

**I Semester**

Course Title:	<b>Mathematics for Civil Engineering Stream-I</b>		
Course Code:	<b>22MATC11</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04
<p><b>Course objectives:</b> The goal of the course <b>Calculus, Differential Equations and Linear Algebra (22MATC11)</b> is to</p> <ul style="list-style-type: none"> <li>• <b>Familiarize</b> the importance of calculus associated with one variable and two variables for civil engineering.</li> <li>• <b>Analyze</b> Civil engineering problems applying Ordinary Differential Equations.</li> <li>• <b>Develop</b> the knowledge of Linear Algebra refereeing to matrices.</li> </ul>			
<p><b>Teaching-Learning Process</b>  <b>Pedagogy (General Instructions):</b>  These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.</li> <li>2. State the need for Mathematics with Engineering Studies and Provide real-life examples.</li> <li>3. Support and guide the students for self-study.</li> <li>4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.</li> <li>5. Encourage the students for group learning to improve their creative and analytical skills.</li> <li>6. Show short related video lectures in the following ways: <ul style="list-style-type: none"> <li>• As an introduction to new topics (pre-lecture activity).</li> <li>• As a revision of topics (post-lecture activity).</li> <li>• As additional examples (post-lecture activity).</li> <li>• As an additional material of challenging topics (pre-and post-lecture activity).</li> <li>• As a model solution of some exercises (post-lecture activity).</li> </ul> </li> </ol>			
<b>Module-1 Calculus (8 hours)</b>			
<p><b>Introduction to polar coordinates and curvature relating to Civil engineering.</b>  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.</p> <p><b>Self-study:</b> Center and circle of curvature, evolutes and involutes.  <b>Applications:</b> Structural design and paths, Strength of materials, Elasticity.  <b>(RBT Levels: L1, L2 and L3)</b></p>			
<b>Module-2 Series Expansion and Multivariable Calculus (8 hours)</b>			

**Introduction to series expansion and partial differentiation in the field of Civil engineering applications.**

Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms - L'Hospital's rule, problems.

Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems.

**Self-study:** Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

**Applications:** Computation of stress and strain, Errors and approximations, Estimating the critical points and extreme values.

**(RBT Levels: L1, L2 and L3)**

**Module-3 Ordinary Differential Equations (ODEs) of first order (8 hours)**

**Introduction to first order ordinary differential equations pertaining to the applications for the Civil engineering.**

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on  $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$  and  $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)$ . 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.**

**Self-Study:** Applications of ODE's: Solvable for x and y.

**Applications:** Rate of Growth or Decay, Conduction of heat.

**(RBT Levels: L1, L2 and L3)**

**Module-4 Ordinary Differential Equations of higher order (8 hours)**

**Importance of higher-order ordinary differential equations in Civil 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.

**Self-Study:** Formulation and solution of Cantilever beam. Finding the solution by the method of undetermined coefficients.

**Applications:** Oscillations of a spring, Transmission lines, highway engineering.

**(RBT Levels: L1, L2 and L3)**

**Module-5 Linear Algebra (8 hours)**

**Introduction of linear algebra related to Civil Engineering applications.**

Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.

**Self-Study:** Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley-Hamilton theorem.

**Applications:** Structural Analysis, Balancing equations.

**(RBT Levels: L1, L2 and L3)**

**List of Laboratory experiments (2 hours/week per batch/ batch strength 15)****10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Solutions of Second order ordinary differential equations with initial/boundary conditions
7	Solution of a differential equation of oscillations of a spring/deflection of a beam with different loads
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

**Suggested software's :** Mathematica/MatLab/Python/Scilab

**Course outcome (Course Skill Set)**

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

CO1	apply the knowledge of calculus to solve problems related to polar curves.
CO2	learn the notion of partial differentiation to compute rate of change multivariate functions.
CO3	Analyze the solution of linear and non linear ordinary differential equations.
CO4	make use of matrix theory for solving for system of linear equations and compute eigenvalues and eigenvectors.
CO5	familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

##### **Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

##### **Reference Books**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> Ed., 2016.
3. **N.P Bali and Manish Goyal:** "A textbook of Engineering Mathematics" Laxmi Publications, 10<sup>th</sup> Ed., 2022.



4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co., Newyork, 6<sup>th</sup> 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, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** “Calculus” Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** “Linear Algebra and its Applications”, Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** “Linear Algebra with applications”, Jones Bartlett Publishers Inc., 6<sup>th</sup> Ed., 2017.

**Web links and Video Lectures (e-Resources):**

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

**II Semester**

Course Title:	<b>Mathematics for Civil Engineering Stream-II</b>		
Course Code:	<b>22MATC21</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

**Course objectives:** The goal of the course **Integral Calculus, Partial Differential Equations and Numerical methods (22MATC21)** is to

- **Familiarize** the importance of Integral calculus and Vector calculus essential for civil engineering.
- **Analyze** Civil engineering problems applying Partial Differential Equations.
- **Develop** the knowledge of solving civil engineering problems numerically.

**Teaching-Learning Process****Pedagogy (General Instructions):**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1 Integral Calculus (8 hours)****Introduction to Integral Calculus in Civil 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.

**Self-Study:** Volume by triple integration, Center of gravity.

**Applications:** Applications to mathematical quantities (Area, Surface area, Volume),. Analysis of probabilistic models.

**(RBT Levels: L1, L2 and L3)**

**Module-2 Vector Calculus (8 hours)**

**Introduction to Vector Calculus in Civil 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.

**Self-Study:** Volume integral and Gauss divergence theorem.

**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)**

**Module-3 Partial Differential Equations (PDE's) (8 hours)****Importance of partial differential equations for Civil 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 one-dimensional heat equation and wave equation.**

**Self-Study:** Solution of one-dimensional heat equation and wave equation by the method of separation of variables.

**Applications: Design of structures (vibration of rod/membrane).**

**(RBT Levels: L1, L2 and L3)**

**Module-4 Numerical methods -1 (8 hours)****Importance of numerical methods for discrete data in the field of Civil Engineering.**

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.

**Self-Study:** Bisection method, Lagrange's inverse Interpolation.

**Applications:** Estimating the approximate roots, extremum values, Area, volume, surface area. Finding approximate solutions to civil engineering problems.

**(RBT Levels: L1, L2 and L3)**

**Module-5 Numerical methods -2 (8 hours)****Introduction to various numerical techniques for handling Civil 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.

**Self-Study:** Adam-Bashforth method.

**Applications:** Finding approximate solutions to ODE related to civil engineering fields.

**(RBT Levels: L1, L2 and L3)**

**List of Laboratory experiments (2 hours/week per batch/ batch strength 15)****10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	Program to compute surface area, volume and centre of gravity
2	Evaluation of improper integrals
3	Finding gradient, divergent, curl and their geometrical interpretation
4	Verification of Green's theorem
5	Solution of one-dimensional heat equation and wave equation
6	Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta $4^{th}$ order and Milne's predictor-corrector method

**Suggested software's :** Mathematica/MatLab/Python/Scilab**Course outcome (Course Skill Set)**

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

CO1	Apply the knowledge of multiple integrals to compute area and volume.
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.
CO3	Demonstrate partial differential equations and their solutions for physical interpretations.
CO4	Apply the knowledge numerical methods in solving physical and engineering phenomena.
CO5	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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.

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One Improvement test before the closing of the academic term may be conducted if necessary.

However best two tests 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.

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- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

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- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

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Publications, 10<sup>th</sup> Ed., 2022.

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped



Course Title:	Physics for CV Stream		
Course Code:	<b>22PHYC12/22</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04
<p><b>Course objectives</b></p> <ul style="list-style-type: none"> <li>To understand the types of oscillation ,shock waves &amp; its generation, and applications.</li> <li>To Study the elastic properties of materials and failures of engineering materials</li> <li>To Study the acoustics buildings and the essentials of radiometry and photometry.</li> <li>To understand the principles photonic devices and their application relevant to civil engineering.</li> <li>To understand the various natural disaster and safety</li> </ul>			
<p><b>Teaching-Learning Process</b></p> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective</p> <ol style="list-style-type: none"> <li>Flipped Class</li> <li>Chalk and Talk</li> <li>Blended Mode of Learning</li> <li>Simulations, Interactive Simulations and Animations</li> <li>NPTEL and Other Videos for theory topics</li> <li>Smart Class Room</li> <li>Lab Experiment Videos</li> </ol>			
<b>Module-1 (8 Hours)</b>			
<p><b>Module -I: Oscillations and Shock waves:</b></p> <p><b>Oscillations:</b> Simple Harmonic motion (SHM), differential equation for SHM(No derivation), Springs:Stiffness Factor and its Physical Significance, series and parallel combination of springs(Derivation) , Types of spring 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.</p> <p><b>Shock waves:</b> 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.</p> <p><b>Pre-requisites: Basics of Oscillations</b></p> <p><b>Self-learning: Simple Harmonic motion, differential equation for SHM</b></p>			
<b>Module-2 (8 Hours)</b>			
<p><b>Elasticity:</b></p> <p>Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson’s ratio and its limiting values. relation between <math>Y</math> , <math>n</math> and <math>\sigma</math> (with derivation), 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</p> <p><b>Pre requisites: Elasticity,Stress &amp; Strain</b></p> <p><b>Self-learning: Stress-Strain Curve</b></p>			
<b>Module-3 (8 Hours)</b>			
<p><b>Acoustics, Radiometry and Photometry:</b></p> <p><b>Acoustics:</b>Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine’s formula (derivation), measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Measurements, Sound Insulation and its measurements. Impact of Noise in Multi-storied buildings</p> <p><b>Radiometry and Photometry:</b> Radiation quantities, Spectral Quantities, Relation between luminescence and radiant quantities, Reflectance and Transmittance, Photometry (cosine law and inverse square law).</p> <p><b>Pre requisites: Basics of Sound, Waves &amp; light properties</b></p> <p><b>Self-learning: Introduction to acoustics</b></p>			

<b>Module-4 (8 Hours)</b>											
<p><b>Photonics:</b>  <b>LASER</b>            Properties of a LASER Beam, Interaction of Radiation with Matter, LASER action, Population Inversion, Metastable State, Requisites of a LASER System, Semiconductor LASER, LASER Range Finder, LIDAR, Road Profiling, Bridge Deflection, Speed Checker. Numerical Problems.</p> <p><b>Optical Fiber</b>            Principle and Construction of Optical Fibers, Acceptance angle and NA, Expression for NA, Modes of Propagation, Attenuation and Fiber Losses, Fiber Optic Displacement Sensor, Fiber Optic Temperature Sensor, Numerical Problems</p> <p><b>Pre requisite: Properties of light</b>  <b>Self-learning: Propagation Mechanism &amp; TIR in optical fiber</b></p>											
<b>Module-5 (8 Hours)</b>											
<p><b>Natural hazards and Safety:</b>            Introduction, Earthquake, (general characteristics, Physics of earthquake, Richter scale of measurement and earthquake resistant measures), Tsunami (causes for tsunami, characteristics, adverse effects, risk reduction measures, engineering structures to withstand tsunami), Landslide (causes such as excess rain fall, geological structure, human excavation etc, types of land slide, adverse effects, engineering solution for land slides). Forest Fires and detection using remote sensing. Fire hazards and fire protection, fire-proofing materials, fire safety regulations and firefighting equipment - Prevention and safety measures. Numerical Problems</p> <p><b>Pre requisite: Oscillations</b>  <b>Self-learning: Richter scale</b></p>											
<p><b>Course outcome (Course Skill Set)</b>            At the end of the course the student will be able to:</p> <table border="1"> <tbody> <tr> <td>CO1</td> <td><b>Elucidate</b> the concepts in oscillations, waves, elasticity and material failures</td> </tr> <tr> <td>CO2</td> <td><b>Summarize</b> concepts of acoustics in buildings and explain the concepts in radiation and photometry</td> </tr> <tr> <td>CO3</td> <td><b>Discuss</b> the principles photonic devices and their application relevant to civil engineering.</td> </tr> <tr> <td>CO4</td> <td><b>Describe</b> the various natural hazards and safety precautions.</td> </tr> <tr> <td>CO5</td> <td><b>Practice</b> working in groups to conduct experiments in physics and <b>perform</b> precise and honest measurements.</td> </tr> </tbody> </table>		CO1	<b>Elucidate</b> the concepts in oscillations, waves, elasticity and material failures	CO2	<b>Summarize</b> concepts of acoustics in buildings and explain the concepts in radiation and photometry	CO3	<b>Discuss</b> the principles photonic devices and their application relevant to civil engineering.	CO4	<b>Describe</b> the various natural hazards and safety precautions.	CO5	<b>Practice</b> working in groups to conduct experiments in physics and <b>perform</b> precise and honest measurements.
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<p><b>Assessment Details (both CIE and SEE)</b>            The weightage 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.</p> <p><b>Continuous Internal Evaluation(CIE):</b>  <b>Two Unit Tests each of 20 Marks (duration 01 hour)</b></p> <ul style="list-style-type: none"> <li>• First test after the completion of 30-40 % of the syllabus</li> <li>• Second test after completion of 80-90% of the syllabus</li> </ul> <p>One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration.</p> <p><b>Two assignments each of 10 Marks</b>            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.</p> <p><b>The sum of two tests, two assignments, will be out of 60 marks and will be scaled down to 30 marks</b></p>											

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination(SEE):****SEE will have two component Theory Examination and Practical Examination****Theory Examination;**

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)
- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.

The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 30 marks**

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Practical Examination;**

- SEE marks for the practical course is **100 Marks**.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and **scored marks shall be scaled down to 20 marks** (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.
- The duration of SEE is 02 or 03 hours

**Note:**

1. Students have to appear in both theory and practical components of CIE and SEE and score a minimum of 40% of the maximum marks of CIE and a minimum of 35% of the maximum marks of SEE. An average of a minimum 40% of the maximum marks of course (100 marks) to pass the course.
2. Passing is CIE is compulsory to become eligible to appear for SEE
3. In SEE passing both theory and practical examinations is compulsory.

If a student fails in any one of the components (Theory/Practical) then he/she has to reappear in the next semester for both components (i.e theory and practical) and pass the both the

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Materials Science and Engineering by R Balasubramaniam, second edition, Wiley India Pvt. Ltd. Ansari Road, Daryaganj, New Delhi-110002.
2. A text book of Engineering Physics by M .N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
3. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002,
4. Building Science: Lighting and Accoustics, B. P. Singh and Devaraj Singh, Dhanpat Rai Publications (P) Ltc.,
5. Building Acoustics : Tor Eric Vigran, Taylor and Francis, 2008 Edition.
6. Photometry Radiometry and Measurements of Optical Losses, Micheal Bukshtab, Springer, 2<sup>nd</sup> edition.
7. Materials Science for Engineers by James F. Shackelford and Madanapalli K Muralidhara, sixth edition, Pearson Education Asia Pvt. Ltd., New Delhi.
8. Lasers and Non Linear Optics, B B Loud, New Age Internationals, 2011 edition
9. Shock waves made simple by Chintoo S Kumar, K Takayama and K P J Reddy: Willey India Pvt. Ltd, Delhi 2014.
10. An Introduction to Disaster Management, Natural Disastr & Man Made Hazards, S. Vaidyanathan, IKON Books P
11. Natural Hazards, Edward Bryant, Cambridge University Press, 2<sup>nd</sup> Edition
12. Natural hazards, Earthquakes, Volcanoes, and landslides by Ramesh P Singh, and Darius Bartlett, CRC Press, Taylor and Francis group.
13. Principles of Fire Safety Engineering Understanding Fire & Fire Protection, Akhil Kumar Das, PHI Learning , II Edition.
14. Disaster Management, R.Subramanaian,S.Chand Publishing,2018.

**Web links and Video Lectures (e-Resources):****Web links:**

**Simple Harmonic motion:**<https://www.youtube.com/watch?v=k2FvSzWeVxQ>

**Shock waves:**<https://physics.info/shock/>

**Shock waves and its applications:**[https://www.youtube.com/watch?v=tz\\_3M3v3kxk](https://www.youtube.com/watch?v=tz_3M3v3kxk)

**Stress- strain curves:**<https://web.mit.edu/course/3/3.11/www/modules/ss.pdf>

**Stress curves:**<https://www.youtube.com/watch?v=f08Y39UiC-o>

**Oscillations and waves :**<https://openstax.org/books/college-physics-2e>

**Earthquakes:**[www.asc-india.org](http://www.asc-india.org)

**Earthquakes and Hazards:**<http://quake.usgs.gov/tsunami>

**Landslide hazards:**<http://landslides.usgs.gov>

**Acoustics:**<https://www.youtube.com/watch?v=fHBPvMDFyO8>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

<http://nptel.ac.in>

<https://swayam.gov.in>

[https://virtuallabs.merlot.org/vl\\_physics.html](https://virtuallabs.merlot.org/vl_physics.html)

<https://phet.colorado.edu>

<https://www.myphysicslab.com>

**Laboratory Component:**

Any Ten Experiments have to be completed from the list of experiments

Note: The experiments have to be classified into

- a) Exercise
- b) Demonstration
- c) Structured Inquiry
- d) Open Ended

Based on the convenience classify the following experiments into above categories selecting at least three experiments for each type. Select at least one simulation/spreadsheet activity.

**List of Experiments:**

1. Uniform Bending
2. n by Torsional Pendulum
3. Forced Mechanical Oscillations and resonance
4. Series & Parallel Resonance
5. Fermi Energy of Conductor
6. Resistivity by Four Probe Method
7. Spring Constant
8. Single Cantilever
9. I by torsional pendulum
10. Laser Diffraction
11. Optical Fiber
12. Newton's Rings
13. GNU Step Interactive Simulations
14. Study of motion using spread Sheets
15. Application of Statistics using Spread Sheet
16. PHET Interactive Simulations :

<https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html.prototype>

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	1	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	1	-	-	-	-	-	2
CO5	3	2	1	-	2	-	-	3	3	-	-	2

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

**Note :** The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competency and Performance Indicators** mentioned in the **AICTE Exam reforms**

## Civil Engineering Stream (Chemistry group)

Course Title:	<b>Chemistry for Civil Engineering Stream</b>		
Course Code:	<b>22CHEE12/22</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
Teaching Hours/Week (L:T:P: S)**	2:2:2:0	Total Marks	100
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Exam Hours	03+02
		Credits	04

### Course objectives

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

### Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

- Tutorial & remedial classes for needy students of small batches (not regular T/R)
- Demonstration of concepts either by building models or by industry visit
- Experiments in laboratories using non- conventional methods
- Use of ICT – Online videos, online courses
- Use of Google classroom for assignments/Notes
- Conducting Make up class / Bridge courses for needy students
- Publication of paper in conference or journal on Teaching & Learning Process

### Module-1: Energy; Source, Conversion and storage (8 hr)

**Fuels:** Introduction, calorific value, determination calorific value using bomb calorimeter, numerical problems.

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

**High energy fuels:** Production (water electrolysis), advantages and storage of hydrogen.

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

**Self-learning:** **Plastic recycling to fuels and its monomers or other useful products.**

### Module-2: Corrosion science and engineering (8 hr)

Introduction, electrochemical theory of corrosion, types of corrosion-differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement). Corrosion control: Metal coating-galvanization, surface conversion coating-anodization and cathodic protection-sacrificial anode method. Corrosion testing by weight loss method. Corrosion penetration rate (CPR)-numerical problems.

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

**Self-learning:** Factors affecting the rate of corrosion, Factors influencing the nature of quality electrodeposit (Current density, concentration of metal ion, pH, and temperature).

### Module-3: Macromolecules for engineering applications (8 hr)

**Polymers:** Introduction, methods of polymerization, molecular weight, number average, weight average, numerical problems, synthesis, properties and industrial applications of Chlorinated polyvinylchloride (CPVC) and polystyrene.

**Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar and Polyester.

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

**Composites:** Introduction, properties and industrial applications of carbon based reinforced materials and metal matrix polymer composites.

**Lubricants:** Introduction, classification, properties and application of lubricants.

**Self-learning: Biodegradable polymer:** Introduction, synthesis, properties and application of

\* NOTE: Wherever the contact hours is not sufficient, tutorial hour can be converted to theory hours



poly lactic acid (PLA).

**Module-4: Phase rule and Analytical techniques (8 hr)**

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

**Analytical techniques:** Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetric); its application in the estimation of the copper, pH-sensor (Glass electrode); its application in the determination of pH of beverages.

**Self-learning:** Determination of viscosity of biofuel and its correlation with temperature.

**Module-5: Materials for mechanical applications (8 hr)**

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

**Ceramics:** Introduction, classification based on chemical composition, properties and applications of perovskites (CaTiO<sub>3</sub>).

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

**Self-learning: Abrasives:** Introduction, classification, properties and application of silicon carbide (carborandum).

**PRACTICAL MODULE**

**A – Demonstration (any two) offline/virtual:**

- A1. Synthesis of polymer
- A2. Quantitative estimation of Aluminium by precipitation method
- A3. Synthesis of iron oxide nanoparticles
- A4. Estimation of total hardness of water by EDTA method

**B – Exercise (compulsorily any 3 to be conducted):**

- B1. Conductometric estimation of acid mixture
- B2. Potentiometric estimation of FAS using K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- B3. Determination of pKa of vinegar using pH sensor (Glass electrode)
- B4. Determination of rate of corrosion of mild steel by weight loss method

**C – Structured Enquiry (compulsorily any 3 to be conducted):**

- C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
- C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
- C3. Estimation of iron in TMT bar by diphenyl amine method
- C4. Estimation of Sodium present in soil/effluent sample using flame photometer

**D – Open Ended Experiments (any two):**

- D1. Gravimetric estimation of gypsum in Portland cement
- D2. Electroplating of desired metal on substrate
- D3. Determination of COD of an industrial effluent sample
- D4. Analysis of cement for its components

**Course outcome (Course Skill Set)**

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

<b>CO1</b>	Identify the terms and processes involved in scientific and engineering applications
<b>CO2</b>	Explain the phenomena of chemistry to describe the methods of engineering processes
<b>CO3</b>	Solve for the problems in chemistry that are pertinent in engineering applications
<b>CO4</b>	Apply the basic concepts of chemistry to explain the chemical properties and processes
<b>CO5</b>	Analyze properties and processes associated with chemical substances in multidisciplinary situations

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination(SEE):**

**SEE will have two component Theory Examination and Practical Examination**

**Theory Examination;**

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)
- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.

The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 30 marks**

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Practical Examination;**

- SEE marks for the practical course is **100 Marks**.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and **scored marks shall be scaled down to 20 marks** (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.
- The duration of SEE is 02 or 03 hours

**Note:**

1. Students have to appear in both theory and practical components of CIE and SEE and score a minimum of 40% of the maximum marks of CIE and a minimum of 35% of the maximum marks of SEE. An average of a minimum 40% of the maximum marks of course (100 marks) to pass the course.
2. Passing in CIE is compulsory to become eligible to appear for SEE
3. In SEE passing both theory and practical examinations is compulsory.
4. If a student fails in any one of the components (Theory/Practical) then he/she has to reappear in the next semester for both components (i.e theory and practical) and pass the both the components.

## Civil Engineering Stream (Chemistry group)

### Suggested Learning Resources:

#### Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher (2022) Bengaluru, ISBN 978-93-85155-70-3
2. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. 2010
3. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
4. Polymer Science, V R Gowariker, 3<sup>rd</sup> Edition
5. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16<sup>th</sup> Edition.
6. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press 2002- 1<sup>st</sup> Edition.
7. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2<sup>nd</sup> Edition.
8. Polymer chemistry, by Anil Kumar P V
9. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 2014-3<sup>rd</sup> Edition.
10. Principles of nanotechnology, Phanikumar, Scitech publications, 2010-2<sup>nd</sup> Edition.
11. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12<sup>th</sup> Edition, 2011.
12. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2<sup>nd</sup> Edition, 2016.
13. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, Bangalore.5<sup>th</sup> Edition, 2014
14. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4<sup>th</sup> Edition, 1999.
15. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3<sup>rd</sup> Edition, 1996.
16. A text book of Engineering chemistry, Shashi chawla, Dhanpat Rai & Co, 2016.
17. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
18. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.

#### Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=faESCxAWR9k>
- <https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh>
- <https://www.youtube.com/watch?v=j5Hml6KN4TI>
- <https://www.youtube.com/watch?v=X9GHBdyYcyo>
- <https://www.youtube.com/watch?v=1xWBPZnEJk8>
- <https://www.youtube.com/watch?v=wRAo-M8xBHM>.

#### Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- <https://www.vlab.co.in/broad-area-chemical-sciences>
- <https://demonstrations.wolfram.com/topics.php>
- <https://interestingengineering.com/science>

#### COs and POs Mapping (Individual teacher has to fill up)

	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	---	---	---	1	---	---	---	---	---
CO2	3	2	1	---	---	---	1	---	---	---	---	---
CO3	3	1	1	---	---	---	1	---	---	---	---	---
CO4	3	2	1	---	---	---	1	---	---	---	---	---
CO5	3	2	1	---	---	---	1	---	---	---	---	---
CO6	3	2	1	---	---	---	2	---	---	---	---	---

Course Title:	<b>ENGINEERING MECHANICS</b>		
Course Code:	<b>22CIV13/23</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Theory	SEE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	Total Marks	100
Total Hours of Pedagogy	25 hrs Lecture+25 hrs Tutorial = 50 hrs	Exam Hours	03
		Credits	03

#### Course objectives

- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To analyse the member forces in trusses
- To make students to learn the effect of friction on different planes
- To develop the student's ability to find out the centre of gravity and moment of inertia and their applications.
- To make the students learn about kinematics and kinetics and their applications.

#### Teaching-Learning Process

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

#### Module-1 (10)

**Resultant of coplanar force system:** Basic dimensions and units, Idealisations, Classification of force system, principle of transmissibility of a force, composition of forces, resolution of a force, Free body diagrams, moment, Principle of moments, couple, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system, Numerical examples.

#### Module-2 (10)

**Equilibrium of coplanar force system:** Equilibrium of coplanar concurrent force system, Lami's theorem, Equilibrium of coplanar parallel force system, types of beams, types of loadings, types of supports, Equilibrium of coplanar non-concurrent force system, support reactions of statically determinate beams subjected to various types of loads, Numerical examples.

#### Module-3(10)

**Analysis of Trusses:** Introduction, Classification of trusses, analysis of plane perfect trusses by the method of joints and method of sections, Numerical examples.

**Friction:** Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, ladder friction, wedge friction Numerical examples.

**Module-4(10)**

**Centroid of Plane areas:** Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, centroid of composite areas and simple built up sections, Numerical examples.

**Moment of inertia of plane areas:** Introduction, Rectangular moment of inertia, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built up sections,, Numerical examples.

**Module-5 (10)**

**Kinematics:**

Linear motion: Introduction, Displacement, speed, velocity, acceleration, acceleration due to gravity, Numerical examples on linear motion

Projectiles: Introduction, numerical examples on projectiles.

**Kinetics:** Introduction, D 'Alembert's principle of dynamic equilibrium and its application in-plane motion and connected bodies including pulleys, Numerical examples.

**Course outcome (Course Skill Set)**

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

C01	Compute the resultant of a force system and resolution of a force
C02	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces
C03	Analyse the frictional resistance offered by different planes
C04	Locate the centroid and compute the moment of inertia of sections
C05	Analyze the bodies in motion



### **Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 hour 30 Minutes)**

- First test after the completion of 30-40 % (after the completion of first two modules) of the syllabus
- Second test after completion of 80-90% ( after the completion of modules three and four) of the syllabus

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

##### **Two assessments each of 20 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 assessment 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 assessments, will be out of 100 marks and will be scaled down to 50 marks**

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

##### **Text Books**

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015,Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

##### **Reference Books:**

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
3. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

5. Bhavikatti S S, Engineering Mechanics, 2019, New Age International

6. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication

**Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT>
- <https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2>
- <https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5>
- <https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18>
- <https://www.youtube.com/watch?v=3YBXteL-qY4>
- <https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10>
- <https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7>
- [https://www.youtube.com/watch?v=atoP5\\_DeTPE](https://www.youtube.com/watch?v=atoP5_DeTPE)
- <https://www.youtube.com/watch?v=ksmsp9OzAsI>
- <https://www.youtube.com/watch?v=x1ef048b3CE>
- [https://www.youtube.com/watch?v=l\\_Nck-X49qc](https://www.youtube.com/watch?v=l_Nck-X49qc)
- [https://play.google.com/store/apps/details?id=appinventor.ai\\_jgarc322.Resultant\\_Force](https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force)
- <https://www.youtube.com/watch?v=RIBeeW1DSZg>
- <https://www.youtube.com/watch?v=R8wKV0UQtlo>
- [https://www.youtube.com/watch?v=0RZHHgL8m\\_A](https://www.youtube.com/watch?v=0RZHHgL8m_A)
- <https://www.youtube.com/watch?v=BlS5KnQOWkY>

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- [https://www.youtube.com/watch?v=Zrc\\_gB1YYS0](https://www.youtube.com/watch?v=Zrc_gB1YYS0)
- <https://play.google.com/store/apps/details?id=vn.edu.best4u.com.bieudonoiluc>
- [https://www.youtube.com/watch?v=Hn\\_iozUo9m4](https://www.youtube.com/watch?v=Hn_iozUo9m4)
- <https://play.google.com/store/apps/details?id=com.teobou>
- <https://www.youtube.com/watch?v=WOHRp3V-QA0>

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	2	3										
C02	2	3										
C03	2	3										
C04	2	3										
C05	2	3										

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

**Note:** Depending on the assessment tool used, higher order POs can be identified by the concerned course instructor.

**I Semester**

Course Title:	Mathematics for CSE Stream-I		
Course Code:	<b>22MATS11</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

**Course objectives:** The goal of the course **Calculus, Modular arithmetic and Linear Algebra (22MATS11)** is to

- **Familiarize** the importance of calculus associated with one variable and multivariable for computer science and engineering.
- **Analyze** computer science and engineering problems applying Ordinary Differential Equations.
- **Apply** the knowledge of modular arithmetic to computer algorithms.
- **Develop** the knowledge of Linear Algebra to solve the system of equations.

**Teaching-Learning Process****Pedagogy (General Instructions):**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1 Calculus (8 hours)****Introduction to polar coordinates and curvature relating to Computer Science and engineering.**

Polar coordinates, Polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems.

**Self-study:** Center and circle of curvature, evolutes and involutes.

**Applications:** Computer graphics, Image processing.

**(RBT Levels: L1, L2 and L3)**

### Module-2 Series Expansion and Multivariable Calculus (8 hours)

**Introduction of series expansion and partial differentiation in Computer Science & Engineering applications.**

Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms - L'Hospital's rule. Problems.

Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems.

**Self-study:** Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

**Applications:** Series expansion in computer programming, Errors and approximations, calculators.

**(RBT Levels: L1, L2 and L3)**

### Module-3 Ordinary Differential Equations (ODEs) of first order (8 hours)

**Introduction to first order ordinary differential equations pertaining to the applications for Computer Science & Engineering.**

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on  $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$  and  $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)$ . Applications of ODE's - Orthogonal trajectories, L-R & C-R circuits. Problems.

**Non-linear differential equations:** Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, reducible to Clairaut's equations. **Problems.**

**Self-Study:** Applications of ODE's, Solvable for x and y.

**Applications of ordinary differential equations:** L-R & C-R circuits, Rate of Growth or Decay, Conduction of heat.

**(RBT Levels: L1, L2 and L3)**

### Module-4 Modular Arithmetic (8 hours)

**Introduction of modular arithmetic and its applications in Computer Science and Engineering.**

Introduction to Congruences, Linear Congruences, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem. Applications of Congruences-RSA algorithm.

**Self-Study:** Divisibility, GCD, Properties of Prime Numbers, Fundamental theorem of Arithmetic.

**Applications:** Cryptography, encoding and decoding, RSA applications in public key encryption.

**(RBT Levels: L1, L2 and L3)**

### Module-5 Linear Algebra (8 hours)

**Introduction of linear algebra related to computer science & engineering.**

Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Problems

**Self-Study:** Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

**Applications:** Boolean matrix, Network Analysis, Markov Analysis, Critical point of a network system. Optimum solution.

(RBT Levels: L1, L2 and L3).

**List of Laboratory experiments (2 hours/week per batch/ batch strength 15)**

**10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Finding GCD using Euclid's Algorithm
7	Applications of Wilson theorem
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

**Suggested software's :** Mathematica/MatLab/Python/Scilab

**Course outcome (Course Skill Set)**

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

CO1	apply the knowledge of calculus to solve problems related to polar curves.
CO2	learn the notion of partial differentiation to compute rate of change multivariate functions
CO3	get Acquainted and to Apply modular arithmetic to computer algorithms.
CO4	make use of matrix theory for solving for system of linear equations and compute eigenvalues and eigenvectors
CO5	familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

##### **Reference Books**

1. **V. Ramana**: "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> Ed., 2016.



3. **N.P Bali and Manish Goyal:** “A textbook of Engineering Mathematics” Laxmi Publications, 10<sup>th</sup> Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co., Newyork, 6<sup>th</sup> 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, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** “Calculus” Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** “Linear Algebra and its Applications”, Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** “Linear Algebra with applications”, Jones Bartlett Publishers Inc., 6<sup>th</sup> Ed., 2017.
10. **William Stallings:** “Cryptography and Network Security” Pearson Prentice Hall, 6<sup>th</sup> Ed., 2013.

#### Web links and Video Lectures (e-Resources):

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#### Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

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#### COs and POs Mapping (Individual teacher has to fill up)

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

**II Semester**

Course Title:	Mathematics for CSE Stream-II		
Course Code:	<b>22MATS21</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

**Course objectives:** The goal of the course **Advanced Calculus, Vector Space and Numerical methods (22MATS21)** is to

- **Familiarize** the importance of Integral calculus and Vector calculus.
- **Learn** vector spaces and linear transformations.
- **Develop** the knowledge of numerical method and apply to solve transcendental and differential equations.

**Teaching-Learning Process****Pedagogy (General Instructions):**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1 Integral Calculus (8 hours)****Introduction to Integral Calculus in Computer Science & Engineering.**

**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.**

**Self-Study: Center of gravity, Duplication formula.**

**Applications:** Antenna and wave propagation, Calculation of optimum value in various geometries. Analysis of probabilistic models.

**(RBT Levels: L1, L2 and L3)**

<b>Module-2 Vector Calculus (8 hours)</b>
<p><b>Introduction to Vector Calculus in Computer Science &amp; Engineering.</b>            Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.</p> <p><b>Curvilinear coordinates:</b> Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality. Problems.</p> <p><b>Self-Study:</b> Volume integral.</p> <p><b>Applications:</b> Conservation of laws, Electrostatics, Analysis of stream lines.</p>
<b>Module-3 Vector Space and Linear Transformations (8 hours)</b>
<p><b>Importance of Vector Space and Linear Transformations in the field of Computer Science &amp; Engineering.</b>  <b>Vector spaces:</b> Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension. Problems.  <b>Linear transformations:</b> Definition and examples, Algebra of transformations, Matrix of a linear transformation. Change of coordinates, Rank and nullity of a linear operator, rank-nullity theorem. Inner product spaces and orthogonality. Problems.</p> <p><b>Self-study:</b> Angles and Projections. Rotation, reflection, contraction and expansion.  <b>Applications:</b> Image processing, AI &amp; ML, Graphs and networks, computer graphics.  <b>(RBT Levels: L1, L2 and L3)</b></p>
<b>Module-4 Numerical methods -1 (8 hours)</b>
<p><b>Importance of numerical methods for discrete data in the field of computer science &amp; engineering.</b>            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.  <b>Numerical integration:</b> Trapezoidal, Simpson's <math>(1/3)^{rd}</math> and <math>(3/8)^{th}</math> rules (without proof). Problems.</p> <p><b>Self-Study:</b> Ramanujan's method, Bisection method, Lagrange's inverse Interpolation, Weddle's rule.  <b>Applications:</b> Estimating the approximate roots, extremum values, Area, volume, surface area. Errors in finite precision.  <b>(RBT Levels: L1, L2 and L3)</b></p>
<b>Module-5 Numerical methods -2 (8 hours)</b>
<p><b>Introduction to various numerical techniques for handling Computer Science &amp; Engineering applications.</b>  <b>Numerical Solution of Ordinary Differential Equations (ODE's):</b> 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.</p> <p><b>Self-Study:</b> Adam-Bashforth method.  <b>Applications:</b> Estimating the approximate solutions of ODE.  <b>(RBT Levels: L1, L2 and L3).</b></p>

**List of Laboratory experiments (2 hours/week per batch/ batch strength 15)****10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	Program to compute area, surface area, volume and centre of gravity
2	Evaluation of improper integrals
3	Finding gradient, divergent, curl and their geometrical interpretation
4	Computation of basis and dimension for a vector space and Graphical representation of linear transformation
5	Computing the inner product and orthogonality
6	Solution of algebraic and transcendental equation by Ramanujan's, Regula-Falsi and Newton-Raphson method
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4 <sup>th</sup> order and Milne's predictor-corrector method

**Suggested software's :** Mathematica/MatLab/Python/Scilab

**Course outcome (Course Skill Set)**

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

CO1	Apply the concept of change of order of integration and variables to evaluate multiple integral and their usage in computing area and volume.
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, orthogonal curvilinear coordinates.
CO3	Demonstrate the idea of Linear dependence and independence of sets in the vector space, and linear transformation
CO4	Apply the knowledge of numerical methods in analysing the discrete data and for solving the physical and engineering problems.
CO5	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

##### **Reference Books**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> Ed., 2016.

3. **N.P Bali and Manish Goyal:** “A textbook of Engineering Mathematics” Laxmi Publications, 10<sup>th</sup> Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co., Newyork, 6<sup>th</sup> 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, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** “Calculus” Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** “Linear Algebra and its Applications”, Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** “Linear Algebra with applications”, Jones Bartlett Publishers Inc., 6<sup>th</sup> Ed., 2017.

**Web links and Video Lectures (e-Resources):**

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	<b>Physics for CSE stream</b>		
Course Code:	<b>22PHYS12/22</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Total Marks	100
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Exam Hours	03+02
		Credits	04
<b>Course objectives</b>			
<ul style="list-style-type: none"> <li>To study the essentials of photonics for engineering applications.</li> <li>To study the principles of quantum mechanics and its application in quantum computing.</li> <li>To study the study the electrical properties of materials</li> <li>To study the essentials of physics for computational aspects like design and data analysis.</li> </ul>			
<b>Teaching-Learning Process</b>			
These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective			
<ol style="list-style-type: none"> <li>Flipped Class</li> <li>Chalk and Talk</li> <li>Blended Mode of Learning</li> <li>Simulations, Interactive Simulations and Animations</li> <li>NPTEL and Other Videos for theory topics</li> <li>Smart Class Room</li> <li>Lab Experiment Videos</li> </ol>			
<b>Module-1 (8 Hours)</b>			
<b>Laser and Optical Fibers:</b>			
<b>LASER</b> : Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients, Laser Action, Population Inversion, Metastable State, Requisites of a laser system, Semiconductor Diode Laser, Applications: Bar code scanner, Laser Printer, Laser Cooling, Numerical Problems			
<b>Optical Fiber</b> : Principle and structure, Acceptance angle and Numerical Aperture (NA) and derivation of Expression for NA, Classification of Optical Fibers, Attenuation and Fiber Losses, Applications: Fiber Optic networking, Fiber Optic Communication.			
<b>Pre requisite: Properties of light</b>			
<b>Self-learning: Total Internal Reflection &amp; Propagation Mechanism (Optical Fibers)</b>			
<b>Module-2 (8 Hours)</b>			
<b>Quantum Mechanics:</b>			
de Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle and its application (Non existence of electron inside the nucleus-Non Relativistic), Principle of Complementarity, Wave Function, Time independent Schrodinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth , Waveforms and Probabilities. Numerical Problems			
<b>Pre requisite: Wave-Particle dualism</b>			
<b>Self-learning: de Broglie Hypothesis</b>			
<b>Module-3 (8 Hours)</b>			
<b>Quantum Computing:</b>			
<b>Wave Function in Ket Notation</b> : Matrix form of wave function, Identity Operator, Determination of $ 0\rangle$ and $ 1\rangle$ , Pauli Matrices and its operations on 0 and 1 states, Mention of Conjugate and Transpose, Unitary Matrix U, Examples : Row and Column Matrices and their multiplication (Inner Product), Probability, Orthogonality			
<b>Principles of Quantum Information &amp; Quantum Computing</b> : Introduction to Quantum Computing, Moore's law & its end. Single particle quantum interference, Classical & quantum information comparison. Differences between classical & quantum computing, quantum superposition and the concept of qubit.			
<b>Properties of a qubit</b> : Mathematical representation. Summation of probabilities, Representation of qubit by Bloch sphere			



**Quantum Gates :**

Single Qubit Gates: Quantum Not Gate , Pauli -Z Gate Hadamard Gate , Pauli Matrices, Phase Gate (or S Gate) , T Gate

Multiple Qubit Gates: Controlled gate, CNOT Gate, (Discussion for 4 different input states). Representation of, Swap gate, Controlled -Z gate , Toffoli gate, Accounting for the extra-ordinary capability of quantum computing, Model Realizations

**Pre requisites: Matrices**

**Self-learning: Moore's law**

**Module-4 (8 Hours)****Electrical Properties of Materials and Applications**

Electrical Conductivity in metals, Resistivity and Mobility, Concept of Phonon, Matheissen's rule. Introduction to Super Conductors, Temperature dependence of resistivity, Meissner Effect, Critical Current, Types of Super Conductors, Temperature dependence of Critical field, BCS theory (Qualitative), Quantum Tunneling, High Temperature superconductivity, Josephson Junction, DC and AC SQUIDS (Qualitative), Applications in Quantum Computing. Numerical Problems.

**Pre requisites: Basics of Electrical conductivity**

**Self-learning: Resistivity and Mobility**

**Module-5 (8 hours)****Application of Physics in computing:****Physics of Animation :**

Taxonomy of physics based animation methods, Frames, Frames per Second, Size and Scale, Motion and Timing in Animations, Constant Force and Acceleration, The Odd rule, Motion Graphs, Numerical Calculations based on Odd Rule, Examples of Character Animation : Jumping, Walking. Numerical Problems

**Statistical Physics for Computing** :Descriptive statistics and inferential statistics, Poisson distribution and Normal Distributions (Bell Curves), Monte Carlo Method. Numerical Problems.

**Pre requisites: Motion in one dimension**

**Self-learning: Frames, Frames per Second**

**Course outcome (Course Skill Set)**

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

CO1	<b>Describe</b> the principles of LASERS and Optical fibers and their relevant applications.
CO2	<b>Discuss</b> the basic principles of the Quantum Mechanics and its application in Quantum Computing.
CO3	<b>Summarize</b> the essential properties of superconductors and applications in Quantum Computing.
CO4	<b>Illustrate</b> the application of physics in design and data analysis.
CO5	<b>Practice</b> working in groups to conduct experiments in physics and <b>perform</b> precise and honest measurements.

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

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**Semester End Examination(SEE):****SEE will have two component Theory Examination and Practical Examination****Theory Examination;**

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)
- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.

The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 30 marks**

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Practical Examination;**

- SEE marks for the practical course is **100 Marks**.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and **scored marks shall be scaled down to 20 marks** (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.
- The duration of SEE is 02 or 03 hours

**Note:**

1. Students have to appear in both theory and practical components of CIE and SEE and score a minimum of 40% of the maximum marks of CIE and a minimum of 35% of the maximum marks of SEE. An average of a minimum 40% of the maximum marks of course (100 marks) to pass the course.
2. Passing in CIE is compulsory to become eligible to appear for SEE
3. In SEE passing both theory and practical examinations is compulsory.

If a student fails in any one of the components (Theory/Practical) then he/she has to reappear in the next semester for both components (i.e theory and practical) and pass the both the components.

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Solid State Physics, S O Pillai, New Age International Private Limited, 8<sup>th</sup> Edition, 2018,.
2. Engineering Physics by Gupta and Gour, Dhanpat Rai Publications, 2016 (Reprint).
3. Concepts of Modern Physics, Arthur Beiser, McGrawhill, 6<sup>th</sup> Edition, 2009.
4. Lasers and Non Linear Optics, B B Loud, New age international, 2011 edition.
5. A text book of Engineering Physics by M .N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
6. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge Universities Press, 2010 Edition.
7. Quantum Computing, Vishal Sahani, McGraw Hill Education, 2007 Edition.
8. Engineering Physics, S P Basavaraj, 2005 Edition,
9. Physics for Animators, Michele Bousquet with Alejandro Garcia, CRC Press, Taylor & Francis, 2016.
10. Quantum Computation and Logic : How Quantum Computers Have Inspired Logical Investigations, Maria Luisa Dalla Chiara, Roberto Giuntini, Roberto Leporini, Giuseppe Sergioli, Trends in Logic, Volume 48, Springer.
11. Statistical Physics : Berkely Physics Course, Volume 5, F. Reif, McGraw Hill.

**Web links and Video Lectures (e-Resources):**

**LASER** : <https://www.youtube.com/watch?v=WgzynzPiyc>

**Superconductivity** : <https://www.youtube.com/watch?v=MT5X15ppn48>

**Optical Fiber** : [https://www.youtube.com/watch?v=N\\_kA8EpCUQo](https://www.youtube.com/watch?v=N_kA8EpCUQo)

**Quantum Mechanics** : <https://www.youtube.com/watch?v=p7bzE1E5PMY&t=136s>

**Quantum Computing** : <https://www.youtube.com/watch?v=jHoEjvuPoB8>

**Physics of Animation** : [https://www.youtube.com/watch?v=kj1kaA\\_8Fu4](https://www.youtube.com/watch?v=kj1kaA_8Fu4)

**Statistical Physics Simulation** : [https://phet.colorado.edu/sims/html/plinko-probability/latest/plinko-probability\\_en.html](https://phet.colorado.edu/sims/html/plinko-probability/latest/plinko-probability_en.html)

**NPTEL Superconductivity**: <https://archive.nptel.ac.in/courses/115/103/115103108/>

**NPTEL Quantum Computing** : <https://archive.nptel.ac.in/courses/115/101/115101092>

**Virtual LAB** : <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>

**Virtual LAB** : <https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

<http://nptel.ac.in>

<https://swayam.gov.in>

[https://virtuallabs.merlot.org/vl\\_physics.html](https://virtuallabs.merlot.org/vl_physics.html)

<https://phet.colorado.edu>

<https://www.myphysicslab.com>

**Laboratory Component:**

Any Ten Experiments have to be completed from the list of experiments

**Note:** The experiments have to be classified into

- a) Exercise
- b) Demonstration
- c) Structured Inquiry
- d) Open Ended

Based on the convenience classify the following experiments into above categories selecting at least three experiments for each type. At least select one simulation/spreadsheet activity.

**List of Experiments:**

1. Wavelength of LASER using Grating
2. Numerical Aperture using optical fiber
3. Four Probe Method
4. Transistor Characteristics
5. Charging and Discharging of a Capacitor
6. Photo-Diode Characteristics
7. Series & Parallel LCR
8. Magnetic Field at any point along the axis of a circular coil
9. Plank's Constant using LEDs.
10. Fermi Energy
11. Black Box
12. Energy gap of a given semiconductor
13. GNU Step Interactive Simulations.
14. Study of motion using spread Sheets
15. Application of Statistic using Spread Sheets
16. PHET Interactive Simulations

<https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	2
CO4	3	2	1	-	1	-	-	-	-	-	-	2
CO5	3	2	1	-	2	-	-	3	3	-	-	2

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**  
**Note :** The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competency and Performance Indicators** mentioned in the **AICTE Exam reforms**.

## Computer Science Engineering Stream (Chemistry group)

Course Title:	<b>Chemistry for CSE</b>		
Course Code:	<b>22CHEE12/22</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)*	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

### Course objectives

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

### Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

- Tutorial & remedial classes for needy students of small batches (not regular T/R)
- Demonstration of concepts either by building models or by industry visit
- Experiments in laboratories using non- conventional methods
- Use of ICT – Online videos, online courses
- Use of Google classroom for assignments/Notes
- Conducting Make up class / Bridge courses for needy students
- Publication of paper in conference or journal on Teaching & Learning Process

### MODULE 1: Sensors and energy Systems (8hr)

**Sensors:** Introduction, working principle and applications of conductometric sensors, Electrochemical sensors, Thermometric sensors, and Optical sensors. Sensors for the measurement of DO. Electrochemical sensors for the pharmaceuticals, surfactants, hydrocarbons, electrochemical gas sensors for SO<sub>x</sub>, NO<sub>x</sub>, Disposable sensors in the detection of biomolecules and pesticides.

**Energy Systems:** Introduction to batteries, Construction, working and applications of Lithium ion and Sodium ion batteries. Quantum dots sensitized solar cells (QDSSC's)- Principle, Properties and Applications

Self -Learning Topics: Type of electrochemical sensors. Gas sensor- O<sub>2</sub> sensor, biosensor- Glucose sensors,

### MODULE 2: Materials for memory and display systems (8hr)

Introduction, Basic concepts of electronic memory, History of organic/polymer electronic memory devices, Classification of electronic memory devices, types of organic memory devices (organic molecules, polymeric materials, organic-inorganic hybrid materials), organic superconducting materials.

Photoactive and electroactive materials, Nanomaterials, organic materials used in optoelectronic devices, Organic photovoltaics, alternative organic photovoltaic materials. Composition, Characteristics, working and applications of Liquid Crystal Displays (LCD's), Organic light emitting diodes (OLED's), Quantum Light emitting diodes (QLED's), Light emitting electrochemical cells.

#### **Self-Learning Topics:**

Properties and functions of Silicon (Si), Germanium (Ge), Copper (Cu), Aluminum (Al), and Brominated flame retardants in computers

### MODULE 3: Corrosion and electrode system (8hr)

\* NOTE: Wherever the contact hours is not sufficient, tutorial hour can be converted to theory hours

**Corrosion chemistry:** Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration, corrosion control-galvanization, anodization and sacrificial anode method. Corrosion penetration rate (CPR) - introduction and numerical problem.

**Electrode system:** Introduction, types of electrodes, Ion selective electrode – definition, construction, working and applications of glass electrode. Determination of pH using glass electrode. Reference electrode: Introduction, calomel electrode – construction, working and applications of calomel electrode. Concentration cell – Definition, construction and Numerical problems.

**Analytical techniques:** Introduction, principle and instrumentation: Conductometry – estimation of weak acid. Potentiometry – estimation of iron.

**Self-Study Components:** IR and UV- visible spectroscopy.

#### **MODULE 4: Polymers and Green fuels (8hr)**

**Polymers:** Introduction, Molecular weight - Number average, weight average and numerical problems, Conducting polymers – synthesis and conducting mechanism of polyacetylene and commercial applications. Preparation, properties, and commercial applications of graphene oxide.

**Green fuels:** Introduction, construction and working of solar photovoltaic cell, advantages, and disadvantages. Generation of energy (green hydrogen) from water electrolysis, advantages, and storage of hydrogen.

**Self-Learning Topics:** *Regenerative fuel cells*

#### **MODULE 5: E-Waste Management (8hr)**

Introduction, sources of e-waste, Composition, Characteristics, and Need of e-waste management. E - waste. Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste, recycling and recovery, different approaches of recycling (separation, Thermal treatments, hydrometallurgical extraction, pyrometallurgical methods, direct recycling). Extraction of gold from E-waste. Role of stake holders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies).

**Self-Learning Topics:** Impact of heavy metals on environment and human health.

#### **PRACTICAL MODULE**

##### **A – Demonstration (any two) offline/virtual:**

- A1. Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch
- A2. Estimate the amount of copper in e-waste by optical sensors (colorimetry)
- A3: Synthesis of Iron-oxide Nanoparticles
- A4. Electrolysis of water

##### **B – Exercise (compulsorily any 3 to be conducted):**

- 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)
- B4. Determination of rate of corrosion of mild steel by weight loss method

##### **C – Structured Enquiry (compulsorily any 3 to be conducted):**

- C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
- C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
- C3. Estimation of iron in TMT bar by diphenyl amine method
- C4. Estimation of Sodium present in soil/effluent sample using flame photometer

##### **D– Open Ended Experiments (any two):**

- D1: Evaluation of acid content in beverages by using pH sensors and simulation.
- D2. Construction of photovoltaic cell.
- D3. Design an experiment to Identify the presence of proteins in given sample.
- D4. Searching suitable PDB file and target for molecular docking

## Computer Science Engineering Stream (Chemistry group)

### Course outcome (Course Skill Set)

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

<b>CO1</b>	Identify the terms and processes involved in scientific and engineering applications
<b>CO2</b>	Explain the phenomena of chemistry to describe the methods of engineering processes
<b>CO3</b>	Solve for the problems in chemistry that are pertinent in engineering applications
<b>CO4</b>	Apply the basic concepts of chemistry to explain the chemical properties and processes
<b>CO5</b>	Analyze properties and processes associated with chemical substances in multidisciplinary situations

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination(SEE):**

**SEE will have two component Theory Examination and Practical Examination**

**Theory Examination;**

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)
- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.

The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 30 marks**

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Practical Examination;**

- SEE marks for the practical course is **100 Marks**.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and **scored marks shall be scaled down to 20 marks** (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.
- The duration of SEE is 02 or 03 hours

**Note:**

1. Students have to appear in both theory and practical components of CIE and SEE and score a minimum of 40% of the maximum marks of CIE and a minimum of 35% of the maximum marks of SEE. An average of a minimum 40% of the maximum marks of course (100 marks) to pass the course.
2. Passing in CIE is compulsory to become eligible to appear for SEE
3. In SEE passing both theory and practical examinations is compulsory.

If a student fails in any one of the components (Theory/Practical) then he/she has to reappear in the next semester for both components (i.e theory and practical) and pass the both the components.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher (2022) Bengaluru, ISBN 978-93-85155-70-3
2. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. 2010
3. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
4. Polymer Science, V R Gowariker, 3<sup>rd</sup> Edition
5. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16<sup>th</sup> Edition.



## Computer Science Engineering Stream (Chemistry group)

- Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press 2002- 1<sup>st</sup> Edition.
- Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2<sup>nd</sup> Edition.
- Polymer chemistry, by Anil Kumar P V
- Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 2014-3<sup>rd</sup> Edition.
- Principles of nanotechnology, Phanikumar, Scitech publications, 2010-2<sup>nd</sup> Edition.
- A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12<sup>th</sup> Edition, 2011.
- A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2<sup>nd</sup> Edition, 2016.
- Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, Bangalore.5<sup>th</sup> Edition, 2014
- Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4<sup>th</sup> Edition, 1999.
- Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3<sup>rd</sup> Edition, 1996.
- A text book of Engineering chemistry, Shashi chawla, Dhanpat Rai & Co, 2016.
- Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
- Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.

### Web links and Video Lectures (e-Resources):

- Electrochemistry: <https://nptel.ac.in/downloads/122101001/>
- Chemistry of materials: <https://nptel.ac.in/courses/104/103/104103019/>
- <https://www.youtube.com/watch?v=faESCxAWR9k>
- <https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLYhmwFtnRhuz8L1bb3X-9IbHrDMjHWWh>
- <https://www.youtube.com/watch?v=j5Hml6KN4TI>
- <https://www.youtube.com/watch?v=X9GHBdyYcyo>
- <https://www.youtube.com/watch?v=1xWBPZnEJk8>

### Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- <https://www.vlab.co.in/broad-area-chemical-sciences>
- <https://demonstrations.wolfram.com/topics.php>
- <https://interestingengineering.com/science>

### COs and POs Mapping (Individual teacher has to fill up)

	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1				1					
CO2	3	1	1				1					
CO3	3	1	1				1					
CO4	3	1	1				1					
CO5	3	1	1				1					

Course Title:	<b>Principles of Programming using C</b>	
Course Code:	<b>22POP13/23</b>	CIE Marks 50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks 50
		Total Marks 100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours 3+2
Total Hours of Pedagogy	40 hours	Credits 03
	<p><b>Course Objectives:</b></p> <p>CLO 1. Elucidate the basic architecture and functionalities of a Computer</p> <p>CLO 2. Apply programming constructs of C language to solve the real-world problems</p> <p>CLO 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems</p> <p>CLO 4. Design and Develop Solutions to problems using structured programming constructs such as functions and procedures</p>	
	<p><b>Teaching-Learning Process (General Instructions)</b></p> <p>These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.</li> <li>2. Use of Video/Animation to explain functioning of various concepts.</li> <li>3. Encourage collaborative (Group Learning) Learning in the class.</li> <li>4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.</li> <li>5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.</li> <li>6. Introduce Topics in manifold representations.</li> <li>7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.</li> <li>8. Discuss how every concept can be applied to the real world-and when that's possible, it helps to improve the students' understanding.</li> <li>9. Use <a href="https://pythontutor.com/visualize.html#mode=edit">https://pythontutor.com/visualize.html#mode=edit</a> in order to visualize the operations of C Programs</li> </ol>	
	<b>Module-1 (6 Hours of Pedagogy)</b>	
	<p><b>Introduction to C:</b> 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,</p> <p><b>Textbook: Chapter 1.1-1.9, 2.1-2.2, 8.1 - 8.6, 9.1-9.14</b></p>	
<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation/ Web Content: <a href="https://tinyurl.com/4xmrexre">https://tinyurl.com/4xmrexre</a>	

<b>Module-2 (6 Hours of Pedagogy)</b>	
Operators in C, Type conversion and typecasting. <b>Decision control and Looping statements:</b> Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement. <b>Textbook: Chapter 9.15-9.16, 10.1-10.6</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method/ Power Point Presentation
<b>Module-3 (8 Hours of Pedagogy)</b>	
Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays, applications of arrays.  Textbook: Chapter 11.1-11.10, 12.1-12.10,12.12	
<b>Teaching-Learning Process</b>	Chalk and talk method/ Power Point Presentation
<b>Module-4 (6 Hours of Pedagogy)</b>	
<b>Strings and Pointers:</b> Introduction, string taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings. <b>Pointers:</b> Introduction to pointers, declaring pointer variables, Types of pointers, Passing arguments to functions using pointers  <b>Textbook: Chapter 13.1-13.6, 14-14.7</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation
<b>Module-5 (6 Hours of Pedagogy)</b>	
<b>Structure, Union, and Enumerated Data Type:</b> Introduction, structures and functions, Unions, unions inside structures, Enumerated data type. <b>Files:</b> Introduction to files, using files in C, reading and writing data files. , Detecting end of file  <b>Textbook: Chapter 15.1 – 15.10, 16.1-16.5</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation
<b>Course Outcomes(Course Skill S et)</b> At the end of the course the student will be able to:  CO1. Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.  CO 2. Apply programming constructs of C language to solve the real world problem  CO 3.Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting  CO 4.Explore user-defined data structures like structures, unions and pointers in implementing solutions  CO5.Design and Develop Solutions to problems using modular programming constructs	

using functions

### Programming Assignments

- 1 Simulation of a Simple Calculator.
- 2 Compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
- 3 An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.
4. Write a C Program to display the following by reading the number of rows as input,

```

          1
        1 2 1
      1 2 3 2 1
    1 2 3 4 3 2 1
    -----
    nth row

```

- 5 Implement Binary Search on Integers.
- 6 Implement Matrix multiplication and validate the rules of multiplication.
- 7 Compute  $\sin(x)/\cos(x)$  using Taylor series approximation. Compare your result with the built-in library function. Print both the results with appropriate inferences.
- 8 Sort the given set of N numbers using Bubble sort.
- 9 Write functions to implement string operations such as compare, concatenate, and find string length. Use the parameter passing techniques.
- 10 Implement structures to read, write and compute average- marks of the students, list the students scoring above and below the average marks for a class of N students.
- 11 Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.
12. Write a C program to copy a text file to another, read both the input file name and target file name.

Note:

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Students can pick one experiment from the questions lot with equal choice to all the students in a batch. Student should develop an algorithm, program, execute and demonstrate the results with appropriate output for the given problem.

Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

**The duration of SEE is 02 hours**

#### **Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

##### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination (SEE):****SEE for IC**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

**The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).**

**Passing standard:**

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

**Suggested Learning Resources:****Textbooks**

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.

**Web links and Video Lectures (e-Resources):**

1. [elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html](http://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>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Quizzes
- Assignments
- Seminars



**I Semester**

Course Title:	Mathematics for Electrical & Electronics Engineering Stream		
Course Code:	<b>22MATE11</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

**Course objectives:** The goal of the course **Calculus, Differential Equations and Linear Algebra (22MATE11)** is to

- **Familiarize** the importance of calculus associated with one variable and multivariable for computer science and engineering.
- **Analyze** computer science and engineering problems applying Ordinary Differential Equations.
- **Apply** the knowledge of modular arithmetic to computer algorithms.
- **Develop** the knowledge of Linear Algebra to solve the system of equations.

**Teaching-Learning Process****Pedagogy (General Instructions):**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1 Calculus (8 hours)**

Introduction to polar coordinates and curvature relating to EC & EE Engineering applications. Polar coordinates, Polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems.

**Self-study:** Center and circle of curvature, evolutes and involutes.

**Applications:** Communication signals, Manufacturing of microphones, and Image processing.  
(RBT Levels: L1, L2 and L3)

**Module-2 Series Expansion and Multivariable Calculus (8 hours)**



Introduction of series expansion and partial differentiation in EC & EE Engineering applications. Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms - L'Hospital's rule. Problems. Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems.

**Self-study:** Euler's Theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

**Applications:** Series expansion in communication signals, Errors and approximations, and vector calculus.

**(RBT Levels: L1, L2 and L3)**

### **Module-3 Ordinary Differential Equations (ODEs) of first order (8 hours)**

**Introduction to first order ordinary differential equations pertaining to the applications for EC & EE engineering.**

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on  $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$  and  $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)$ . Applications of ODE's -Orthogonal trajectories, L-R and C-R circuits. Problems.

**Non-linear differential equations:** Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, reducible to Clairaut's equations. Problems.

**Self-Study:** Applications of ODE's, Solvable for x and y.

**Applications of ordinary differential equations:** L-R and C-R circuits, Rate of Growth or Decay, Conduction of heat.

**(RBT Levels: L1, L2 and L3)**

### **Module-4 Integral Calculus (8 hours)**

**Introduction to Integral Calculus in EC & EE 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.

**Self-Study:** Volume by triple integration, Center of gravity.

**Applications:** Antenna and wave propagation, Calculation of optimum power in electrical circuits, field theory.

**(RBT Levels: L1, L2 and L3)**

### **Module-5 Linear Algebra (8 hours)**

**Introduction of linear algebra related to EC & EE engineering applications.**

Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Problems

**Self-Study:** Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

**Applications of Linear Algebra:** Network Analysis, Markov Analysis, Critical point of a network system. Optimum solution.

(RBT Levels: L1, L2 and L3)

**List of Laboratory experiments (2 hours/week per batch/ batch strength 15)**

**10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Program to compute area, volume and centre of gravity
7	Evaluation of improper integrals
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

**Suggested software's :** Mathematica/MatLab/Python/Scilab

**Course outcome (Course Skill Set)**

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

CO1	apply the knowledge of calculus to solve problems related to polar curves.
CO2	learn the notion of partial differentiation to compute rate of change multivariate functions
CO3	apply the concept of change of order of integration and variables to evaluate multiple integral and their usage in computing area and volume.
CO4	make use of matrix theory for solving for system of linear equations and compute eigenvalues and eigenvectors
CO5	familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

##### **Reference Books**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017

2. **Srimanta Pal & Subodh C. Bhunia:** “Engineering Mathematics” Oxford University Press, 3<sup>rd</sup> Ed., 2016.
3. **N.P Bali and Manish Goyal:** “A textbook of Engineering Mathematics” Laxmi Publications, 10<sup>th</sup> Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co., Newyork, 6<sup>th</sup> 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, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** “Calculus” Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** “Linear Algebra and its Applications”, Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** “Linear Algebra with applications”, Jones Bartlett Publishers Inc., 6<sup>th</sup> Ed., 2017.

**Web links and Video Lectures (e-Resources):**

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

**II Semester**

Course Title:	<b>Mathematics for EEE streams</b>		
Course Code:	<b>22MATE21</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

**Course objectives:** The goal of the course **Advanced Calculus, Transforms and Numerical methods (22MATE21)** is to

- **Familiarize** the importance of Integral calculus and Vector calculus essential for electronics and electrical engineering.
- **Analyze** electronics and electrical engineering problems applying Partial Differential Equations.
- **Develop** the knowledge of solving electronics and electrical engineering problems numerically.

**Teaching-Learning Process****Pedagogy (General Instructions):**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1 Vector Calculus (8 hours)****Introduction to Vector Calculus in EC & EE 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.

**Self-Study:** Volume integral and Gauss divergence theorem.

**Applications:** Conservation of laws, Electrostatics, Analysis of stream lines and electric potentials.  
(RBT Levels: L1, L2 and L3)

<b>Module-2 Vector Space and Linear Transformations (8 hours)</b>
<p><b>Importance of Vector Space and Linear Transformations in the field of EC &amp; EE engineering applications.</b></p> <p><b>Vector spaces:</b> Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension.</p> <p><b>Linear transformations:</b> Definition and examples, Algebra of transformations, Matrix of a linear transformation. Change of coordinates, Rank and nullity of a linear operator, Rank-Nullity theorem. Inner product spaces and orthogonality.</p> <p><b>Self-study:</b> Angles and Projections. Rotation, reflection, contraction and expansion.</p> <p><b>Applications:</b> Image processing, AI &amp; ML, Graphs and networks, computer graphics. (RBT Levels: L1, L2 and L3)</p>
<b>Module-3 Laplace Transform (8 hours)</b>
<p><b>Importance of Laplace Transform for EC &amp; EE engineering applications.</b></p> <p>Existence and Uniqueness of Laplace transform (LT), transform of elementary functions, region of convergence, Properties–Linearity, Scaling, t-shift property, s-domain shift, differentiation in the s-domain, division by t, differentiation and integration in the time domain, LT of special functions-periodic functions (square wave, saw-tooth wave, triangular wave, full &amp; half wave rectifier), Heaviside Unit step function, Unit impulse function.</p> <p><b>Inverse Laplace Transforms:</b> Definition, properties, evaluation using different methods, convolution theorem (without proof), problems, and Applications to solve ordinary differential equations.</p> <p><b>Self-Study:</b> Verification of convolution theorem.</p> <p><b>Applications:</b> Signals and systems, Control systems, LR, CR &amp; LCR circuits. (RBT Levels: L1, L2 and L3)</p>
<b>Module-4 Numerical methods -1 (8 hours)</b>
<p><b>Importance of numerical methods for discrete data in the field of EC &amp; EE engineering applications.</b></p> <p>Solution of polynomial and transcendental equations: Regula-Falsi method and Newton-Raphson method (only formulae). Problems.</p> <p>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.</p> <p><b>Numerical integration:</b> Trapezoidal, Simpson's (1/3)<sup>rd</sup> and (3/8)<sup>th</sup> rules (without proof). Problems.</p> <p><b>Self-Study:</b> Bisection method, Lagrange’s inverse Interpolation, Weddle's rule.</p> <p><b>Applications:</b> Estimating the approximate roots, extremum values, Area, volume, surface area. (RBT Levels: L1, L2 and L3)</p>
<b>Module-5 Numerical methods -2 (8 hours)</b>
<p><b>Introduction to various numerical techniques for handling EC &amp; EE applications.</b></p> <p><b>Numerical Solution of Ordinary Differential Equations (ODE’s):</b></p> <p>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.</p> <p><b>Self-Study:</b> Adam-Bashforth method.</p> <p><b>Applications:</b> Estimating the approximate solutions of ODE for electric circuits. (RBT Levels: L1, L2 and L3)</p>



**List of Laboratory experiments (2 hours/week per batch/ batch strength 15)****10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	Finding gradient, divergent, curl and their geometrical interpretation and Verification of Green's theorem
2	Computation of basis and dimension for a vector space and Graphical representation of linear transformation
3	Visualization in time and frequency domain of standard functions
4	Computing inverse Laplace transform of standard functions
5	Laplace transform of convolution of two functions
6	Computing the approximate roots for algebraic and transcendental equation
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's (1/3) <sup>rd</sup> and (3/8) <sup>th</sup> rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4 <sup>th</sup> order and Milne's predictor-corrector method

**Suggested software's :** Mathematica/MatLab/Python/Scilab

**Course outcome (Course Skill Set)**

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

CO1	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.
CO2	Demonstrate the idea of Linear dependence and independence of sets in the vector space, and linear transformation
CO3	To understand the concept of Laplace transform and to solve initial value problems.
CO4	Apply the knowledge numerical methods in solving physical and engineering phenomena.
CO5	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

##### **Reference Books**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> Ed., 2016.
3. **N.P Bali and Manish Goyal:** "A textbook of Engineering Mathematics" Laxmi Publications, 10<sup>th</sup> Ed., 2022.

4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co., Newyork, 6<sup>th</sup> 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, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** “Calculus” Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** “Linear Algebra and its Applications”, Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** “Linear Algebra with applications”, Jones Bartlett Publishers Inc., 6<sup>th</sup> Ed., 2017.

**Web links and Video Lectures (e-Resources):**

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped,    Level 2-Moderately Mapped,    Level 1-Low Mapped,    Level 0- Not Mapped

Course Title:	<b>Physics for Electrical &amp; Electronics Engineering Stream</b>		
Course Code:	<b>22PHYE12/22</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours+10-12 Lab Slots	Credits	04
<b>Course objectives</b>			
<ul style="list-style-type: none"> <li>To study the principles of quantum mechanics</li> <li>To understand the properties of dielectrics and superconductors</li> <li>To study the essentials of photonics for engineering applications.</li> <li>To understand the fundamentals of vector calculus and EM waves.</li> <li>To study the knowledge about semiconductors and devices.</li> </ul>			
<b>Teaching-Learning Process</b>			
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective			
<ol style="list-style-type: none"> <li>Flipped Class</li> <li>Chalk and Talk</li> <li>Blended Mode of Learning</li> <li>Simulations, Interactive Simulations and Animations</li> <li>NPTEL and Other Videos for theory topics</li> <li>Smart Class Room</li> <li>Lab Experiment Videos</li> </ol>			
<b>Module-1 (08 Hours)</b>			
<b>Quantum Mechanics:</b>			
de Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle and its application (Non-existence of electron inside the nucleus-Non Relativistic), Principle of Complementarity, Wave Function, Time independent Schrodinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Particle inside one-dimensional infinite potential well, Waveforms and Probabilities. Numerical Problems			
<b>Pre-requisite: Wave-Particle dualism</b>			
<b>Self-learning: de Broglie Hypothesis</b>			
<b>Module-2 (08 hours)</b>			
<b>Electrical Properties of Solids:</b>			
<b>Dielectric Properties:</b> Polar and non-polar dielectrics, Types of Polarization, internal fields in solid, Clausius-Mossottiequation(Derivation), solid, liquid and gaseous dielectrics. Application of dielectrics in transformers, Capacitors, and Electrical Insulation. Numerical problems.			
<b>Superconductivity:</b> Introduction to Superconductors, Temperature dependence of resistivity, Meissner's Effect, Silsbee Effect, Types of Super Conductors, Temperature dependence of Critical field, BCS theory (Qualitative), High-Temperature superconductivity, SQUID, MAGLEV, Numerical problems.			
<b>Pre-requisites: Difference between Insulators &amp; Dielectrics.</b>			
<b>Self-learning: Dielectrics Basics</b>			
<b>Module-3 (08 hours)</b>			
<b>Lasers and Optical Fibers:</b>			
<b>Lasers:</b> Characteristics of LASER, Interaction of radiation with matter, Expression for energy density equation and its significance. Requisites of a Laser system. Conditions for Laser action. Principle, Construction and working of carbon dioxide laser. Application of Lasers in Defence (Laser range finder) and Laser Printing. Numerical problems.			
<b>Optical Fibers:</b> Propagation mechanism, TIR, angle of acceptance, Numerical aperture, fractional index change, Modes of propagation, Number of modes and V parameter, Types of optical fibers. Attenuation and Mention of expression for attenuation coefficient, Attenuation spectrum of an optical fiber with optical windows. Discussion of the block diagram of point-to-point communication, Intensity-based fiber optic displacement sensor, Merits and demerits. Numerical problems.			
<b>Pre-requisite: Properties of light</b>			
<b>Self-learning: Propagation Mechanism &amp;TIR in optical fiber</b>			

<b>Module-4(08 hours)</b>
<p><b>Maxwell's Equations and EM waves:</b>  <b>Maxwell's Equations:</b> Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density &amp; equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum.  <b>EM Waves:</b> The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, and their transverse nature. Numerical problems.  <b>Pre-requisite:Electricity &amp; Magnetism</b>  <b>Self-learning: Fundamentals of vector calculus</b></p>

<b>Module-5 (08 hours)</b>
<p><b>Semiconductor and Devices:</b>  Fermi energy and Fermi level, Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band &amp; holes concentration in valance band (only mention the expression), Law of mass action, Electrical conductivity of a semiconductor (derivation), Hall effect, Expression for Hall coefficient (derivation) and its application.  Photodiode and Power responsivity, Construction and working of Semiconducting Laser,Four probe method to determine resistivity, Phototransistor. Numerical problems.  <b>Pre-requisite: Basics of Semiconductors</b>  <b>Self-learning: Photodiode</b></p>

### Course outcome (Course Skill Set)

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

CO1	<b>Describe</b> the fundamental principles of Quantum Mechanics and the essentials of Photonics
CO2	<b>Elucidate</b> the concepts of dielectrics and superconductivity
CO3	<b>Discuss</b> the fundamentals of vector calculus and their applications in Maxwell's Equations and EM Waves
CO4	<b>Summarize</b> the properties of semiconductors and the working principles of semiconductor devices
CO5	<b>Practice</b> working in groups to conduct experiments in physics and perform precise and honest measurements

### Assessment Details (both CIE and SEE)

The weightage 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 of20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination (SEE):****SEE for IC**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

**The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).**

**Passing standard:**

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. A Textbook of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand. & Company Ltd, New Delhi.
2. An Introduction to Lasers theory and applications by M.N.Avadhanulu and P.S.Hemne revised Edition 2012. S. Chand and Company Ltd -New Delhi.
3. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017.
4. Concepts of Modern Physics-Arthur Beiser: 6th Ed;Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006.
5. Fundamentals of Fibre Optics in Telecommunication & Sensor Systems, B.P. Pal, New Age International Publishers.
6. Introduction to Electrodynamics, David Griffith, 4<sup>th</sup> Edition, Cambridge University Press 2017.
7. Lasers and Non-Linear Optics – B.B. Laud, 3rd Ed, New Age International Publishers 2011.
8. LASERS Principles, Types and Applications by K.R. Nambiar-New Age International Publishers.
9. Solid State Physics-S O Pillai, 8th Ed- New Age International Publishers-2018.

**Web links and Video Lectures (e-Resources):**

**Laser:** <https://www.britannica.com/technology/laser.k>

**Laser:** <https://nptel.ac.in/courses/115/102/115102124/>

**Quantum mechanics:** <https://nptel.ac.in/courses/115/104/115104096/>

**Physics:** <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html>

**Numerical Aperture of fiber:** <https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement>

**NPTEL Superconductivity:** <https://archive.nptel.ac.in/courses/115/103/115103108/>

**Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning**

<http://nptel.ac.in>

<https://swayam.gov.in>

<https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>

<https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1>

[https://virtuallabs.merlot.org/vl\\_physics.html](https://virtuallabs.merlot.org/vl_physics.html)

<https://phet.colorado.edu>

<https://www.myphysicslab.com>

**Laboratory Component:**

Any Ten Experiments have to be completed from the list of experiments

Note: The experiments have to be classified into

- Exercise
- Demonstration
- Structured Inquiry
- Open Ended

Based on convenience classify the following experiments into the above categories. Select at least one simulation/spreadsheet activity.

**List of Experiments:**

- Wavelength of LASER using Grating
- Numerical Aperture using optical fiber
- Four Probe Method
- Charging and Discharging of a Capacitor
- Transistor Characteristics
- Photo-Diode Characteristics
- Series and Parallel LCR Circuits
- Magnetic Field at any point along the axis of a circular coil
- Plank's Constant using LEDs.
- Fermi Energy
- Black Box
- Energy Gap of the given Semiconductor
- Dielectric Constant
- PHET Interactive Simulations  
(<https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>)
- Online Circuit Simulator (<https://www.partsim.com/simulator>)
- Study of Electrical quantities using spreadsheet

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	1	-	-	-	-	-	-	2
CO5	3	2	1	-	2	-	-	3	3	-	-	2

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

**Note:** The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competency and Performance Indicators** mentioned in the **AICTE Exam reforms**.



## Electrical & Electronics Engineering Stream (Chemistry group)

Course Title:	<b>Chemistry for EEE Stream</b>		
Course Code:	<b>22CHEE12/22</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
Teaching Hours/Week (L:T:P: S)**	2:2:2:0	Total Marks	100
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Exam Hours	03+02
		Credits	04

### Course objectives

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

### Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

- Tutorial & remedial classes for needy students of small batches (not regular T/R)
- Demonstration of concepts either by building models or by industry visit
- Experiments in laboratories using non- conventional methods
- Use of ICT – Online videos, online courses
- Use of Google classroom for assignments/Notes
- Conducting Make up class / Bridge courses for needy students
- Publication of paper in conference or journal on Teaching & Learning Process

### MODULE 1: Chemistry of electronic materials (8hr)

**Conductors and Insulators:** Introduction, principle with examples, semiconductors- production of electronic grade silicon-Czochralski process (CZ) and float zone (FZ) methods.

**Polymers:** Introduction, Molecular weight - Number average, weight average and numerical problems, Conducting polymers – synthesis and conducting mechanism of polyacetylene. Preparation, properties and commercial applications of graphene oxide.

**PCB:** Electroless plating – Introduction, Principle of Electroless plating - copper in the manufacture of double-sided PCB.

**Self-Study Components:** Technological importance of metal finishing and distinction between electroplating and Electroless plating.

### MODULE 2: Energy conversion and storage (8hr)

**Batteries:** Introduction, classification of batteries, components, construction, working and applications of modern batteries: Na-ion battery, solid state battery (Li-polymer battery) and flow battery (Vanadium redox flow battery).

**Fuel cells:** Introduction, construction, working and applications of methanol-oxygen and polymer electrolyte fuel cell.

**Solar energy:** Introduction, importance of solar PV cell, construction and working solar PV cell, advantages and disadvantages.

**Self-Study Components:** Electrodes for electrostatic double layer capacitors, pseudo capacitors, and hybrid capacitor.

### MODULE 3: Corrosion science and e-waste management (8hr)

**Corrosion chemistry:** Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration, corrosion control-galvanization, anodization and sacrificial anode method. Corrosion penetration rate (CPR) - introduction and numerical problem.

**E-waste management:** Introduction, sources, types of, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

**Self-Study Components:** Recycling of PCB and battery components

\* NOTE: Wherever the contact hours is not sufficient, tutorial hour can be converted to theory hours



**MODULE 4: Nanomaterials and Display systems (8hr)**

**Nanomaterials:** Introduction, size dependent properties of nanomaterials (Surface area, Catalytic, Conducting), preparation of nanomaterials by sol-gel and co-precipitation method with example. Introduction, properties and applications- nanofibers, nanophotonics, nanosensors,

**Display systems:** Liquid crystals - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). properties and application in Organic light emitting diodes (OLED's), Quantum Light emitting diodes (QLED's).

Perovskite materials- Introduction, properties and applications in optoelectronic devices

**Self-Study Components:** Properties and Electrochemical applications of carbon nanotubes and graphene.

**MODULE 5: Sensors in Analytical techniques (8hr)**

**Electrode system:** Introduction, types of electrodes, Ion selective electrode – definition, construction, working and applications of glass electrode. Determination of pH using glass electrode. Reference electrode: Introduction, calomel electrode – construction, working and applications of calomel electrode. Concentration cell – Definition, construction and Numerical problems.

**Sensors:** Introduction, working principle and applications of conductometric sensors, Electrochemical sensors, Thermometric sensors, and Optical sensors

**Analytical techniques:** Introduction, principle and instrumentation: Colorimetric sensors – estimation of copper, Potentiometric sensors – estimation of iron, Conductometric sensors – estimation of weak acid.

**Self-Study Components:** IR and UV- visible spectroscopy.

**PRACTICAL MODULE**

**A – Demonstration (any two) offline/virtual:**

- A1. Synthesis of polymer.
- A2. Quantitative estimation of aluminum by precipitation as basic sulphate.
- A3. Synthesis of iron oxide nanoparticles by precipitation method.
- A4. Electroplating of copper on metallic objects.

**B – Exercise (compulsorily any 3 to be conducted):**

- 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)
- B4. Determination of rate of corrosion of mild steel by weight loss method

**C – Structured Enquiry (compulsorily any 3 to be conducted):**

- C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
- C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
- C3. Estimation of iron in TMT bar by diphenyl amine method
- C4. Estimation of Sodium present in soil/effluent sample using flame photometer

**D – Open Ended Experiments (any two):**

- D1. Estimation of metal in e-waste by optical sensors.
- D2. Electroless plating of Nickle on Copper
- D3. Determination of glucose by electrochemical sensors.
- D4. Synthesis of polyaniline and its conductivity measurement

**Course outcome (Course Skill Set)**

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

<b>CO1</b>	Identify the terms and processes involved in scientific and engineering applications
<b>CO2</b>	Explain the phenomena of chemistry to describe the methods of engineering processes
<b>CO3</b>	Solve for the problems in chemistry that are pertinent in engineering applications
<b>CO4</b>	Apply the basic concepts of chemistry to explain the chemical properties and processes
<b>CO5</b>	Analyze properties and processes associated with chemical substances in multidisciplinary situations

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination(SEE):**

**SEE will have two component Theory Examination and Practical Examination**

**Theory Examination;**

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)
- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.

The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 30 marks**

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Practical Examination;**

- SEE marks for the practical course is **100 Marks**.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and **scored marks shall be scaled down to 20 marks** (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.
- The duration of SEE is 02 or 03 hours

**Note:**

1. Students have to appear in both theory and practical components of CIE and SEE and score a minimum of 40% of the maximum marks of CIE and a minimum of 35% of the maximum marks of SEE. An average of a minimum 40% of the maximum marks of course (100 marks) to pass the course.
2. Passing in CIE is compulsory to become eligible to appear for SEE
3. In SEE passing both theory and practical examinations is compulsory.

If a student fails in any one of the components (Theory/Practical) then he/she has to reappear in the next semester for both components (i.e theory and practical) and pass the both the components.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher (2022) Bengaluru, ISBN 978-93-85155-70-3
2. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. 2010
3. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
4. Polymer Science, V R Gowariker, 3<sup>rd</sup> Edition
5. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16<sup>th</sup> Edition.
6. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press 2002- 1<sup>st</sup> Edition.
7. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2<sup>nd</sup> Edition.
8. Polymer chemistry, by Anil Kumar P V
9. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 2014-3<sup>rd</sup> Edition.
10. Principles of nanotechnology, Phanikumar, Scitech publications, 2010-2<sup>nd</sup> Edition.
11. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12<sup>th</sup> Edition, 2011.
12. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2<sup>nd</sup> Edition, 2016.
13. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, Bangalore.5<sup>th</sup> Edition, 2014
14. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4<sup>th</sup> Edition, 1999.
15. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3<sup>rd</sup> Edition, 1996.
16. A text book of Engineering chemistry, Shashi chawla, Dhanpat Rai & Co, 2016.
17. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
18. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.

**Web links and Video Lectures (e-Resources):**

- Electrochemistry: <https://nptel.ac.in/downloads/122101001/>
- Chemistry of materials: <https://nptel.ac.in/courses/104/103/104103019/>
- <https://www.youtube.com/watch?v=faESCxAWR9k>
- <https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWWh>
- <https://www.youtube.com/watch?v=j5Hml6KN4TI>
- <https://www.youtube.com/watch?v=X9GHBdyYcyo>
- <https://www.youtube.com/watch?v=1xWBPZnEJk8>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- <https://www.vlab.co.in/broad-area-chemical-sciences>
- <https://demonstrations.wolfram.com/topics.php>
- <https://interestingengineering.com/science>

**COs and POs Mapping (Individual teacher has to fill up)**

	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	<b>3</b>	<b>1</b>	<b>1</b>				<b>1</b>					
<b>CO2</b>	<b>3</b>	<b>1</b>	<b>1</b>				<b>1</b>					
<b>CO3</b>	<b>3</b>	<b>1</b>	<b>1</b>				<b>1</b>					
<b>CO4</b>	<b>3</b>	<b>1</b>	<b>1</b>				<b>1</b>					
<b>CO5</b>	<b>3</b>	<b>1</b>	<b>1</b>				<b>1</b>					

Course Title:	<b>Elements of Electrical Engineering</b>		
Course Code:	<b>22EEE13/23</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	Total Marks	100
Total Hours of Pedagogy	40 hours	Exam Hours	03
		Credits	03
<b>Course objectives</b> <ul style="list-style-type: none"> <li>To explain the basic laws used in the analysis of DC circuits, electromagnetism.</li> <li>To explain the behavior of circuit elements in single-phase circuits.</li> <li>To explain three phase circuits, balanced loads and measurement of three phase power.</li> <li>To explain the measuring techniques, measuring instruments and domestic wiring.</li> <li>To explain electricity billing, equipment and personal safety measures.</li> </ul>			
<b>Teaching-Learning Process</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective <ol style="list-style-type: none"> <li>Chalk and talk</li> <li>Animated/NPTEL videos</li> <li>Cut sections</li> <li>PPTs</li> </ol>			
<b>Module-1 (08 Hrs)</b>			
<b>DC circuits:</b> Ohm's law and Kirchoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. <b>Electromagnetism:</b> Faraday's Laws of Electromagnetic Induction, Lenz's Law, Flemings rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field. Simple Numerical.			
<b>Module-2 (08 Hrs)</b>			
<b>Single-phase AC circuits:</b> 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. Series, Parallel and Series-Parallel circuits. Simple Numerical.			
<b>Module-3(08 Hrs)</b>			
<b>Three-phase AC circuits:</b> 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. Simple Numerical.			
<b>Module-4(08 Hrs)</b>			
<b>Measuring instruments:</b> construction and working principle of whetstone's bridge, Kelvin's double bridge, Megger, Maxwell's bridge for inductance, Schering's bridge for capacitance, concepts of current transformer and potential transformer. <b>Domestic Wiring:</b> Requirements, Types of wiring: casing, capping. Two way and three way control of load.			
<b>Module-5 (08 Hrs)</b>			
<b>Electricity bill:</b> Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. <b>Equipment Safety measures:</b> Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. <b>Personal safety measures:</b> Electric Shock, Earthing and its types, Safety Precautions to avoid shock, and Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB).			

**Course outcome (Course Skill Set)**

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

C01	Understand the concepts of DC circuits and Electromagnetism.
C02	Understand the concepts of single phase and Three phase AC circuits.
C03	Apply the basic Electrical laws to solve circuits.
C04	Understand the concepts of measurements and measuring Instruments
C05	Explain the concepts of domestic wiring, electricity billing, circuit protective devices and personal safety measures.

**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

**Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)****Text Books:**

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.

**Reference Books:**

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3. Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016.
4. Electrical and electronic measurements and instrumentation by A K Sawhney, Dhanapat Rai and Co. edition, January 2015

**Web links and Video Lectures (e-Resources):**

- [www.nptel.ac.in](http://www.nptel.ac.in)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Wherever required, faculty shall demonstrate the concepts through laboratory experiments.

**COs and POs Mapping (Individual teacher has to fill up)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	1	1	1	1	0	0	0	1
CO2	3	3	2	1	1	1	0	0	0	0	0	1
CO3	3	2	1	1	1	1	1	1	0	0	0	1
CO4	3	2	2	1	0	1	1	1	0	0	0	1
CO5	3	1	2	0	1	2	1	1	0	0	1	1

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

Course Title:	<b>Basic Electronics (For ECE and Allied Branches)</b>		
Course Code:	<b>22BEE13/23</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03

**Course objectives:** Students will be taught

- Operation of Semiconductor diode, Zener diode and Special purpose diodes and their applications.
- Biasing circuits for transistor (BJT) as an amplifier.
- Study of linear Op-amps and its applications.
- Logic circuits and their optimization.
- Principles of Transducers and Communication.

### Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various analog and digital circuits.
3. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
4. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

### Module-1 (8 Hours)

**Semiconductor Diodes:** Introduction, PN Junction diode, Characteristics and Parameters, Diode Approximations, DC Load Line analysis (Text 1: 2.1,2.2,2.3,2.4)

**Diode Applications:** Introduction, Half Wave Rectification, Full Wave Rectification, Full Wave Rectifier Power Supply: Capacitor Filter Circuit, RC  $\pi$  Filter (includes numerical) (Text 1: 3.1,3.2,3.4,3.5)

**Zener Diodes:** Junction Breakdown, Circuit Symbol and Package, Characteristics and Parameters, Equivalent Circuit, Zener Diode Voltage Regulator. (Text1:2.9, 3.7)

### Module-2(8 Hours)

**Bipolar Junction Transistors:** Introduction, BJT Voltages & Currents, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, BJT Biasing: Introduction, DC Load line and Bias point (Text 1: 4.2, 4.3, 4.5,4.6, 5.1)

**Field Effect Transistor:** Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs (Text 1: 9.1,9.2,9.5)

### Module-3(8 Hours)

**Operational Amplifiers:** Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, Slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp , Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non Inverting Amplifier

**Op-Amp Applications:** Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator (Text 2: 1.1, 1.2, 1.3, 1.5, 2.2, 2.3, 2.4, 2.6, 6.5.1, 6.5.2, 6.5.3, 6.12, 6.13).

### Module-4(8 Hours)

**Boolean Algebra and Logic Circuits:** Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations,



Digital Logic Gates (Text 3: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)

**Combinational logic:** Introduction, Design procedure, Adders- Half adder, Full adder (Text 3:4.1, 4.2, 4.3)

### Module-5(8 Hours)

**Introduction to Transducers:** Introduction, Resistive Transducers, Inductive Transducers, Capacitive Transducers, Thermal transducers, Optoelectronic transducer, and Piezoelectric transducers (Text 4: Chapter 18: 18.1, 18.2, 18.3, 18.4, 18.5)

**Communications :** Introduction to communication, Communication System, Modulation (Text book 5: 1.1, 1.2, 1.3)

### Course outcome (Course Skill Set)

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

**CO1:**Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.(Level: C3)

**CO2:**Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices (Level: C3)

**CO3:**Develop competence knowledge to construct basic digital circuit by make use of basic gate and its function.(Level: C3)

**CO4:** Construct the conceptual blocks for basic communication system. (Level: C3)

**CO5:** Apply the knowledge of various transducers principle in sensor system. (Level: C3)

### A. CO v/s PO Mapping Table

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	2						
CO2	3	2	3	-	2	1						
CO3	3	2	3	-	3				1			
CO4	2	1	1	-	2	1			1			1
CO5	2	1	1	-	2	1			1			1

### **Assessment Details (both CIE and SEE)**

The weightage 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.

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#### **Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

### **Suggested Learning Resources:**

#### **Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Electronic Devices and Circuits, David A Bell, 5<sup>th</sup> Edition, Oxford, 2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4<sup>th</sup> Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8
4. Electronic Instrumentation and Measurements (3rd Edition) – David A. Bell, Oxford University Press, 2013
5. Electronic Communication Systems, George Kennedy, 4<sup>th</sup> Edition, TMH

#### **Web links and Video Lectures (e-Resources):**

- <https://nptel.ac.in/courses/122106025>
- <https://nptel.ac.in/courses/108105132>
- <https://nptel.ac.in/courses/117104072>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**I Semester**

Course Title:	<b>Mathematics for mechanical engineering stream-I</b>		
Course Code:	<b>22MATM11</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

**Course objectives:** The goal of the course **Calculus, Ordinary Differential Equations and Linear Algebra (22MATM11)** is to

- **Familiarize** the importance of calculus associated with one variable and two variables for Mechanical engineering.
- **Analyze** Mechanical engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

**Teaching-Learning Process****Pedagogy (General Instructions):**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1 Calculus (8 hours)****Introduction to polar coordinates and curvature relating to mechanical engineering.**

Polar coordinates, Polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems.

**Self-study:** Center and circle of curvature, evolutes and involutes.

**Applications:** Applied Mechanics, Strength of Materials, Elasticity.

**(RBT Levels: L1, L2 and L3)**

**Module-2 Series Expansion and Multivariable Calculus (8 hours)**

**Introduction to series expansion and partial differentiation in the field of mechanical engineering applications.**

Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms - L'Hospital's rule, Problems.

Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems.

**Self-study:** Euler's theorem and problems. Method of Lagrange's undetermined multipliers with a single constraint.

**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)**

**Module-3 Ordinary Differential Equations (ODEs) of first order (8 hours)**

**Introduction to first order ordinary differential equations pertaining to the applications for mechanical engineering.**

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations- Integrating factors on  $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$  and  $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)$ . 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.

**Self-Study:** Applications of ODE's: L-R circuits. Solvable for x and y.

**Applications:** Rate of Growth or Decay, Conduction of heat.

**(RBT Levels: L1, L2 and L3)**

**Module-4 Ordinary Differential Equations of higher order (8 hours)**

**Importance of higher-order ordinary differential equations in Mechanical Engineering applications.**

Higher-order linear ODE's with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre homogeneous differential equations. Problems.

**Self-Study:** Formulation and solution of oscillations of a spring. Finding the solution by the method of undetermined coefficients.

**Applications:** Applications to oscillations of a spring, Mechanical systems and Transmission lines.

**(RBT Levels: L1, L2 and L3)**

**Module-5 Linear Algebra (8 hours)**

**Introduction of linear algebra related to Mechanical Engineering applications.**

Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss - Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.

**Self-Study:** Solution of a system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

**Applications of Linear Algebra:** Network Analysis, Balancing equations.  
(RBT Levels: L1, L2 and L3)

**List of Laboratory experiments (2 hours/week per batch/ batch strength 15)**

**10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Solutions of Second order ordinary differential equations with initial/ boundary conditions
7	Solution of differential equation of oscillations of a spring with various load
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

**Suggested software's :** Mathematica/MatLab/Python/Scilab

**Course outcome (Course Skill Set)**

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

CO1	Apply the knowledge of calculus to solve problems related to polar curves.
CO2	Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO3	Analyze the solution of linear and non-linear ordinary differential equations.
CO4	Get acquainted with solving equations by matrix methods
CO5	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

##### **Reference Books**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> Ed., 2016.

3. **N.P Bali and Manish Goyal:** “A textbook of Engineering Mathematics” Laxmi Publications, 10<sup>th</sup> Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co., Newyork, 6<sup>th</sup> 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, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** “Calculus” Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** “Linear Algebra and its Applications”, Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** “Linear Algebra with applications”, Jones Bartlett Publishers Inc., 6<sup>th</sup> Ed., 2017.

**Web links and Video Lectures (e-Resources):**

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped,    Level 2-Moderately Mapped,    Level 1-Low Mapped,    Level 0- Not Mapped



**II Semester**

Course Title:	<b>Mathematics for mechanical engineering streams</b>		
Course Code:	<b>22MATM21</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:2:2:0	Exam Hours	03+02
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

**Course objectives:** The goal of the course **Integral Calculus, Partial Differential Equations and Numerical methods (22MATM21)** is to

- **Familiarize** the importance of Integral calculus and Vector calculus essential for Mechanical engineering.
- **Analyze** Mechanical engineering problems applying Partial Differential Equations.
- **Develop** the knowledge of solving Mechanical engineering problems numerically.

**Teaching-Learning Process****Pedagogy (General Instructions):**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1 Integral Calculus (8 hours)****Introduction to Integral Calculus in Mechanical 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.**

**Self-Study:** Volume by triple integration, Center of gravity.

**Applications:** Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models.

**(RBT Levels: L1, L2 and L3)**

<b>Module-2 Vector Calculus (8 hours)</b>
<p><b>Introduction to Vector Calculus in Mechanical Engineering applications.</b>  <b>Vector Differentiation:</b> Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.  <b>Vector Integration:</b> Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems.</p> <p><b>Self-Study:</b> Volume integral and Gauss divergence theorem.  <b>Applications:</b> Heat and mass transfer, oil refinery problems, environmental engineering, velocity and acceleration of moving particle, analysis of stream lines.  <b>(RBT Levels: L1, L2 and L3)</b></p>
<b>Module-3 Partial Differential Equations (PDE's) (8 hours)</b>
<p><b>Importance of partial differential equations for Mechanical Engineering application.</b>  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.</p> <p><b>Self-Study:</b> Solution of the one-dimensional heat equation and wave equation by the method of separation of variables.  <b>Applications:</b> Vibration of a rod/membrane.  <b>(RBT Levels: L1, L2 and L3)</b></p>
<b>Module-4 Numerical Methods -1 (8 hours)</b>
<p><b>Importance of numerical methods for discrete data in the field of Mechanical Engineering.</b>  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.  <b>Numerical integration:</b> Trapezoidal, Simpson's <math>(1/3)^{rd}</math> and <math>(3/8)^{th}</math> rules (without proof). Problems.</p> <p><b>Self-Study:</b> Bisection method, Lagrange's inverse Interpolation, Weddle's rule.  <b>Applications:</b> Finding approximate solutions to solve mechanical engineering problems involving numerical data.  <b>(RBT Levels: L1, L2 and L3)</b></p>
<b>Module-5 Numerical Methods -2 (8 hours)</b>
<p><b>Introduction to various numerical techniques for handling Mechanical Engineering applications.</b>  <b>Numerical Solution of Ordinary Differential Equations (ODE's):</b>  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.</p> <p><b>Self-Study:</b> Adam-Bashforth method.  <b>Applications:</b> Finding approximate solutions to solve mechanical engineering problems.</p>

**(RBT Levels: L1, L2 and L3)****List of Laboratory experiments (2 hours/week per batch/ batch strength 15)****10 lab sessions + 1 repetition class + 1 Lab Assessment**

1	Program to compute surface area, volume and centre of gravity
2	Evaluation of improper integrals
3	Finding gradient, divergent, curl and their geometrical interpretation
4	Verification of Green's theorem
5	Solution of one-dimensional heat equation and wave equation
6	Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4 <sup>th</sup> order and Milne's predictor-corrector method

**Suggested software's : Mathematica/MatLab/Python/Scilab****Course outcome (Course Skill Set)**

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

CO1	Apply the knowledge of multiple integrals to compute area and volume.
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.
CO3	Demonstrate partial differential equations and their solutions for physical interpretations.
CO4	Apply the knowledge numerical methods in solving physical and engineering phenomena.
CO5	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

##### **Text Books**

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2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

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Publications, 10<sup>th</sup> Ed., 2022.

4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co., Newyork, 6<sup>th</sup> 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.
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7. **James Stewart:** “Calculus” Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** “Linear Algebra and its Applications”, Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** “Linear Algebra with applications”, Jones Bartlett Publishers Inc., 6<sup>th</sup> Ed., 2017.

**Web links and Video Lectures (e-Resources):**

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

## Mechanical Engineering Stream (Chemistry group)

Course Title:	<b>Applied Chemistry for MES</b>		
Course Code:	<b>22CHEM12/22</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
Teaching Hours/Week (L:T:P: S)**	2:2:2:0	Total Marks	100
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Exam Hours	03+02
		Credits	04

### Course objectives

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

### Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

- Tutorial & remedial classes for needy students of small batches (not regular T/R)
- Demonstration of concepts either by building models or by industry visit
- Experiments in laboratories using non- conventional methods
- Use of ICT – Online videos, online courses
- Use of Google classroom for assignments/Notes
- Conducting Make up class / Bridge courses for needy students
- Publication of paper in conference or journal on Teaching & Learning Process

### Module-1: Energy; Source, Conversion and storage (8 hr)

**Fuels:** Introduction, calorific value, determination calorific value using bomb calorimeter, numerical problems.

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

**High energy fuels:** Production (water electrolysis), advantages and storage of hydrogen.

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

**Self-learning:** Plastic recycling to fuels and its monomers or other useful products.

### Module-2: Corrosion science and engineering (8 hr)

Introduction, electrochemical theory of corrosion, types of corrosion-differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement). Corrosion control: Metal coating-galvanization, surface conversion coating-anodization and cathodic protection-sacrificial anode method. Corrosion testing by weight loss method. Corrosion penetration rate (CPR)-numerical problems.

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

**Self-learning:** Factors affecting the rate of corrosion, Factors influencing the nature of quality electrodeposit (Current density, concentration of metal ion, pH, and temperature).

### Module-3: Macromolecules for engineering applications (8 hr)

**Polymers:** Introduction, methods of polymerization, molecular weight, number average, weight average, numerical problems, synthesis, properties and industrial applications of Chlorinated polyvinylchloride (CPVC) and polystyrene.

**Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar and Polyester.

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

**Composites:** Introduction, properties and industrial applications of carbon based reinforced materials and metal matrix polymer composites.

**Lubricants:** Introduction, classification, properties and application of lubricants.

**Self-learning: Biodegradable polymer:** Introduction, synthesis, properties and application of

\* NOTE: Wherever the contact hours is not sufficient, tutorial hour can be converted to theory hours

## Mechanical Engineering Stream (Chemistry group)

poly lactic acid (PLA).

### Module-4: Phase rule and Analytical techniques (8 hr)

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

**Analytical techniques:** Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetric); its application in the estimation of the copper, pH-sensor (Glass electrode); its application in the determination of pH of beverages.

**Self-learning:** Determination of viscosity of biofuel and its correlation with temperature.

### Module-5: Materials for mechanical applications (8 hr)

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

**Ceramics:** Introduction, classification based on chemical composition, properties and applications of perovskites ( $\text{CaTiO}_3$ ).

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

**Self-learning: Abrasives:** Introduction, classification, properties and application of silicon carbide (carborandum).

### PRACTICAL MODULE

#### A – Demonstration (any two) offline/virtual:

- A1. Synthesis of polymer
- A2. Preparation of urea formaldehyde resin
- A3. Synthesis of iron oxide nanoparticles
- A4. Determination of acid value of biofuel

#### B – Exercise (compulsorily any 3 to be conducted):

- B1. Conductometric estimation of acid mixture
- B2. Potentiometric estimation of FAS using  $\text{K}_2\text{Cr}_2\text{O}_7$
- B3. Determination of pKa of vinegar using pH sensor (Glass electrode)
- B4. Determination of rate of corrosion of mild steel by weight loss method

#### C – Structured Enquiry (compulsorily any 3 to be conducted):

- C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
- C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
- C3. Estimation of iron in TMT bar by diphenyl amine method
- C4. Estimation of Sodium present in soil/effluent sample using flame photometry

#### D – Open Ended Experiments (any two):

- D1. Estimation of percentage of iron in steel
- D2. Electroplating of desired metal on substrate
- D3. Synthesis of biodiesel
- D4. Synthesis of graphene oxide nano particle

### **Course outcome (Course Skill Set)**

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

<b>CO1</b>	Identify the terms and processes involved in scientific and engineering applications
<b>CO2</b>	Explain the phenomena of chemistry to describe the methods of engineering processes
<b>CO3</b>	Solve for the problems in chemistry that are pertinent in engineering applications
<b>CO4</b>	Apply the basic concepts of chemistry to explain the chemical properties and processes
<b>CO5</b>	Analyze properties and processes associated with chemical substances in multidisciplinary situations

## Mechanical Engineering Stream (Chemistry group)

### Assessment Details (both CIE and SEE)

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### CIE for the practical component of the Integrated Course

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC for **20 marks**.

### Semester End Examination(SEE):

**SEE will have two component Theory Examination and Practical Examination**

#### Theory Examination;

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)
- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 30 marks**.



## Mechanical Engineering Stream (Chemistry group)

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

### Practical Examination;

- SEE marks for the practical course is **100 Marks**.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and **scored marks shall be scaled down to 20 marks** (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.
- The duration of SEE is 02 or 03 hours

### Note:

1. Students have to appear in both theory and practical components of CIE and SEE and score a minimum of 40% of the maximum marks of CIE and a minimum of 35% of the maximum marks of SEE. And average of minimum 40% of out of 100 marks to pass the course.
2. Passing in CIE is compulsory to become eligible to appear for SEE
3. In SEE passing both theory and practical examinations is compulsory.
4. If a student fails in any one of the components (Theory/Practical) then he/she has to reappear in next semester for both the components i.e theory and practical and pass the both the components.

### Suggested Learning Resources:

#### Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher (2022) Bengaluru, ISBN 978-93-85155-70-3
2. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. 2010
3. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
4. Polymer Science, V R Gowariker, 3<sup>rd</sup> Edition
5. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16<sup>th</sup> Edition.
6. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press 2002- 1<sup>st</sup> Edition.
7. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2<sup>nd</sup> Edition.
8. Polymer chemistry, by Anil Kumar P V
9. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 2014-3<sup>rd</sup> Edition.
10. Principles of nanotechnology, Phanikumar, Scitech publications, 2010-2<sup>nd</sup> Edition.
11. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12<sup>th</sup> Edition, 2011.
12. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2<sup>nd</sup> Edition, 2016.
13. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, Bangalore.5<sup>th</sup> Edition, 2014
14. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4<sup>th</sup> Edition, 1999.
15. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3<sup>rd</sup> Edition, 1996.

## Mechanical Engineering Stream (Chemistry group)

16. A text book of Engineering chemistry, Shashi chawla, Dhanpat Rai & Co, 2016.
17. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
18. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.

### Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=faESCxAWR9k>
- <https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh>
- <https://www.youtube.com/watch?v=j5Hml6KN4TI>
- <https://www.youtube.com/watch?v=X9GHBdyYcyo>
- <https://www.youtube.com/watch?v=1xWBPZnEJk8>
- <https://www.youtube.com/watch?v=wRAo-M8xBHM>.

### Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- <https://www.vlab.co.in/broad-area-chemical-sciences>
- <https://demonstrations.wolfram.com/topics.php>
- <https://interestingengineering.com/science>

### COs and POs Mapping (Individual teacher has to fill up)

	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	1	1				1					
C02	3	1	1				1					
C03	3	1	1				1					
C04	3	1	1				1					
C05	3	1	1				1					

Course Title:	<b>ELEMENTS OF MECHANICAL ENGINEERING</b>		
Course Code:	22EME13/23	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course Learning Objectives</b>			
<p><b>CLO 1.</b> Acquire a basic understanding about scope of mechanical engineering, fundamentals about steam and non-conventional energy sources.</p> <p><b>CLO 2.</b> Acquire a basic knowledge about conventional and advanced manufacturing processes.</p> <p><b>CLO 3.</b> Acquiring a basic understanding about IC engines, propulsive devices and air-conditioner.</p> <p><b>CLO 4.</b> Acquiring a basic knowledge about power transmission and joining processes.</p> <p><b>CLO 5.</b> Acquiring a basic insight into future mobility and mechatronics and robotics.</p>			
<b>Teaching-Learning Process</b>			
<ul style="list-style-type: none"> <li>• Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.</li> <li>• Arrange visits to show the live working models other than laboratory topics.</li> <li>• Adopt collaborative (Group Learning) Learning in the class.</li> <li>• Adopt Problem Based Learning (PBL), which foster students' Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.</li> </ul>			
<b>Module-1 (8 hours)</b>			
<b>Introduction to Mechanical Engineering (Overview only):</b>			
Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.			
<b>Steam Formation and Application:</b>			
Modes of heat transfer, Steam formation, Types of steam, Steam properties and applications of steam (simple numerical problems).			
<b>Energy Sources and Power Plants:</b>			
Basic working principles of Hydel power plant, Thermal power plant, nuclear power plant, Solar power plant, Tidal power plant and Wind power plant.			
<b>Module-2 (8 hours)</b>			
<b>Machine Tool Operations:</b>			
<b>Lathe:</b> Principle of working of a center lathe, lathe operations: Turning, facing, knurling, thread cutting, taper turning by swivelling the compound rest,			
<b>Drilling Machine:</b> Working of simple drilling machine, drilling operations: drilling, boring, reaming, tapping, counter sinking, counter boring,			
<b>Milling Machine:</b> Working and types of milling machine, milling operations: plane milling, end milling and slot milling.			
(No sketches of machine tools, sketches to be used only for explaining the operations).			
<b>Introduction to Advanced Manufacturing Systems:</b> Introduction, components of CNC, advantages and applications of CNC, 3D printing.			

<b>Module-3 (8 hours)</b>	
<b>Introduction to IC Engines:</b> Components and working principles, 4-Stroke Petrol and Diesel engines, Application of IC Engines, performance of IC engines (Simple numerical).	
<b>Introduction to Refrigeration and Air Conditioning:</b> Principle of refrigeration, Refrigerants and their desirable properties. Working principle of VCR refrigeration system, working principle of room air conditioner & Applications of air Conditioners	
<b>Module-4 (8 hours)</b>	
<b>Mechanical Power Transmission:</b>	
<b>Gear Drives:</b> Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, simple and compound gear trains (simple numerical problems)	
<b>Belt Drives:</b> Introduction, Types of belt drives (Flat and V-Belt Drive), length of the belt and tensions ratio (simple numerical problems)	
<b>Joining Processes:</b> Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding, (types of flames), TIG welding, MIG welding and Fusion welding.	
<b>Module-5 (8 hours)</b>	
<b>Insight into future mobility technology;</b> Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of Electric Vehicles (EVs) and Hybrid vehicles.	
<b>Introduction to Mechatronics and Robotics:</b> open-loop and closed-loop mechatronic systems. Joints & links, Robot anatomy, Applications of Robots in material handling, processing and assembly and inspection.	
<b>Course outcome (Indicative)</b>	
At the end of the course the student will be able to:	
C01	Explain the role of mechanical engineering in industry and society, fundamentals of steam and non-conventional energy sources
C02	Describe different conventional and advanced machining processes, IC engines, propulsive devices, air-conditioning, refrigeration.
C03	Explain different gear drives, gear trains, aspects of future mobility and fundamentals of robotics
C04	Determine the condition of steam and its energy, performance parameters of IC engines, velocity ratio and power transmitted through power transmission systems.

**Assessment Details (both CIE and SEE)**

The weightage 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):**

Three Unit Tests each of **20 Marks (duration 01 hour)**

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester
- Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours) t the end of the 13<sup>th</sup> week of the semester.

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Test Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
2. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, MediaPromoters and Publishers Pvt. Ltd., 2010.

**Reference Books**

1. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition,

2012												
2.Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rdEd., 2003.												
3.Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1												
<b>Web links and Video Lectures (e-Resources):</b>												
<ul style="list-style-type: none"> <li>• <a href="https://www.tlv.com/global/TL/steam-theory/principal-applications-for-steam.html">https://www.tlv.com/global/TL/steam-theory/principal-applications-for-steam.html</a></li> <li>• <a href="https://www.forbesmarshall.com/Knowledge/SteamPedia/About-Steam/Fundamental-Applications-of-Steam">https://www.forbesmarshall.com/Knowledge/SteamPedia/About-Steam/Fundamental-Applications-of-Steam</a></li> <li>• <a href="https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-and-process-industry/">https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-and-process-industry/</a></li> <li>• <a href="#">Videos   Makino (For Machine Tool Operation)</a></li> </ul>												
<b>Activity Based Learning (Suggested Activities in Class)/ Practical Based learning</b>												
<ol style="list-style-type: none"> <li>1. Visit to any manufacturing/aero/auto industry or any power plant</li> <li>2. Demonstration of lathe/milling/drilling/CNC operations</li> <li>3. Demonstration of working of IC engine/refrigerator</li> <li>4. Demonstration of metal joining process</li> <li>5. Video demonstration of latest trends in mobility/robotics</li> </ol>												
<b>COs and POs Mapping (CO-PO mappings are only Indicative)</b>												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	3	2				1	1			1		1
C02	3	2				1	1			1		1
C03	3	2				1	1			1		1
C04	3	3				1	1					1
C05												
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped												

Course Title:	<b>Computer Aided Engineering Drawing</b>		
Course Code	<b>22CAED13/23</b>	CIE Marks	50
Teaching Hour/Week (L:T:P:S)	2:0:2:0	SEE Marks	50
Total Hours of Teaching - Learning	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning Objectives:</b> <b>CLO1:</b> To understand the basic principles and conventions of engineering drawing <b>CLO2:</b> To use drawing as a communication mode <b>CLO3:</b> To generate pictorial views using CAD software <b>CLO4:</b> To understand the development of surfaces <b>CLO5:</b> To visualize engineering components			
<b>Teaching-Learning (General Instructions):</b> <ul style="list-style-type: none"> <li>• Students should be made aware of powerful engineering communication tool – Drawing.</li> <li>• Simple Case studies can be suitably selected by the teacher for hands on practice to induce the feel of fruitfulness of learning.</li> <li>• Appropriate Models, Power Point presentation, Charts, Videos, shall be used to enhance visualization before hands on practice.</li> <li>• For application problems use very generally available actual objects. (Example: For rectangular prism / object; matchbox, carton boxes, book, etc can be used. Similarly for other shapes)</li> <li>• Use any CAD software for generating orthographic and pictorial views.</li> <li>• Make use of sketch book with graph sheets for manual / preparatory sketching</li> </ul>			
<b>Module-1</b>			
<b>Introduction: for CIE only</b> 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 of 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. <b>Orthographic Projections of Points, Lines and Planes:</b> Introduction to Orthographic projections: Orthographic projections of points in 1 <sup>st</sup> and 3 <sup>rd</sup> quadrants. Orthographic projections of lines (Placed in First quadrant only). Orthographic projections of planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (Placed in First quadrant only using change of position method). <i>Application on projections of Lines &amp; Planes (For CIE only)</i>			
<b>Module-2</b>			
<b>Orthographic Projection of Solids:</b> Orthographic projection of right regular solids ( <b>Solids Resting on HP only</b> ): Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cylinders, Cones, Cubes & Tetrahedron.  <i>Projections of Frustum of cone and pyramids (For practice only, not for CIE and SEE).</i>			

### Module-3

#### **Isometric Projections:**

Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids.

#### **Conversion of simple isometric drawings into orthographic views.**

Problems on applications of Isometric projections of simple objects / engineering components.

*Introduction to drawing views using 3D environment (For CIE only).*

### Module-4

#### **Development of Lateral Surfaces of Solids:**

Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only.

Development of lateral surfaces of their frustums and truncations.

Problems on applications of development of lateral surfaces like funnels and trays.

*Problems on applications of development of lateral surfaces of transition pieces connecting circular duct and rectangular duct (For CIE Only)*

### Module-5

#### **Multidisciplinary Applications & Practice (For CIE Only):**

**Free hand Sketching;** True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc

**Drawing Simple Mechanisms;** Bicycles, Tricycles, Gear trains, Ratchets, two-wheeler cart & Four-wheeler carts to dimensions etc

**Electric Wiring and lighting diagrams;** Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software

**Basic Building Drawing;** Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or suitable software,

**Electronics Engineering Drawings-** Like, Simple Electronics Circuit Drawings, practice on layers concept.

**Graphs & Charts:** Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.

#### **Course Outcomes**

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

**CO 1.** Draw and communicate the objects with definite shape and dimensions

**CO 2.** Recognize and Draw the shape and size of objects through different views

**CO 3.** Develop the lateral surfaces of the object

**CO 4.** Create a Drawing views using CAD software.

**CO 5.** Identify the interdisciplinary engineering components or systems through its graphical representation.



### Assessment Details (both CIE and SEE):

The weightage 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) and that for SEE minimum passing marks is 35% of the maximum marks (18 marks). 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 of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### Continuous Internal Evaluation (CIE)

- CIE shall be evaluated for max. marks of 100 and later the same shall be scaled-down to 50 marks as detailed below:
- CIE component should comprise of Continuous evaluation of Drawing work of students as and when the Modules are covered based on below detailed weightage.

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Sketching (b)
Module 1	15	10	05
Module 2	20	15	05
Module 3	20	20	00
Module 4	20	20	00
Module 5	25	15	10
<b>Total</b>	<b>100</b>	<b>80</b>	<b>20</b>
<b>Consideration of Class work</b>	<b>Total of [(a) + (b)] = 100 Scaled down to 30 Marks</b>		

- At least one **Test** covering all the modules is to be conducted for 100 marks and evaluation to be based SEE pattern, and the same is to be scaled down to **20Marks**.
- The final CIE = Class work marks + Test marks

#### Semester End Examination (SEE)

- SEE shall be conducted and evaluated for maximum marks 100. Marks obtained shall be accounted for SEE final marks, reducing it by 50%
- Question paper shall be set jointly by both Internal and External Examiner and made available for each batch as per schedule. ***Questions are to be set preferably from Text Books.***
- **Related to Module-1:** One full question can be set either from “*points & lines*” or “*planes*”.
- Evaluation shall be carried jointly by both the examiners.
- Scheme of Evaluation: *To be defined by the examiners jointly and the same shall be submitted to the university along with question paper.*
- One full question shall be set from each of the Module from Modules 1,2,3 and 4 as per the below table weightage details. **However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.**

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Preparatory sketching (b)
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
<b>Total</b>	<b>100</b>	<b>80</b>	<b>20</b>
<b>Consideration of SEE Marks</b>		<b>Total of (a) + (b) ÷ 2 = Final SEE marks</b>	

### Suggested Learning Resources:

#### Text Books

- *S.N. Lal, & T Madhusudhan.*, Engineering Visulisation, 1<sup>st</sup> Edition, Cengage, Publication
- *Parthasarathy N. S., Vela Murali*, Engineering Drawing, Oxford University Press, 2015.

#### Reference Books

- *Bhattacharya S. K.*, Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
- *Chris Schroder*, Printed Circuit Board Design using AutoCAD, Newnes, 1997.
- *K S Sai Ram* Design of steel structures, , Third Edition by Pearson
- *Nainan p kurian* Design of foundation systems, Narosa publications
- *A S Pabla*, Electrical power distribution, 6th edition, Tata Mcgraw hill
- *Bhatt, N.D.*, *Engineering Drawing: Plane and Solid Geometry*, 53<sup>rd</sup> edition, Charotar Publishing House Pvt. Limited, 2019.
- *K. R. Gopalakrishna, & Sudhir Gopalakrishna*: Textbook Of Computer Aided Engineering Drawing, 39<sup>th</sup> Edition, Subash Stores, Bangalore, 2017

### COs and POs Mapping (CO-PO mappings are only Indicative)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2			3	1		1	1	3		2
CO2	3	2			3	1		1	1	3		2
CO3	3	2			3	1		1	1	3		2
CO4	3	3			3	1	1		1	3		1
CO5	3	2			3				1	3		2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

## Communicative English

Course Title:	<b>Communicative English</b>		
Course Code:	<b>22ENG16</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01
<p><b>Course objectives:</b> The course Communicative English (22ENG16) will enable the students,</p> <ol style="list-style-type: none"> <li>To know about Fundamentals of Communicative English and Communication Skills in general.</li> <li>To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.</li> <li>To impart basic English grammar and essentials of important language skills.</li> <li>To enhance with English vocabulary and language proficiency for better communication skills.</li> <li>To learn about Techniques of Information Transfer through presentation.</li> </ol>			
<p><b>Teaching-Learning Process :</b>          These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective:          Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software’s to meet the present requirements of the Global employment market.          (i) Direct instructional method ( Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning,          (v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio visual methods through language Labs in teaching of LSRW skills.          Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.</p>			
<p><b>Language Lab :</b> To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.</p>			
<b>Module-1</b>		<b>(03 hours of pedagogy)</b>	
<p><b>Introduction to Communicative English :</b> Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.</p>			
<b>Module-2</b>		<b>(03 hours of pedagogy)</b>	
<p><b>Introduction to Phonetics :</b> Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation.</p>			
<b>Module-3</b>		<b>(03 hours of pedagogy)</b>	
<p><b>Basic English Communicative Grammar and Vocabulary PART - I :</b> Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.</p>			
<b>Module-4</b>		<b>(03 hours of pedagogy)</b>	
<p><b>Basic English Communicative Grammar and Vocabulary PART - II:</b> Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.</p>			
<b>Module-5</b>		<b>(03 hours of pedagogy)</b>	
<p><b>Communication Skills for Employment :</b> Information Transfer: Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises.</p>			

**Course outcome (Course Skill Set)**

At the end of the course Communicative English (22ENG16) the student will be able to:

CO1	Understand and apply the Fundamentals of Communication Skills in their communication skills.
CO2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.
CO3	To impart basic English grammar and essentials of language skills as per present requirement.
CO4	Understand and use all types of English vocabulary and language proficiency.
CO5	Adopt the Techniques of Information Transfer through presentation.

**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

**Two assignments each of 20 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 100 marks and will be scaled down to 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 marks for SEE.

**Suggested Learning Resources:****Textbook:**

- 1) **Communication Skills** by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd - 2019.
- 2) **A Textbook of English Language Communication Skills**, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

**Reference Books:**

1. **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
2. **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3. **English Language Communication Skills – Lab Manual cum Workbook**, Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.
4. **A Course in Technical English – D Praveen Sam, KN Shoba**, Cambridge University Press – 2020.
5. **Practical English Usage** by Michael Swan, Oxford University Press – 2016.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments

**Theory - 01 Credit Course****Professional Writing Skills in English**

Course Title:	<b>Professional Writing Skills in English</b>		
Course Code:	<b>22PWS26</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01
<b>Course objectives:</b>			
The course Professional Writing Skills in English (22PWS26) will enable the students,			
<ol style="list-style-type: none"> <li>To Identify the Common Errors in Writing and Speaking of English.</li> <li>To Achieve better Technical writing and Presentation skills for employment.</li> <li>To read Technical proposals properly and make them to write good technical reports.</li> <li>To Acquire Employment and Workplace communication skills.</li> <li>To learn about Techniques of Information Transfer through presentation in different level.</li> </ol>			
<b>Teaching-Learning Process</b>			
These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.			
(i) Direct instructional method ( Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning,			
(v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio visual methods through language Labs in teaching of of LSRW skills.			
Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.			
<b>Language Lab :</b> To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.			
<b>Module-1</b>		<b>(03 hours of pedagogy)</b>	
<b>Identifying Common Errors in Writing and Speaking English :</b> Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.			
<b>Module-2</b>		<b>(03 hours of pedagogy)</b>	
<b>Nature and Style of sensible writing: Organizing</b> Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.			
<b>Module-3</b>		<b>(03 hours of pedagogy)</b>	
<b>Technical Reading and Writing Practices:</b> 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.			
<b>Module-4</b>		<b>(03 hours of pedagogy)</b>	
<b>Professional Communication for Employment:</b> Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails, Blog Writing and Memos.			
<b>Module-5</b>		<b>(03 hours of pedagogy)</b>	
<b>Professional Communication at Workplace:</b> Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Intra and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills.			

**Course outcome (Course Skill Set)**

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

CO1	To understand and identify the Common Errors in Writing and Speaking.
CO2	To Achieve better Technical writing and Presentation skills.
CO3	To read Technical proposals properly and make them to Write good technical reports.
CO4	Acquire Employment and Workplace communication skills.
CO5	To learn about Techniques of Information Transfer through presentation in different level.

**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 hour)**

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**Two assignments each of 20 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 100 marks and will be scaled down to 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 marks for SEE.

**Suggested Learning Resources:****Textbook:**

- 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 learning India 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** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
- 3) **Technical Communication – Principles and Practice**, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
- 4) **High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd – 2015.
- 5) **Effective Technical Communication – Second Edition** by M Ashraf Rizvi, McGraw Hill Education (India) Private

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments



## Theory - 01 Credit Course

**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಕನ್ನಡ ಬಲ್ಲ ಮತ್ತು ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ**

Course Title:	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ		
Course Code:	22KSK17 / 27	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01
<b>Course objectives : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:</b>			
The course (22KSK17/27) will enable the students,			
<ol style="list-style-type: none"> <li>1. ವ್ಯಕ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.</li> <li>2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸುವುದು.</li> <li>3. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.</li> <li>4. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.</li> <li>5. ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.</li> </ol>			
<b>ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :</b>			
These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.			
<ol style="list-style-type: none"> <li>1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.</li> <li>2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.</li> <li>3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.</li> </ol>			
<b>ಘಟಕ -1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ</li> <li>2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ</li> <li>3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ</li> </ol>			
<b>ಘಟಕ - 2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ಕಿ ಲಕ್ಕಮ್ಮ.</li> <li>2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸಿದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು</li> <li>3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ</li> </ol>			
<b>ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ಯ ಕೆಲವು ಭಾಗಗಳು</li> <li>2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ</li> <li>3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು</li> </ol>			
<b>ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್</li> <li>2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ</li> </ol>			
<b>ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ</li> <li>2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ</li> </ol>			

**Course outcome (Course Skill Set)**

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ (22KSK17/27) ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ :

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

C01	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.
C02	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಪೂರ್ತಿ ಮೂಡುತ್ತದೆ.
C03	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಹೆಚ್ಚಾಗುತ್ತದೆ.
C04	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.
C05	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

**Two assignments each of 20 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 100 marks and will be scaled down to 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 marks for SEE.

**University Prescribed Textbook :****ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ**

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

**ಸೂಚನೆ :**

1. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.
2. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments.



Theory - 01 Credit Course

**ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)****ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)**

Course Title:	ಬಳಕೆ ಕನ್ನಡ		
Course Code:	22KBK17 / 27	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

**Course objectives : ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:**

The course (22KBK17/27) will enable the students,

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 conversation.
5. To know about Karnataka state and its language, literature and General information about this state.

**ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :**

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.
4. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕೈಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.
5. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

**Module - 1****(03 hours of pedagogy)**

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 conversation, Listening and Speaking Activities, Key to Transcription
3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words

<b>Module - 2</b>	(03 hours of pedagogy)
<ol style="list-style-type: none"> <li>1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - <b>Possessive forms of nouns, dubitive question and Relative nouns</b></li> <li>2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು <b>Qualitative, Quantitative and Colour Adjectives, Numerals</b></li> </ol>	
<ol style="list-style-type: none"> <li>3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು -ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ - (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) - <b>Predictive Forms, Locative Case</b></li> </ol>	
<b>Module - 3</b>	(03 hours of pedagogy)
<ol style="list-style-type: none"> <li>1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - <b>Dative Cases, and Numerals</b></li> <li>2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು - <b>Ordinal numerals and Plural markers</b></li> <li>3. ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು &amp; ವರ್ಣ ಗುಣವಾಚಕಗಳು - <b>Defective/Negative Verbs &amp; Colour Adjectives</b></li> </ol>	
<b>Module- 4</b>	(03 hours of pedagogy)
<ol style="list-style-type: none"> <li>1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು <b>Permission, Commands, encouraging and Urging words (Imperative words and sentences)</b></li> <li>2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು <b>Accusative Cases and Potential Forms used in General Communication</b></li> </ol>	
<ol style="list-style-type: none"> <li>3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs</li> <li>4. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words</li> </ol>	
<b>Module - 5</b>	(03 hours of pedagogy)
<ol style="list-style-type: none"> <li>1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು -Different types of Tense, Time and Verbs</li> <li>2. ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms</li> </ol>	
<ol style="list-style-type: none"> <li>3. <b>Kannada Vocabulary List :ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು -Kannada Words in Conversation</b></li> </ol>	

### Course outcome (Course Skill Set)

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:

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

C01	To understand the necessity of learning of local language for comfortable life.
C02	To speak, read and write Kannada language as per requirement.
C03	To communicate (converse) in Kannada language in their daily life with kannada speakers.
C04	To Listen and understand the Kannada language properly.
C05	To speak in polite conversation.

### Assessment Details (both CIE and SEE)

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

**Two assignments each of 20 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 100 marks and will be scaled down to 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 marks for SEE.

**University Prescribed Textbook :**

**ಬಳಕೆ ಕನ್ನಡ**

**ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ**

**ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,**

**ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.**

**ಸೂಚನೆ :**

1. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.
2. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions,
- ✓ Seminars and assignments

**Theory - 01 Credit Course****Indian Constitution**

Course Title:	<b>Indian Constitution</b>		
Course Code:	<b>22IC017 / 27</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

**Course objectives :**

The course **INDIAN CONSTITUTION (22IC017 / 27)** will enable the students,

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 & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

**Teaching-Learning Process**

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

- (i) Direct instructional method ( Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.
- (iii) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

**Module-1****(03 hours of pedagogy)**

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.

**Module-2****(03 hours of pedagogy)**

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.

**Module-3****(03 hours of pedagogy)**

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.

**Module-4****(03 hours of pedagogy)**

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.

**Module-5****(03 hours of pedagogy)**

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.

**Course outcome (Course Skill Set)**

At the end of the course 22IC017/27 the student will be able to:

C01	Analyse the basic structure of Indian Constitution.
C02	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
C03	know about our Union Government, political structure & codes, procedures.
C04	Understand our State Executive & Elections system of India.
C05	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

### Assessment Details (both CIE and SEE)

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

##### Two assignments each of 20 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 100 marks and will be scaled down to 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 marks for SEE.

#### Suggested Learning Resources:

##### Textbook:

1. **“Constitution of India” (for Competitive Exams)** - Published by Naidhrava 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 Shubham Singles, Charles E. Haries, and et al: 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.Senthilkumar, **“Engineering Ethics”,** Prentice –Hall, 2004.

#### Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions
- ✓ Seminars and assignments

**I Semester**

<b>INNOVATION and DESIGN THINKING</b>			
Course Code	<b>21IDT18/28</b>	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	01	Exam Hours	02
<p><b>Course Category:</b> Foundation</p> <p><b>Preamble:</b> This course provides an introduction to the basic concepts and techniques of engineering and reverse engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aid.</p> <p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>• To explain the concept of design thinking for product and service development</li> <li>• To explain the fundamental concept of innovation and design thinking</li> <li>• To discuss the methods of implementing design thinking in the real world.</li> </ul>			
<p><b>Teaching-Learning Process (General Instructions)</b></p> <p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.</li> <li>2. Show Video/animation films to explain concepts</li> <li>3. Encourage collaborative (Group Learning) Learning in the class</li> <li>4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking</li> <li>5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.</li> <li>6. Topics will be introduced in multiple representations.</li> <li>7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.</li> <li>8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.</li> </ol>			
<b>Module-1</b>			
<b>PROCESS OF DESIGN</b>			
<b>Understanding Design thinking</b>			
Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping			
<b>Teaching-Learning Process</b>	Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos		
<b>Module-2</b>			
<b>Tools for Design Thinking</b>			
Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design			
<b>Teaching-Learning</b>	Case studies on design thinking for real-time interaction and analysis		

<b>Process</b>	Simulation exercises for collaborated enabled design thinking Live examples on the success of collaborated design thinking	
<b>Module-3</b>		
<b>Design Thinking in IT</b> Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping		
<b>Teaching-Learning Process</b>	Case studies on design thinking and business acceptance of the design Simulation on the role of virtual eco-system for collaborated prototyping	
<b>Module-4</b>		
<b>DT For strategic innovations</b> Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.		
<b>Teaching-Learning Process</b>	Business model examples of successful designs Presentation by the students on the success of design Live project on design thinking in a group of 4 students	
<b>Module-5</b>		
Design thinking workshop Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test		
<b>Teaching-Learning Process</b>	8 hours design thinking workshop from the expert and then presentation by the students on the learning from the workshop	
<b>Course Outcomes:</b> Upon the successful completion of the course, students will be able to:		
<b>CO Nos.</b>	<b>Course Outcomes</b>	<b>Knowledge Level (Based on revised Bloom's Taxonomy)</b>
CO1	Appreciate various design process procedure	K2
CO2	Generate and develop design ideas through different technique	K2
CO3	Identify the significance of reverse Engineering to Understand products	K2
CO4	Draw technical drawing for design ideas	K3



**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

**Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for subject

SEE paper will be set for 50 questions of each of 01 marks. The pattern of the question paper is MCQ. The time allotted for SEE is **01 hour**

**Suggested Learning Resources:****Text Books :**

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengage learning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

**References:**



5. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

**Web links and Video Lectures (e-Resources):**

1. [www.tutor2u.net/business/presentations/. /productlifecycle/default.html](http://www.tutor2u.net/business/presentations/. /productlifecycle/default.html)
2. [https://docs.oracle.com/cd/E11108\\_02/otn/pdf/. /E11087\\_01.pdf](https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf)
3. [www.bizfilings.com](http://www.bizfilings.com) › Home › Marketing › Product Development
4. <https://www.mindtools.com/brainstm.html>
5. <https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit>
6. [www.vertabelo.com/blog/documentation/reverse-engineering](http://www.vertabelo.com/blog/documentation/reverse-engineering)  
<https://support.microsoft.com/en-us/kb/273814>
7. <https://support.google.com/docs/answer/179740?hl=en>
8. <https://www.youtube.com/watch?v=2mjSDIBaUIM>  
[thevirtualinstructor.com/foreshortening.html](http://thevirtualinstructor.com/foreshortening.html)  
<https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf>  
<https://dschool.stanford.edu/use-our-methods/> 6. <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process> 7.  
<http://www.creativityatwork.com/design-thinking-strategy-for-innovation/> 49 8.  
<https://www.nngroup.com/articles/design-thinking/> 9.  
<https://designthinkingforeducators.com/design-thinking/> 10.  
[www.designthinkingformobility.org/wp-content/.../10/NapkinPitch\\_Worksheet.pdf](http://www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- <http://dschool.stanford.edu/dgift/>

[https://onlinecourses.nptel.ac.in/noc19\\_mg60/preview](https://onlinecourses.nptel.ac.in/noc19_mg60/preview)

**Theory - 01 Credit Course****Scientific Foundations of Health**

Course Title:	<b>Scientific Foundations of Health</b>		
Course Code:	<b>22SFH18/28</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01
<b>Course objectives</b>			
The course Scientific Foundations of Health (22SFH18/28) will enable the students,			
<ol style="list-style-type: none"> <li>To know about Health and wellness (and its Beliefs) &amp; It's balance for positive mindset.</li> <li>To Build the healthy lifestyles for good health for their better future.</li> <li>To Create a Healthy and caring relationships to meet the requirements of good/social/positive life.</li> <li>To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future</li> <li>To Prevent and fight against harmful diseases for good health through positive mindset</li> </ol>			
<b>Teaching-Learning Process</b>			
These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective:			
Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.			
(i) Direct instructional method ( Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio visual methods.			
Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.			
<b>Module-1</b>		<b>(03 hours of pedagogy)</b>	
<b>Good Health &amp; It's balance for positive mindset:</b> 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.			
<b>Module-2</b>		<b>(03 hours of pedagogy)</b>	
<b>Building of healthy lifestyles for better future:</b> 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 <del>Wellness and physical function</del> <del>How to avoid exercise injuries</del>			
<b>Module-3</b>		<b>(03 hours of pedagogy)</b>	
<b>Creation of Healthy and caring relationships :</b> 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.			
<b>Module-4</b>		<b>(03 hours of pedagogy)</b>	
<b>Avoiding risks and harmful habits :</b> 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.			
<b>Module-5</b>		<b>(03 hours of pedagogy)</b>	
<b>Preventing &amp; fighting against diseases for good health:</b> 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.			

**Course outcome (Course Skill Set) :**

At the end of the course Scientific Foundations of Health (22SFH18/28) the student will be able to:

CO1	To understand and analyse about Health and wellness (and its Beliefs) & Its balance for positive mindset.
CO2	Develop the healthy lifestyles for good health for their better future.
CO3	Build a Healthy and caring relationships to meet the requirements of good/social/positive life.
CO4	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.
CO5	Prevent and fight against harmful diseases for good health through positive mindset.

**Assessment Details (both CIE and SEE) :**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration.

**Two assignments each of 20 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 100 marks and will be scaled down to 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 marks for SEE.

**Suggested Learning Resources:****Textbook:**

1. **"Scientific Foundations of Health" – Study Material Prepared by Dr. L Thimmesh, 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.
3. **SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos** and other materials / notes.
4. **Scientific Foundations of Health (Health & Wellness) - General Books** published for university and colleges references by popular authors and published by the reputed publisher.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments

Course Title:	<b>Introduction to Civil Engineering</b>		
Course Code:	<b>22ESC141/241</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:0:0	Exam Hours	03
Total Hours of Pedagogy	25 hrs Lecture+25 hrs Tutorial = 50 hrs	Credits	03

#### Course objectives

- To make students learn the scope of various specializations of civil engineering.
- To make students learn the concepts of sustainable infrastructure
- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To develop the student's ability to find out the center of gravity and moment of inertia and their applications.
- To make the students learn about kinematics

#### Teaching-Learning Process

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Civil Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group) Learning in the class.
5. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
10. Individual teachers can devise innovative pedagogy to improve teaching-learning.

#### Module-1 (10)

#### Civil Engineering Disciplines and Building Science

**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, Construction Chemicals.

**Structural elements of a building:** foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase

#### Module-2 (10)

#### Societal and Global Impact of Infrastructure

**Infrastructure:** Introduction to sustainable development goals, Smart city concept, clean city

concept, Safe city concept

**Environment:** Water Supply and Sanitary systems, urban air pollution management, Solid waste management, identification of Landfill sites, urban flood control

**Built-environment:** Energy efficient buildings, recycling, Temperature and Sound control in buildings, Security systems; Smart buildings.

**Module-3(10)**

**Analysis of force systems:** Concept of idealization, system of forces, principles of superposition and transmissibility, Resolution and composition of forces, Law of Parallelogram 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

**Module-4(10)**

**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

**Module-5 (10)**

**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, section modulus, radius of gyration, moment of inertia of built-up sections, Numerical Examples.

**Course outcome (Course Skill Set)**

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

C01	Understand the various disciplines of civil engineering
C02	Understand the infrastructure requirement for sustainable development
C03	Compute the resultant and equilibrium of force systems.
C04	Locate the centroid of plane and built-up sections
C05	Compute the moment of inertia of plane and built-up sections.

### **Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

##### **Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

##### **Text Books**

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015,Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

##### **Reference Books:**

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
3. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
5. Bhavikatti S S, Engineering Mechanics, 2019, New Age International
6. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication

**Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT>
- <https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2>
- <https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5>
- <https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18>
- <https://www.youtube.com/watch?v=3YBXteL-qY4>
- <https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10>
- <https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7>
- [https://www.youtube.com/watch?v=atoP5\\_DeTPE](https://www.youtube.com/watch?v=atoP5_DeTPE)
- <https://www.youtube.com/watch?v=ksmsp9OzAsI>
- <https://www.youtube.com/watch?v=x1ef048b3CE>
- [https://www.youtube.com/watch?v=l\\_Nck-X49qc](https://www.youtube.com/watch?v=l_Nck-X49qc)
- [https://play.google.com/store/apps/details?id=appinventor.ai\\_jgarc322.Resultant\\_Force](https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force)
- <https://www.youtube.com/watch?v=RIBeeW1DSZg>
- <https://www.youtube.com/watch?v=R8wKV0UQtlo>
- [https://www.youtube.com/watch?v=0RZHHgL8m\\_A](https://www.youtube.com/watch?v=0RZHHgL8m_A)
- <https://www.youtube.com/watch?v=Bl5KnQOWkY>

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- [https://www.youtube.com/watch?v=Zrc\\_gB1YYS0](https://www.youtube.com/watch?v=Zrc_gB1YYS0)
- <https://play.google.com/store/apps/details?id=vn.edu.best4u.com.bieudonoiluc>
- [https://www.youtube.com/watch?v=Hn\\_iozUo9m4](https://www.youtube.com/watch?v=Hn_iozUo9m4)
- <https://play.google.com/store/apps/details?id=com.teobou>
- <https://www.youtube.com/watch?v=WOHRp3V-QA0>

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	1					1						
C02	1					1	1					
C03	2	3										
C04	2	3										
C05	2	3										

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

**Note:** Depending on the assessment tool used, higher order POs can be identified by the concerned course instructor.

<b>Introduction to Electrical Engineering</b>			
Course Code:	<b>22ESC142/242</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<p><b>Course objectives</b></p> <ul style="list-style-type: none"> <li>To explain the laws used in the analysis of DC and AC circuits.</li> <li>To explain the behavior of circuit elements in single-phase circuits.</li> <li>To explain the construction and operation of transformers, DC generators and motors and induction motors.</li> <li>To introduce concepts of circuit protecting devices and earthing.</li> <li>To explain electric power generation, transmission and distribution, electricity billing, equipment and personal safety measures.</li> </ul>			
<p><b>Teaching-Learning Process</b></p> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective</p> <ol style="list-style-type: none"> <li>Chalk and talk</li> <li>Animated/NPTEL videos</li> <li>Cut sections</li> <li>PPTs</li> </ol>			
<b>Module-1 (08 Hrs)</b>			
<p><b>Introduction:</b> Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach.</p> <p><b>Power Generation:</b> Hydel, Nuclear, Solar &amp; wind power generation (Block Diagram approach).</p> <p><b>DC Circuits:</b> Ohm's Law and its limitations. KCL &amp; KVL, series, parallel, series-parallel circuits. Simple Numerical.</p>			
<b>Module-2 (08 Hrs)</b>			
<p><b>A.C. Fundamentals:</b> Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (only definitions) Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. (Simple Numerical).</p>			
<b>Module-3(08 Hrs)</b>			
<p><b>DC Machines:</b> <b>DC Generator:</b> Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple numerical. <b>DC Motor:</b> Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature &amp; field) of DC motors (series &amp; shunt only). Applications of DC motors. Simple numerical.</p>			



<b>Module-4(08 Hrs)</b>	
<b>Transformers:</b> Necessity of transformer, principle of operation, Types and construction of single-phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and simple numerical.	
<b>Three-phase induction Motors:</b> Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical.	
<b>Module-5 (08 Hrs)</b>	
<b>Domestic Wiring:</b> Requirements, Types of wiring: casing, capping. Two way and three way control of load.	
<b>Electricity Bill:</b> Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.	
<b>Equipment Safety measures:</b> Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.	
<b>Personal safety measures:</b> Electric Shock, Earthing and its types, Safety Precautions to avoid shock.	
<b>Course outcome (Course Skill Set)</b>	
At the end of the course the student will be able to:	
CO1	Understand the concepts of various energy sources and Electric circuits.
CO2	Apply the basic Electrical laws to solve circuits.
CO3	Discuss the construction and operation of various Electrical Machines.
CO4	Identify suitable Electrical machine for practical implementation.
CO5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.

### Assessment Details (both CIE and SEE)

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

##### Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

#### Semester End Examination(SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### Suggested Learning Resources:

##### Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

###### Text Books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.

###### Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3<sup>rd</sup> edition, 2014.

**Web links and Video Lectures (e-Resources):**

- [www.nptel.ac.in](http://www.nptel.ac.in)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

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**COs and POs Mapping (Individual teacher has to fill up)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	1	1	1	1	0	0	0	1
CO2	3	3	2	1	1	1	0	0	0	0	0	1
CO3	3	2	1	1	1	1	1	1	0	0	0	1
CO4	3	2	2	1	0	1	1	1	0	0	0	1
CO5	3	1	2	0	1	2	1	1	0	0	1	1

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

Course Title:	<b>Introduction to Electronics Engineering</b>		
Course Code:	<b>22ESC143/243</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<p><b>Course objectives</b></p> <ol style="list-style-type: none"> <li>1. To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.</li> <li>2. To equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.</li> <li>3. Professionalism &amp; Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.</li> </ol>			
<p><b>Teaching-Learning Process</b></p> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective</p> <ol style="list-style-type: none"> <li>1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.</li> <li>2. Arrange visits to nearby PSUs such as BHEL, BEL, ISRO, etc., and small-scale hardware Industries to give brief information about the electronics manufacturing industry.</li> <li>3. Show Video/animation films to explain the functioning of various analog and digital circuits.</li> <li>4. Encourage collaborative (Group) Learning in the class</li> <li>5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking</li> <li>6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.</li> <li>7. Topics will be introduced in multiple representations.</li> <li>8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.</li> <li>9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.</li> </ol>			
<b>Module-1 (8 hours )</b>			
<p><b>Power Supplies</b> –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.</p> <p><b>Amplifiers</b> – CE amplifier with and without feedback, Multi-stage amplifier; BJT as a switch: Cut-off and saturation modes.(Text 1)</p>			
<b>Module-2(8 hours )</b>			

<p><b>Oscillators</b> – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations)</p> <p><b>Operational amplifiers</b> - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op-amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator.(Text 1)</p>
<b>Module-3 ( 8 hours)</b>
<p><b>Boolean Algebra and Logic Circuits:</b> Binary numbers, Number Base Conversion, octal &amp; Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)</p> <p><b>Combinational logic:</b> Introduction, Design procedure, Adders- Half adder, Full adder (Text 2:4.1, 4.2, 4.3)</p>
<b>Module-4 ( 8 hours)</b>
<p><b>Embedded Systems</b> – Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC</p> <p><b>Sensors and Interfacing</b> – Instrumentation and control systems, Transducers, Sensors, Actuators, LED, 7-Segment LED Display. (Text 1)</p>
<b>Module-5 ( 8 hours)</b>
<p><b>Analog Communication Schemes</b> – Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM , FM, Concept of Radio wave propagation (Ground, space, sky)</p> <p><b>Digital Modulation Schemes:</b> Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques. ( Text 3)</p>

### **Assessment Details (both CIE and SEE)**

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#### **Continuous Internal Evaluation(CIE):**

##### **Two Unit Tests each of 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

##### **Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

##### **Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4 th Edition, Elsevier, 2015. DOI <https://doi.org/10.4324/9781315737980>. eBook ISBN9781315737980

2<sup>nd</sup>

2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-84.

3. D P Kothari, I J Nagrath, 'Basic Electronics', 2<sup>nd</sup> edition, McGraw Hill Education (India), Private Limited, 2018.

Course Title:	<b>INTRODUCTION TO MECHANICAL ENGINEERING</b>		
Course Code:	<b>22ESC144/244</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course Learning Objectives</b>			
<ul style="list-style-type: none"> <li>To develop basic Knowledge on Mechanical Engineering, Fundamentals and Energy Sources.</li> <li>Understand the concept of different types of Machine tool operations and Modern Manufacturing Processes like CNC, 3D printing.</li> <li>To know the concept of IC engines and Future Mobility vehicles.</li> <li>To give exposure in the field of Engineering Materials and Manufacturing Processes Technology and its applications</li> <li>To acquire a basic understanding role of Mechanical Engineering in the Robotics and Automation in industry.</li> </ul>			
<b>Teaching-Learning Process</b>			
<ul style="list-style-type: none"> <li>Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.</li> <li>Arrange visits to show the live working models other than laboratory topics.</li> <li>Adopt collaborative (Group Learning) Learning in the class.</li> <li>Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.</li> </ul>			
<b>Module-1 (8 hours)</b>			
<b>Introduction:</b> Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.			
<b>Energy:</b> 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			
<b>Module-2 (8 hours)</b>			
<b>Machine Tool Operations:</b>			
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).			
<b>Introduction to Advanced Manufacturing Systems:</b> Introduction, components of CNC, advantages and applications of CNC, 3D printing.			
<b>Module-3 (8 hours)</b>			
<b>Introduction to IC Engines:</b> Components and Working Principles, 4-Stroke Petrol and Diesel Engines, Application of IC Engines.			
<b>Insight into Future Mobility;</b> Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles.			
<b>Module-4 (8 hours)</b>			
<b>Engineering Materials:</b> Types and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer. Shape Memory Alloys.			
<b>Joining Processes:</b> Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames.			
<b>Module-5 (8 hours)</b>			

**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.

**Course Outcome (Course Skill Set)**

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

C01	Explain the concepts of Role of Mechanical Engineering and Energy sources.
C02	Describe the Machine Tool Operations and advanced Manufacturing process.
C03	Explain the Working Principle of IC engines and EV vehicles.
C04	Discuss the Properties of Common Engineering Materials and various Metal Joining Processes.
C05	Explain the Concepts of Mechatronics, Robotics and Automation in IoT



### **Assessment Details (both CIE and SEE)**

The weightage 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):**

Three Unit Tests each of **20 Marks (duration 01 hour)**

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester
- Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours) t the end of the 13<sup>th</sup> week of the semester.

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)****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 3rdEd., 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.

**Web links and Video Lectures (e-Resources):**

- <https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-and-process-industry/>
- [Videos | Makino \(For Machine Tool Operation\)](#)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstration of lathe/milling/drilling operations
- Demonstration of working of IC Engine.
- Study arc welding, oxy-acetylene gas flame structure.
- Video demonstration of latest trends in mobility robotics and Automation
- Demonstration of developing models on machine tools

**COs and POs Mapping (CO-PO mappings are only Indicative)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3					1	2			1		1
CO2	3					1	1			1		1
CO3	3					1	1			1		1
CO4	3					1	1			1		1
CO5	3					1	1			1		1

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title	<b>Introduction to C Programming</b>		
Course Code:	<b>22ESC145/245</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
	<p><b>Course Objectives:</b></p> <p>CLO 1. Elucidate the basic architecture and functionalities of a Computer</p> <p>CLO 2. Apply programming constructs of C language to solve the real-world problems</p> <p>CLO 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems</p> <p>CLO 4. Design and Develop Solutions to problems using modular programming constructs such as functions and procedures</p>		
	<p><b>Teaching-Learning Process (General Instructions)</b></p> <p>These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.</li> <li>2. Use of Video/Animation to explain functioning of various concepts.</li> <li>3. Encourage collaborative (Group Learning) Learning in the class.</li> <li>4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.</li> <li>5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.</li> <li>6. Introduce Topics in manifold representations.</li> <li>7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.</li> <li>8. Discuss how every concept can be applied to the real world-and when that's possible, it helps to improve the students' understanding.</li> <li>9. Use <a href="https://pythontutor.com/visualize.html#mode=edit">https://pythontutor.com/visualize.html#mode=edit</a> in order to visualize the operations of C Programs</li> </ol>		
	<b>Module-1 (6 Hours of Pedagogy)</b>		
	<p><b>Introduction to C:</b> 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,  <b>Textbook: Chapter 1.1-1.9, 2.1-2.2, 8.1 – 8.6, 9.1-9.14</b></p>		
	<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation	
	<b>Module-2 (6 Hours of Pedagogy)</b>		
	<p>Operators in C, Type conversion and typecasting.</p> <p><b>Decision control and Looping statements:</b> Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement.  <b>Textbook: Chapter 9.15-9.16, 10.1-10.6</b></p>		
	<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation	

<b>Module-3 (6 Hours of Pedagogy)</b>	
<p>Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.</p> <p><b>Arrays:</b> Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions,</p> <p><b>Textbook: Chapter 11.1-11.13, 12.1-12.6</b></p>	
<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation
<b>Module-4 (6 Hours of Pedagogy)</b>	
<p>Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays.</p> <p><b>Applications of arrays and introduction to strings:</b> Applications of arrays, case study with sorting techniques.</p> <p><b>Introduction to strings:</b> Reading strings, writing strings, summary of functions used to read and write characters. Suppressing input using a Scanset.</p> <p><b>Textbook: Chapter 12.7-12.12</b></p>	
<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation
<b>Module-5 (6 Hours of Pedagogy)</b>	
<p><b>Strings:</b> String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings.</p> <p><b>Pointers:</b> Understanding the Computers Memory, Introduction to Pointers, Declaring Pointer Variables</p> <p><b>Structures:</b> Introduction to structures</p> <p><b>Textbook: Chapter 13.1-13.6, 14.1-14.3, 15.1</b></p>	
<b>Teaching-Learning Process</b>	Chalk and talk method/Power Point Presentation
<p><b>Course Outcomes (Course Skill Set)</b></p> <p>At the end of the course the student will be able to:</p> <p>CO1. Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.</p> <p>CO 2. Apply programming constructs of C language to solve the real world problem</p> <p>CO 3. Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting</p> <p>CO 4. Explore user-defined data structures like structures, unions and pointers in implementing solutions</p> <p>CO5. Design and Develop Solutions to problems using modular programming constructs using functions</p>	

**Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination (SEE):****SEE for IC**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

**The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion**

**will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).**

**Passing standard:**

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

**Suggested Learning Resources:**

**Textbooks**

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.

**Web links and Video Lectures (e-Resources):**

1. [elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html](http://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.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Quizzes
- Assignments
- Seminars

**Lab Assignments**

1	C Program to find Mechanical Energy of a particle using $E = mgh + \frac{1}{2} mv^2$ .
2	C Program to convert Kilometers into Meters and Centimeters.
3	C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4	Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants $b_1, b_2, b_3$ such that the equation is balanced on both sides and it must be the reduced form.
5	Implement Matrix multiplication and validate the rules of multiplication.

6	Compute $\sin(x)/\cos(x)$ using Taylor series approximation. Compare your result with the built-in library function. Print both the results with appropriate inferences.
7	Sort the given set of N numbers using Bubblesort.
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.

Course Title:	<b>Smart Materials and systems</b>		
Course Code:	<b>22ETC15a/25a</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 Hours	Credits	03

#### Course objectives

- To develop the students ability to learn emerging materials.
- To make students to learn prefabricated building components
- To understand the sensors deployed in smart buildings
- To learn building information modelling for building design
- To learn the concepts of 3-D printing

#### Teaching-Learning Process

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Civil Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group) Learning in the class.
5. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
10. Individual teachers can device innovative pedagogy to improve teaching-learning.

#### Module-1 (08)

##### Emerging Materials

Honey comb structure (Carbon composites), Nano-materials, engineered polymers, emerging sustainable by products (Fly ash and GGBS) and construction chemicals

#### Module-2 (08)

##### Prefabricated/ Manufactured building components

Definition, types of prefabricated/ manufactured building components and infrastructure, modular coordination, standardization, materials, systems, production, transportation and installation.

#### Module-3(08)

##### 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



**Module-4(08)**

**BIM and IBMS**

BIM: Definition, Necessity, advantages, BIM in building design, infrastructure design and construction  
IBMS – Definition, Necessity, advantages, Types of IBMS

**Module-5 (08)**

**3-D Printing**

Importance, Historic development, advantages, common terminologies, classification, Process chain, 3 – D modelling, Data conversion and transmission, checking and preparation, Building, Post processing, Applications

**Course outcome (Course Skill Set)**

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

CO1	Make use emerging materials for construction
CO2	Decide the proper prefabricated building component
CO3	Use smart materials and methods in building construction
CO4	Implement BIM in building design
CO5	Prepare 3-D modelling and manufacture building component

### **Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

##### **Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

##### **Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Donald R. Askeland and Pradeep P. Fulay, Essentials of Materials Science and Engineering, 2009, Cengage Learning.
- 2.
- 3.
- 4.
- 5.

**Web links and Video Lectures (e-Resources):**

- YouTube Videos.
- 

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Site visits to understand the prefabricated building components.
- Visit to Smart material manufacturing facilities
- Visit to 3-D printing facility

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	2	3										
C02	2	3										
C03	2	3										
C04	2	3										
C05	2	3										

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

**Note:** Depending on the assessment tool used, higher order POs can be identified by the concerned course instructor.

Course Title:	<b>GREEN BUILDINGS</b>		
Course Code:	<b>22ETC15b/25b</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03

**Course objectives:** This course will enable students to:

- Understand the Definition, Concept & Objectives of the terms cost effective construction and green building
- Apply cost effective techniques in construction
- 3.Apply cost effective Technologies and Methods in Construction
- Understand the Problems due to Global Warming
- State the Concept of Green Building
- Understand Green Buildings

#### **Teaching-Learning Process**

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Civil Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group) Learning in the class.
5. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
10. Individual teachers can device innovative pedagogy to improve teaching-learning.

#### **Module-1 (08)**

**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- LimePoszolana 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.

#### **Module-2 (08)**

**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 - Contributions of agencies - Costford - Nirmithi Kendra - Habitat

**Module-3(08)**

**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.

**Module-4(08)**

**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)

**Module-5 (08)**

**Utility of Solar Energy in Buildings**

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

**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. Urban Environment and Green Buildings. Green Cover and Built Environment.

**Course outcome (Course Skill Set)**

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

C01	Select different building materials for construction
C02	Apply effective environmental friendly building technology
C03	Analyze global warming due to different materials in construction
C04	Analyse buildings for green rating
C05	Use alternate source of energy and effective use water

### **Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

##### **Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

#### **Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### **Suggested Learning Resources:**

##### **Text Books**

1. HarharaIyer G, Green Building Fundamentals, Notion Press
2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices

**Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=THgQF8zHBW8>
- [https://www.youtube.com/watch?v=DRO\\_rIkywxQ](https://www.youtube.com/watch?v=DRO_rIkywxQ)
- 
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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Students have to visit a building which is green rated and prepare a report

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	2	1				1	1					
C02	2	1				1	1					
C03	2	1				1	1					
C04	2	1				1	1					
C05	2	1				1	1					

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

**Note:** Depending on the assessment tool used, higher order POs can be identified by the concerned course instructor.

Course Title:	<b>Introduction to Nanotechnology</b>		
Course Code:	<b>22ETC15e/25e</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	ETC (Integrated)	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	02:00:02:00	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Teaching Department	NT/Chem/Phys/Any Engg. Branch	QP setting	NT/Chem/Phys
<p><b>Course objectives</b></p> <ul style="list-style-type: none"> <li>To provide a comprehensive overview of synthesis and characterization of nanoparticles, nanocomposites and hierarchical materials with nanoscale features.</li> <li>To provide the engineering students with necessary background for understanding various nanomaterials characterization techniques</li> <li>To develop an understanding of the basis of the choice of material for device applications</li> <li>To give an insight into complete systems where nanotechnology can be used to improve our everyday life</li> </ul>			
<p><b>Teaching-Learning Process</b></p> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective</p> <ol style="list-style-type: none"> <li>Chalk and Talk</li> <li>Powerpoint presentation</li> <li>Video Lecturing</li> <li>E-sources</li> <li>Self learning</li> </ol>			
<b>Module-1 (07 hours of pedagogy)</b>			
<p><b>Introduction to Nanomaterials</b></p> <p>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</p>			
<b>Module-2 (07 hours of pedagogy)</b>			



<p><b>Characterization of Nanomaterials</b></p> <p>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 and SEM.</p> <p>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)</p>	
<p><b>Module-3(07 hours of pedagogy)</b></p>	
<p><b>Carbon Based Materials</b></p> <p>Introduction, Synthesis, Properties (electrical, Electronic and Mechanical), and Applications of Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials: Carbon nanocomposites, nanofibres, nanodiscs, nanodiamonds.</p>	
<p><b>Module-4(07 hours of pedagogy)</b></p>	
<p><b>Nanotechnology in Energy storage and conversion</b></p> <p>Solar cells: First generation, Second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells.</p> <p>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</p> <p>Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes</p> <p><b>Self study for lifelong learning:</b></p> <p>Super capacitors: Introduction, construction and working of supercapacitor</p>	
<p><b>Module-5 (07 hours of pedagogy)</b></p>	
<p><b>Applications of Nanotechnology</b></p> <p>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.</p> <p><b>Self study for lifelong learning:</b></p> <p>Nano coatings (Photocatalysts) and super hydrophobic coatings (Lotus effect)</p>	
<p><b>Course outcome (Course Skill Set)</b></p> <p>At the end of the course the student will be able to:</p>	
C01	Demonstrate the synthesis of nanoparticles by various techniques. [L2]
C02	Explain working of basic instruments used in characterization of nanoparticles. [L2]
C03	Discuss the application of nanotechnology to mechanical and civil domains [L2]
C04	Classify the nanomaterials based on the dimensions. [L3]
C05	Assess the suitability of nanomaterials for various device applications. [L4]

**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration. **One Question each on Lab session should be included in IA tests**

**Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Nano Materials – A.K. Bandyopadhyay/ New Age Publishers
2. Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Springer Series in Materials Science
3. Nano Essentials- T. Pradeep/TMH
4. Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications. Cambridge University Press, 2011
5. M.A. Shah, K.A. Shah, “Nanotechnology: The Science of Small”, Wiley India, ISBN 13: 9788126538683

**Reference Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
2. Understanding Nanotechnology, Scientific American 2002
3. Nanotechnology, M. Ratner and D. Ratner, Prentice Hall 2003
4. Nanotechnology, M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, CRC Press Boca Raton 2002
5. Recent reviews on Li-ion batteries, solar cells and fuel cells

**Web links and Video Lectures (e-Resources):**

- <https://nptel.ac.in/courses/118104008>
- <https://www.digimat.in/nptel/courses/video/118104008/L16.html>
- <https://archive.nptel.ac.in/courses/113/106/113106099/>
- <https://nptel.ac.in/courses/112107283>
- [https://onlinecourses.nptel.ac.in/noc22\\_me131/preview](https://onlinecourses.nptel.ac.in/noc22_me131/preview)

**Practical Based learning (Any 5 experiments x 2 hours = 10 practical hours)**

- Preparation of silver nanoparticles and characterization of particle size by optical spectroscopy
- Preparation of ZnO nanoparticles by combustion technique
- Preparation of Al<sub>2</sub>O<sub>3</sub> nanoparticles by precipitation method
- Preparation of Silica nanoparticles by sol-gel method
- Preparation of metal oxide nanoparticles by hydrothermal method
- Preparation of thin films by SILAR method
- Determination of Band gap of given material using Tauc plot

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	2						2	1		
CO2	3	3	2									
CO3	3	3										
CO4	3	3							2	1		2
CO5	3	3							2	1		2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	<b>Introduction to Sustainable Engineering</b>		
Course Code:	<b>22ETC15g/25g</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3-0-0-0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course Learning Objectives:</b> <ul style="list-style-type: none"> <li>To familiarize the students to the area of sustainability and concepts of sustainability engineering</li> <li>To enable students with an understanding of principles and frame work of sustainable engineering</li> <li>To provide students with an understanding of Life Cycle Assessment tool in sustainable engineering</li> <li>To provide students with understanding of integration of sustainability with design.</li> </ul>			
<b>Teaching-Learning Process</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective <ol style="list-style-type: none"> <li>Explanation via real life problem, deliberate on solution and inquiry type teaching</li> <li>Instructions with interactions in class room lectures (physical/hybrid)</li> <li>Use of ICT Tools including You Tube videos and related MOOCs, AR/VR/MR tools</li> <li>Flipped Classroom session (approx. 10% of classes)</li> <li>Guest talks and competitions for learning beyond the syllabus</li> <li>Students oral presentation of case studies</li> </ol>			
<b>Module-1 (8 Hours)</b>			
<b>Sustainable Development and Role of Engineers:</b> 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 <b>Sustainable Engineering Concepts:</b> Key concepts – Factor 4 and Factor 10: Goals of sustainability, System Thinking, Life Cycle Thinking and Circular Economy			
<b>Module-2 (8 Hours)</b>			
<b>Sustainable Engineering and Concepts, Principles and Frame Work:</b> Green Economy and Low Carbon Economy, Eco Efficiency, Triple bottom Line, Guiding principles of sustainable engineering, Frameworks for sustainable Engineering. <b>Tools for sustainability Assessment:</b> Environmental Management System, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental			
<b>Module-3( 8 Hours)</b>			
<b>Fundamentals of Life Cycle Assessment</b> 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.			
<b>Module-4(8 Hours)</b>			
<b>Environmental Life Cycle Costing, Social Life Cycle Assessment, and Life Cycle Sustainability Assessment:</b> 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 <b>Introduction to Environmental Economics:</b> 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			

**Module-5 (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,

**Course outcome (Course Skill Set)**

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

C01	Elucidate the basics of sustainable development, sustainable engineering and its role in engineering
C02	Application of Sustainable Engineering Concepts and Principles in Engineering
C03	Apply the Principle, and methodology of Life Cycle Assessment Tool to engineering systems
C04	Understand integration methods of sustainability to Engineering Design
C05	

**Assessment Details (both CIE and SEE)**

The weightage 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):**

Three Unit Tests each of **20 Marks (duration 01 hour)**

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester
- Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours) t the end of the 13<sup>th</sup> week of the semester.

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Introduction to Sustainability for Engineers, ToolseeramRamjeawon, CRC Press, 1<sup>st</sup>Edn., 2020
2. Sustainability Engineering: Concepts, Design and Case studies, Prentice Hall, 1<sup>st</sup>Edn, 2015
3. System Analysis for sustainable Engineering: Theory and applications, Ni bin Chang, McGraw Hill Publications, 1<sup>st</sup>Edn., 2010
4. Engineering for Sustainable development: Delivery a sustainable development goals, UNESCO, International Centre for Engineering Education, France, 1<sup>st</sup>Edn., 2021
5. Introduction to Sustainable Engineering, Rag. R.L. and Ramesh Lakshmi Dinachandran, PHI Learning Pvt. Ltd., 2<sup>nd</sup>Edn, 2016

**Web links and Video Lectures (e-Resources):**

- VTU/EDUSAT/SWAYAM/NPTEL/MOOC.
- <https://nptel.ac.in/courses/127105018>
- <https://nptel.ac.in/courses/107103081/www.macfound.org>
- <https://unesdoc.unesco.org/>
- <https://unesdoc.unesco.org/ark:/48223/pf0000375644.locale=en>
- <https://engineeringforoneplanet.org/>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Group Discussion of case studies.
- Solutions to real time case studies
- Seminar/Poster Presentation

**COs and POs Mapping (Individual course teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01												
C02												
C03												
C04												
C05												

**Level 3- Highly Mapped. Level 2-Moderately Mapped. Level 1-Low Mapped. Level 0- Not Mapped**

<b>Course Title:</b>	<b>RENEWABLE ENERGY SOURCES</b>		
<b>Course Code:</b>	<b>22ETC15h/25h</b>	<b>CIE Marks</b>	<b>50</b>
<b>Course Type (Theory/Practical /Integrated )</b>	<b>Theory</b>	<b>SEE Marks</b>	<b>50</b>
		<b>Total Marks</b>	<b>100</b>
<b>Teaching Hours/Week (L:T:P:S)</b>	<b>3:0:0:0</b>	<b>Exam Hours</b>	<b>03</b>
<b>Total Hours of Pedagogy</b>	<b>40 hours</b>	<b>Credits</b>	<b>03</b>
<b>Course Learning Objectives</b> <ul style="list-style-type: none"> <li>• Create awareness about sources of energy and able to estimate how long the available conventional fuel reserves will last.</li> <li>• Learn the fundamental concepts about solar energy systems and devices.</li> <li>• Study on the applications of wind energy.</li> <li>• Understand the working of OTEC, Biomass energy, mini-micro hydro systems and geothermal energy system.</li> </ul>			
<b>Teaching-Learning Process</b> <ol style="list-style-type: none"> <li>1. Lecture by use of boards/LCD projectors/OHP projectors.</li> <li>2. Laboratory experiments/teaching aids.</li> <li>3. Industrial/guest lectures.</li> <li>4. Industrial visits/in-plant training.</li> <li>5. Self- learning such as use of NPTEL materials and internets.</li> <li>6. Assignments/Seminars.</li> </ol>			
<b>Module-1 (08 Hours)</b>			
<b>INTRODUCTION:</b> World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation– Renewable Energy Scenario in India and around the World – Potentials – Achievements / Applications – Economics of renewable energy systems.			
<b>Module-2 (08 Hours)</b>			
<b>SOLAR ENERGY:</b> Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.			
<b>Module-3(08 Hours)</b>			
<b>WIND ENERGY:</b> Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection– Details of Wind Turbine Generator – Safety and Environmental Aspects			
<b>Module-4(08 Hours)</b>			
<b>BIO – ENERGY:</b> Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production– Bio diesel – Cogeneration - Biomass Applications			
<b>Module-5 (08 Hours)</b>			
<b>OTHER RENEWABLE ENERGY SOURCES:</b> Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage – Fuel cell Systems – Hybrid Systems.			
<b>Course Outcome (Course Skill Set)</b>			
At the end of the course the student will be able to:			
CO1	Explain the importance and applications of renewable Energy		
CO2	Describe the method of power generation from Solar Energy		
CO3	Discuss the method of power generation from Wind Energy		
CO4	Explain the method of power generation from Bio Energy		
CO5	Describe the Tidal energy, Wave Energy, OTEC, Hydro energy, Geothermal Energy, Fuel Cells and Hybrid Systems.		



**Assessment Details (both CIE and SEE)**

The weightage 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):**

Three Unit Tests each of **20 Marks (duration 01 hour)**

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester
- Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours) t the end of the 13<sup>th</sup> week of the semester.

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Rai. G.D., "Non Conventional Energy Sources", Khanna Publishers, New Delhi, 2011.
2. B. H. Khan, Non-Conventional Energy Resources, The McGraw Hill.
3. Twidell, J.W. & Weir, A. Renewable Energy Sources, EFN Spon Ltd., UK, 2006.
4. S. P. Sukhatme and J.K. Nayak, Solar Energy – Principles of Thermal Collection and Storage, Tata McGraw-Hill, New Delhi.
5. Garg, Prakash, Solar Energy, Fundamentals and Applications, Tata McGraw Hill.

**Web links and Video Lectures (e-Resources):**



- [https://www.un.org/en/climatechange/what-is-renewable-energy?gclid=Cj0KCCQjwqoibBhDUARIsAH2OpWgWuINfEag3jPN6ilb3IjOP47ZfMRjgvXosZeYQM07yDRbU7oofBywaAtX6EALw\\_wcB](https://www.un.org/en/climatechange/what-is-renewable-energy?gclid=Cj0KCCQjwqoibBhDUARIsAH2OpWgWuINfEag3jPN6ilb3IjOP47ZfMRjgvXosZeYQM07yDRbU7oofBywaAtX6EALw_wcB)
- Introduction to Renewable Energy and its types - Introduction Renewable Energy and Energy Storage. <https://youtu.be/A2KvSLoonGs>
- Solar Energy - Sources of Energy <https://youtu.be/VirsrRnZWdM>
- Renewable and Non-Renewable Sources of Energy <https://youtu.be/A9Z8Ro4Z5b8>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstrate why an increased dependence on renewable energy sources is an inevitable part of our future.
- Energy Conversions - Can one form of energy be changed into another form?
- What are the practical sources of energy?

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

Course Title:	<b>Waste Management</b>		
Course Code:	<b>22ETC15i/25i</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	3 hrs of Theory
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course objectives</b> <ul style="list-style-type: none"> <li>To learn broader understandings on various aspects of solid waste management practiced in industries.</li> <li>To learn recovery of products from solid waste to compost and biogas, incineration and energy recovery, hazardous waste management and treatment, and integrated waste management.</li> </ul>			
<b>Teaching-Learning Process</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective <ol style="list-style-type: none"> <li>1. Include traditional teaching learning process such as Chalk and Talk using writing boards.</li> <li>2. Construct graphical and pictorial representation of the subject in the form of Chart, hand-outs or PowerPoint presentations.</li> <li>3. Collaborate with students how tools are applied to solve biological problems.</li> <li>4. Integrate real time case studies in various scientific tools used.</li> <li>5. Reflective approaches on analysing how and why the tools are used in self-reflected or published data.</li> <li>6. Incorporate Inquiry based approach using demonstration, field study, experiments and project work</li> </ol>			
<b>Module-1 (08)</b>			
<b>INTRODUCTION TO SOLID WASTE MANAGEMENT:</b> Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management) and EST (environmentally sound technologies), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India..			
<b>Module-2 (08)</b>			
<b>WASTE GENERATION ASPECTS:</b> Waste stream assessment (WSA), waste generation and composition, waste characteristics (physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions.			
<b>Module-3 (08)</b>			
<b>COLLECTION, STORAGE, TRANSPORT AND DISPOSAL OF WASTES:</b> Waste Collection, Storage and Transport: Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system, a case study. Waste Disposal: key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues, a case study.			
<b>Module-4 (08)</b>			
<b>WASTE PROCESSING TECHNIQUES &amp; SOURCE REDUCTION, PRODUCT RECOVERY &amp; RECYCLING:</b> Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering. Source Reduction, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, significance of recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes, a case study.			
<b>Module-5 (08)</b>			
<b>HAZARDOUS WASTE MANAGEMENT AND TREATMENT:</b> Identification and classification of hazardous waste, hazardous waste treatment, pollution prevention and waste minimization, hazardous wastes management in India.			

**Course outcome (Course Skill Set)**

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

CO1	Apply the basics of solid waste management towards sustainable development
CO2	Apply technologies to process waste and dispose the same.
CO3	Design working models to convert waste to energy
CO4	Identify and classify hazardous waste and manage the hazard

**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

**Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks.
- Students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Books****Text Books:**

1. Tchobaanoglous, G., Theisen, H., and Samuel A Vigil, Integrated Solid Waste Management, McGraw-Hill Publishers, 1993.
2. Bilitewski B., Hard He G., Marek K., Weissbach A., and Boeddicker H., Waste Management, Springer, 1994.

**Reference Books:**

1. White, F. R., Franke P. R., & Hindle M., Integrated solid waste management: a life cycle inventory. McDougall, P. John Wiley & Sons. 2001
2. Nicholas, P., & Cheremisinoff, P. D., Handbook of solid waste management and waste minimization technologies, Imprint of Elsevier Science. 2005

**Web links and Video Lectures (e-Resources):**

- <https://nptel.ac.in/courses/105103205>
- <https://www.youtube.com/watch?v=k0ktJRoRcOA>
- <https://nptel.ac.in/courses/103/107/103107125/>
- [https://onlinecourses.nptel.ac.in/noc22\\_ce76/preview](https://onlinecourses.nptel.ac.in/noc22_ce76/preview)
- [https://onlinecourses.swayam2.ac.in/cec20\\_ge13/preview](https://onlinecourses.swayam2.ac.in/cec20_ge13/preview)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- AV presentation by students (on specific topics).
- Discussion of case studies based on research findings.
- Model making and Poster presentations

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	3					3	3					
C02	3					3	3					
C03	3					3	3					
C04	3					3	3					

**Level 3- Highly Mapped,    Level 2-Moderately Mapped,    Level 1-Low Mapped,    Level 0- Not Mapped**

Course Title:	<b>Emerging applications of Biotechnology</b>		
Course Code:	<b>22ETC15j/25j</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	3 hrs of Theory
Total Hours of Pedagogy	40 hours	Credits	03
<p><b>Course objectives</b></p> <ol style="list-style-type: none"> <li>1. To learn the Significance of Biosensors</li> <li>2. To learn the Fundamentals and Applications of biosensors.</li> <li>3. To Understanding the basics of Biosensing Technology.</li> <li>4. To recognize the application of biosensors in health, environment, agriculture and food industry.</li> </ol>			
<p><b>Teaching-Learning Process</b></p> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective</p> <ol style="list-style-type: none"> <li>1. Include traditional teaching learning process such as Chalk and Talk using writing boards.</li> <li>2. Construct graphical and pictorial representation of the subject in the form of Chart, hand-outs or PowerPoint presentations.</li> <li>3. Collaborate with students how tools are applied to solve biological problems.</li> <li>4. Integrate real time case studies in various scientific tools used.</li> <li>5. Reflective approaches on analysing how and why the tools are used in self-reflected or published data.</li> <li>6. Incorporate Inquiry based approach using demonstration, field study, experiments and project work</li> </ol>			
<b>Module-1 (8)</b>			
<p><b>INTRODUCTION TO BIOSENSORS</b></p> <p>Definitions, biological inspiration, types of sensors, target analytes, various recognition, Recognition event : Catalytic, Single and multiple enzyme, Bio Affinity: Labeled and Label free, whole cell sensing – bacteria, yeast, mammalian cell, Generation of Biosensor; Biomolecule Immobilization Techniques, Enzyme Kinetics</p>			
<b>Module-2 (8)</b>			
<p><b>BASIC DESIGN AND TRANSDUCER</b></p> <p>Considerations calibration, dynamic Range, signal to noise, sensitivity, selectivity, Interference recognition/Transduction membrane protein sensors: ion channels, Types of Transducer, Optical; Fiber Optic, ECL, Surface Plasmon Resonance, Electro chemical; FET, Impedance, Piezoelectric; Cantileaver</p>			
<b>Module-3(8)</b>			
<p><b>APPLICATIONS OF BIOSENSORS IN HEALTH AND ENVIRONMENT</b></p> <p>Biosensors and diabetes management, Microfabricated biosensors and point-of-care diagnostics systems, Noninvasive biosensors in clinical analysis; Surface plasmon resonance and evanescent wave biosensors, Biosensor in cancer and HIV early diagnosis.</p>			
<b>Module-4(8)</b>			
<p><b>APPLICATIONS OF BIOSENSORS IN FOOD AND AGRICULTURE INDUSTRY</b></p> <p>Detection of product content, allergic components, pathogens, pesticide residues. Monitoring of raw material conversions. Detection of crop diseases, pathogens in plants, Detection of soil nutrients, pesticide and its residual detection.</p>			
<b>Module-5 (8)</b>			
<p><b>APPLICATIONS OF NANOMATERIALS IN BIOSENSORS</b></p> <p>Nano Materials in biosensors; Carbon based Nano Material, Metal oxide and nano particle, Quantum dots, Role of nano material in Signal Amplifications, Detection and Transducer Fabrication</p>			

**Course outcome (Course Skill Set)**

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

CO1	To classify types of biosensors based on concepts
CO2	To learn the Fundamentals of biosensors
CO3	To analyse the application of biosensing technology
CO4	To analyse the application of nanomaterial in biosensors

**Assessment Details (both CIE and SEE)**

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

**Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks.
- Students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:****Books****Text Books:**

1. Jeong-Yeol Yoon, Introduction to Biosensors, Springer-Verlag New York Ed. 2016
2. Mohammed Zourob, Recognition Receptors in Biosens; Publisher: Springer-Verlag New York Ed. 2010

**Reference Books:**

1. Zvi Liron, Novel Approaches in Biosensors and Rapid Diagnostic Assays; Publisher: Springer US Ed..2001
2. Pierre R. C, and Loïc J.B, Biosensor Principles and Applications, , CRC Press, 2019

**Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=kQ6CY1qpGjY>
- <https://nptel.ac.in/courses/102101054>
- [https://onlinecourses.nptel.ac.in/noc20\\_ph13/preview](https://onlinecourses.nptel.ac.in/noc20_ph13/preview)
- [https://onlinecourses.nptel.ac.in/noc22\\_ph01/preview](https://onlinecourses.nptel.ac.in/noc22_ph01/preview)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- AV presentation by students (on specific topics).
- Discussion of case studies based on research findings.
- Model making and Poster presentations

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	2			2		2					
CO2	2	2			2		2					
CO3	3	2			2		2					
CO4	3	2			2		2					

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	Introduction to Cyber Security		
Course Code:	<b>22ETC15I/25I</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3-0-0-0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course objectives</b> <ul style="list-style-type: none"> <li>To familiarize cybercrime terminologies and perspectives</li> <li>To understand Cyber Offenses and Botnets</li> <li>To gain knowledge on tools and methods used in cybercrimes</li> <li>To understand phishing and computer forensics</li> </ul>			
<b>Teaching-Learning Process</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective <ol style="list-style-type: none"> <li>Chalk and Board</li> <li>Demonstration</li> <li>Interactive learning</li> <li>Videos and online material</li> </ol>			
<b>Module-1 (8 hours of pedagogy)</b>			
<b>Introduction to Cybercrime:</b>  <p style="text-align: center;"><b>Cybercrime:</b> 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</p> Textbook:1 Chapter 1 (1.1 to 1.5, 1.7-1.9)			
<b>Module-2 (8 hours of pedagogy)</b>			
<b>Cyber Offenses:</b>  <p><b>How Criminals Plan Them:</b> Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercaafe &amp; cybercrimes.</p> <p><b>Botnets:</b> The fuel for cybercrime, Attack Vector.</p> Textbook:1 Chapter 2 (2.1 to 2.7)			
<b>Module-3 (8 hours of pedagogy)</b>			



**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)

**Module-4 ( 8 ours of pedagogy)**

**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)

**Module-5 (8 hours of pedagogy)**

**Understnading Computer Forensics:** Introdcution, 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)

**Course outcome (Course Skill Set)**

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

CO1	Explain the cybercrime terminologies
CO2	Describe Cyber offenses and Botnets
CO3	Illustrate Tools and Methods used on Cybercrime
CO4	Explain Phishing and Identity Theft
CO5	Justify the need of computer forensics

### Assessment Details (both CIE and SEE)

The weightage 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 30 Marks (duration 01 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 two tests out of three shall be taken into consideration

##### Two assignments each of 20 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 100 marks and will be scaled down to 50 marks**

#### Semester End Examination(SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

#### Suggested Learning Resources:

##### 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)

#### Web links and Video Lectures (e-Resources):

- [https://www.youtube.com/watch?v=yC\\_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS\\_rt9swsu](https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu)
- [https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJcktziO4DtI4\\_](https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJcktziO4DtI4_)
- [https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL\\_uaeekrhGzJlB8XQBxU3z\\_hDwT95xlk](https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z_hDwT95xlk)
- <https://www.youtube.com/watch?v=KqSqyKwVuA8>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Illustration of standard case study of cyber crime
- Setup a cyber court at Institute level

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
C01												
C02												
C03												
C04												
C05												

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

Course Title:	Introduction to Python Programming		
Course Code:	<b>22PLC15B/25B</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<p><b>Course objectives</b></p> <ul style="list-style-type: none"> <li>• Learn the syntax and semantics of the Python programming language.</li> <li>• Illustrate the process of structuring the data using lists, tuples</li> <li>• Appraise the need for working with various documents like Excel, PDF, Word and Others.</li> <li>• Demonstrate the use of built-in functions to navigate the file system.</li> <li>• Implement the Object Oriented Programming concepts in Python.</li> </ul>			
<p><b>Teaching-Learning Process</b></p> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective</p> <ol style="list-style-type: none"> <li>1. Use <a href="https://pythontutor.com/visualize.html#mode=edit">https://pythontutor.com/visualize.html#mode=edit</a> in order to visualize the python code</li> <li>2. Demonstrate and visualize basic data types (list, tuple, dictionary).</li> <li>3. Chalk and talk</li> <li>4. online and videos</li> </ol>			
<b>Module-1 (08 hrs)</b>			
<p><b>Python Basics:</b> Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, <b>Flow control:</b> Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(), <b>Functions:</b> def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number</p> <p><b>Textbook 1: Chapters 1 – 3</b></p>			
<b>Module-2 (08 hrs)</b>			
<p><b>Lists:</b> The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References,</p> <p><b>Dictionaries and Structuring Data:</b> The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things,</p> <p><b>Textbook 1: Chapters 4 – 5</b></p>			
<b>Module-3 (08 hrs)</b>			

	<p><b>Manipulating Strings:</b> Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup</p> <p><b>Reading and Writing Files:</b> Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the print.format() Function, Project: Generating Random Quiz Files, Project: Multiclipboard,</p> <p><b>Textbook 1: Chapters 6 , 8</b></p>
	<b>Module-4 (08 hrs)</b>
	<p><b>Organizing Files:</b> The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates, Project: Backing Up a Folder into a ZIP File,</p> <p><b>Debugging:</b> Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE's Debugger.</p> <p><b>Textbook 1: Chapters 9-10</b></p>
	<b>Module-5 (08 hrs)</b>
	<p><b>Classes and objects:</b> Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying,</p> <p><b>Classes and functions:</b> Time, Pure functions, Modifiers, Prototyping versus planning,</p> <p><b>Classes and methods:</b> Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The __str__ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation,</p> <p><b>Textbook 2: Chapters 15 – 17</b></p>
<b>Course outcome (Course Skill Set)</b>	
At the end of the course the student will be able to:	
C01	Demonstrate proficiency in handling loops and creation of functions.
C02	Identify the methods to create and manipulate lists, tuples and dictionaries.
C03	Develop programs for string processing and file organization
C04	Interpret the concepts of Object-Oriented Programming as used in Python.
<b>Programming Exercises:</b>	
<ol style="list-style-type: none"> <li>1. <ol style="list-style-type: none"> <li>a. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.</li> <li>b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.</li> </ol> </li> <li>2. <ol style="list-style-type: none"> <li>a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.</li> <li>b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).</li> </ol> </li> <li>3. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.</li> <li>4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.</li> <li>5. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary</li> </ol>	

with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]

6. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
7. Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.
8. Write a function named DivExp which takes TWO parameters a, b and returns a value c ( $c=a/b$ ). Write suitable assertion for  $a>0$  in function DivExp and raise an exception for when  $b=0$ . Develop a suitable program which reads two values from the console and calls a function DivExp.
9. Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N ( $N \geq 2$ ) complex numbers and to compute the addition of N complex numbers.
10. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use `__init__()` method to initialize name, USN and the lists to store marks and total, Use `getMarks()` method to read marks into the list, and `display()` method to display the score card details.]

#### **Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination (SEE):****SEE for IC**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

**The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).**

**Passing standard:**

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

**Suggested Learning Resources:****Text Books**

1. Al Sweigart, "**Automate the Boring Stuff with Python**", 1<sup>st</sup> Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>) (Chapters 1 to 18, except 12) for lambda functions use this link: <https://www.learnbyexample.org/python-lambda-function/>
2. Allen B. Downey, "**Think Python: How to Think Like a Computer Scientist**", 2<sup>nd</sup> Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf>) (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)

**Web links and Video Lectures (e-Resources):**

- <https://www.learnbyexample.org/python/>
- <https://www.learnpython.org/>
- <https://pythontutor.com/visualize.html#mode=edit>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Quizzes for list, tuple, string dictionary slicing operations using below link  
<https://github.com/sushantkhara/Data-Structures-And-Algorithms-with-Python/raw/main/Python%203%20%20400%20exercises%20and%20solutions%20for%20beginners.pdf>

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
C01							
C02							
C03							
C04							
C05							

**Level 3- Highly Mapped,    Level 2-Moderately Mapped,    Level 1-Low Mapped,    Level 0- Not Mapped**



Course Title:	Introduction to Web Programming		
Course Code:	<b>22PLC15A/22PLC25A</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course objectives</b> <ul style="list-style-type: none"> <li>● To use the syntax and semantics of HTML and XHTML</li> <li>● To develop different parts of a web page</li> <li>● To understand how CSS can enhance the design of a webpage.</li> <li>● To create and apply CSS styling to a webpage</li> <li>● To get familiarity with the JavaScript language and understand Document Object Model handling of Java Script</li> </ul>			
<b>Teaching-Learning Process</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective <ol style="list-style-type: none"> <li>1. Use <a href="https://pythontutor.com/visualize.html#mode=edit">https://pythontutor.com/visualize.html#mode=edit</a> in order to visualize the operations of Javascripts</li> <li>2. Chalk and talk</li> <li>3. Online demonstration</li> <li>4. Hands on problem solving</li> </ol>			
<b>Module-1 (8 hours)</b>			
<b>Module-1:Traditional HTML and XHTML:</b>  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?  <b>TextBook1: Chapter 1</b>			
<b>Module-2 (8 hours)</b>			
<b>Module-2: HTML5:</b>  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 <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications  <b>TextBook1: Chapter 2</b>			
<b>Module-3 (8 hours)</b>			
<b>Module-3: Cascading Style Sheets (CSS)</b>  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**

**Module-4 (8 hours)**

**Module-4: Tables and CSS, Links and Images**

Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo-Class 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**

**Module-5 (8 hours)**

**Module-5: Introduction to JavaScript: 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**

**Course outcome (Course Skill Set)**

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

C01	Explain the historical context and justification for HTML over XHTML
C02	Develop HTML5 documents and adding various semantic markup tags
C03	Analyse various attributes, values and types of CSS
C04	Implement core constructs and event handling mechanisms of JavaScript.

**Programming Assignments:**

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
  - (iv) 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

<b>Department</b>	<b>Sem1</b>	<i>SubjectA</i>
		<i>SubjectB</i>
		<i>SubjectC</i>
	<b>Sem2</b>	<i>SubjectE</i>
		<i>SubjectF</i>
		<i>SubjectG</i>
	<b>Sem3</b>	<i>SubjectH</i>
		<i>SubjectI</i>
		<i>SubjectJ</i>

3. Use HTML5 for performing following tasks:
- (i) Draw a square using HTML5 SVG , fill the square with green color and make 6px brown stroke 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 information about 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 the appropriate 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 to the left

Also demonstrate list style type with user defined image logos

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

**Sign up today**

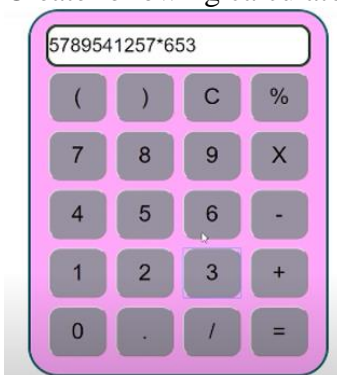
Name:

E-mail:

Password:

Confirm password:

8. Create following calculator interface with HTML and CSS



9. Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay
10. 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.

#### Assessment Details (both CIE and SEE)

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

**CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments’ write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

**Semester End Examination (SEE):**

**SEE for IC**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

**The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).**

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- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

**TextBook-1: HTML & CSS: The Complete Reference Thomas A. Powell, , Fifth Edition, Tata McGraw Hill,**

**TextBook-2: WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition**

**Web links and Video Lectures (e-Resources):**

[https://onlinecourses.swyam2.ac.in/aic20\\_sp11/preview](https://onlinecourses.swyam2.ac.in/aic20_sp11/preview)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Develop simple GUI interfaces for a computer program to interact with users

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**

Course Title:	Basics of Java Programming		
Course Code:	<b>22PLC15C/22PLC25C</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course objectives</b> <ul style="list-style-type: none"> <li>● Learn fundamental features of object oriented language and JAVA</li> <li>● Set up Java JDK environment to create, debug and run simple Java programs.</li> <li>● Learn object oriented concepts using programming examples.</li> <li>● Study the concepts of importing of packages and exception handling mechanism.</li> </ul>			
<b>Teaching-Learning Process</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective <ol style="list-style-type: none"> <li>1. Use <a href="https://pythontutor.com/visualize.html#mode=edit">https://pythontutor.com/visualize.html#mode=edit</a> in order to visualize the Java programs</li> <li>2. Chalk and talk</li> <li>3. Onine demonstration</li> <li>4. Hands on problem solving</li> </ol>			
<b>Module-1 (8 hours)</b>			
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			
<b>Module-2 (8 hours)</b>			
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 5			
<b>Module-3 (8 hours)</b>			
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 <b>Text book 1:</b> Ch 6, Ch 7 ( 7.1-7.9 )			
<b>Module-4 (8 hours)</b>			
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			
<b>Module-5 (8 hours)</b>			

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 10

### Course outcome (Course Skill Set)

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

CO1	To explain the features and object oriented concepts in JAVA programming
CO2	To analyse working of bitwise operators in JAVA
CO3	To develop simple programs based on polymorphism and inheritance
CO4	To describe the concepts of importing packages and exception handling mechanism

### Programming Assignments

1. Write a JAVA program that prints all real solutions to the quadratic equation  $ax^2+bx+c=0$ . Read in a, b, c and use the quadratic formula.
2. Write a JAVA program for multiplication of two arrays.
3. Demonstrate the following operations and sign extension with Java programs  
(i) << (ii) >> (iii) >>>
4. Write a JAVA program to sort list of elements in ascending and descending order
5. Create a JAVA class called Student with the following details as variables within it.

USN

NAME

BRANCH

PHONE

PERCENTAGE

Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.

6. Write a JAVA program demonstrating Method overloading and Constructor overloading.
7. Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a JAVA program to read and display at least 3 staff objects of all three categories.
8. Demonstrate dynamic dispatch using abstract class in JAVA.
9. Create two packages P1 and P2. In package P1, create class A, class B inherited from A, class C. In package P2, create class D inherited from class A in package P1 and class E. Demonstrate working of access modifiers (private, public, protected, default) in all these classes using JAVA.
10. Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of ArrayIndexOutOfBoundsException.



## Assessment Details (both CIE and SEE)

### Assessment Details (both CIE and SEE)

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

#### CIE for the practical component of the Integrated Course

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

### Semester End Examination(SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.

**The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 30 marks.**

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

Lab SEE will be conducted based on the Lab assignments with both internal and external examiners as per prevailing practice. The exam will be conducted for 50 marks and minimum passing is 20 marks. The marks obtained will be proportionally reduced to 20 marks (max) and will be summed with theory SEE to get the total SEE marks.

**Passing in the subject:** The student will pass the subject only if he obtained minimum passing marks both in theory SEE and Lab SEE. If a student fails in either theory/lab he has to clear the corresponding component only. Grading will be assigned by combining the performance in Lab and theory.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.

**Web links and Video Lectures (e-Resources):**

- [https://onlinecourses.nptel.ac.in/noc22\\_cs47/preview](https://onlinecourses.nptel.ac.in/noc22_cs47/preview)

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Conduct on spot problem solving based on JAVA
- Develop simple GUI interfaces for a computer program to interact with users

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	Introduction to C++ Programming		
Course Code:	<b>22PLC15D/22PLC25D</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated )	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<b>Course objectives</b> <ul style="list-style-type: none"> <li>● Understanding about object oriented programming and Gain knowledge about the capability to store information together in an object.</li> <li>● Understand the capability of a class to rely upon another class and functions.</li> <li>● Understand about constructors which are special type of functions.</li> <li>● Create and process data in files using file I/O functions</li> <li>● Use the generic programming features of C++ including Exception handling</li> </ul>			
<b>Teaching-Learning Process</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective <ol style="list-style-type: none"> <li>1. Chalk and talk</li> <li>2. Onine demonstration</li> <li>3. Hands on problem solving</li> </ol>			
<b>Module-1 (8 hours)</b>			
Introduction to Object Oriented Programming: Computer programming background- C++ overview. First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.			
<b>Textbook 1: Chapter 1(1.1 to 1.8)</b>			
<b>Module-2 (8 hours)</b>			
Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading.			
<b>Textbook 2: Chapter 3(3.2,3.3,3.4,3.13,3.14,3.19, 3.20) , chapter 4(4.3,4.4,4.5,4.6,4.7,4.9)</b>			
<b>Module-3 (8 hours)</b>			
Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance-Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.			
<b>Textbook 2: Chapter 6 (6.2,6.11) chapter 8 (8.1 to,8.8)</b>			
<b>Module-4 (8 hours)</b>			
I/O Streams: C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling during file operations.			
<b>Textbook 1: Chapter 12(12.5) , Chapter 13 (13.6,13.7)</b>			

**Module-5 (8 hours)**

Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch  
blockThrow statement- Pre-defined exceptions in C++

**Textbook 2: Chapter 13 (13.2 to13.6)****Course outcome (Course Skill Set)**

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

C01	Able to understand and design the solution to a problem using object-oriented programming concepts.
C02	Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
C03	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
C04	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.

**Programming Assignments:**

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 C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.

8. Write a C++ program to write and read time in/from binary file using fstream

9. 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.

10. Write a C++ program function which handles array of bounds exception using C++.

#### **Assessment Details (both CIE and SEE)**

The weightage 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 20 Marks (duration 01 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 two tests 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 60 marks and will be scaled down to 30 marks**

##### **CIE for the practical component of the Integrated Course**

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
- The laboratory test (**duration 02/03 hours**) at the end of the 14<sup>th</sup> /15<sup>th</sup> week of the semester /after

completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks.**

**Semester End Examination (SEE):  
SEE for IC**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

**The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).**

**Passing standard:**

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

Textbooks

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.

**Web links and Video Lectures (e-Resources):**

Web links and Video Lectures (e-Resources):

1. Basics of C++ - <https://www.youtube.com/watch?v=BCIS40yzssA>
2. Functions of C++ - <https://www.youtube.com/watch?v=p8ehAjZWjPw>

Tutorial Link:

1. [https://www.w3schools.com/cpp/cpp\\_intro.asp](https://www.w3schools.com/cpp/cpp_intro.asp)
2. <https://www.edx.org/course/introduction-to-c-3>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Assign small tasks to Develop and demonstrate using C++

**COs and POs Mapping (Individual teacher has to fill up)**

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**