudhayan. Aryabhatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna, Susruta, Kanada & Charak • Rabindranath Tagore, C.V. Raman, Har Gobind Khorana, Mother Teresa, Subrahmanyan Chandrasekhar, Amartya Sen, V.S. Naipaul, Venkatraman Ramakrishnan, Kailash Satyarthi and Abhijit Banerjee	05	5
VI	**Sustainable Practices in Ancient India** • Agriculture, waste management, water conservation, forest conservation, architecture, urban planning, biodiversity preservation, etc • Yoga, pranayama, and meditation for health and well-being	05	3

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 10 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 30 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following
Assignments: 10 marks (All COs / LOs should be covered)
Attendance (Theory & Practical): 05 marks
Teacher Assessment Examination (TAE):10 Marks

List of Teacher Assessment Examination (TAE):

a. Assignment
b. Case Study
c. Debate
d. Solution for Social Problems
e. Field Visit
f. Group Project
g. Flipped Classroom
h. Topic Review
i. Quiz
j. Mind Mapping
k. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Text Books:

I. A.K Bag, History of technology in India (Set 3 vol), Indian Nation Science Academy, 1997.

2. An Introduction to Indian Knowledge Systems: Concepts and Applications, B Mahadevan, V R Bhat, and Nagendra Pavana R N; 2022 (Prentice Hall of India).

3. Ancient Indian Knowledge: Implications To Education System, Boski Singh; 2019

4. India's Glorious Scientific Tradition by Suresh Soni; 2010 (Ocean Books Pvt. Ltd.)

5. Indian Art: Forms, Concerns, and Development in Historical Perspective (History of Science, Philosophy and Culture in Indian Civilization), General Editor: D.P. Chattopadhyaya, Ed. By. B.N. Goswamy, 1999 Munshiram Manoharlal Publishers Pvt. Ltd.

Useful Links:

1. **https://swayam.gov.in/explorer?searchText=iks**
2. **https://iksindia.org/book-list.php**
3. **https://iksindia.org/index.php**
4. **http://egyankosh.ac.in**
5. **https://www.indianculture.gov.in**

Liberal Learning Courses for F. Tech

- Course registration will follow a first-come, first-served basis. If a course is full, students must choose from the remaining available options or the HOD may assign a course.
- Each LLC course is one credit and involves two hours of weekly instruction.
- There will be Practical/Project Assessment.
- Marks will be recorded as a total score out of 25 for Practical/Project Assessment.
- Min 15 to Max 50 students in each course Except Social Activities
- Course will be offered based on student choice and availability of resources to conduct a course.
- College will offer any of the following courses at the start of Sem. - I and Sem. - II.
- If any other course which is not listed can be offered with approval of BOS
- Syllabus for each course is designed to provide a comprehensive overview, but it can be adapted and expanded based on the specific needs & interests of the students and professional experience of the instructor.
- As each course is unique in its nature and content, course instructor can adopt their own teaching methodologies and there are no hard constraints from the college as far as expected learning outcomes delivered.

Course Bucket

Group A
Yoga and Meditation
Basics of Photography
Performing Arts – Dance
Urban Gardening
Anchoring and Script Writing
Music
Basics of Cinematography

Group B
Physical fitness and sports
Basics of Printing and Designing
Performing Arts – Theatre
Functional English
Personality development
Basics of Hotel Management
Tribal Art

Note:

- These courses are tentative and may or may not be offered.
- Their availability depends `on the situation and the availability of faculty, staff, and resources.
- The institution is not obligated to conduct these courses.
- There is no extra fee for these courses.

Course Title: Liberal Learning Course												
Semester: I/II			**Term:** Odd/Even				**Course Code: 25FECC101/201**					
Teaching Scheme							**Evaluation Scheme**					
Contact Hrs.			**Credit Allotted**			**Total Credit**	**IAE 1**	**IAE 2**	**ESE**	**CA**	**Oral/Pract / Tut.**	**Total**
Th	**Tu**	**Pr**	**Th**	**Tu**	**Pr**							
--	--	2	--	--	1	1	--	--	--	--	25	25

IAE: Internal Assessment Examination ESE: End Semester Examination
CA: Continuous Assessment

Course Title: Yoga and Meditation

Module	Contents	Hours
I	**Introduction:** Presentations on Introduction to Yoga and its History. Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga.	04
II	Lab Exp: 2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up. Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Experiment 2 to 4 must be followed by shavasana for self-relaxation.	04
III	Lab Exp: 4 Perform Sarvangasna, Halasana, Kandharasana (setubandhasana) Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana Lab Exp: 6 Perform Paschimottasana, Baddhakonasana, Bharadwajasana.	06
IV	Lab Exp: 7 Perform Veera Bhadrasana, Vrukshasana, Trikonasana. Follow up experiment 5 to 7 with shavasana for self-relaxation	06
V	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhati Pranayam Kriya Lab Exp:10 Practice Bhramary Pranayam.	04
VI	Lab Exp: 11 Perform sitting in Dhyan Mudra and meditating. Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice)	06

Reference Books:

1. Davis, M., Eshelman, E.R., & McKay, M. (2019) The Relaxation and Stress Reduction Workbook, 6th Ed., New Harbinger Publications, Oakland.
2. Ray, L., & Sutherland, A. (2022) Yoga for Every Body: A Beginner's Guide to the Practice of Yoga Postures, Breathing Exercises and Meditation, 1st Ed., Vital Life Books, London.
3. Saradananda, S. (2019) Mudras for Modern Living: 49 Inspiring Cards to Boost Your Health, Enhance Your Yoga and Deepen Your Meditation, 1st Ed., Watkins Publishing, London.
4. Swanson, A. (2019) Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice, 1st Ed., DK Publishing, New York.

Course Title: Basics of Photography

Module	Contents	Hours
I	**Introduction to Photography** 1. History and evolution of photography 2. Overview of different types of cameras 3. Understanding exposure: aperture, shutter speed, and ISO	06
II	**Camera Operation and Handling** 1. Basic camera controls and functions 2. Proper camera handling techniques 3. Practical exercises in camera operation	06
III	**Composition and Framing** 1. Rule of thirds and other composition techniques 2. Framing and cropping for impact 3. Hands-on composition exercises	04
IV	**Lighting Essentials & Portrait Photography** 1. Natural vs. artificial light 2. Basic principles of exposure and lighting 3. Lighting a Subject 4. Practical use of Different Light Sources	06
V	**Nature, Landscape & Wildlife Photography** □□ Finding the right location □□ Capturing the essence of a landscape □□ Macro & Telephoto Photography	04
VI	**Mobile Photography & Editing** 1. Using your phone cameras settings 2. Basics of Editing	04

Course Title: Performing Arts – Dance

Module	Contents	Hours
I	Introduction to origin and development of different types of dances and improvisational activity, difference between folk dance and folk art.	06
II	Basic dance steps and movement, Choreographing steps on songs	06

III	Basic introduction to Bharatanatyam, Origin and history of Bharatnatyam* Ashtrasa's of Bharatnatyam. Nataraja and it's symbolism	06
IV	Authentic steps of traditional Indian folk dances, Origin, history and Development of Indian folk dances, Their God and Goddess whom they worship	04
V	Traditional costume and ornaments for Dance	04
VI	Traditional instruments for Dance	04

Course Title: Performing Arts – Theatre

Module	Contents	Hours
I	Overview of course objectives and expectations, Introduction to basic theatrical terminology and concepts. Introduction to Acting theory based on Natyasastra (NS): Rasa theory (Nine Rasa)	10
II	Types of Acting, Different Theories of acting – Tholkappiyam, Western etc.	10
III	Understanding different types of theatrical spaces, Fundamentals of lighting design: Color, intensity, and focus.	4
IV	Acoustics and sound. Rigging systems and safety protocols.	2
V	Costume design and construction techniques, Makeup application and prosthetics	2
VI	Theatre of cruelty and Poor Theatre Acting	2

Course Title: Physical Fitness and Sports

Module	Content	Hours
I	**Importance of Physical Education and Sports** 1. Importance of physical education, physical literacy, sports, health and fitness and physical activities 2. Importance and benefits of participation in any sports or fitness activities.	5
II	**Develop physical health as well as mental health through Physical Activities.** 1. Organization of various sports and fitness events 2. General Rules & Regulation/Laws of the Sports & Games	5

III	**Ground Measurement/Specifications of the Games** **1.** Skills & Technique of the Sports & Games	5
IV	**Introduction to Sports and Fitness Activities** Participation in any choice base physical activities, students involve themselves in any physical Activities. **(Students must submit the Geo Tagged photos, Enrolment receipt, Certificate etc.)**	5
V	Participation in any Local / Fest /Inter Class/ Intra Collegiate/ Intercollegiate /State / National etc. competition **(Geo tagged Photo)** Participation in any practice sessions conducted by any Sports Institution **(Geo tagged Photo)**	5
VI	Visit to any sports competition/ Workshop/ Seminar **(Geo tagged Photo)**	5

Reference Books:

1. Foundations of Physical Education by Charles A. Bucher, 16th Edition, 2008.
2. Physical Education in Ancient India by S. H. Deshpande, 1st Edition, 1992.
3. Test, Measurement and Evaluation in Sports and Physical Education by Dr. Devinder K. Kansal, 5th Revised and Updated Edition.
4. Health and Fitness through Physical Education by Russel R. Pate.

Course Title: Urban Gardening

Module	Content	Hours
I	**Introduction to Urban Gardening** 1. Concept, benefits, scope, and real-world examples of urban farming. 2. Types of gardening - Terrace garden, balcony garden, vertical garden, container gardening	4
II	**Soil and Growing Media** Understanding garden soil, cocopeat, compost, vermicompost etc. and soil preparation (potting Mix)	4
III	Plant Selection and Sowing, garden septup 1. Choosing vegetables, herbs, or flowering plants; sowing methods and seed care. 2. Using recycled containers, grow bags, and vertical structures for space-saving gardens.	4
IV	Watering and Light Management Irrigation techniques, water conservation, sunlight requirements. basic Polyhouse, green house etc.	4

V	**Organic Fertilizers and Composting** Types of fertilizers, DIY compost making using kitchen/plant waste; use of natural fertilizers.	4
VI	**Pest Control and Maintenance** : Identification and natural control of pests; pruning and harvesting techniques.	4

Reference Books:

1. Sharma, R.K. (2018) Basics of Horticulture, 3rd Ed., New India Publishing Agency, New Delhi.
2. Singh, Jitendra (2017) Urban Gardening: A Beginner's Guide to Growing Plants in Indian Cities, 1st Ed., Rupa Publications, New Delhi.
3. Chadha, K.L. (2016) Handbook of Horticulture, Revised Ed., Indian Council of Agricultural Research (ICAR), New Delhi.
4. Tiwari, A.K. (2021) Organic Gardening in India: Techniques and Practices, 2nd Ed., CBS Publishers & Distributors,
New Delhi.

Course Title: Functional English Course

Module	Content	Hours
I	**Introduction to Phonetics** 1. Introduction to linguistics 2. Introduction to speech sounds, vowels, consonants, phonetic symbols 3. Listening to speech sounds	4
II	**Conversational Skills** 1. Meaning, importance of Conversational skills 2. Face to face formal communication 3. Telephonic conversation	4
III	**Presentation Skills- II** 1. Meaning, importance of speech, extempore 2. Preparing speech, do's and don'ts of speech, extempore 3. Speech presentation/ extempore	4
IV	**Presentation Skills- II** 4. Meaning, importance of presentation skills 5. Preparing presentation, do's and don'ts of presentation 6. PPT presentation	4
V	**Group Discussion** 1. Meaning, importance of GD 2. Performing GD	4

Reference Books:

1. Balasubramanian, T. (2013) A Textbook of English Phonetics for Indian Students, 2nd Ed., Macmillan, New Delhi
2. Kumar, K. J. (2012) Mass Communication in India, 4th Ed., Jaico Publishing House, Mumbai
3. Raman, M. & S. Sharma (2011) Communication Skills, OUP, New Delhi, India.

Course Title: Tribal Art

Module	Content	Hours
I	**Introduction to Tribal Art and Craft** Overview of Indian Tribal Arts 1.Importance and diversity of tribal art forms 2.Cultural relevance of Warli and Bamboo art **History of Warli Painting** 1.Origins in Maharashtra's Warli tribe 2.Symbolism, themes, and evolution **Introduction to Bamboo Craft** 1.Traditional uses and cultural context 2.Bamboo as a sustainable material	4
II	**Warli Painting Techniques** 1.Basic Elements and Motifs 2.Human figures, animals, nature, daily life 3.Use of geometry and minimalism **Materials and Tools** 1.Natural colors, cow dung base, handmade brushes 2.Modern adaptations with acrylics/paper 3.Surface Preparation 4.Preparing paper, cloth, or wood for painting	4
III	**Bamboo Craft Fundamentals** 1.Types and Properties of Bamboo 2.Varieties used in handicrafts 3.Cutting, treating, and preparing bamboo **Basic Tools and Safety** 1.Cutting, slicing, and shaping tools 2.Safety precautions in handling bamboo **Simple Bamboo Projects** 3.Pen holders, keychains, photo frames	4

IV	**Creative Composition and Design** 1.Advanced Warli Storytelling 2.Creating scenes: festivals, farming, rituals **Framing narratives through motifs** 1.Intermediate Bamboo Articles 2.Crafting small utility items (lamps, trays, coasters) **Combining design with function** 1.Mixed Media Exploration 2.Using Warli art on bamboo surfaces 3.Innovative fusion pieces	4
V	**Finishing, Presentation, and Entrepreneurship** 1.Finishing Techniques 2.Varnishing, framing, assembling articles 3.Quality control in handmade products **Art as a Business** 1.Pricing, branding, and marketing handmade art 2.Selling through exhibitions and online platforms 3.Final Project & Showcase **Creating a complete Warli-bamboo fusion piece** 1.Virtual or physical display for peer/facilitator review	4

Reference Books:

1. Jain, Jyotindra. *Other Masters: Five Contemporary Folk and Tribal Artists of India*. Crafts Museum & Marg Publications, 1998.
2. Chavan, Sudha. *Warli Painting: A Tribal Art Form*. Wisdom Tree, 2016.
3. Nene, S.N. *Bamboo and Cane Crafts of Northeast India*. Agam Kala Prakashan, 2002.
4. Purkayastha, Usha. *Bamboo Works: A Traditional Skill in Modern Design*. NID Publication, 2010.
5. Singh, Ranjan, and Ranjan, M.P. *Handmade in India: A Geographic Encyclopedia of Indian Handicrafts*. Council of Handicraft Development Corporations & Mapin Publishing, 2009.

Course Title: Basics of Printing and Designing

Module	Content	Hours
I	**Introduction to Printing and Design** Overview of printing history, modern printing techniques, and design workflow.	4
II	**Color Theory and Typography** Basics of RGB vs CMYK, fonts, alignment, readability, and visual hierarchy.	4
III	**Introduction to Design Tools** Hands-on with tools like Canva or CorelDRAW – interface, basic shapes, text, templates.	4
IV	**Designing a Visiting Card** Creating a personal/business card layout with appropriate dimensions and resolution.	4
V	**Designing a Poster/Flyer** Create an event or product poster using images, text, and layout principles.	4
VI	**File Formats and Print Setup** Understanding PDF, TIFF, JPG; bleed, margins, and print-ready export.	4

Reference books:

1. Ambrose, G., & Harris, P. (2011). *Basics design 02: Layout*. AVA Publishing.
2. Heller, S., & Meggs, P. B. (2006). *Graphic design history*. Pearson Education.
3. Kipphan, H. (2001). *Handbook of print media: Technologies and production methods*. Springer.
4. Lupton, E., & Phillips, J. C. (2015). *Graphic design: The new basics* (2nd ed.). Princeton Architectural Press.
5. Pipes, A. (2007). *Foundations of art and design*. Laurence King Publishing.
6. Wheeler, A. (2017). *Designing brand identity: An essential guide for the whole branding team* (5th ed.). Wiley.

Course Title: Basic of Cinematography

Module	Content	Hours
I	**Introduction to Cinematography** 1.Definition and Scope of Cinematography 2.History and Evolution of Cinematography 3.Roles in a Cinematic Production (Director, DOP, Camera Assistant) 4.Types of Cinematic Productions (Feature, Documentary, Ad, Short, etc.) 5.Visual Language and Storytelling Basics	4

II	**Camera Systems and Operation** 1.Anatomy of a Camera (Lens, Sensor, Viewfinder, Media) 2.Types of Cameras (DSLR, Mirrorless, Cinema Cameras, Smartphone) 3.Camera Settings (ISO, Shutter Speed, Aperture, Frame Rate) 4.Focus Techniques and Depth of Field 5.Lens Types and Their Effects (Prime, Zoom, Wide, Telephoto)	4
III	**Lighting for Cinematography** 1.Fundamentals of Light (Intensity, Quality, Color Temperature) 2.Lighting Equipment (Key Light, Fill Light, Back Light, Practical Light) 3.Three-Point Lighting Setup 4.Natural vs Artificial Lighting 5.Lighting for Mood and Genre	4
IV	**Composition and Visual Aesthetics** 1. Rules of Framing (Rule of Thirds, Leading Lines, Symmetry) 2. Camera Angles and Movements (Pan, Tilt, Dolly, Zoom, Handheld) 3. Shot Sizes (Wide, Medium, Close-up, POV) 4. Continuity and Blocking 5. Color Theory and Visual Style	4
V	**Post-production and Cinematic Technology** 1. Basics of Video Editing (Cuts, Transitions, Montage) 2. Color Correction and Grading 3. Introduction to Sound in Cinematography 4. File Formats, Codecs, and Compression 5. Emerging Technologies (HDR, Virtual Cinematography, Drones, AI Tools)	4

Reference Books:

1. Brown, B. (2016). Cinematography: Theory and practice: Image making for cinematographers and directors (3rd ed.). Routledge.
2. Mercado, G. (2010). The filmmaker's eye: Learning (and breaking) the rules of cinematic composition. Focal Press.
3. Brown, B. (2012). Motion picture and video lighting (2nd ed.). Focal Press.
4. Stump, D. (2014). Digital cinematography: Fundamentals, tools, techniques, and workflows. Focal Press.
5. Mascelli, J. V. (1998). The five C's of cinematography: Motion picture filming techniques. Silman-James Press.
6. Kenworthy, C. (2012). Master shots: 100 advanced camera techniques to get an expensive look on your low-budget movie (Vols. 1–3). Michael Wiese Productions.

Course Title: Anchoring and Script Writing

Module	Content	Hours
I	**Fundamentals of Anchoring** 1 Introduction to Anchoring: Role and Scope 2 Voice Modulation, Pronunciation, and Articulation 3 Body Language and Stage Presence 4 Types of Anchoring: Live Shows, News, Sports, Events, Webcasts 5 Ethics and Professionalism in Anchoring	4
II	**Elements of Script Writing** 1 Structure of a Script: Beginning, Middle, End 2 Format and Writing Styles (Screenplay, Rundown, Cue Sheet) 3 Writing for Voice vs. Writing for Screen 4 Dialogue and Monologue Writing Techniques 5 Visualizing Through Words: Scene Setting and Action Description	4
III	**Script Writing for Different Media** 1 Television Anchoring and News Script 2 Radio Jockeying and Audio Script Writing 3 Online/Digital Content Scripting (Podcasts, Reels, YouTube) 4 Script Writing for Documentaries 5 Promotional and Ad Script Writing	4
IV	**Live Performance and Studio Presentation** 1 Rehearsal Techniques and Cold Reading 2 Teleprompter and Cue Card Handling 3 Dealing with Stage Anxiety and Improvisation 4 Coordination with Crew: Timing and Cues 5 Case Studies of Successful Anchors and Their Techniques	4
V	**Industry Practices and Technology** 1 Script Breakdown and Scheduling 2 Multi-Camera vs. Single-Camera Production Scripting 3 Integration with Editing and Post-production 4 Use of AI Tools and Scripting Software (Final Draft, Celtx) 5 Copyright, Plagiarism, and Ethical Concerns in Writing	4

Reference Books:

1. Chatterjee, S. (2012). Anchoring: A practical guide. HarperCollins Publishers India.
2. Field, S. (2005). Screenplay: The foundations of screenwriting (3rd ed.). Delta.
3. McKee, R. (1997). Story: Substance, structure, style and the principles of screenwriting. Regan Books.
4. Hilliard, R. L. (2014). Writing for television, radio, and new media (11th ed.). Cengage Learning.
5. Seger, L. (2010). Writing subtext: What lies beneath. Michael Wiese Productions.
6. Trottier, D. (2014). The screenwriter's bible: A complete guide to writing, formatting, and selling your script (6th ed.). Silman-James Press.

Course Title: Basics of Hotel Management

Module	Content	Hours
I	**Introduction to Hotel Industry** 1. Evolution and history of hospitality 2.Types of hotels and classification (star ratings, ownership, service types) 3.Key departments in a hotel (front office, housekeeping, F&B, etc.)	4
II	**Front Office Operations** 1.Guest cycle and reservations 2.Check-in/check-out procedures 3.Customer service and handling complaints 4.Role of concierge and bell desk	4
III	**Housekeeping Management** 1.Importance of cleanliness and hygiene 2.Daily cleaning procedures 3.Linen and laundry operations 4.Room status codes and coordination with front office	4
IV	**Food & Beverage Services** 1.Basics of food production and kitchen hierarchy 2.Types of services: buffet, à la carte, silver service 3.Restaurant operations and table setting 4.Basics of menu planning	4
V	**Soft Skills & Hospitality Ethics** 1.Professional grooming and etiquette 2.Communication skills and body language 3.Time management and teamwork 4.Safety, security, and ethical practices in hospitality	4

Reference Books:

1. Andrews, S. (2009). Hotel front office: Operations and management (2nd ed.). Tata McGraw-Hill Education.
2. Walker, J. R. (2016). Introduction to hospitality (7th ed.). Pearson Education.
3. Raghubalan, G., & Raghubalan, S. (2015). Hotel housekeeping: Operations and management (3rd ed.). Oxford University Press.
4. Davis, B., Lockwood, A., Alcott, P., & Saggerson, S. (2018). Food and beverage management (6th ed.). Routledge.
5. Ninemeier, J. D. (2013). Management of food and beverage operations (6th ed.). Educational Institute of the American Hotel & Lodging Association.

Course Title: Personality Development

Module	Content	Hours
I	**Self-Awareness and Positive Attitude** SWOT analysis, attitude building, self-esteem, self-assessment	5
II	**Communication Skills** Verbal & non-verbal communication, active listening, assertiveness	5
III	**Interpersonal Skills & Teamwork** Group dynamics, empathy, collaboration games, conflict resolution	5
IV	**Time & Stress Management** Prioritization, time matrix, coping strategies, relaxation techniques	5
V	**Leadership and Goal Setting** Leadership styles, decision making, SMART goals, motivation	5
VI	**Grooming, Etiquette & Public Speaking** Body language, grooming tips, mock presentations, dining etiquette	5

Reference Books:

- Personality Development – Elizabeth Hurlock
- You Can Win – Shiv Khera
- The 7 Habits of Highly Effective People – Stephen R. Covey
- How to Win Friends and Influence People – Dale Carnegie
- Emotional Intelligence – Daniel Goleman

Course Title: Music

Module	Content	Hours
I	**Basics of Music** Elements: pitch, tempo, rhythm, melody, harmony, dynamics. Introduction to notation.	5
II	**Indian and Western Music Traditions** Overview of Hindustani, Carnatic, Classical, Folk, Pop, Jazz, Blues. Listening and analysis	5
III	**Vocal and Instrumental Practice** Breathing techniques, scales (sargam / solfege), intro to instruments (keyboard/guitar etc).	5

IV	**Rhythm and Percussion Workshop** Taal, clapping exercises, percussive patterns (tabla/djembe/cajón), rhythm circle activity.	5
V	**Music Composition & Technology** Intro to composing, writing a jingle, using apps (GarageBand, BandLab, FL Studio basics).	5
VI	**Final Performance and Reflection** Group/solo performance, project showcase, feedback and reflections, peer review.	5

Reference Books:

1. The Enjoyment of Music – Forney & Dell'Antonio
2. Understanding Music – Jeremy Yudkin
3. A Beginner's Guide to Music Theory – Michael Miller
4. The World of Music – David Willoughby
5. Music Composition for Dummies – Scott Jarrett & Holly Day

Evaluation and Assessment Scheme:

There will be final oral/practical/project/presentation/performance type of assessment of 25 marks foe all Liberal Learning Courses. (5 Marks Attendance , 20 Marks assessment)