KARNATAK LAW SOCIETY'S

GOGTE INSTITUTE OF TECHNOLOGY

UDYAMBAG, BELAGAVI-590008

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

(APPROVED BY AICTE, NEW DELHI)

1st Year B.E. Scheme and Syllabus (2022 Scheme)

AERONAUTICAL ENGINEERING

REVISED FROM AY 2024-25

INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

QUALITY POLICY

- Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
- Fostering cultural, ethical, moral and social values in the human resources of the institution.
- Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

DEPARTMENT VISION

MISSION

PROGRAM OUTCOMES (POs)	
1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

KLS Gogte Institute of Technology
1st Year B.E.
Scheme of Teaching and Examination- 2022
Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2022-23)

Total credits for B.E. Program: 160

Credit definition:

Offline Courses	Online Courses
• 1-hour Lecture **(L)** per week = 1 Credit • 2 hours Tutorial **(T)** per week = 1 Credit, • 2 hours Practical /Drawing **(P)** per week = 1 Credit	04 weeks =1 Credit 08 weeks = 2 Credit 12 weeks = 3 Credit

Semester wise distribution of credits for B.E program

Year	Semester	Credits	Total/Year	Cumulative Credits
1st	I	20	40	40
	II	20		
2nd	III			
	IV			
3rd	V			
	VI			
4th	VII			
	VIII			
Total			160	

Curriculum frame work:

Structure of Undergraduate Engineering program

S.No.	Category of courses	VTU Breakup of credits	KLSGIT Breakup of credits
1	Humanities and Social Sciences including Management courses (English, Kannada, Indian Constitution, Environmental Sciences and Management)	10	
2	Basic Science courses	23	
3	Engineering Science courses including workshop, drawing	20	
4	Professional Core Courses	46	
5	Professional Elective courses relevant to chosen specialization/branch	9	
6	Open subjects – Electives from other technical, emerging, arts commerce and	6	..
7	Mini, Project, Major Project work and Seminar	13	
8	Summer Internship and Research /Industrial Internship	20	
9	Ability Enhancement Courses, including Research Methodology, NCC/NSS/ Sports/Ex- Curricular, Online Certification Course	11	
10	Universal Human Values	2	
	TOTAL	**160**	**160**

L-T-P Model for Courses

	Contact Hours				Credits	
S.No.	**L-T-P**	**Lecture**	**Tutorial**	**Practical**	**L-T-P**	**Total**
1	3 - 0 - 0	3	0	0	3 - 0 - 0	3
2	3 - 2 - 0	3	2	0	3 - 1 - 0	4
3	3 - 0 - 2	3	0	2	3 - 0 - 1	4
4	2 - 0 - 2	2	0	2	2 - 0 - 1	3
	1 - 0 - 4	1	0	4	1 - 0 - 2	3

Theory courses having the corresponding lab are converted to integrated type course. Also, the electives (if possible) can also be made integrated type.

Integrated courses (Professional Core/Electives): Integrated courses will have **Theory Syllabus with Practical Syllabus of the same course**. In such a course there could be **no Semester End Examination (SEE) for the practical syllabus** of the course, however, Continuous Internal Evaluation (CIE) will be conducted for the practical topics. SEE should include questions from practical topics.

SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC- Emerging Technology Course, AEC- Ability Enhancement Course, HSMS-Humanity and Social Science and Management Course, SDC- Skill Development Course,

KLS Gogte Institute of Technology

1st Year B.E. Scheme of Teaching and Examination 2022

1st Semester for Aeronautical Engg. Physics Cycle					Hours/week			Total contact hours/week	Credits	Examination		
S. No.	Course Type	Course Code	Course Title	Teaching Dept.	L	T	P			CIE	SEE	Total
1	ASC	22MATM11	Mathematics for Mech Engg -I	Mathematics	3	0	2	5	4	100	100	200
2	ASC	22PHYM12	Applied Physics for Mech Engg. Stream	Physics	3	0	2	5	4	100	100	200
3	ESC	22EAE13	Elements of Aeronautical Engineering	Aero. Dept.	3	0	0	3	3	100	100	200
4	ESC-I	22ESC14X	Engineering Science Course-I	Engg. Dept.	3	0	0	3	3	100	100	200
5	ETC	22ETC15X	Emerging Technology Course	Engg. Dept.	3	0	0	3	3	100	100	200
6	AEC	22ENG16	Communicative English	English	1	0	0	1	1	50	50	100
7	HSMC	22KSK17/ 22KBK17	Samskrutika Kannada/ Balake Kannada	Kannada Faculty	1	0	0	1	1	50	50	100
8	SDC	22IIL18	Idea to Innovation Lab	Engg. Depts	0	0	2	2	1	100	-	100
									20			

2nd Semester for Aeronautical Engg. Chemistry Cycle					Hours/week			Total contact hours/week	Credits	Examination		
S.No.	Course Type	Course Code	Course Title	Teaching Dept.	L	T	P			CIE	SEE	Total
1	ASC	22MATM21	Mathematics for Mech Engg.-II	Mathematics	3	0	2	5	4	100	100	200
2	ASC	22CHEM22	Chemistry for Mech Engg. Stream	Chemistry	3	0	2	5	4	100	100	200
3	ESC	22CED23	Computer-Aided Engineering Drawing	Mech. Dept.	2	0	2	4	3	100	100	200
4	ESC-II	22ESC24X	Engineering Science Course-II	Engg. Dept.	3	0	0	3	3	100	100	200
5	PLC	22PLC25X	Programming Language Course	Engg. Dept.	2	0	2	4	3	100	100	200
6	AEC	22PWS26	Professional Writing Skills in English	English	1	0	0	1	1	50	50	100
7	HSMS	22ICO27	Indian Constitution	Humanities	1	0	0	1	1	50	50	100
8	AEC	22SFH28	Scientific Foundations for Health	Dept/Sports	1	0	0	1	1	50	50	100
									20			

Engineering Science Courses (ESC)

Code	Title	L	T	P	1st Semester	2nd Semester
22ESC141/241	Introduction to Civil Engineering	3	0	0	AE,ME,EE,CSE,EC,ISE,AI	AE,ME,EE,CSE,EC,ISE,AI
22ESC142/242	Introduction to Electrical Engineering	3	0	0	AE,CV,ME,CSE,EC,ISE,AI	AE,CV,ME,CSE,EC,ISE,AI
22ESC143/243	Introduction to Electronics Engineering	3	0	0	AE,CV,ME,EE,CSE,ISE,AI	AE,CV,ME,EE, CSE,ISE,AI
22ESC144/244	Introduction to Mechanical Engineering	3	0	0	AE,CV,EE,CSE,EC,ISE,AI	AE,CV,EE,CSE,EC,ISE,AI
22ESC145/245	Introduction to C Programming	2	0	2	AE,CV,ME,EE,EC	AE,CV,ME,EE,EC
22ESC146/246	Introduction to Aeronautical Engineering	3	0	0	CV,ME,EE,CSE,EC,ISE,AI	CV,ME,EE,CSE,EC,ISE,AI

Emerging Technology Courses (ETC)

Code	Title	L	T	P	1st Semester-Phy	2nd Semester-Che	Offering Dept.
22ETC15/25A	Smart Materials and Systems	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	ME
22ETC15/25B	Green Buildings	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	CV
22ETC15/25C	Introduction to Nano Technology	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	NanoScience
22ETC15/25D	Introduction to Sustainable Engineering	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	CV
22ETC15/25E	Renewable Energy Sources	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	EE,ME
22ETC15/25F	Introduction to Communication Systems	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	EC
22ETC15/25G	Introduction to Internet of Things (IoT)	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	ISE
22ETC15/25H	Introduction to Cyber Security	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	CSE
22ETC15/25I	Introduction to Solar technology	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	EE
22ETC15/25J	Introduction to Electric vehicles	3	0	0	AE,EE ,CSE,ISE,AI	EC,ME,CV	EE

Programming Language Courses (PLC)

Code	Title	L	T	P	1st Semester-Che	2nd Semester-Phy
22PLC15/25A	Introduction to Web Programming	2	0	2	EC,ME,CV	AE,EE ,CSE,ISE,AI
22PLC15/25B	Introduction to Python Programming	2	0	2	EC,ME,CV	AE,EE ,CSE,ISE,AI
22PLC15/25C	Basics of JAVA programming	2	0	2	EC,ME,CV	AE,EE ,CSE,ISE,AI
22PLC15/25D	Introduction to C++ Programming	2	0	2	EC,ME,CV	AE,EE ,CSE,ISE,AI

- The student has to select one course from the ESC group.
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester
- The students must select one course from either ETC or PLC group according to the cycle.
- All students will be undergoing Communicative English in 1 sem and Professional Writing Skills in English in 2 sem.

Credit Definition: 1-hour Lecture (L) per week=1Credit 2-hoursTutorial(T) per week=1Credit 2-hours Practical / Drawing (P) per week=1Credit 2-hous Skill Development Actives (SDA) per week = 1 Credit	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions
Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.	
AICTE Activity Points to be earned by students admitted to BE/ B.Tech. / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.	
22MATX11/21 Shall have the 03 hours of theory examination (SEE), however, practical sessions question shall be included in the theory question papers. All 01 Credit- courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ and or descriptive.	

Mathematics for ME/AE Engineering Stream-I

Course Code	22MATM11	Course type	Integrated	Credits L-T-P	3 - 0- 1
Hours/week: L-T-P	3 - 0 – 2			Total credits	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs;P = 20 Hrs Total = 60 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	• **Familiarize** the importance of calculus associated with one variable and two variables for Mechanical engineering
2.	• **Analyze** Mechanical engineering problems applying Ordinary Differential Equations.
3.	• **Develop** the knowledge of Linear Algebra refereeing to matrices

Required Knowledge of : Basic Trigonometry, Calculus, Algebra, Matrices

Unit – I	Contact Hours = 8 Hours

Calculus:

Introduction to polar coordinates and curvature relating to **ME/AE** Engineering.
Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems
Applications: Structural design and paths, Strength of materials, Elasticity.
(RBT Levels: L1, L2 and L3)

Unit – II	Contact Hours = 8 Hours

Series Expansion and Multivariable Calculus:Introduction to series expansion and partial differentiation in the field of **ME/AE** engineering applications**. Taylor's** and Maclaurin's series expansion for one variable (Statement only) −problems. Partial differentiation, Euler's theorem and problems, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and Minima for a function of two variables. Problems
Applications: Computation of stress and strain, errors and approximations in Manufacturing process, estimating the critical points and extreme values ,vector calculus
(RBT Levels: L1, L2 and L3).

Unit – III	Contact Hours = 8 Hours

Ordinary Differential Equations (ODEs) of first order: Introduction to first order ordinary differential equations pertaining to the applications for the **ME/AE** Engineering.
Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations, Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$, $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Applications of ODE's – Orthogonal Trajectories, Newton's law of cooling.
Nonlinear differential equations: Introduction to general and singular solutions, Solvable for

p only, Clairaut's equations, Reducible to Clairaut's equations. Problems.
Applications: Rate of Growth or Decay, Conduction of heat.
(RBT Levels: L1, L2 and L3)

Unit – IV	**Contact Hours = 8 Hours**

Linear Algebra: Introduction of linear algebra related to **ME/AE** Engineering applications.Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Introduction to Quadratic and Canonical form.
Applications: Structural Analysis, Balancing equations.
(RBT Levels: L1, L2 and L3)

Unit –V	**Contact Hours = 8 Hours**

Ordinary Differential Equations of higher order: Importance of higher-order ordinary differential equations in **ME/AE** Engineering applications.
Higher-order linear ODE's with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Problems.
Applications: Oscillations of a spring, Mechanical systems and Transmission lines, highway engineering.
(RBT Levels: L1, L2 and L3)

Flipped Classroom Details

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**2**	**2**	**2**	**2**	**2**

List of Experiments

Unit No.	**No. of Experiments**	**Topic(s) related to Experiment**
1	1	2D plots for Cartesian and polar curves.
1	2	Finding angle between polar curves, curvature and radius of curvature of a given curve.
2	3	Finding partial derivatives, Jacobian and plotting the graph.
2	4	Applications to Maxima and Minima of two variables.
3	5	Solution of first order differential equation and plotting the graphs.
5	6	Solutions of Second order ordinary differential equations with initial/boundary conditions.
5	7	Solution of a differential equation of oscillations of a spring/deflection of a beam with different loads.
4	8	Numerical solution of system of linear equations, test for consistency and graphical representation.
4	9	Solution of system of linear equations using Gauss-Seidel iteration.
4	10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

Unit No.	Self-Study Topics
1	Centre and circle of curvature, evolutes and involutes.
2	Indeterminate forms –L- Hospital's rule, problems Method of Lagrange's undetermined multipliers with single constraint.
3	Applications of ODE's: Solvable for x and y.
4	Gauss-Jordan Method,Solution of a system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.
5	Formulation and solution of oscillations of a spring. Finding the solution by the method of undetermined coefficients.

Books	
	Text Books:
1.	B. S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 42thEd., 2021 onwards.
2.	Erwin Kreyszig: "Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006 and onwards.
	Reference Books:
1.	B.V. Ramana**: "**Higher Engineering Mathematics"McGraw-Hill Education, 11thEd., 2004 onwards.
2.	Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics"Oxford University Press, 3rd Ed., 2016 onwards
3	N.P Bali and Manish Goyal:"A textbook of Engineering Mathematics"Laxmi Publications, 10th Ed., 2022 onwards
4	C. Ray Wylie, Louis C. Barrett: **"**Advanced Engineering Mathematics"McGraw –Hill Book Co., New york, 6thEd., 2017 onwards
5	Gupta C.B, Sing S.R and Mukesh Kumar**:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6	H. K. Dass and Er. Rajnish Verma**:** "Higher Engineering Mathematics"S. Chand Publication, 3rd Ed., 2014.
7	James Stewart**: "**Calculus"Cengage Publications, 7thEd., 2019.
8	David C Lay**: "**Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
9	Gareth Williams**:"**Linear Algebra with applications", Jones Bartlett Publishers Inc., 6thEd., 2017.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/111/106/111106051/
2.	https://www.classcentral.com/course/udemy-calculus-3-26232
3	https://nptel.ac.in/courses/111104137
4	https://archive.nptel.ac.in/courses/111/106/111106100/
5	https://nptel.ac.in/courses/111107108

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project

3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Apply the knowledge of calculus to solve problems related to polar curves and Learn the notion of partial differentiation to compute rate of change multivariate functions.	**L1, L2 , L3**	**1**	
2.	Apply the concept multiple integral to compute area and volume.	**L1, L2 , L3**	**1**	
3.	Analyze the solution of linear, non-linear ordinary differential equations. Make use of matrix theory for solving for system of linear equations and compute Eigen values and eigenvectors	**L1, L2 , L3**	**1**	
4.	Familiarize with modern mathematical tool namely MATLAB	**L1, L2 , L3**	**5**	

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks
IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive.				
Conduct of Lab: 1. Conducting the experiment and journal: 5 marks 2. Calculations, results, graph, conclusion and Outcome: 5 marks				
Lab test: (Batchwise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph and conclusion: 15 marks 5. Viva voce: 10 marks				
Eligibility for SEE: 1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**				

2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥ 35%, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 questions each Question Carries 6 Marks. 2. From Part B answer any one full question from each unit and each Question Carries 10 Marks. 3. From Part C answer any one full question and each Question Carries 20 Marks.

CO-PO Mapping (planned)													**CO-PSO Mapping(planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓														
2	✓														
3	✓														
4					✓										
5															
6															
Tick mark the CO, PO and PSO mapping															

Chemistry for Mechanical and Aeronautical Engineering

Course Code	**22CHEM12/22**	**Course type**	Integrated	**Credits L-T-P**	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To enable students to acquire knowledge on principles of chemistry for engineeringapplications.
2.	To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering
3.	To provide students with a solid foundation in analytical reasoning required to solve societal problems

Required Knowledge : Students should have the fundamentals of Chemistry

Unit – I : Energy; Source, Conversion and Storage	**Contact Hours = 8 Hours**

Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Knocking in petrol and diesel engines. Octane and cetane numbers,Antinocking agents.

Green fuels: Introduction, power alcohol, synthesis and applications of biodiesel.

High energy fuels: Production of hydrogen by electrolysis of water and its advantages.

Energy devices: Introduction, construction, working, and applications of Photovoltaic cells, Li-ion battery, Lithium-sulfur and direct methanol-oxygen fuel cell.

Unit – II : Corrosion Science and Engineering	**Contact Hours = 8 Hours**

Corrosion: Introduction, electrochemical theory of corrosion, types of corrosion- differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement). Factors affecting the rate of corrosion, factors influencing the nature and quality of electrodeposit (Current density, concentration of metal ion, pH and temperature).

Corrosion control: Metal coating-galvanization, Chemical conversion coating-anodizing of aluminium and cathodic protection-sacrificial anodic method. Corrosion testing by weight loss method (Salt spray test). Corrosion penetration rate (CPR)-numerical problems.

Metal finishing: Introduction, technological importance. Electroplating: Introduction, Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel.

Unit – III : **Macromolecules for Engineering Applications**	**Contact Hours = 8 Hours**

Polymers: Introduction, methods of polymerization (Bulk, suspension, emulsion and solution), molecular weight; number average and weight average, numerical problems. Synthesis, properties and industrial applications of Acrylonitrile Butadiene Styrene polymer (ABS), polyvinylcarbazole (PVK). Synthesis, properties and industrial applications of Nomex fiber, Biodegradable polymer: Introduction, synthesis, properties and applications of polylactic acid (PLA).

Fibers: Introduction, synthesis, properties and industrial applications of Kevlar and carbon fiber.

Plastics: Introduction, synthesis, properties and industrial applications of poly(methyl methacrylate) (PMMA) and Polycarbonate.

Composites: Introduction, properties and industrial applications of carbon-based reinforced composites. Manufacturing of composites by filament winding.

Lubricants: Introduction, classification, properties and applications of lubricants.

Unit – IV : **Phase Rule and Analytical Techniques**	**Contact Hours = 8 Hours**

Phase rule: Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component-lead-silver system. Two component Iron-Carbide phase diagram.

Analytical techniques: Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetry); its application in the estimation of the copper, pH-sensor (Glass electrode); its application in the determination of pH of solutions. Numericals on pH measurement. Determination of viscosity of biofuel and its correlation with temperature.

Unit – V : **Materials for Engineering Applications**	**Contact Hours = 8 Hours**

Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico.

Ceramics: Introduction, classification based on chemical composition, properties and applications of perovskites ($CaTiO_3$).

Abrasives: Introduction, classification, properties and applications of silicon carbide (carborundum).

Nanochemistry: Introduction, size-dependent properties of nanomaterial (surface area, catalytical and thermal), synthesis of nanoparticles by sol-gel, and co-precipitation method.
Nanomaterials: Introduction, properties and engineering applications of carbon nanotubes and graphene.

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	**2**	A4. Determination of acid value of biofuel D3. Synthesis of biodiesel
2	**5**	A2. Electroplating of chromium B4. Determination of rate of corrosion of mild steel by weight loss method D2. Electroplating of metal B5. Estimation of total hardness of water by EDTA method C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample
3	**2**	A1. Synthesis of polymer C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
4	**5**	B1. Conductometric estimation of acid mixture B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$ B3. Determination of pKa of vinegar using pH sensor (Glass electrode) C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry) C4. Estimation of Sodium present in soil/effluent sample using flame photometry
5	**4**	A3. Synthesis of nanoparticles C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method D1. Estimation of percentage of iron in steel D4. Synthesis of Aluminium Oxide nano particle

Books	
	Text Books:
1.	John O'M Bockris and Amulya K. N. Reddy, "Modern Electrochemistry", 2nd Ed. Vol. 2B, Electrodics in Chemistry, Engineering, Biology, and Environmental Science.
2.	Shashi Chawla, "A text Book of Engineering Chemistry" Dhanpat Rai and Co. (Pvt) Ltd., 3rd Ed. Reprint 2013.
3.	Monika Jain and P. C. Jain, "Engineering Chemistry" 17th Ed. Dhanpat Rai and Co. (Pvt) Ltd., 2019.
4.	R. V. Gadag and A. N. Shetty, "Engineering Chemistry", IK International Publishing House, New Delhi, 3rd Edition 2014.
5.	B. S. Jai Prakash, R. Venugopal, Shivakumariah and Pushpa Iyengar, "Chemistry for Engineering Students", Subhash Stores, Bengaluru, 2014.
	Reference Books:
1.	National Research Council 1995. Expanding the Vision of Sensor Materials. Washington, DC: The National Academies Press. https://doi.org/10.17226/4782.
2.	K. Kalyanasundaram, Dye-sensitized Solar Cells, EPFL Press, 03-Aug-2010.

3.	Surana K., Mehra R.M. Quantum Dot Sensitized Solar Cells (QDSSCs). In: Khan Z. (eds) Nanomaterials and Their Applications. Advanced Structured Materials, Vol 84. Springer, Singapore 2018. https://doi.org/10.1007/978-981-10-6214-8_12
4.	Dr. H. Panda, "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017.
5.	D. Pletcher, F.C. Walsh, "Industrial Electrochemistry", Springer Netherlands, 2012.
6.	Robert Baboian, "Corrosion Tests and Standards Application and Interpretation", ASTM International, 2005.
7.	A.K.Shaha, "Combustion Engineering and Fuel Technology", Oxford & IBH Publishing Company.
8.	Fred W. Billmeyer, "Textbook of Polymer Science", 3rd Ed.2007, Wiley Publication.
9.	C. D. Varghese, "Electroplating and other Surface Treatments- A Practical Guide", Tata Mcgraw-Hill Publishing Co. Ltd. 3rd Reprint 2003.
10.	EIRI Board of Consultants and Engineers, "Hand Book of Electroplating anodizing and Surface Finishing Technology", Engineers India Research Institute, New Delhi.
11.	V R Gowariker,"Polymer Science",2019, New Age International Publishers.
12.	Mars Fontana,"CORROSION ENGINEERING", 2017, McGraw Hill Education.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	Electrochemistry: https://nptel.ac.in/downloads/122101001/
2.	Polymers: https://nptel.ac.in/courses/113105028/
3.	Chemistry of materials: https://nptel.ac.in/courses/104/103/104103019/
4	https://www.vlab.co.in/broad-area-chemical-sciences
5	https://demonstrations.wolfram.com/topics.php
6	https://interestingengineering.com/science
7	http://libgen.rs/
8	https://nptel.ac.in/downloads/122101001/
9	https://nptel.ac.in/courses/104/103/104103019/
10	https://ndl.iitkgp.ac.in/
11	https://www.youtube.com/watch?v=faESCxAWR9k
12	https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X - 9IbHrDMjHWWh
13	https://www.youtube.com/watch?v=j5Hml6KN4TI
14	https://www.youtube.com/watch?v=X9GHBdyYcyo
15	https://www.youtube.com/watch?v=1xWBPZnEJk8
16	https://www.youtube.com/watch?v=wRAo-M8xBHM

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)				
Learning Levels: **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Identify** the terms involved in scientific and engineering application processes	Re	1,9	NA
2.	**Explain** the phenomena of chemistry to describe the methods of engineering processes	Un	1,9,10	NA
3.	**Solve** the problems in chemistry that are pertinent in engineering applications	Ap	1	NA
4.	**Apply** the basic concepts of chemistry to explain the chemical properties and processes	Ap	1, 9,10,12	NA
5.	**Analyze** properties and Processes associated with chemical substances in multidisciplinary situations	An	1,10,12	NA

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be > 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	√								√						
2	√								√	√					
3	√														
4	√									√		√			
5	√								√	√		√			
Tick mark the CO, PO and PSO mapping															

Computer Aided Engineering Drawing

Course Code	22CED13/23	**Course type**	**Core**	**Credits L-T-P**	2 – 0- 1
Hours/week: L-T-P	2 – 0 – 2			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0Hrs; P = 20Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the basic principles and conventions of engineering drawing.
2.	To use drawing as a communication mode.
3.	To generate orthographic and pictorial views using CAD software.
4.	To understand the development of surfaces.
5.	To visualize engineering components.

Pre-requisites: Usage of drawing instruments**.**
General Instructions: 1. Use AUTOCAD software for generating orthographic and pictorial views.
2. Make use of sketch book with blank sheets for manual / preparatory sketching.

Unit – I	**Contact Hours = 10 Hours** **L: 6 hours P: 4 hours**

Introduction:(for CIE only)
Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP in 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines: (for CIE only)
Introduction to Orthographic projections: Orthographic projections of points in 1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only): Simple problem on line (Given one end, true length and true inclinations with respect to both planes, to draw its projections.)

Orthographic projections of planes: **(for CIE and SEE)**
Orthographic projections of square, rectangle, hexagon, and circular lamina (Placed in First quadrant and on HP only, using change of position method, and not involving determination of apparent angle of line in the final top view.)

Unit – II	**Contact Hours = 10 Hours** **L: 6 hours P: 4 hours**

Orthographic Projections of Solids: **(for CIE and SEE)**
Orthographic projections of right regular solids: Prisms & Pyramids (square, rectangle, hexagon); Cylinders, Cones; Cube & Tetrahedron (All solids Resting on HP only and not involving determination of apparent angle of axis in the final top view.)

Unit – III	Contact Hours = 10 Hours L: 6 hours P: 4 hours
Isometric Projections: (for CIE and SEE) Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids (types covered in unit II), cylinders, cones and spheres. Isometric projection of combination of two simple solids when their axes are coinciding. ***Conversion of isometric drawings of simple objects / engineering components into orthographic views. (For CIE only)***	

Unit – IV	Contact Hours = 10 Hours L: 6 hours P: 4 hours
Development of Lateral Surfaces of Solids: **(for CIE and SEE)** Concept of Section of Solid. Development of lateral surfaces of right regular prisms, pyramids (types covered in unit II), cylinders and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations with a single section plane only (section plane perpendicular to VP and inclined to HP only). Problems on applications of development of lateral surfaces like funnels and trays.	

Unit –V *(For CIE Only)*	Contact Hours = 10 Hours L: 6 hours P: 4 hours
Multidisciplinary Applications & Practice (For CIE Only): **Free hand Sketching**: Roads, Buildings, Utensils, Hand tools & Furniture etc. **Drawing Simple Mechanisms**: Gear trains, Ratchets, Chain and belt drives, etc. **Electric Wiring and lighting diagrams:** Automatic fire alarm, Call bell system, UPS system. **Basic Building Drawing:** Architectural floor plan of a two bed room residential building, basic foundation drawing, steel structures- Frames, bridges, trusses. **Electronics Engineering Drawings**: Simple Electronics Circuit Drawings.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. of Flipped Classroom Sessions	2	2	2	2	2

List of Exercises on AUTOCAD during Laboratory sessions

Unit No.	No. of Lab Sessions	Topic(s) related to Exercises
1	**1**	Introduction, projections of points
1	**1**	Projections of straight lines
1	**2**	Projections of planes
2	**2**	Projections of solids
3	**2**	Isometric projections
4	**2**	Development of surfaces

Books	
	Text Books:
1.	K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook Of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2010
2.	S.N. Lal, & T.Madhusudhan: Engineering Visualization, 1st Edition, Cengage Publication, 2012
3.	Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015
	Reference Books:
1.	Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.
2.	Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
3.	K. S. Sai Ram, Design of steel structures, Third Edition by Pearson Publication, 2016
	E-resourses (NPTEL/SWAYAM. Any Other)- mention links
1	https://nptel.ac.in/courses/112/105/112105294/
2	https://nptel.ac.in/courses/112/103/112103019/
3	https://nptel.ac.in/courses/105/104/105104148/
4	https://nptel.ac.in/courses/112/102/112102304/
5	Building plans- https://www.designingbuildings.co.uk/wiki/Engineering_drawing
6	Circuits- https://www.smartdraw.com/circuit-diagram/
7	Mechanical Components-http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2474

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment/Project
3.	Flipped Classes	3.	CAD Print outs/sketches
4.	Use of simple models (Lamina, solids)	4.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Visualize and **apply** basic drafting fundamentals	L3	1	1
2.	**Apply** basic concepts to develop construction/drawing techniques	L3	1	1
3.	**Create** detailed and standard drawings using CAD tool	L3	1,5	1

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive.
Conduct of Lab: 1. Conducting the experiment and journal: 5 marks 2. Calculations, results, graph, conclusion and Outcome: 5 marks
Lab test: (Batchwise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph and conclusion: 15 marks 5. Viva voce: 10 marks
Eligibility for SEE: 1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE** 2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.** 3. Lab test is COMPULSORY 4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.** 5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35%, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains **2 questions each from unit I to Unit IV each carrying 25 marks**. Students have to answer one full question from each unit, **only by sketching in answer script**. (No print out)

Articulation matrix

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓												✓		
3	✓				✓								✓		

Mathematics for ME/AE Engineering Stream-II

Course Code	**22MATM21**	**Course type**	**integrated**	**Credits L-T-P**	3 - 0- 1
Hours/week: L-T-P	3 - 0 – 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs;P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	**Familiarize** the importance of Integral calculus and Vector calculus essential for ME/AE Engineering.
2.	**Analyze** ME/AE Engineering problems applying Partial Differential Equations.
3.	**Develop** the knowledge of solving ME/AE Engineering problems numerically.
4.	**Familiarize** the importance of Integral calculus and Vector calculus essential for ME/AE Engineering.

Required Knowledge of : Basic Trigonometry, Calculus, Algebra, Matrices, I Semester knowledge

Unit – I	**Contact Hours = 8 Hours**

Introduction to Integral Calculus in ME/AE Engineering applications.

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. **Problems.**

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems.

Applications: Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models.**(RBT Levels: L1, L2 and L3)**

Unit – II	**Contact Hours = 8 Hours**

Introduction to Vector Calculus in ME/AE Engineering applications.

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.

Vector Integration: Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems

Applications: Heat and mass transfer, oil refinery problems, environmental engineering. Analysis of stream lines, velocity and acceleration of a moving particle.
(RBT Levels: L1, L2 and L3)

Unit – III	**Contact Hours = 8 Hours**

Importance of numerical methods for discrete data in the field of ME/AEEngineering.

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof). Problems.

Numerical integration: Trapezoidal, Simpson's $(1/3)^{rd}$and $(3/8)^{th}$rules (without proof).

Problems.
Applications: Finding approximate solutions to solve ME/AE engineering problems involving numerical data.**(RBT Levels: L1, L2 and L3)**

Unit –IV	Contact Hours = 8 Hours

Introduction to various numerical techniques for handling ME/AE Engineering applications.
Numerical Solution of Ordinary Differential Equations (ODE's): Numerical solution of ordinary differential equations of first order and first degree – Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (No derivations of formulae). Problems.
Applications: Finding approximate solutions to ODE related to ME/AE engineering fields.

Unit –V	Contact Hours = 8 Hours

Importance of partial differential equations for ME/AE Engineering application.
Formation of PDE's by elimination of arbitrary constants and functions. Solution of non homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of the one dimensional heat equation and wave equation
Applications: Vibration of a rod/membrane.**(RBT Levels: L1, L2 and L3)**

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	Program to compute surface area, volume and centre of gravity
1	2	Evaluation of improper integrals
2	3	Finding gradient, divergent, curl and their geometrical interpretation
2	4	Verification of Green's theorem
5	5	Solution of one-dimensional heat equation and wave equation
3	6	Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method
3	7	Interpolation/Extrapolation using Newton's forward and backward difference formula
3	8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$and $(3/8)^{th}$rule
4	9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
4	10	Solution of ODE of first order and first degree by Runge-Kutta 4^{th}order and Milne's method

Unit No.	Self-Study Topics
1	Volume by triple integration, Centre of gravity.
2	Volume integral and Gauss divergence theorem.

3	Bisection method, Lagrange's inverse Interpolation, Weddle's rule.
4	Adam-Bashforth method
5	Solution of one-dimensional heat equation and wave equation by the method of Separation of variables

	Books
	Text Books:
1	**B. S. Grewal**: "Higher Engineering Mathematics" Khanna publishers, 44th Ed., 2021.
2	**E. Kreyszig**: "Advanced Engineering Mathematics" John Wiley & Sons, 10th Ed., 2018.
	Reference Books:
1	**V. Ramana:** "Higher Engineering Mathematics"McGraw-Hill Education, 11th Ed., 2017
2	**Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics"Oxford University Press, 3rd Ed., 2016.
3	**N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics"Laxmi Publications, 10th Ed., 2022.
4	**C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics"McGraw –HillBook Co., Newyork, 6th Ed., 2017.
5	**Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
6	**H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics"S. Chand Publication, 3rd Ed., 2014.
7	**James Stewart: "**Calculus"Cengage Publications, 7th Ed., 2019.
8	**David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018
9	**Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6thEd., 2017.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1	https://www.youtube.com/watch?v=ksS_yOK1vtk&list=PLbRMhDVUMngfIrZCNOyPZwHUU1pP66vQW&ab_channel=IITKharagpurJuly2018
2	https://www.youtube.com/watch?v=TWAN_T66Cps&list=PLq-Gm0yRYwTguDcfylj1ZicXxzdZCAr5S&ab_channel=NumericalMethods
3	https://www.youtube.com/watch?v=zT83sJ5IrEE&list=PLyqSpQzTE6M-QT7PvEBHV0iNMvZk9mocO&ab_channel=nptelhrd
4	https://www.youtube.com/watch?v=p8u0Fc63OYg&list=PLOzRYVm0a65eWglxWw5WzQLrlG2EaiTIi&index=24&ab_channel=IITBombayJuly2018

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Apply the knowledge of multiple integrals to compute area and volume and Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.	L1, L2 and L3	1	
2.	Apply the knowledge of numerical methods in analyzing the discrete data and for solving the physical and engineering problems.	L1, L2 and L3	1	
3.	Demonstrate partial differential equations and their solutions for physical interpretations.	L1, L2 and L3	1	
4.	Familiarize with modern mathematical tool namely MATLAB	L1, L2 and L3	5	

Scheme of Continuous Internal Evaluation (CIE) for Integrated course:

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A(30 marks),B(50 marks) and C (20 marks).** Students have to answer 1. From Part A answer any 5 questions each Question Carries 6 Marks. 2. From Part B answer any one full question from each unit and each Question Carries 10 Marks. 3. From Part C answer any one full question and each Question Carries 20 Marks.

CO-PO Mapping (planned)													CO-PSO Mapping(planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓														
2	✓														
3	✓														
4					✓										
5															
6															
Tick mark the CO, PO and PSO mapping															

Applied Physics for Mechanical stream

Course Code	**22PHYM12/22**	**Course type**	**ASC**	**Credits L-T-P**	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the types of oscillation, shock waves & its generation, and applications.
2.	To Study the elastic properties of materials and failures of engineering materials
3.	To understand the fundamentals of thermoelectric materials and devices and their application.
4.	To understand the Concepts in Low temperature phenomena and generation of low temperature.
5	To study the various relevant material characterization techniques

Required Knowledge of : Basic Physics

Unit – I Oscillations and Shock waves:	**Contact Hours = 8 Hours**
Oscillations: Simple Harmonic motion (SHM), Differential equation for SHM (No derivation), Sprigs: Stiffness Factor and its Physical Significance, Series and Parallel combination of springs (Derivation), Types of Springs and their applications. Theory of Damped oscillations (Qualitative), Types of Damping (Graphical Approach). Engineering applications of Damped oscillations, Theory of Forced oscillations (Qualitative), Resonance, Sharpness of resonance. Numerical Problems. **Shock waves:** Mach number and Mach Angle, Mach Regimes, Definition and Characteristics of Shock waves, Construction and working of Reddy Shock tube, Applications of Shock Waves, Numerical problems.	

Unit – II Elasticity	**Contact Hours = 8 Hours**
Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Y, n and σ (with derivation), mention relation between K, Y and σ, limiting values of Poisson's ratio. Beams, Bending moment and derivation of expression, Cantilever and I section girder and their Engineering Applications, Elastic materials (qualitative). Failures of engineering materials - Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), Numerical problems.	

Unit – III Thermoelectric materials and devices:	**Contact Hours = 8 Hours**
Thermo emf and thermo current, Seeback effect, Peltier effect, Seeback and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T_1 and T_2, Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Space Program (RTG), Numerical Problems.	
Unit – IV Cryogenics:	**Contact Hours = 8 Hours**
Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Thermodynamical analysis of Joule Thomson effect, Liquefaction of Oxygen by cascade process, Lindey's air liquefier, Liquefaction of Helium and its properties, Platinum Resistance Thermometer, Applications of Cryogenics, in Aerospace, Tribology and Food processing(qualitative), Numerical Problems.	

Unit–V Material Characterization and Instrumentation Techniques:	**Contact Hours = 8 Hours**
Introduction to nano materials: Nanomaterial and nanocomposites. Principle, construction and working of X-ray Diffractometer, Crystallite size determination by Scherrer equation, Atomic Force Microscopy (AFM): Principle, construction, working and applications, X-ray photoelectron spectroscopy (XPS), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Numerical Problems.	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**1**	**1**	**1**	**1**	**1**

List of Experiments

Unit No.	**No. of Experiments**	**Topic(s) related to Experiment**
1	4	**Elasticity** 1. Determination of Young's modulus of the material of the given bar Uniform Bending 2. Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum. 3. Determination of Young's modulus of the material of the given bar Single Cantilever. 4. Determination of the Moment of Inertia of the given irregular body using torsional pendulum.
	1	1. Determination of Fermi Energy of Copper.
	1	1. Study the frequency response of Series & Parallel LCR circuits.
	4	1. Determination of Energy gap of the given Semiconductor. 2. Determination of wavelength of LASER using Diffraction Grating. 3. Determination of acceptance angle and numerical aperture of the given Optical Fiber. 4. Determination of the Radius of Curvature of the given Plano Convex Lens by setting Newton's Rings.

Unit No.	Self-Study Topics
1	Simple Harmonic motion (SHM),), Resonance, Sharpness of resonance.
2	Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio,
3	Thermo couples
4	Joule Thomson effect
5	Nanomaterial and nanocomposites

Books	
	Text Books:
1	M. N. Avadhanulu and P. G. Kshirasagar. A text book of Engineering Physics, S. Chand and company limited, 9th Revised Edition (2014) onwards.
2	Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition and onwards
3	D.S.Mathur Heat and Thermodynamics (I-Edition) –- S. Chand & Company Ltd., New-Delhi, 1991 and onwards
4	Brijlal & Subramanyam, Heat and Thermodynamics, ,S. Chand & Company Ltd., New Delhi,
5	Bahman Zohuri , Physics of Cryogenics by, Elsevier, 2018 and onwards
6	Materials Characterization Techniques, Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008 and onwards
	Reference Books:
1	R. K. Gaur and S. L. Gupta, Engineering Physics by, , Dhanpat Rai Publications Ltd , 2010 edition and onwards
2	Nanoscience and Nanotechnology: Fundamentals to Frontiers – M.S.Ramachandra Rao & Shubra Singh, Wiley India Pvt Ltd
3	Nano Composite Materials-Synthesis, Properties and Applications, J. Parameswaranpillai,, N.Hameed, T.Kurian, Y. Yu, CRC Press
4	Shock waves made simple by Chintoo S Kumar, K Takayama and K P J Reddy: Willey India Pvt. Ltd, Delhi,2014, and onwards
5	"Theory of Elasticity", Timoshenko, S. and Goodier J.N. 2nd Edition, McGraw Hill Book Co, 2001and onwards
	"Theory of Elasticity", Sadhu Singh, Khanna Publishers, 1997 and onwards
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1	**Simple Harmonic motion:** https://www.youtube.com/watch?v=k2FvSzWeVxQ
2	**Shock waves :**https://physics.info/shock/
3	**Shock waves and its applications:** https://www.youtube.com/watch?v=tz_3M3v3kxk
4	**Stress- strain curves:** https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
5	**Stress curves:** https://www.youtube.com/watch?v=f08Y39UiC-o
6	**Fracture in materials:** https://www.youtube.com/watch?v=x47nky4MbK8
7	**Thermoelecticity:**https://www.youtube.com/watch?v=2w7NBuu5w9c&list=PLtkeUZItwHK5y6qy1GFxa4Z4RcmzUaaz6
8	**Thermoelectric generator and coolers:** https://www.youtube.com/watch?v=NruYdb31xk8
9	**Cryogenics:** https://cevgroup.org/cryogenics-basics-applications/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project

3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs		

Course Outcome (COs) **Learning Levels:** **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Remember** the fundamentals of oscillations, waves, elasticity, thermoelectric properties, cryogenics and material characterization techniques.	Re, Un, Ap	1,12	
2.	**Understand** the principles of oscillations, waves, elasticity, thermoelectric properties, cryogenics and material characterization techniques.	Re, Un, Ap	1,12	
3.	**Apply** the concepts of oscillations, waves, elasticity, thermoelectric properties, cryogenics and material characterization techniques.	Re, Un, Ap	1,12	
4.	**Anayse the** experiment in a group**, Design and Develop** the innovative experiment.	Re, Un, Ap	1,2,9,12	

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score**

40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass should be ≥ 35% , however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	√											√			
2	√											√			
3	√											√			
4	√	√							√			√			
Tick mark the CO, PO and PSO mapping															

Elements of Aeronautical Engineering

Course Code	22EAE13	Course type	ESC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100 marks
Flipped Classes content	10 Hours			SEE Marks	100 marks

Course learning objectives	
Students should	
1.	Understand the history, basic principle of aviation, trends in aerospace Industry.
2.	Understand the basics of flight &aircraft propulsion.
3.	Understand the various flight controls and dynamics of aircraft
4.	Understand different systems of an aircraft

Unit – I **Introduction to Aircrafts**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
History of aviation; History of Indian Aviation Sector, History of Unmanned Air Vehicles, Basic components of an aircraft; structural members; Helicopters, their parts and functions. Introduction to Military Aircraft, Transport Aircraft, Unmanned Aircraft, Classification of aircraft and space vehicles, Classification and Applications of Unmanned Air Vehicles, global and Indian Aircraft scenario. Aircraft materials.	
Topics for Flipped Classes: History of aviation; History of Indian Aviation Sector	

Unit – II **Basic principles of flight**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
International standard atmosphere and its properties; significance of speed of sound; Mach number, airspeed and groundspeed; Bernoulli's theorem and derivation for Bernoulli's equation, measurement of airspeed; aerofoil nomenclature, Types of Aerofoils, forces acting on Aerofoil, pressure distribution over aerofoil. Centre of pressure, Aerodynamic center, Aspect Ratio, Introduction to Lift and drag components. Circulation and its effects. Magnus effect and Kutta condition, Introduction to wind tunnel testing. Introduction to rotary wing and flapping wing aerodynamics. Introduction to Boundary layer, Types and effect of boundary layer.	
Topics for Flipped Classes: Aerofoil nomenclature, Types of Aerofoils	

Unit – III **Aircraft Propulsion**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
Classification of Aircraft power plants, Aircraft power plants – basic principles of piston & jet engines and Rocket engine, Brayton cycle and its application to gas turbine engines; SFC, TSFC, Specific Impulse, Propulsive Efficiency, Thermal efficiency, Overall efficiency, production of thrust by propellers and jets. Introduction to Rocket and Missile propulsion.	
Topics for Flipped Classes: classification of Aircraft power plants	

Unit – IV **Aircraft Performance and Stability**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
Phases of flight, Steady level flight, stalling speed, High lift Devices, Thrust and power curves, Excess power, Range and endurance, Introduction to maneuver and accelerated flight performance. Aircraft axis system; aircraft motions; static and dynamic stability; longitudinal, lateral and directional	

static stability; Numerical on trim conditions, Effect of wings and Tail configurations on static stability. Introduction to transonic and supersonic flight.
Topics for Flipped Classes: High lift Devices, Aircraft axis system

Unit – V **Aircraft Systems**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
Cockpit instrumentation and displays; Basic flight control system & FBW, navigation system, Environment control system and oxygen system, hydraulic and pneumatic systems, fuel system, communication system, APU, Instrument landing system.	
Topics for Flipped Classes: APU, Instrument landing system	

Unit No.	**Self-Study Component**
1	Drones (flapping wing, MAV, quad copters)
2	Bernoulli's theorem and its application for generation of lift, Flight regimes.
3	Ramjet, Scramjet
4	Effect of flaps and stats on lift, control tabs, stalling, gliding, landing, turning
5	power generation & Distribution systems

Books	
	Text Books:
1.	John D. Anderson, "Introduction to Flight", McGraw-Hill Education, 2011. ISBN 9780071086059.
2.	Lalit Gupta and O P Sharma, "Fundamentals of Flight Vol-I to Vol-IV", Himalayan Books, 2006, ISBN-13: 978-8170020974
	Reference Books:
1.	Ian Moir, Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration", John Wiley & Sons, 2011. ISBN 978111965006.
2.	Nelson R.C., "Flight stability and automatic control", McGraw-Hill International Editions, 1998. ISBN 9780071158381.
3.	Sutton G.P., "Rocket Propulsion Elements", John Wiley, New York, 8th Ed., 2011; ISBN: 1118174208, 9781118174203.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL: Online Resources: Lecture by: Prof. Rajkumar S. Pant, IIT Bombay https://swayam.gov.in/nd1_noc19_ae05/preview
2.	NPTEL: (Unit III) Online Resources: Lecture by: Prof. Debi Prasad Mishra, IIT Kanpur https://swayam.gov.in/nd1_noc19_ae08/preview

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the types of Aircrafts & industries	L2 (Un)	1,12	1,2,3
2.	**Estimate** various Aerodynamic forces & Compare various Atmosphere layers properties	L3 (Ap)	1,2,12	1,2,3

3.	**Interpret** the air-breathing engines & its components	L2 (Un)	1,12	1,2,3
4.	**Illustrate** the basics of flight dynamics, aircraft performance and maneuverability.	L2 (Un)	1,12	1,2,3
5.	**Demonstrate** the various systems of aircraft	L2 (Un)	1,9,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be > 35%, however overall score of CIE + SEE should be > 40%
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	√											√	√	√	√
2	√	√										√	√	√	√
3	√											√	√	√	√
4	√											√	√	√	√
5	√											√	√	√	√
Tick mark the CO, PO and PSO mapping															

Engineering Science Courses (ESC)

INTRODUCTION TO CIVIL ENGINEERING

Course Code	22ESC141/241	Course type	ESC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0– 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	To make students learn the scope of various specializations of civil engineering.
2.	To make students learn the concepts of sustainable infrastructure
3.	To develop students' ability to analyze the problems involving forces, moments with their applications.
4.	To develop the student's ability to find out the center of gravity and moment of inertia and their applications.

Unit – I	Contact Hours = 8 Hours
Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management. **Basic Materials of Construction**: Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel.	

Unit – II	Contact Hours = 8 Hours
Structural elements of a building: Foundation, plinth, lintel, chejja, Masonry wall, column, beam, and slab **Infrastructure & Environment:** Introduction to sustainable development, Smart city concept, Introduction to Water Supply and Sanitary system **Introduction to Force:** Concept of idealization, system of forces, principles of superposition and transmissibility.	

Unit – III	Contact Hours = 8 Hours
Analysis of force systems: Resolution and composition of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems and numerical examples.	

Unit – IV	Contact Hours = 8 Hours
Centroid: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane laminae from first principles, centroid of built-up sections. Numerical examples.	

Unit – V	Contact Hours = 8 Hours
Moment of inertia: Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, radius of gyration, moment of inertia of built-up sections, Numerical Examples.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	02	02	02	02	02

Books	
	Text Books:
1.	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, **"Basic Civil Engineering and Engineering Mechanics"**, Laxmi Publications, 2015
2.	Kolhapure B K, **"Elements of Civil Engineering and Engineering Mechanics"**, EBPB, 2014
3.	Bhavikatti S S, **"Engineering Mechanics"**, New Age International Publications, 2019
	Reference Books:
1.	Beer F.P. and Johnston E. R., **"Mechanics for Engineers"**, Statics and Dynamics,, McGraw Hill, 1987
2.	Irving H. Shames, **"Engineering Mechanics"**, Prentice-Hall, 2019
3.	Reddy Vijaykumar K and Suresh Kumar K, **"Engineering Mechanics"**, BS publication, 2011
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
2.	https://www.youtube.com/watch?v=atoP5_DeTPE

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	Understand the various disciplines of civil engineering	Un	1	1
2.	Understand the infrastructure requirement for sustainable development and force system	Un	1,7	1,3
3.	Compute the resultant and equilibrium of force systems.	Un & Ap	1,2	1
4.	Locate the centroid of plane and built-up sections	Un & Ap	1,2	1
5.	Compute the moment of inertia of plane and built-up sections.	Un & Ap	1,2	1

Scheme of Continuous Internal Evaluation (CIE) for Theory course:

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	√												√		
2	√						√						√		√
3	√	√											√		
4	√	√											√		
5	√	√											√		

Introduction to Electrical Engineering

Course Code	22ESC142/242	Course type	ESC-I	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To understand the basics of typical power system measuring instruments and various power generation sources.
2.	To understand the basics of DC and single-phase AC circuits
3.	2. To understand the basics of three phase AC circuits and working, construction, types of three phase Induction motor.
4.	To understand the working principle, construction and types of single-phase transformer and DC motors.
5.	To understand the working principle of various domestic appliances.

Pre-requisites: Fundamentals of electrical circuits.

Unit – I	Contact Hours = 8 Hours
Typical Electrical System: A typical power system single line diagram, typical domestic wiring layout, protection of electrical systems using fuse & MCB, earthing and energy billing, safety measures. **Power Generation:** Hydel, thermal, solar & wind power generation (Block Diagram approach).	

Unit – II	Contact Hours = 8 Hours
DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. **Single-phase AC circuits:** Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phasor representation of alternating quantities. Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor, numerical.	

Unit – III	Contact Hours = 8 Hours
Transformer: Principle of operation, working and construction of single-phase transformer (core and shell type), EMF equation, transformation ratio, losses, efficiency, voltage regulation and its significance, illustrative problems on EMF equation and efficiency only, applications of transformers. **DC Motor:** Principle of operation, construction and working, back Emf, torque equation. Shunt and series motors, operating characteristics and applications,	

Unit – IV	Contact Hours = 8 Hours
Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Measurement of 3-phase power by 2-wattmeter method (excluding derivations). Simple Numerical. **Three Phase Induction Motor:** Principle of operation, types and constructional features, slip and its significance, applications of squirrel cage and slip ring motors, necessity of a starter, illustrative examples on slip calculations.	

Unit – V	Contact Hours = 8 Hours
Measuring instruments: Classification of measuring instruments, essential requirements of an instrument, construction and operation ofdynamometer typewattmeter, electronic energy meter, current transformer and potential transformer. **Domestic Appliances:** Construction and working of LED lamps, Ceiling Fan, Water Heater and UPS (Block diagram approach)	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	DC Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, First Edition 2019.
2.	B.L.Theraja, A text book of Electrical Technology, S Chandand Company, reprint edition 2014.
	Reference Books:
1.	D.P.Kothari and I.J.Nagrath, Basic Electrical Engineering, Tata McGraw Hill 4th edition, 2019.
2.	V. K. Mehta, Rohit Mehta, Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd edition, 2015.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	www.nptel.ac.in
2.	https://www.youtube.com/watch?v=rLUyP6g1VNI&list=PL425060D3C78350E1

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
		4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	**Explain** the electrical energy sources, layout and components of electrical power systems, basic concepts of Electric circuits and Electromagnetism, basic power system protection and power and energy calculations.	Un	1,12	1
2.	**Explain** and a**nalyze** DC and single phase and three phase AC circuits	An	1,12	1
3.	**Explain** the types, construction and operation of electrical machines such as DC motor, transformer and induction motor.	Un	1,12	1,2
4.	**Explain** the performance characteristics of electrical machines and **identify** the relevant practical applications.	Un	1,12	1,2

Scheme of Continuous Internal Evaluation (CIE) for Theory course:

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**			
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
1	✓											✓	✓			
2	✓											✓	✓			
3	✓											✓	✓	✓		
4	✓											✓	✓	✓		
Tick mark the CO, PO and PSO mapping																

Introduction to Electronics Engineering

Course Code	**22ESC143/243**	**Course type**	ESC-I	**Credits L-T-P**	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand working of diodes and transistors, their performance and application as rectifier, amplifier and oscillator.
2.	To understand working of OPAMP and its applications, and explain the working of commonly used domestic appliances.
3.	To understand concept of Boolean algebra and Realization of Boolean expressions using logic gates.
4.	To understand working of various types of Transducers and Sensors

Pre-requisites: Fundamentals of electronic circuits.

Unit – I	**Contact Hours = 8 Hours**
Semiconductor Diodes: Introduction, PN Junction diode, Characteristics and Parameters, **Diode Applications:** Introduction, Half Wave Rectifier, Full Wave Rectifier, Capacitor Filter Circuit, numerical **Zener Diodes:** Characteristics and, Zener Diode Voltage Regulator.	

Unit – II	**Contact Hours = 8 Hours**
Bipolar Junction Transistors: Introduction, BJT configurations (CB, CC, CE), modes of operation of BJT. **Amplifiers**-Introductions to amplifiers, transistor working as amplifier, R-C coupled amplifiers, types of power amplifiers. Applications of power amplifiers.	

Unit – III	**Contact Hours = 8 Hours**
Oscillators–Introduction, Barkhausen criterion, types of oscillators, R-C phase shift oscillator, Crystal oscillators. **Operational amplifiers** – Introduction, characteristics of ideal and practical op-amp; working of op-amp, inverting and non-inverting amplifiers, voltage follower, summer, subtractor, ZCD.	

Unit – IV	**Contact Hours = 8 Hours**
Digital Electronics: Boolean algebra, binary number system, logic gates, truth table, operations. **Realization of Boolean expressions**: Introduction, logic diagram and truth table of half adder and full adder.	

Unit – V	**Contact Hours = 8 Hours**
Transducers and Sensors: Introduction, classification, resistance transducer, thermoelectric transducer, photoelectric transducer, hall effect transducer. types of Sensors, proximity sensor, pneumatic sensor, light sensor, thermal sensor.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),PrivateLimited,2018.
2.	Robert L. Boylestad, "Electronic devices and circuit Theory", Pearson Education, 9th edition.
	Reference Books:
1.	David A. Bell, "Electronic Devices & Circuits", Oxford university press, 5th edition.
2.	M. Morris Mano, Digital Logic and Computer Design, , PHI Learning, 2008
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	www.nptel.ac.in

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
		4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the construction, types and operational characteristics of solid-state devices such as PN junction diode, Bipolar Junction Transistor, Operational Amplifier	Un	1,12	3
2.	**Explain** the application circuits ofdiodes, transistors &OPAMP circuits&**determine** the performance parameters.	Ap	1,12	3
3.	**Explain** the basic concepts of digital electronic circuit components and performance of logiccircuits.	Un	1,12	3
4.	**Explain** the types, working and applications of transducers and sensors.	Un	1,12	3

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**			
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
1	✓											✓			✓	
2	✓											✓			✓	
3	✓											✓			✓	
4	✓											✓			✓	
5	✓											✓			✓	
Tick mark the CO, PO and PSO mapping																

Introduction to Mechanical Engineering

Course Code	22ESC144/244	**Course type**	ESC	**Credits L-T-P**	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	50
Flipped Classes content	05 Hours			**SEE Marks**	50

Course learning objectives	
1.	To develop basic Knowledge on Mechanical Engineering, Fundamentals and Energy Sources.
2.	Understand the concept of different types of Machine tool operations and Modern Manufacturing Processes like CNC, 3D printing.
3.	To know the concept of IC engines and Future Mobility vehicles.
4.	To give exposure in the field of Engineering Materials and Manufacturing Processes Technology and its applications
5.	To acquire a basic understanding role of Mechanical Engineering in the Robotics and Automation in industry.

Pre-requisites : Basic idea on general engineering concepts

Unit – I	**Contact Hours = 8 Hours**
Introduction: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Energy:** Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion	

Unit – II	**Contact Hours = 8 Hours**
Machine Tool Operations: Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Milling operations: plane milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations). **Introduction to Advanced Manufacturing Systems:** Introduction, components of CNC, advantages and applications of CNC, 3D printing.	

Unit – III	**Contact Hours = 8 Hours**
Introduction to IC Engines: Components and Working Principles, 4-Strokes Petrol and Diesel Engines, Application of IC Engines. **Insight into Future Mobility:** Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles.	
Unit – IV	**Contact Hours = 8 Hours**
Engineering Materials: Types and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer. Shape Memory Alloys. **Joining Processes:** Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames.	

Unit – V	Contact Hours = 8 Hours
Introduction to Mechatronics and Robotics: open-loop and closed-loop mechatronic systems. Classification based on robotics configuration: polar cylindrical, Cartesian coordinate and spherical. Application, Advantages and disadvantages. Automation in industry: Definition, types – Fixed, programmable and flexible automation, basic elements with block diagrams, advantages. **Introduction to IOT:** Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008.
2.	An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012.
	Reference Books:
1.	Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
2.	Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
3.	Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017.
4.	Robotics, Appu Kuttan KK K. International Pvt. Ltd, volume 1.
5.	Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A Practical Approach", ETI Labs.
6.	Raj kamal, "Internet of Things: Architecture and Design", McGraw hill.
	E-resources (NPTEL/SWAYAM... Any Other)- mention links
1.	https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing- and-process-industry/)
2.	https://www.makino.com/en-us/resources/content-library/videos

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Discuss** the latest happenings in the area of Mechanical Engineering and its allied fields.	L2	1,12	1
2.	**Explain** the fundamentals involved in various manufacturing processes with a basic idea of materials involved.	L2	1,2	1
3.	**Discuss** the latest happenings in the field of mobility and IOT.	L2	1,12	1

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓											✓	✓		
2	✓	✓											✓		
3	✓											✓	✓		
Tick mark the CO, PO and PSO mapping															

Introduction to C Programming

Course Code	22ESC145/245	**Course type**	**Integrated**	**Credits L-T-P**	2 - 0 - 1
Hours/week: L - T- P	2- 0 - 2			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	Elucidate the basic architecture and functionalities of a Computer Design and Develop Solutions to problems using modular programming constructs such as functions and procedures
2.	Apply programming constructs of C language to solve the real-world problems
3.	Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems .
4.	Design and Develop Solutions to problems using modular programming constructs such as functions and procedures

Required Knowledge of :

Unit – I	**Contact Hours = 6 Hours**
Introduction to C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C, Textbook: Chapter 1.1-1.9, 2.1-2.2, 8.1 – 8.6, 9.1-9.14	

Unit – II	**Contact Hours = 6 Hours**
Operators in C, Type conversion and typecasting. Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement. Textbook: Chapter 9.15-9.16, 10.1-10.6	

Unit – III	**Contact Hours = 6 Hours**
Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays Textbook: Chapter 11.1-11.13, 12.1-12.6	

Unit – IV	**Contact Hours = 6 Hours**
Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, Applications of arrays and introduction to strings: Applications of arrays, case study with sorting techniques. Introduction to strings: Reading strings, writing strings, summary of functions used to read and write characters. Textbook: Chapter 12.7-12.12	
Unit – V	**Contact Hours = 6 Hours**
Strings: String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings. Pointers: Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables Structures: Introduction to structures Textbook: Chapter 13.1-13.6, 14.1-14.3,15.1	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	**1**	1. C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.
2	**3**	2. C Program to convert Kilometers into Meters and Centimeters 3. Program to check whether the given number is palindrome or not. 4. Compute sin(x)/cos(x) using Taylor series approximation. Compare you result with the built-in library function. Print both the results with appropriate inferences.
3	**1**	5. Sort the given set of N numbers using Bubble sort.
4	**1**	6. Implement Matrix multiplication and validate the rules of multiplication.
5	**4**	7. C Program to Check the Given Character is Lowercase or Uppercase or Special Character. 8. Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques 9. Implement structures to read, write and compute average-marks and the students scoring above and below the average marks for a class of N students. 10. Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.

Unit No.	Self-Study Topics
1	Data types ,Symbolic constants
2	Evaluation of expressions, operator precedence and associativity
3	Need for user defined functions
4	String handling functions

Books	
	Text Books:
1.	1. Computer fundamentals and programming in c, “Reema Thareja”, Oxford University, Second edition,2017.
	Reference Books:
1.	E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2.	Brian W. Kernighan and Dennis M. Ritchie, The ‘C’ Programming Language, Prentice Hall of

	India.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2.	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem solving methods.
3.	https://tinyurl.com/4xmrexre

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.	L1	PO1	PSO1
CO2	Apply programming constructs of C language to solve the real world problem	L2,L3	PO1,PO2,PO3	PSO1
CO3	Design and Develop Solutions to problems using modular programming constructs.	L4	PO3,PO4,PO5,PO10,PO11,PO12	PSO1,PSO2,PSO3

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓	✓											✓		
3			✓	✓	✓								✓	✓	
4			✓	✓	✓								✓	✓	
5			✓	✓	✓					✓	✓	✓	✓	✓	✓
6															
Tick mark the CO, PO and PSO mapping															

Introduction to Aeronautical Engineering

Course Code	22ESC146/246	**Course type**	**ESC**	**Credits L-T-P**	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100 marks
Flipped Classes content	10 Hours			**SEE Marks**	100 marks

Course learning objectives	
Students should	
1.	Understand the history, basic principle of aviation, trends in aerospace Industry.
2.	Understand the basics of flight &aircraft propulsion.
3.	Understand the various flight controls and dynamics of aircraft
4.	Understand different systems of an aircraft

Unit – I **Introduction to Aircrafts**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
History of aviation; History of Indian Aviation Sector, History of Unmanned Air Vehicles, Basic components of an aircraft; structural members; Helicopters, their parts and functions. Introduction to Military Aircraft, Transport Aircraft, Unmanned Aircraft, Classification of aircraft and space vehicles, Classification and Applications of Unmanned Air Vehicles, global and Indian Aircraft scenario. Aircraft materials.	
Topics for Flipped Classes: History of aviation; History of Indian Aviation Sector	

Unit – II **Basic principles of flight**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
International standard atmosphere and its properties; significance of speed of sound; Mach number, airspeed and groundspeed; Bernoulli's theorem and measurement of airspeed; aerofoil nomenclature, Types of Aerofoils, forces acting on Aerofoil, pressure distribution over aerofoil. Centre of pressure, Aerodynamic center, Aspect Ratio, Introduction to Lift and drag components. Introduction to wind tunnel testing. Introduction to rotary wing aerodynamics.	
Topics for Flipped Classes: Aerofoil nomenclature, Types of Aerofoils	

Unit – III **Aircraft Propulsion**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
classification of Aircraft power plants, Aircraft power plants – basic principles of piston & jet engines and Rocket engine, Brayton cycle and its application to gas turbine engines; SFC, TSFC, Specific Impulse, Propulsive Efficiency, Thermal efficiency, Overall efficiency, production of thrust by propellers and jets.	
Topics for Flipped Classes: classification of Aircraft power plants	

Unit – IV **Aircraft Performance and Stability**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
Phases of flight, Steady level flight, stalling speed, High lift Devices, Thrust and power curves, Excess power, Range and endurance, Introduction to maneuver and accelerated flight performance. Aircraft axis system; aircraft motions; static and dynamic stability; longitudinal, lateral and directional static stability; Numerical on trim conditions, Effect of wings and Tail configurations on static stability. Introduction to transonic and supersonic flight.	
Topics for Flipped Classes: High lift Devices, Aircraft axis system	

Unit – V **Aircraft Systems**	**Contact Hours = 8 Hours** **Flipped Classes Content = 2 Hours**
cockpit instrumentation and displays; Basic flight control system & FBW, navigation system, Environment control system and oxygen system, hydraulic and pneumatic systems, fuel system, communication system, APU, Instrument landing system.	
Topics for Flipped Classes: APU, Instrument landing system	

Unit No.	**Self-Study Component**
1	Drones (flapping wing, MAV, quad copters)
2	Bernoulli's theorem and its application for generation of lift, Flight regimes.
3	Ramjet, Scramjet
4	Effect of flaps and stats on lift, control tabs, stalling, gliding, landing, turning
5	power generation & Distribution systems

Books	
	Text Books:
1.	John D. Anderson, "Introduction to Flight", McGraw-Hill Education, 2011. ISBN 9780071086059.
2.	Lalit Gupta and O P Sharma, "Fundamentals of Flight Vol-I to Vol-IV", Himalayan Books, 2006, ISBN-13: 978-8170020974
	Reference Books:
1.	Ian Moir, Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration", John Wiley & Sons, 2011. ISBN 978111965006.
2.	Nelson R.C., "Flight stability and automatic control", McGraw-Hill International Editions, 1998. ISBN 9780071158381.
3.	Sutton G.P., "Rocket Propulsion Elements", John Wiley, New York, 8th Ed., 2011; ISBN: 1118174208, 9781118174203.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL: Online Resources: Lecture by: Prof. Rajkumar S. Pant, IIT Bombay https://swayam.gov.in/nd1_noc19_ae05/preview
2.	NPTEL: (Unit III) Online Resources: Lecture by: Prof. Debi Prasad Mishra, IIT Kanpur https://swayam.gov.in/nd1_noc19_ae08/preview

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the types of Aircrafts & industries	L2 (Un)	1,12	1,2,3
2.	**Estimate** various Aerodynamic forces & Compare various Atmosphere layers properties	L3 (Ap)	1,2,12	1,2,3
3.	**Interpret** the air-breathing engines & its components	L2 (Un)	1,12	1,2,3
4.	**Illustrate** the basics of flight dynamics, aircraft performance and	L2 (Un)	1,12	1,2,3

	maneuverability.			
5.	**Demonstrate** the various systems of aircraft	L2 (Un)	1,9,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive
-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	√											√	√	√	√
2	√	√										√	√	√	√
3	√											√	√	√	√
4	√											√	√	√	√
5	√											√	√	√	√
Tick mark the CO, PO and PSO mapping															

Engineering Technology Courses (ETC)

Smart Materials and Systems

Course Code	22ETC15A	**Course type**	ETC	**Credits L-T-P**	3 – 0- 0
Hours/week: L-T-P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	50
Flipped Classes content	05 Hours			**SEE Marks**	50

Course learning objectives	
1.	To develop the students ability to learn emerging materials.
2.	To make students to learn prefabricated building components.
3.	To understand the sensors deployed in smart buildings.
4.	To learn building information modelling for building design.
5.	To learn the concepts of 3D printing.

Pre-requisites : General idea on engineering materials and building components.

Unit – I	**Contact Hours = 8 Hours**
Emerging Materials Honey comb structure (Carbon composites), Nano-materials, engineered polymers, emerging sustainable by products (Fly ash and GGBS) and construction chemicals, Shape memory alloys.	

Unit – II	**Contact Hours = 8 Hours**
Prefabricated/ Manufactured building components Definition, types of prefabricated/ manufactured building components and infrastructure, modular coordination, standardization, materials, systems, production, transportation and installation.	

Unit – III	**Contact Hours = 8 Hours**
Smart Materials Definition, Principles of Piezo-electricity, materials (Polymers and Ceramics), sensors (Piezo-electric sensor, strain gauge, shear sensor, in-plane and out of plane sensor, accelerometer), smart composites.	

Unit – IV	**Contact Hours = 8 Hours**
BIM and IBMS BIM: Definition, Necessity, advantages, BIM in building design, infrastructure design and construction IBMS – Definition, Necessity, advantages, Types of IBMS.	

Unit –V	**Contact Hours = 8 Hours**
3D Printing Importance, Historic development, advantages, common terminologies, classification, materials used in 3D printing, Process chain, 3D modelling, Data conversion and transmission, checking and preparation, Building, Post processing, Applications.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Donald R. Askeland and Pradeep P. Fulay, Essentials of Materials Science and Engineering, 2009, Cengage Learning.
2.	Dr. S. Sathish, Advances in Civil Engineering, 2019, AkiNik Publications.
3.	Ian Gibson, David Rosen and Brent Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2014, Springer Nature.
	Reference Books:
1.	by Ulrich Knaack, Sharon Chung-Klatte, Rein hard Hassel bach, Prefabricated Systems: Principles of Construction, Birkhauser Publisher.
	E-resources (NPTEL/SWAYAM... Any Other)- mention links
1.	YouTube Videos.

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	***Apply*** the knowledge of smart materials and other emerging materials to engineering requirements.	L3	1	1
2.	***Implement*** the knowledge of PFBC, BIM and IBIMS in architecture, engineering, and construction industry to generate better buildings and designs.	L3	1	1
3.	***Practice*** 3D modeling and 3D printing in manufacturing and building sectors.	L2	1	1

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓												✓		
3	✓												✓		
Tick mark the CO, PO and PSO mapping															

Green Buildings

Course Code	22ETC15B	Course type	ETC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	To study the green buildings towards sustainable development and its rating systems
2.	To study the energy efficiency of building constructions
3.	To study various materials used in construction of green buildings
4.	To study the indoor environmental quality of green buildings using various building codes.

Pre-requisites: Environmental Studies

Unit – I	Contact Hours = 8 Hours

Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime Pozzolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials- Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials.

Unit – II	Contact Hours = 8 Hours

Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre-engineered and ready to use building elements - wood products - steel and plastic

Unit – III	Contact Hours = 8 Hours

Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

Unit – IV	Contact Hours = 8 Hours

Green Building Rating Systems- BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures (Concepts only)

Unit – V	Contact Hours = 8 Hours
Utility of Solar Energy in Buildings Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. **Green Composites for Buildings** Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. UrbanEnvironment and Green Buildings.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	02	02	02	02	02

Books	
	Text Books:
1.	Mike Montoya, **"Green Building Fundamentals"**, Pearson, USA, 2010.
2.	GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
	Reference Books:
1.	IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2.	Non-Conventional Energy Resources by G. D. Rai, Khanna Publishers.
3.	K.S. Jagadish, B.V. Venkatarama Reddy and K.S. NanjundaRao, **"Alternative building materials and technologies"**
4.	Sustainable Building Design Manual, Vol.1 and 2, TERI, New Delhi 2004.
	E-resourses (NPTEL/SWAYAM, Any Other)- mention links
1.	https://www.youtube.com/watch?v=THgQF8zHBW8
2.	https://www.youtube.com/watch?v=DRO_rIkywxQ

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	**Identify** the different building materials for construction	**Un**	6,7	3
2.	**Apply** effective environmental friendly building technology in construction	**Un**	6,7	3
3.	**Understand** the effect of global warming	**Un**	6,7	3
4.	**Understand** the green buildings rating systems	**Un**	6,7	3
5.	**Use** alternate source of energy and effective use of water.	**Ap**	6,7	3

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						√	√								√
2						√	√								√
3						√	√								√
4						√	√								√
5						√	√								√

Introduction to Nano Technology

Course Code	**22ETC15C**	**Course type**	ETC	**Credits L-T-P**	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To provide a comprehensive overview of synthesis and characterization of nanoparticles, nanocomposites and hierarchical materials with nanoscale features.
2.	To provide the engineering students with necessary background for understanding various nanomaterials characterization techniques
3.	To develop an understanding of the basis of the choice of material for device applications
4.	To give an insight into complete systems where nanotechnology can be used to improve our everyday life

Pre-requisites : Basic science fundamentals

Unit – I: Introduction to Nanomaterials	**Contact Hours = 8 Hours**

Nanotechnology, Frontier of future-an overview, Length Scales, Variation of physical properties from bulk to thin films to nanomaterials, Confinement of electron in 0D, 1D, 2D and 3D systems, Surface to Volume Ratio, Synthesis of Nanomaterials: Bottom-Up approach: Chemical Routes for Synthesis of nanomaterials - Sol-gel, Precipitation, Solution Combustion synthesis, Hydrothermal, SILAR, Chemical Bath Deposition. Top-Down approach- Ball milling technique, Sputtering, Laser Ablation

Unit – II: Characterization of Nanomaterials	**Contact Hours = 8 Hours**

Basic principles and instrumentations of Electron Microscopy –Transmission Electron Microscope, Scanning Electron Microscope, Scanning Probes- Scanning Tunneling microscope, Atomic Force Microscope –different imaging modes, comparison of SEM and TEM, AFM and STM, AFM & SEM.
Basic principles of working of X-ray diffraction, derivation of Debye-Scherrer equation, numericals on Debye Scherrer equation, Optical Spectroscopy- Instrumentation and application of IR, UV/VIS (Band gap measurement)

Unit – III: Carbon Based Materials	**Contact Hours = 8 Hours**

Introduction, Synthesis, Properties (electrical, Electronic and Mechanical), and Applications of Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials: Carbon nanocomposites, nanofibres, nanodiscs, nanodiamonds.

Unit – IV: Nanotechnology in Energy storage and conversion	**Contact Hours = 8 Hours**

Solar cells: First generation, second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells.
Batteries: Nanotechnology in Lithium ion battery- working, Requirements of anodic and cathodic materials, classification based on ion storage mechanisms, limitations of graphite anodes, Advances in Cathodic materials, Anodic materials, Separators
Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes
Super capacitors: Introduction, construction and working of supercapacitor

Unit – V: Applications of Nanotechnology	Contact Hours = 8 Hours
Nanotech Applications and Recent Breakthroughs: Introduction, Significant Impact of Nanotechnology and Nanomaterial, Medicine and Healthcare Applications, Biological and Biochemical Applications (Nano biotechnology), Electronic Applications (Nano electronics), Computing Applications (Nano computers), Chemical Applications (Nano chemistry), Optical Applications (Nano photonics), Agriculture and Food Applications, Recent Major Breakthroughs in Nanotechnology. Nano coatings (Photocatalysts) and super hydrophobic coatings (Lotus effect)	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Books	
	Text Books:
1.	A.K. Bandyopadhyay, Nano Materials –/ New Age Publishers, 2008
2.	C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Nanocrystals: Synthesis, Properties and Applications – SpringerSeries in Materials Science, 2007
3.	T. Pradeep/TMH, Nano Essentials, Mc Graw Hill, 2007
4.	Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications. Cambridge UniversityPress, 2011
5.	M.A. Shah, K.A. Shah, "Nanotechnology: The Science of Small", Wiley India, 2013., (ISBN 13: 9788126538683)
	Reference Books:
1.	C. P. Poole and F. J. Owens, Introduction to Nanotechnology, Wiley, 2003
2.	Understanding Nanotechnology, Scientific American 2002
3.	M. Ratner and D. Ratner, Nanotechnology, Prentice Hall 2003
4.	M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, Nanotechnology, CRC Press Boca Raton 2002
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/118104008
2.	https://www.digimat.in/nptel/courses/video/118104008/L16.html
3.	https://archive.nptel.ac.in/courses/113/106/113106099/
4.	https://nptel.ac.in/courses/112107283
5.	https://onlinecourses.nptel.ac.in/noc22_me131/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Identify techniques used in synthesis and characterization of nanomaterials.	1	1	NA
2.	Demonstrate the synthesis, characterization and applications of nanomaterials in various fields.	2	1,9, 10, 12	NA
3.	Solve the numerical problems that are pertaining to nanotechnologies.	3	1	NA
4.	Analyze the different synthesis and characterization techniques of nanomaterials.	4	1	NA

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	√														
2	√								√	√		√			
3	√														
4	√														
Tick mark the CO, PO and PSO mapping															

INTRODUCTION TO SUSTAINABLE ENGINEERING

Course Code	**22ETC15D**	**Course type**	**ETC**	**Credits L-T-P**	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To familiarize the students to the area of sustainability and concepts of sustainability engineering
2.	To enable students with an understanding of principles and frame work of sustainable engineering
3.	To provide students with an understanding of Life Cycle Assessment tool in sustainable engineering
4.	To provide students with understanding of integration of sustainability with design.

Pre-requisites: Environmental Studies

Unit – I	**Contact Hours = 8 Hours**

Sustainable Development and Role of Engineers: Introduction, Why and What is Sustainable Development, THE SDFs, Paris Agreement and Role of Engineering, Sustainable Development and the Engineering Profession, Key attributes of the Graduate Engineering.

Sustainable Engineering Concepts: Key concepts – Factor 4 and Factor 10: Goals of sustainability, System Thinking, Life Cycle Thinking and Circular Economy

Unit – II	**Contact Hours = 8 Hours**

Sustainable Engineering and Concepts, Principles and Frame Work: Green Economy and Low Carbon Economy, Eco Efficiency, Triple bottom Line, Guiding principles of sustainable engineering, Frameworks for sustainable Engineering.

Tools for sustainability Assessment: Environmental Management System, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental

Unit – III	**Contact Hours = 8 Hours**

Fundamentals of Life Cycle Assessment

Why and What is LCA, LCA Goal and Scope, Life cycle inventory, Life Cycle Impact Assessment, Interpretation and presentation of Results, Iterative Nature of LCA, Methodological Choices, LCI Databases and LCA Softwares, Strength and Limitations of LCA.

Unit – IV	**Contact Hours = 8 Hours**

Environmental Life Cycle Costing, Social Life Cycle Assessment, and Life Cycle Sustainability Assessment: Introduction, Environmental Life Cycle Costing, Social Life Cycle Assessment, Life Cycle Sustainability, LCA Applications in Engineering: Environmental Product Declarations and Product Category Rules, Carbon and Water Foot Printing, Energy systems, Buildings and the Built Environment**,** Chemical and Chemical Production Food and Agriculture

Introduction to Environmental Economics: Introduction – What Is Environmental Economics?, Valuing the Environment, Market-based Incentives (or Economic Instruments) for

Sustainability, Command-and-Control versus Economic Instruments, A Simple Model of Pollution Control

Unit – V	**Contact Hours = 8 Hours**
Integrating Sustainability in Engineering Design: Problems Solving in Engineering, conventional to Sustainable Engineering Design Process, Design for Life Guidelines and Strategies, Measuring Sustainability, Sustainable Design through sustainable procurement criteria, Case studies on sustainable Engineering Design Process – Sustainable Process Design, Sustainable Production Design Sustainable product design in Electronic Engineering	

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**02**	**02**	**02**	**02**	**02**

Flipped Classroom Details

Books	
	Text Books:
1.	Toolseeram Ramjeawon,**" Introduction to Sustainability for Engineers"**, CRC Press, 1st Edn., 2020
2.	**"Sustainability Engineering: Concepts, Design and Case studies"**, Prentice Hall, 1st Edn, 2015
	Reference Books:
1.	Ni bin Chang, **"System Analysis for sustainable Engineering: Theory and applications"**, McGraw Hill Publications,1st Edn., 2010
2.	**"Engineering for Sustainable development: Delivery a sustainable development goals"**, UNESCO, International Centre for Engineering Education, France, 1st Edn., 2021
3	Rag. R.L. and Ramesh Lakshmi Dinachandran, **"Introduction to Sustainable Engineering"**, PHI Learning Pvt. Ltd., 2nd Edn, 2016
	E-resourses (NPTEL/SWAYAM, Any Other)- mention links
1.	https://nptel.ac.in/courses/127105018
2.	https:/https://nptel.ac.in/courses/107103081/www.macfound.org

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs) **Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Elucidate the basics of sustainable development, sustainable engineering and its role in engineering	2	1,6,7	3

2.	Application of Sustainable Engineering Concepts and Principles in Engineering	2	1,6,7	3
3.	Apply the Principle, and methodology of Life Cycle Assessment Tool to engineering systems	2	1,6,7	3
4.	Understand integration methods of sustainability to Engineering Design	2	1,6,7	3

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
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-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						√	√								√
2						√	√								√
3						√	√								√
4						√	√								√

RENEWABLE ENERGY SOURCES

Course Code	**22ETC15E**	**Course type**	ETC	**Credits L-T-P**	3 – 0- 0
Hours/week: L-T-P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	50
Flipped Classes content	05 Hours			**SEE Marks**	50

Course learning objectives	
1.	To understand energy scenario and their utilizations.
2.	To explore society's present needs and future energy demands.
3.	To study the principles of renewable energy conversion systems.
4.	To exposed to energy conversion methods.
5.	To exposed to Green Energy concepts.

Pre-requisites : General idea on Renewable energy sources.

Unit – I	**Contact Hours = 8 Hours**

Introduction :

Principles of renewable energy; energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, oil shale. Introduction to Internet of energy (IOE).

Unit – II	**Contact Hours = 8 Hours**

Solar Energy : Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. Solar Thermal systems: Flat plate collector; Solar distillation; Solar pond electric power plant.

Solar electric power generation- Principle of Solar cell, Photovoltaic system for electric power generation, advantages, disadvantages and applications of solar photovoltaic system.

Unit – III	**Contact Hours = 8 Hours**

Wind Energy : Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Basic components of wind energy conversion system (WECS) ; Classification of WECS- Horizontal axis- single, double and multi -blade system. Vertical axis- Savonius and Darrieus types.

Biomass Energy: Introduction; Photosynthesis Process; Bio fuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft) .

Unit – IV	**Contact Hours = 8 Hours**

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages anal limitations.

Ocean Thermal Energy Conversion: Principle of working, OTEC power stations in the world, problems associated with OTEC.

Unit –V	Contact Hours = 8 Hours
Green Energy :-Introduction, Fuel Cells, Classification of fuel cells—H_2 ; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem dissociated with hydrogen energy.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition.
2.	Energy Technology, S.Rao and Dr. B.B. Parulekar, Khanna Publication. Solar energy, Subhas P Sukhatme, Tata Mc Graw Hill, 2"Edition, 1996.
3.	
	Reference Books:
1.	Principles of Energy conversation, A. W. Culp J.r.,, McGraw Hill, 1996
2.	Non-(“Convention Energy Resources. Shobh. Nath Singh, Pearson. 2016
	E-resources (NPTEL/SWAYAM... Any Other)- mention links
1.	YouTube Videos.
2.	Web links and Video Lectures (e-Resources) :
3.	Web links and Video Lectures (e-Resources) :
1. 2. 3.	E-bookURL:https://www.pdfdrive.com/non-conventional-enerey-systems-nptel-d17376903.html E-book URL: https://www.pdfdrive.com/renewable-energy-sources-and-their-applications-e33423592.html E-bookURL:https://www.pdtdrive.corn/lecture-notes-on-renewable-energy-sources-e3433914°9.html

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	***Apply*** the knowledge of smart materials and other emerging materials to engineering requirements.	L3	1	1
2.	***Implement*** the knowledge of PFBC, BIM and IBIMS in architecture, engineering, and construction industry to generate better buildings and designs.	L3	1	1

3.	***Practice*** 3D modeling and 3D printing in manufacturing and building sectors.	L2	1	1

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive
-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓												✓		
3	✓												✓		
Tick mark the CO, PO and PSO mapping															

INTRODUCTION TO COMMUNICATION SYSTEMS

Course Code	**22ETC15F**	**Course type**		**Credits L-T-P**	3 – 0 – 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To know the basics of Analog and Pulse Modulation Techniques
2.	To know the Principles of Basic RF Digital Modulation Techniques.
3.	To understand the working Principle of Transmitters and Receivers used in Communication
4.	To know the current applications and standards used Digital Communication.

Pre-requisites: Pre-university Mathematics and Physics.

Unit – I	**Contact Hours = 8 Hours**
Introduction to Analog communication systems, General Block diagram of Communication System , difference between wired and wireless communication. Analog Modulation its need and types definition of AM, FM, PM Applications of Each.	

Unit – II	**Contact Hours = 8 Hours**
Introduction to sampling Theorem, Block Diagram of Digital Communication System. Basic RF Digital modulation techniques ASK, FSK, PSK (Block Diagram Representation). Definition of MODEM. Advantages of Digital Communication over Analog Communication.	

Unit – III	**Contact Hours = 8 Hours**
Trans receiver used in communication system, Block diagram of Analog Transmitters(AM and FM) What is Heterodyning in communication, Its advantages, Block diagram of Analog Superheterodyne Receivers (AM and FM). Definition of RADAR and its applications.	

Unit – IV	**Contact Hours = 8 Hours**
Cellular Communication, Radio communications: satellite communication, microwave communication, wireless communication and television broadcasting. Communication channels: coaxial cable, twisted pair cable, optical fibre.	

Unit – V	**Contact Hours = 8 Hours**
Wired and Wireless Communication – Standards and protocols of wired - ethernet, SPI, I2C, UART, CAN (block diagram approach) and wireless communication–Bluetooth, WLAN, Zigbee, NFC, Wave (vehicular communication) (block diagram approach), 4G, 5G.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Books	
	Text Books:
1.	George Kennedy, Bernard Davis, SRM Prasanna "Electronic Communication System " ,Tata-McGraw Hill, 5th Edition, 2009 onwards.
2.	B Sklar, "Digital Communication Fundamentals and Applications ", 2nd Edition Pearson Education , 2009 and onwards.
3.	
	Reference Books:
1.	Simon Haykin, " Digital Communication", John Wiley, 2005 and onwards
2.	
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	
2.	

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Appraise the fundamental concepts, principles, theories, and terminology used in the Radio communication systems.	2	1,2,8,10	
2.	Collaborate effectively within professional teams and interdisciplinary contexts.	2	1,2,8,10	
3.	Apply effective oral, written and visual communication skills to present a coherent and sustained argument to the public in a specialist area.	2	1,2,8,10	
4.	Keep pace with the technological advancements in the relevant course, to write good technical paper and participate in the paper presentation competitions.	2	1,2,8,10	

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓						✓		✓					
2	✓	✓						✓		✓					
3	✓	✓						✓		✓					
4	✓	✓						✓		✓					
Tick mark the CO, PO and PSO mapping															

Introduction to Internet of Things (IoT)

Course Code	22ETC15G	Course type	ETC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	Understand the fundamentals of Internet of Things (IoT) and its building blocks along with their characteristics to solve the real world problems.
2.	Understand the recent application of IoT in everyday life
3.	Gain insights about the current trends of Associated IoT Technologies and IoT Analytics

Pre-requisites : Basics of Computer Networking

Unit – I	Contact Hours = 8 Hours
Basics of Networking: Introduction, Network Types, Layered network models Emergence of IoT: Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components Textbook 1: Chapter 1- 1.1 to 1.3 Chapter 4 – 4.1 to 4.4	

Unit – II	Contact Hours = 8 Hours
IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. Textbook 1: Chapter 5 – 5.1 to 5.9	

Unit – III	Contact Hours = 8 Hours
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading. Textbook 1: Chapter 6 – 6.1 to 6.5	

Unit – IV	Contact Hours = 8 Hours
ASSOCIATED IOT TECHNOLOGIES Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service. IoT CASE STUDIES Agricultural IoT – Introduction and Case Studies Textbook 1: Chapter 10– 10.1 to 10.6; Chapter 12- 12.1-12.2	

Unit – V	Contact Hours = 8 Hours
IoT CASE STUDIES AND FUTURE TRENDS : Vehicular IoT – Introduction, Healthcare IoT – Introduction, Case Studies IoT Analytics – Introduction Textbook 1: Chapter 13– 13.1; Chapter 14- 14.1-14.2; Chapter 17- 17.1	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Books	
	Text Books:
1.	Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
	Reference Books:
1.	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
2.	S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Describe the evolution of IoT, IoT networking components, and addressing strategies in IoT.	Re	PO2	PSO1
2.	Classify various sensing devices and actuator types	Un	PO2,PO6	PSO1,PSO2
3.	Demonstrate the processing in IoT	Ap	PO4	PSO2
4.	Explain Associated IoT Technologies	Re	PO1,PO2	PSO2
5.	Illustrate architecture of IOT Applications	Un	PO1,PO2,PO6	PSO1,PSO2

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1		√											√		
2		√				√							√	√	
3				√										√	
4	√	√												√	
5	√	√				√								√	
Tick mark the CO, PO and PSO mapping															

Introduction to Cyber Security

Course Code	22ETC15H	Course type	Theory	Total credits	3
Hours/week: L-T-P	3-0-0			CIE Marks	100
Total Contact Hours	L = 40Hrs; T = 0 Hrs; P = 0 Hrs Total = 40Hrs			SEE Marks	100
Flipped Classes content	10 Hours				

Course learning objectives	
1.	To understanding cybercrime, offences and botnets terminologies and perspectives.
2.	To realize phishing and computer forensics.
3.	To gain knowledge on tools and methods used in cybercrimes.

Required Knowledge of: Basics knowledge of Networking

Unit – I	Contact Hours = 8 Hours
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime, and Information Security, who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws, Global Perspectives. **Textbook:1 Chapter 1 (1.1 to 1.5, 1.7-1.9)**	

Unit – II	Contact Hours = 8 Hours
Cyber Offenses: How Criminals Plan Them: Introduction, how criminals plan the attacks, Social Engineering, Cyber Stalking, Cyber-caafe & cybercrimes. Botnets: The fuel for cybercrime, Attack Vector. **Textbook:1 Chapter 2 (2.1 to 2.7)**	

Unit – III	Contact Hours = 8 Hours
Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks. **Textbook:1 Chapter 4 (4.1 to 4.9, 4.12)**	

Unit – IV	Contact Hours = 8 Hours
Phishing and Identity Theft: Introduction, methods of phishing, phishing, phising techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft. **Textbook:1 Chapter 5 (5.1. to 5.3)**	

Unit –V	Contact Hours = 8 Hours
Understanding Computer Forensics: Introduction, Historical Background of Cyberforensics, Digital Foresics Science, Need for Computer Foresics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics. **Textbook:1 Chapter 7 (7.1. to 7.5, 7.7 to 7.9)**	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Unit No.	Self-Study Topics
1	Cyber Security a Business Trip
2	A Construction Company Gets Hammered by A Keylogger
3	Stolen Hospital Laptop Causes Heartburn
4	Hotel CEO Finds Unwelcome Guests in Email Account
5	A Dark Web of Issues for A Small Government Contractor

Books	
	Textbooks:
1.	Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year) 1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018).

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Virtual Labs (if present)	4.	Semester End Examination

Course Outcome (COs)
Learning Levels:
Re - Remember; Un - Understand; Ap – Apply: An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
CO1	To understand phishing and computer forensics.	L2	PO1, PO2, PO4, PO5, PO7, PO8, PO9, PO10, PO12	PSO1, PSO2, PSO3
CO2	To realize phishing and computer forensics.	L3	PO1, PO3	PSO1
CO3	To gain knowledge on tools and methods used in cybercrimes.	L3, L4	PO1, PO2, PO5, PO6	PSO1, PSO2

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive -Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.
Eligibility for SEE: **-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.** **-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													**CO-PSO Mapping(planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓		✓										✓		
2	✓	✓			✓	✓							✓	✓	
3	✓	✓		✓	✓		✓	✓	✓	✓		✓	✓	✓	✓
Tick marks the CO, PO and PSO mapping															

Introduction to Solar technology

Course Code	22ETC15I	Course type	ETC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To understand the basics of solar energy systems and their advantages
2.	To understand the principals and design of solar PV systems
3.	To study the principals and design of solar thermal systems
4.	To understand the principal and working of various batteries used in solar PV systems.

Pre-requisites : BasicPhysics

Unit – I	Contact Hours = 8 Hours
Solar energy basics: Introduction, solar constant, basic sun-earth angles – definitions and their representation, solar radiation geometry (numerical problems), estimation of solar radiation of horizontal and tilted surfaces (numerical problems); measurement of solar radiation data – Pyranometer and Pyrheliometer.	

Unit – II	Contact Hours = 8 Hours
Solar electric systems: Solar thermal electric power generation – solar pond and concentrating solar collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and disadvantages.	

Unit – III	Contact Hours = 8 Hours
Solar PV Systems: Solar cell fundamentals, characteristics, classification, construction of module, panel and array, stand-alone and grid connected; Applications – Street lighting, domestic lighting and solar water pumping systems, case study.	

Unit – IV	Contact Hours = 8 Hours
Solar Thermal systems: Principle of conversion of solar radiation into heat, solar water heaters (Flat Plate Collectors), solar cookers – Box type, concentrating dish type, solar driers, solar still, solar furnaces, solar green houses, case study.	

Unit – V	Contact Hours = 8 Hours
Applications of batteries in solar PV system: Types of wires, choice of wires, wire sizing, Types of batteries,Series connection and parallel connection of batteries, estimation of energy storage, battery fault detection, and battery maintenance.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
Text Books:	
1.	Chetan Singh Solanki, "Solar Photovoltaic Technology and Systems", PHI
2.	Khan B. H., **"Non-Conventional Energy Resources",**TMH, New Delhi, 2006.
Reference Books:	
1.	S P Sukhatme and J K Nayak.,**" Solar Energy", Third Edition,**TMH, 2005
2.	G.D. Rai,**"Non-Conventional Sources of Energy",** 4th Edition, Khanna Publishers, New Delhi, 2007.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/117108141
2.	https://www.edx.org/course/delftx-solar-energy

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
		4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	To understand the conceptual knowledge of the technology related to solar PV and thermal systems and batteries	Un	1,6,7,9,12	1
2.	To explain various components used in solar PV and thermal systems.	Un	1,7,9,12	1,2
3.	To explain the various types of batteries used in solar PV systems.	Un	1,7,9,12	1
4.	To design and analyze of solar PV systems.	An	1,3,7,9,11,12	1

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive -Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.
Eligibility for SEE: **-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.** **-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**			
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
1	✓					✓	✓		✓			✓	✓			
2	✓						✓		✓			✓	✓	✓		
3	✓						✓		✓			✓	✓			
4	✓		✓				✓		✓		✓	✓	✓			
Tick mark the CO, PO and PSO mapping																

Introduction to Electric Vehicles

Course Code	22ETC15J	Course type	ETC	Credits L-T-P	3 – 0- 0
Hours/week: L-T-P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To understand the overview of electric vehicles in India & comparison between conventional IC engine and EV.
2.	To understand fundamentals of electric vehicle.
3.	To study the EV architecture and configuration
4.	To understand the battery system for EV.
5.	To study the BMS and types of EV charging station(schemes)

Pre-requisites : Basic Physics

Unit – I	Contact Hours = 8 Hours
Introduction: EV history, overview of electric vehicles in India, EV advantages, EV market, importance of different transportation development strategies to future oil supply, comparison between conventional vehicle & electric vehicle, EV system, types of electric vehicle.	

Unit – II	Contact Hours = 8 Hours
Motors & Characteristics: Transmission methods (arrangements), types of motors used in EV, speed transfer characteristics, torque transfer characteristics, power, and energy requirements.	

Unit – III	Contact Hours = 8 Hours
EV Architectures and Configurations: Architectural structures and configurations, The major EV subsystems – drives, inverters, batteries and energy storage, chargers, sensors and controls, regenerative breaking.	

Unit – IV	Contact Hours = 8 Hours
Storage for EV: Types of batteries, parameters of battery-voltage rating, Ah rating, cut off voltage, max charge voltage, open circuit voltage, terminal voltage, C-Rating, Specific Energy , Specific Power, selection of battery for EV(energy density, size & weight, terminal voltage, mechanical withstanding, temperature, maintenance, safe).	

Unit –V	Contact Hours = 8 Hours
BMS & Charging stations: Battery management system, controller, SOC, DOD, SOH, Cell Balancing, Cell Safety, types of EV charging schemes, construction, features, impact of EV.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Electric Vehicle Technology Explained,James Larminie, John Lowry, 2nd Edition, wiley publication ISBN: 978-1-119-94273-3, September 2012.
2.	Electric Vehicle Engineering, Per Enge, Nick Enge, Stephen Zoepf, McGraw Hill , 1st Edition 2021
	Reference Books
1.	Electric Vehicle Technology,Prof. Suresh Pawar, Notion Press, September 2021.
2.	ELECTRIC and HYBRID VEHICLES Design Fundamentals, Iqbal Husain, CRC PRESS, Boca Raton London New York Washington, D.C.
	NPTEL sources
1.	https://nptel.ac.in/courses/108106170
2.	https://nptel.ac.in/courses/108102121

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Compare conventional and electric vehicles and Analyze the need of EV in transportation industry highlighting impact on global & environment.	An	1,7,12	1
2.	Explain the EV architecture and compare different types of motors for EV applications	Un	1,12	2
3.	Explain the BMS and different EV charging scheme	Un	1,2,12	1
4.	Select the suitable battery system for EV	Ap	1,7,12	1,3

Scheme of Continuous Internal Evaluation (CIE) for Theory course

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**			
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
1	✓						✓					✓	✓			
2	✓											✓		✓		
3	✓	✓										✓	✓			
4	✓						✓					✓	✓		✓	
Tick mark the CO, PO and PSO mapping																

Programming Language Courses (PLC)

INTRODUCTION TO WEB PROGRAMMING

Course Code	22PLC25A	**Course type**	**Integrated**	**Credits L-T-P**	2 – 0 - 1
Hours/week: L - T- P	2 – 0 – 2			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P =20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To use the syntax and semantics of HTML and XHTML
2.	To develop different parts of a web page
3.	To understand how CSS can enhance the design of a webpage.
4.	To create and apply CSS styling to a webpage
5.	To get familiarity with the JavaScript language and understand Document Object Model handling of Java Script

Pre-requisites :

Unit – I: Traditional HTML and XHTML:	**Contact Hours = 6 Hours**
First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths? TextBook1: Chapter 1	

Unit – II: HTML5:	**Contact Hours = 6 Hours**
Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with , HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications TextBook1: Chapter 2	

Unit – III: Cascading Style Sheets (CSS)	**Contact Hours = 6 Hours**
Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case Study: Description of a Small City's Core Area. TextBook2-: Chapter 3	

Unit – IV : Tables and CSS, Links and Images	Contact Hours = 6 Hours
Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural PseudoClass Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element . TextBook2: 5.2 to 5.8, 6.2, 6.3, 6.6., 6.7, 6.9, 6.10, 6.12, 7.2 to 7.4	

Unit – V Introduction to JavaScript:	Contact Hours = 6 Hours
Functions, DOM, Forms, and Event Handlers History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Accessing a Form's Control Values, reset and focus Methods TextBook2: 8.2 to 8,13, 8.15, 8.16	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Books	
	Text Books:
1.	HTML & CSS: The Complete Reference Thomas A. Powell, , Fifth Edition, Tata McGraw Hill,
2.	WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	Explain the historical context and justification for HTML over XHTML	2	1,2	1
2.	Develop HTML5 documents and adding various semantic markup tags and analyzing the attributes, values and types of CSS	5,6	1,2,3,4,9,10	1,2,3
3	Implement core constructs and event handling mechanisms of JavaScript.	3	1,2,3,5,9,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be $\geq$ 35% &, however overall score of CIE + SEE should be $\geq$ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓											✓		
2	✓	✓	✓	✓					✓	✓			✓	✓	✓
3	✓	✓	✓		✓				✓	✓		✓	✓	✓	✓
Tick mark the CO, PO and PSO mapping															

Lab Termworks

1. Create an XHTML page using tags to accomplish the following:
   (i) A paragraph containing text "All that glitters is not gold". Bold face and italicize this text
   (ii) Create equation:
   $$x = 1/3(y_1^2 + z_1^2$$
   (iii) Put a background image to a page and demonstrate all attributes of background image

Create unordered list of 5 fruits and ordered list of 3 flowers

2. Create following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary

<table>
<tr><td rowspan="9">Department</td><td rowspan="3">Sem1</td><td>SubjectA</td></tr>
<tr><td>SubjectB</td></tr>
<tr><td>SubjectC</td></tr>
<tr><td rowspan="3">Sem2</td><td>SubjectE</td></tr>
<tr><td>SubjectF</td></tr>
<tr><td>SubjectG</td></tr>
<tr><td rowspan="3">Sem3</td><td>SubjectH</td></tr>
<tr><td>SubjectI</td></tr>
<tr><td>SubjectJ</td></tr>
</table>

3. Use HTML5 for performing following tasks:
   (i) Draw a square using HTML5 SVG , fill the square with green color and make 6px brownstroke width
   (ii) Write the following mathematical expression by using HTML5 MathML.d=x^2-y^2
   (iii) Redirecting current page to another page after 5 seconds using HTML5 meta tag
4. Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>,<figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives informationabout travel experience.

5. Create a class called **income**, and make it a background color of #0ff. Create a class called **expenses**, and make it a background color of #f0f. Create a class called **profit**, and make it a background color of #f00. Throughout the document, any text that mentions income, expenses, or profit, attach theappropriate class to that piece of text. Further create following line of text in the same document:

   ~~The current price is 50₹~~ and new price is 40₹

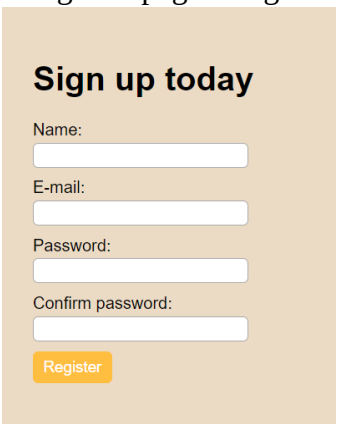
6. Change the tag **li** to have the following properties:
   - A display status of inline
   - A medium, double-lined, black border
   - No list style type

   Add the following properties to the style for **li**:

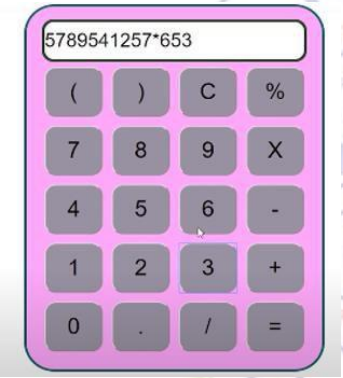
- Margin of 5px
- Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px tothe left

Also demonstrate list style type with user defined image logos

7. Create following web page using HTML and CSS with tabular layout



8. Create following calculator interface with HTML and CSS



9. Create following calculator interface with HTML and CSS.
10. Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay
11. Create a webpage containing 3 overlapping images using HTML, CSS and JS. Further when the mouse is over any image, it should be on the top and fully displayed

INTRODUCTION TO PYTHON PROGRAMMING

Course Code	**22PLC25B**	**Course type**		**Credits L-T-P**	2 - 0 - 1
Hours/week: L - T- P	2 - 0 - 2			**Total credits**	3
Total Contact Hours	L = 30 Hrs.; T = 0 Hrs.; P = 20 Hrs. Total = 50 Hrs.			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the basics of algorithmic and flow chart for problem solving.
2.	To learn to solve problems using Python basics of Data expression and Statements
3.	To learn to solve problems using Python conditionals, loops and functions
4.	To use Python data structures – lists, tuples, dictionaries, strings to represent complex data

Unit – I	**Contact Hours = 6 Hours**
Introduction to Programming: Meaning of problem solving, Definition of programming, Software bug, Programming errors, Natural language v/s Formal language, Programming Paradigm, interpreted v/s compiled, typed v/s type-less programming language. Algorithms: Definition, characteristics, building blocks of Algorithms, Pseudo-code, flowcharts, Algorithmic problem solving, Simple strategies for developing algorithms, Examples, Introduction to Python: History, Salient features, Working with IDLE.	

Unit – II	**Contact Hours = 6 Hours**
Basics of Python programming: Keywords, Variables, Data types, Literals, Operators Input and output statements in python; String formatting options.	

Unit – III	**Contact Hours = 6 Hours**
Decision making: if statement syntax, simple Programs (including algorithm and flow chart) If-else syntax, flow chart, simple Programs (including algorithm and flow chart) If-elif-else, syntax, flowchart, simple Programs (including algorithm and flow chart) Iteration: state, while loop: syntax, flowchart, simple Programs (including algorithm and flow chart) for loop: syntax, flow chart. simple Programs (including algorithm and flow chart).	

Unit – IV	**Contact Hours = 6 Hours**
Introductions to user-defined functions, syntax, simple programs on functions; Working with strings and simple programs; Working with Lists and simple programs.	

Unit – V	**Contact Hours = 6 Hours**
Working with Tuples and simple programs. Working with Dictionaries and simple programs.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	**2**	Write algorithms and explore Flowgorithm tool to draw flowcharts for given programs.
2	**3**	1)Operators 2)Input and output statements in python 3)String formatting options
3	**4**	1) Decision making (if, if-else) 2) Iterating(looping) (for, while)
4	**3**	1)Lists 2)Tuples 3)Dictionary
5	**2**	1)Strings 2)Functions

Unit No.	Self-Study Topics
1.	Simple strategies for developing algorithms.
2.	Python code using modules
5.	Python File handling

Books	
	Text Books:
1.	Al Sweigart, **"Automate the Boring Stuff with Python",** 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)
2.	S.A. Kulkarni, "Problem solving and python programming", 2nd edition Yesdee publishing pvt. Ltd. 2019
	Reference Books:
1.	Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition, Green Tea Press, 2015.
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2.	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Understand the problem solving through writing algorithms and flowcharts for given problems.	Un	1,3,5,10,12	1
2.	Explain basic principles of Python programming and Apply them to write programs using the procedure oriented programming paradigm.	Un,Ap	1,2,3,5,9,10,12	1,2,3
3.	Explain the basic data structures of python and apply them suitably for given programs.	Un,Ap	1,2,3,5,9,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**

2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✔		✔		✔					✔		✔	✔		
2	✔	✔	✔		✔				✔	✔		✔	✔	✔	✔
3	✔	✔	✔		✔				✔	✔		✔	✔	✔	✔
Tick mark the CO, PO and PSO mapping															

BASICS OF JAVA PROGRAMMING

Course Code	**22PLC25C**	**Course type**	Integrated	**Credits L-T-P**	2 – 0 - 1
Hours/week: L - T- P	2-0-2			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the fundamentals of object-oriented programming in Java.
2.	To demonstrate the object-oriented features such as encapsulation, inheritance and polymorphism to design and develop programs in Java.
3.	To understand exception handling mechanism and the concept of Packages and Interfaces in Java.
4.	To learn setting up Java JDK environment to create, debug and run simple Java programs.

Pre-requisites : Procedure Oriented Programming Languages

Unit – I	**Contact Hours = 6 Hours**
An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings Text book 1: Ch 2, Ch 3	

Unit – II	**Contact Hours = 6 Hours**
Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java‟s Selection Statements, Iteration Statements, Jump Statements. Text book 1: Ch 4, Ch	

Unit – III	**Contact Hours = 6 Hours**
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited Text book 1: Ch 6, Ch 7 (7.1-7.9)	

Unit – IV	**Contact Hours = 6 Hours**
Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class. Text book 1: Ch 8	

Unit – V	Contact Hours = 6 Hours
Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces. Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java‟s Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions. Text book 1: Ch 9, Ch 1	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	2	2-dimensional array.
		String handling.
2	2	Control /Selection Statements.
		Iteration Statements
3	2	Class and its Parameterized Methods and Constructors.
		Method Overloading.
4	2	Inheritance.
		Method overriding
5	2	Packages and interfaces.
		Exception handling

Books	
	Text Books:
1.	Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007 onwards
2.	E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
	Reference Books:
1.	Kathy Sierra & Bert Bates, “Head First Java”, O’Reilly, 2nd Edition and onwards.
2.	Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
	E-resourses (NPTEL/SWAYAM. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview
2.	https://www.w3schools.com/java
3.	https://freecodecamp.org
4.	https://www.tutorialspoint.com/java8
5.	https://www.javatpoint.com

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** classes, objects, members of a class and relationships among them needed for a specific problem.	Un	1,2,3,9,10,12	1,3
2.	**Apply** OOP principles (encapsulation, inheritance, polymorphism etc.) and proper program structure to write application programs.	Ap	1,2,3,5,9,10,12	1,2,3
3.	**Develop** skills in writing programs using exception handling techniques.	Ap	1,2,3,5,9,10,12	1,2,3
4.	**Experiment with** the concept of packages and interfaces.	Ap	1,3,9,10,12	1,3

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													CO-PSO Mapping(planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**
1	√	√	√						√	√		√	√		√
2	√	√	√		√				√	√		√	√	√	√
3	√	√	√		√				√	√		√	√	√	√
4	√		√						√	√		√	√		√
5	√		√						√	√		√	√		√
Tick mark the CO, PO and PSO mapping															

INTRODUCTION TO C++ PROGRAMMING

Course Code	22PLC25D	Course type	PLC	Credits L-T-P	2 - 0 – 1
Hours/week: L - T- P	2 - 0 – 2			Total credits	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	To Understanding Object-Oriented Programming concepts.
2.	To Understand importance of inline and virtual functions.
3.	To study about constructor, destructor and its usage.
4.	To study importance of inheritance, polymorphism in C++.
5	To gain knowledge about exception handling in C++.

Required Knowledge of: C programming

Unit – I	Contact Hours = 6 Hours
Introduction to Object Oriented Programming: Computer programming background, C++ overview, what is an object, Classes and methods, abstraction, encapsulation, inheritance and polymorphism., first C++program, C++ syntax, Tokens, Keywords, Identifiers, constants and Operators in C++, Scope resolution operator, Expressions and their types, Special assignment expressions.	

Unit – II	Contact Hours = 6 Hours
Functions in C++: – Functions, Inline function, function overloading, friend and virtual functions, specifying a class, C++ program with a class, arrays within a class, Constructors, Multiple constructors in a class, Copy constructor, Dynamic constructor, Destructors.	

Unit – III	Contact Hours = 6 Hours
Inheritance: Derived Classes, Single inheritance, multiple inheritance, Hierarchical, Inheritance, Hybrid Inheritance, Pointers to objects and derived classes, this pointer.	

Unit – IV	Contact Hours = 6 Hours
Polymorphism: Polymorphism, Types of polymorphism, Function overloading, defining operator overloading, Overloading Unary and binary operators, Virtual and pure virtual functions.	

Unit – V	Contact Hours = 6 Hours
Exception Handling: Introduction to Exception, Benefits of Exception handling, Try and catch block, Throw statement, pre-defined exceptions in C++.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

No. of Experiments	Topic(s) related to Experiment
1	Write a C++ program to sort the elements in ascending and descending order.
2	Write a C++ program to find the sum of all the natural numbers from 1 to n.
3	Write a C++ program to swap 2 values by writing a function that uses call by reference technique.
4	Write a C++ program to demonstrate function overloading for the following prototypes. add(int a, int b) add(double a, double b)
5	Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.
6	Suppose we have three classes Vehicle, FourWheeler, and Car. The class Vehicle is the base class, the class FourWheeler is derived from it and the class Car is derived from the class FourWheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class FourWheeler has a method 'fourWheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods. So, if we invoke the methods in this order, car(), fourWheeler(), and vehicle(), then the output will be: I am a car I have four wheels I am a vehicle Write a C++ program to demonstrate multilevel inheritance using this.
7	Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.
8	Write a C++ program function which handles array of bounds exception using C++.

Unit No.	Self-Study Topics
1	Escape Sequence in C++
2	Inline functions and Macros
3	Ambiguity in multiple inheritance
4	Run time polymorphism
5	Exceptions in Constructors and Destructors

Books	
	Text Books:
1.	Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
2.	Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.
	Weblinks and Video Lectures (e-Resources):
3.	1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA 2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw
	Tutorial Link:
4.	1. https://www.w3schools.com/cpp/cpp_intro.asp 2. https://www.edx.org/course/introduction-to-c-3

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	Explain the basic concepts of Object-Oriented programming	Re, Un	1,5	1
2.	Appreciate the use the functions for modularity	Un, Ap	1,2,5	2
3.	Implement the concepts of Object oriented programming such as polymorphism, Inheritance	Un, Ap	1,2,3,4, 5	1,2
4.	Implement and Appreciate the purpose of Exception Handling	Un, Ap	1,2,3,4, 5	1,2

Scheme of Continuous Internal Evaluation (CIE) for Integrated course

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab: 1. Conducting the experiment and journal: 5 marks 2. Calculations, results, graph, conclusion and Outcome: 5 marks
Lab test: (Batchwise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph and conclusion: 15 marks 5. Viva voce: 10 marks
Eligibility for SEE: 1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE** 2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.** 3. Lab test is COMPULSORY 4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.** 5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: Score should be ≥ 35% &, however overall score of CIE + SEE should be ≥ 40%.**
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓				✓								✓		
2	✓	✓			✓									✓	
3	✓	✓	✓	✓	✓								✓	✓	
4	✓	✓	✓	✓	✓								✓	✓	
Tick mark the CO, PO and PSO mapping															

Communicative and Professional Writing Skills in English

Communicative English

Course Code	**22ENG16**	**Course type**	Theory	**Credits L-T-P**	1- 0 - 0
Hours/week: L - T- P	1 – 0 – 0			**Total credits**	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs			**CIE Marks**	50
Flipped Classes content	3 Hours			**SEE Marks**	50

Course learning objectives	
1.	Comprehend the Fundamentals of Communicative English
2.	Identify the Nuances of Phonetics, Intonations, and Stress, to Enhance Pronunciation Skills for Better Communication Skills.
3.	Impart Basic English Grammar and English Vocabulary to Develop Language Proficiency for Effective Communication.
4.	Adopt the Techniques of Information Transfer through the presentation.

Pre-requisites: Conversant [familiar] with rudimentary English Grammar.
▪ Ability to understand spoken English or to speak, read, and write/frame simple and grammatically correct sentences in English.

Unit	**Introduction to Communicative English**	**Contact Hours = 3 Hours**
Content of the Unit: Communicative English fundamentals and Importance, Process of Communicative English, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.		

Unit – II	**Introduction to Phonetics**	**Contact Hours = 3 Hours**
Content of the Unit: Phonetic Transcription, Pronunciation Guidelines to consonants & vowels, Syllables, Stress and Intonation, Silent Letters, [Spelling Rules] and Words often Misspelt.		

Unit – III Basic English Communicative Grammar and Vocabulary PART - I	**Contact Hours = 3 Hours**
Content of the Unit: Parts of Speech, Articles. Question Tags, One Word Substitutes, Strong and Weak forms of words,Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.	

Unit – IV Basic English Communicative Grammar and Vocabulary PART - II	**Contact Hours = 3 Hours**
Content of the Unit: Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Types of tenses and Exercises on it.	

Unit – V	**Skills for Employment**	**Contact Hours = 3 Hours**
Content of the Unit: Oral Presentation and its Practice-Difference between extempore/Public Speaking. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises.		

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	**	**	**1 class**	**1 class**	**1 class**

Books	
	Text Books:
1.	**Communication Skills** by Sanjay Kumar & Pushpa Lata, Oxford University Press India Pvt Ltd - 2019.
2.	**A Textbook of English Language Communication Skills** (ISBN-978-81-955465-2-7), Published by InfiniteLearning Solutions, Bengaluru - 2022.
	Reference Books:
1.	**Technical Communication** by Gajendra Singh Chauhan Et al (ISBN-978-93-5350-050-4), Cengage Learning India Pvt Limited [Latest Revised Edition] - 2019.
2.	**English for Engineers** by N.P. Sudarshan and C. Savitha, Cambridge University Press – 2018.
3.	**Practical English Usage** by Michael Swan, Oxford University Press – 2016.
	E-resources
1.	Esol courses: https://www.esolcourses.com
2.	Business vocabulary: https://www.cambridgeenglish.org/images/22099-vocabulary-list.pdf

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Assignments
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap – Apply: An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Comprehend the Fundamentals of Communicative English	L1 (Re)	10	
2.	Identify The Nuances of Phonetics, Intonations, and Stress, and Enhance Pronunciation Skills for Better Communication Skills.	L2 (Un)	10	
3.	Impart Basic English Grammar, Enhance English Vocabulary to Develop Language Proficiency for Effective Communication.	L2 (Un)	10	
5.	Adopt the Techniques of Information Transfer through the presentation.	L3 (Ap)	10	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	OA/ Course Seminar/ Activity	Total Marks
Marks	15+15 = 30	10 + 10 = 20	50
Minimum score to be eligible for SEE: 20 OUT OF 50			

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1 hour duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
2.	Passing Score should be ≥ 35% ,however overall score of CIE + SEE should be ≥ 40%
3.	Question paper will be of MCQ type with questions from all units.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1										√					
2										√					
3										√					
4										√					
5										√					
Tick Mark the CO, PO and PSO mapping															

Professional Writing Skills in English

Course Code	**22PWS26**	**Course type**	Theory	**Credits L-T-P**	1– 0 - 0
Hours/week: L - T- P	1 – 0 – 0			**Total credits**	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs P = 0 Hrs Total = 15 Hrs			**CIE Marks**	50
Flipped Classes content	3 Hours			**SEE Marks**	50

Course learning objectives	
1.	Identifying Common Errors in Writing and Speaking English
2.	Acquire Nature and Style of Sensible Writing Skills
3.	Attain Better Technical Writing and Presentation Skills for Employment.
4.	Impart Employment and Workplace Communication Skills.

Pre-requisites:
▪ Ability to write/frame simple and grammatically correct sentences in English.

Unit – I **Identifying Common Errors in Writing and Speaking English**	**Contact Hours = 3 Hours**
Content of the Unit: Common errors identification in parts of speech, phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.	

Unit – II Nature and Style of sensible writing: Organizing	**Contact Hours = 3 Hours**
Content of the Unit: Principles of Paragraphs in Documents, Writing Introduction andConclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.	

Unit – III Technical Reading and Writing Practices	**Contact Hours = 3 Hours**
Content of the Unit: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error& Sentence Improvement, Cloze Test and Theme Detection Exercises.	

Unit – IV Professional Communication for Employment	**Contact Hours = 3 Hours**
Content of the Unit: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for productive reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing an effective resume for employment, Emails.	

Unit – V Professional Communication Workplace	Contact Hours = 3 Hours
Content of the Unit: Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI, Intra and Interpersonal Communication Skills at the workplace, Non-Verbal Communication Skills and their importance in GD Interviews. Presentation skills.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	**	**	1 class	1 class	1 class

Books	
	Text Books:
1.	**"Professional Writing Skills in English"** published by Fillip Learning – Education (ILS), Bangalore – 2022.
2.	**"Functional English"** (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learningIndia Pvt Limited [Latest Edition 2019].
	Reference Books:
1.	**English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
2.	**Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma,Oxford University Press 2017.
3.	**High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd – 2015.
	E-resourses
1.	Proficiency Level Tests: https://examenglish.com
2.	Write and Improve: https://writeandimprove.com

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Assignments
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	Identifying Common Errors in Writing and Speaking English	L1 (Re)	10	
2.	Acquire Nature and Style of Sensible Writing Skills	L2 (Un)	10	
3.	Attain Better Technical Writing and Presentation Skills for Employment.	L2 (Un)	10	
4.	Employment and Workplace Communication Skills.	L3 (Ap)	10	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	OA/ Course Seminar/ Activity	Total Marks
Marks	15+15 = 30	10 + 10 = 20	50
Minimum score to be eligible for SEE: 20 OUT OF 50			

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1 hour duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
2.	Passing Score should be ≥ 35% ,however overall score of CIE + SEE should be ≥ 40%
3.	Question paper will be of MCQ type with questions from all units.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**
1										√					
2										√					
3										√					
4										√					
5										√					
Tick Mark the CO, PO and PSO mapping															

Indian Constitution

Indian Constitution

Course Code	22ICO17	Course type		Credits L-T-P	1 – 0 - 0
Hours/week: L - T- P	1– 0 – 0			Total credits	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs			CIE Marks	50
Flipped Classes content	05 Hours			SEE Marks	50

Course learning objectives	
1.	To know about the basic structure of Indian Constitution.
2.	To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3.	To know about our Union Government, political structure & codes, procedures.
4.	To know the State Executive and Elections system of India.

Pre-requisites : English language, Social studies

Unit – I	Contact Hours = 3 Hours
Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly.	

Unit – II	Contact Hours = 3 Hours
Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. building.	

Unit – III	Contact Hours = 3 Hours
Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive: Parliamentary System, Union Executive — President, Prime Minister, Union Cabinet.	

Unit – IV	Contact Hours = 3 Hours
Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism.	
Unit – V	**Contact Hours = 3 Hours**
State Executive and Governor, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.	

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	01	01	01	01	01

Books	
	Text Books:
1.	**"Constitution of India" (for Competitive** Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. — 2022.
2.	**"Introduction to the Constitution of India",** (Students Edition.) by Durga Das Basu(DD Basu):Prentice —Hall, 2008.
	Reference Books:
1.	**"Constitution of India,** Professional Ethics and **Human** Rights" by ShubhamSingles, Charles E. Haries, and et a1: published by Cengage Learning India, Latest Edition — 2019.
2.	"The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition,Bengaluru.\
3.	"Samvidhana Odu" - **for** Students **& Youths by Justice HN** Nagamohan Dhas, Sahayana, kerekon.
4.	M.Govindarajan, S.Natarajan, V.S.Senthi1kumar, "Engineering Ethics", Prentice — Hall, 2004.
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	
2.	

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Understand the requirement, history and the basic structure of Indian Constitution.	Un	6, 8,12	4
2.	Understand the components of Indian Constitution viz People and Government and basics of Legislative, Judiciary and Executive aspects.	Un	6, 8,12	4

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	OA/ Course Seminar/ Activity	Total Marks
Marks	15+15 = 30	10 + 10 = 20	50
Minimum score to be eligible for SEE: 20 OUT OF 50			

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1 hour duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
2.	Passing Score should be ≥ 35% ,however overall score of CIE + SEE should be ≥ 40%
3.	Question paper will be of MCQ type with questions from all units.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**	**PSO 4**
1						√		√				√				√
2						√		√				√				√
Tick mark the CO, PO and PSO mapping																

Scientific Foundations for Health

Scientific Foundations for Health

Course Code	22SFH18/28	Course type	Theory	Credits L-T-P	1 – 0 - 0
Hours/week: L - T- P	1 – 0 – 0			Total credits	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs			CIE Marks	50
Flipped Classes content				SEE Marks	50

Course learning objectives	
1.	To know about Health and wellness (and its Beliefs) & It's balance for positive mindset.
2.	To Build the healthy lifestyles for good health for their better future.
3.	To Create a Healthy and caring relationships to meet the requirements of good/social/positive life.
4.	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future
5.	To Prevent and fight against harmful diseases for good health through positive mindset

Unit – I Good Health & It's balance for positive mindset:	Contact Hours = 3 Hours
Health -Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Methods to improve good psychological health, Changing health habits for good health.	

Unit – II Building of healthy lifestyles for better future:	Contact Hours = 3 Hours
Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries.	

Unit – III Creation of Healthy and caring relationships :	Contact Hours = 3 Hours
Building communication skills, Friends and friendship - Education, the value of relationship and communication skills, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering.	

Unit – IV Avoiding risks and harmful habits :	Contact Hours = 3 Hours
Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, how addiction develops, Types of addictions, influencing factors of addictions, Differences between addictive people and non addictive people & their behaviors. Effects of addictions Such as..., how to recovery from addictions.	

Unit – V Preventing & fighting against diseases for good health:	Contact Hours = 3 Hours
How to protect from different types of infections, How to reduce risks for good health, Reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life, Health & Wellness of youth :a challenge for upcoming future, Measuring of health & wealth status.	

Books	
	Text Books:
1.	"Scientific Foundations of Health" – Study Material Prepared by Dr. L Thimmesha, Published in VTU - University Website.
2.	"Scientific Foundations of Health", (ISBN-978-81-955465-6-5) published by Infinite Learning Solutions, Bangalore – 2022.
3.	Health Psychology - A Textbook, FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press.
	Reference Books:
1.	Health Psychology (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.
2.	HEALTH PSYCHOLOGY (Ninth Edition) by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press.
	E-resourses (NPTEL/SWAYAM. Any Other)- mention links

Course delivery methods		Assessment methods	
1.	✓ Chalk and Talk	1.	✓ IA tests
2.	✓ PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	✓ Course Seminar
		5.	✓ Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	To understand and analyse about Health and wellness (and its Beliefs) & It's balance for positive mindset.	Un	6	
2.	Develop the healthy lifestyles for good health for their better future.	Un	6	
3.	Build a Healthy and caring relationships to meet the requirements of good/social/positive life.	Un	6	
4.	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.	Re	6	
5.	Prevent and fight against harmful diseases for good health through positive mindset.	Un	6	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	OA/ Course Seminar/ Activity	Total Marks
Marks	15+15 = 30	10 + 10 = 20	50
Minimum score to be eligible for SEE: 20 OUT OF 50			

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1 hour duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
2.	Passing Score should be ≥ 35% ,however overall score of CIE + SEE should be ≥ 40%
3.	Question paper will be of MCQ type with questions from all units.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						✓									
2						✓									
3						✓									
4						✓									
5						✓									
Tick mark the CO, PO and PSO mapping															

Samskrutika Kannada and Balake Kannada

Samskrutika Kannada

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ – ಕನ್ನಡ ಬಲ್ಲ ಮತ್ತು ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ

Course Code	**22 KSK 17/27**	**Course type**	**Theory**	**Credits**	01
Hours/week: L - T- P	1-0-0			**Total credits**	01
Total Contact Hours of Pedagogy	**15 Hours**			**CIE Marks**	50
Flipped Classes content				**SEE Marks**	50

Course learning objectives : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು :	
1.	ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಳ್ಳುವುದು.
2.	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
3.	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ, ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
4.	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
5.	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಳ್ಳುವುದು.

Pre-requisites :

Unit – I ಘಟಕ-1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು	**Contact Hours = 8 Hours**
Content of the Unit : 1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ : ಪಂಪ ನಾಗರಾಜಯ್ಯ 2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜೆ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ 3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ	

Unit – II ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯಭಾಗ	**Contact Hours = 8 Hours**
Content of the Unit : 1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ , ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ 2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ – ಕನಕದಾಸರು 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಶರೀಫ	

Unit – III ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	**Contact Hours = 8 Hours**
Content of the Unit : 1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದ. ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	

Unit – IV ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	**Contact Hours = 8 Hours**
Content of the Unit: 1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	

Unit – V ಸಾಂಸ್ಕೃತಿಕ , ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	Contact Hours = 8 Hours

Content of the Unit : 1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ

2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

Course Outcome (Course skill set)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ **(22KSK17/27)**

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

CO 1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿಸುತ್ತದೆ.
CO 2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಅವಧಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ.
CO 3	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ, ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡುತ್ತದೆ.
CO 4	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
CO 5	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 15 Marks (duration ½ hour)

- First test after the completion of 30-40 % of the syllabus
- Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best twotests out of three shall be taken into consideration

Two assignments each of 10 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test

question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 50 marks.

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour.** The student must secure a minimum of 35% of the maximum

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ :

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.	Re / Un	10	--
2.	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆಸ್ಪೂರ್ತಿ ಮೂಡುತ್ತದೆ	Re / Un	10	--
3.	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ, ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಗುತ್ತದೆ.	Re / Un	10	--
4.	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.	Re / Un	10	--
5.	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.	Re / Un	10	--

Scheme of Continuous Internal Evaluation (CIE): Theory course

Components	Addition of two IA tests	Online Quiz	Addition of two Assignments	Course Seminar	Total Marks
Marks	15 + 15 = 30	-	10+10 =20	-	50

Minimum score to be eligible for SEE: 20 OUT OF 50

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 01 hours duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
2.	SEE Score should be $\geq$ 35% ,however overall score of CIE + SEE should be $\geq$ 40%
3.	Question paper will be of MCQ type and will cover the entire unit of course. It will contain 50 questions, each of the 01 mark.

University Prescribed Textbook:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ
ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ
ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಂಗ
ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

ವಿಶೇಷ ಸೂಚನೆ : 1.ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ ಇರುತ್ತದೆ.
2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಪದ್ಯ ಮತ್ತು ಗದ್ಯ ಭಾಗ ಹಾಗೂ ಇತರ ಲೇಖನಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1										✓					
2										✓					
3										✓					
4										✓					
5										✓					
Tick mark the CO, PO and PSO mapping															

Balake Kannada

Course Code	22KBK17 / 27	Course type	Theory	Credits L-T-P	1– 0 - 0
Hours/week: L - T- P	1-0-0			Total credits	01
Total Contact Hours	15 hours			CIE Marks	50
Flipped Classes content				SEE Marks	50

Course learning objectives	
1.	To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
2.	To enable learners to Listen and understand the Kannada language properly.
3.	To speak, read and write Kannada language as per requirement.
4.	To train the learners for correct and polite conservation.
5.	To know about Karnataka state and its language, literature and General information about this state.

Pre-requisites :

Unit – I	Contact Hours = 3 Hours
1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language. 2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities, Key to Transcription. 3. Personal pronouns, Possessive Forms, Interrogative words	

Unit – II	Contact Hours = 3 Hours
1.Possessive forms of nouns, dubitive question and Relative nouns. 2.Qualitative, Quantitative a nd Colour Adjectives, Numerals adjectives. 3. Predictive Forms, Locative Case	

Unit – III	Contact Hours = 3 Hours
1. Dative Cases, and Numerals. 2. Ordinal numerals and Plural markers. 3. Defective/Negative Verbs & Colour Adjectives	

Unit – IV	Contact Hours = 3 Hours
1.Permission, Commands, encouraging and Urging words (Imperative words and sentences) 2. Accusative Cases and Potential Forms used in General Communication 3. Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs 4. Comparitive, Relationship, Identification and Negation Words	

Unit – V	Contact Hours = 3 Hours
1.Different types of Tense, Time and Verbs 2. Formation of Past, Future and Present Tense Sentences with Verb Forms 3. Kannada Words in Conversation	
Books	
	Text Books:
1.	Name of the author(s), Title of the Book, Publisher, Edition/Year _____ and onwards
2.	BALAKE KANNADA
	Reference Books:
1.	Name of the author(s), Title of the Book, Publisher, Edition/Year _____ and onwards
	E-resourses (NPTEL/SWAYAM. Any Other)- mention links

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

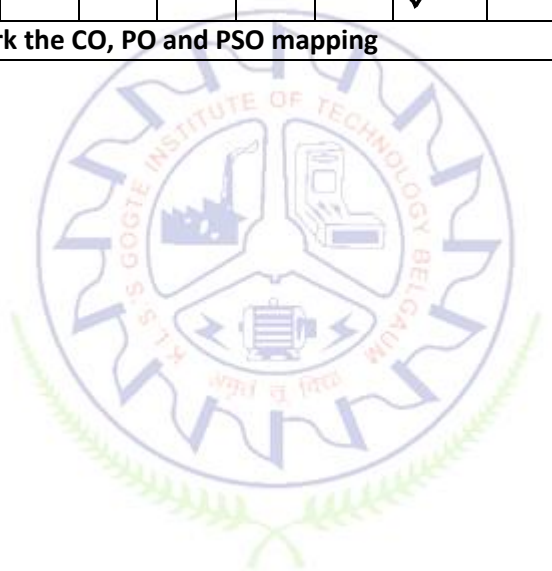
Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	To understand the necessity of learning of local language for comfortable life.	Re / Un	10	
2.	To speak, read and write Kannada language as per requirement.	Re / Un	10	
3.	To communicate (converse) in Kannada language in their daily life with kannada speakers.	Re / Un	10	
4.	To Listen and understand the Kannada language properly.	Re / Un	10	
5.	To speak in polite conservation.	Re / Un	10	

Scheme of Continuous Internal Evaluation (CIE): Theory course

Components	Addition of two IA tests	Online Quiz	OBA	Course Seminar	Total Marks
Marks	15+15= 30	-	10 + 10	-	50
OBA - Open Book Assignment **Minimum score to be eligible for SEE: 20 out of 50**					

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1 hour duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
2.	SEE Score should be ≥ 35% ,however overall score of CIE + SEE should be ≥ 40%
3.	Question paper will be of MCQ type and will cover the entire unit of course. It will contain 50 questions, each of the 01 mark.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1										✓					
2										✓					
3										✓					
4										✓					
5										✓					
Tick mark the CO, PO and PSO mapping															



Idea to Innovation Lab

Idea to Innovation Lab

Course Code	22IIL18/28	Course type	SDC	Credits L-T-P	0 – 0- 1
Hours/week: L-T-P	0 – 0 – 2			Total credits	1
Total Contact Hours	L = 0; T = 0; P = 24 Hrs, Total = 24Hrs			CIE Marks	100 marks
Flipped Classes content	------			SEE Marks	00 marks

Course learning objectives	
1	To familiarize the students about the design thinking approach.
2	To prepare the students for problem analysis and solving.
3	To create awareness amongst the students about the significance of different engineeringdisciplines in product development.
4	To enable students to understand the importance of basic skilling for domestic applications.
5	To enable the students to apply ethical and sustainability perspectives.

S.No	(PART A) - List of Experiments
1	Experiment on sensor tracking data and Arduino based circuit operation
2	Experiment on motor control by Simulink, MATLAB
3	Experiment on development of android app using MIT app
4	Experiment on data analysis and visualization using MS excel
5	Experiment on demonstration of front end and backend of software using MS Access
	(PART B) - List of Experiments
6	Experiment on design of an electrical extension box
7	Experiment on disassembly and assembly of a Gas Stove
8	Experiment on disassembly and assembly of the flush tank
9	Experiment on building battery pack using dry cells
10	Experiment on fixing of spare wheel for a blown out tyre

List of software (Open Source)	
1	Gear Simulator, Mechanalyser, Gear Generator
2	NI Multisim, Arduino studio (IDE), Eagle layout editor
3	MS Excel, MIT APP
Books	
	Text Books:
1	C. Starkey, “Basic Engineering Design”, Butterworth-Heinemann Publisher 1988.
2	Ken Hurst, “Engineering Design Principles”, Elsevier publication, Swan Press, 2010
3	Richard G Budynas and J Keith Nisbett, Shigley’s “ Mechanical Engineering Design”, Mc Graw Hill, 9th Edition, 2011

4	Kenneth Ayala, "The 8051 Microcontroller, Architecture, Programming, and Applications", West publishing Company.
5	K. K. Chitkara, "Construction Project Management", 4th Edition, Tata McGraw-Hill, 2019.
6	B. L. Theraja, "A textbook of Electrical Technology", S. Chand Publication.
	Reference Books:
1	Rattan, S.S. "Theory of Machines", 3rd Edition, Tata McGraw-Hill, 2009.
2	Yousef Haik, SangarappillaiSivaloganathan, Tamer M. Shahin, "Engineering Design Process", Cengage learning, 2011.
3	Hugh Jack, "Engineering Design, Planning, and Management", Academic press 2013.
4	Boylsted, "Electronic Devices and Circuits", Person publication, 2013.
5	R. P. Jain, "Modern Digital Electronics" 2/e, TMH publication
6	Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry 1st Edition, Wiley publication, 2015.
7	Simon Monk, "Programming Arduino Next Steps: Going Further with Sketches", McGraw Hill / Tab Electronics.
8	Massimo Banzi, "Make: Getting Started with Arduino, 3rd Edition", Shroff Publications, 2014.
9	Stuart Yarnold "Arduino in Easy Steps", In Easy Steps Publications, 2015.
10	Blum, "Arduino Programming in 24 Hours, Sams Teach Yourself", 1st Edition, Pearson Publications, 2015
11	V. K. Mehta, "Principles of Electronics", S. Chand Publication, 2014
12	A guide to the Project Management Body of Knowledge (PMBOK) 6th Edition
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1	http://epics.ieee.org/

Course delivery methods		**Assessment methods**	
1	Concept Explanation	1	Activity records
2	Demonstration	2	Product reviews
3	Hands on experience	3	Model Making

Course Outcome (COs) At the end of the course, the student will be able to (Highlight there presenting learning level).			
Learning Levels: L1- Remember; L2 - Understand; L3 - Apply; L4 -Analysis; L5 - Evaluate; L6 – Create		**Learning Level**	**PO(s)**
1	**Describe** the problem statement by **Applying** the design thinking skills and Engineering ethics.	3	1,2
2	**Analyze** the problem statement, **Identify and apply** the suitable methods / processes required for execution and product development.	4	2,4,8
3	**Select** the appropriate mechanisms and mode of power transmission for the product.	3	3

4	**Optimize** the source of electrical power systems, software and hardware requirement for the product.	3	3,5
5	**Apply** the knowledge of basic skilling for domestic application throughout.	3	1,12

Scheme of Continuous Internal Evaluation (CIE):

- **Each individual experiment will be evaluated for 10 marks**
- **Split marks will be: Conduction – 05 marks and Viva Voce – 05 marks.**

Part A Marks	Part B Marks	Total Marks (Part A+ Part B)
50	50	100

Minimum score to be pass the course is: 40 out of 100 in CIE

***Note**: Certification of journal and project is mandatory.*

CO-PO Mapping (planned)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO 11**	**PO 12**
1	√	√						√				
2		√		√								
3			√									
4	√		√		√							
5	√											√

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