

| Unit | Contents of the Module | Hours | Cos |
|------|---|-------|---------|
| 1 | <p>DIFFERENTIAL CALCULUS:</p> <p>Derivation of nth derivative of some elementary functions – illustrative examples, Leibnitz Theorem (without proof) – Problems, Statement of Rolle’s Theorem and geometrical interpretation, Lagrange’s Mean Value Theorem and Cauchy’s MVT(with proof), Taylor’s and Maclaurin’s Series Expansions for a function of one variable (statement only) – problems , Angle between Radius Vector and Tangent.</p> | 12 | CO1 |
| 2 | <p>PARTIAL DIFFERENTIATION:</p> <p>Partial Derivatives of second and higher orders, Total Derivatives, Partial Differentiation of composite functions (change of variables), Differentiation of an Implicit function, definition and evaluation of Jacobians, Maxima and Minima of functions of two variables, Differentiation under integral sign- Leibnitz rule.</p> | 10 | CO2 |
| 3 | <p>VECTOR DIFFERENTIAL CALCULUS :</p> <p>Derivative of a vector function, Velocity, Acceleration, Scalar and Vector Fields, Gradient, Divergence and Curl.</p> | 10 | CO3 |
| 4 | <p>ORDINARY DIFFERENTIAL EQUATIONS:</p> <p>Solution of first order and first degree Differential equations: Linear Differential equations - Bernoulli’s Differential equations, Exact Differential equations, Reducible to Exact Differential equations, Physical Applications – Newton’s law of cooling, Law of natural decay, Law of natural growth, Flow of electricity.</p> <p>Equations solvable for p, Equations solvable for y, Equations solvable for x.</p> | 10 | CO4 |
| 5 | <p>LINEAR ALGEBRA:</p> <p>Elementary Transformation, Reduction of the given Matrix to Echelon form, Rank of a matrix, Solution of a system of Equations by Gauss Elimination method, Gauss-Jordon Method, Dominant Eigen Values by Rayleigh’s Power Method.</p> | 10 | CO5,CO6 |

Self-study component:

Note:

- 1. Questions for CIE and SEE not to be set from self-study component.**
- 2. Assignment Questions should be from self-study component only.**

UNIT 1: Derivatives of Arc and Curvature, Radius of curvature (Cartesian and Parametric form).

UNIT 2: Lagrange's method of undetermined multipliers (with one subsidiary condition).

UNIT 3: Vector Identities.

UNIT 4: Solution of Linear first order Differential equations: Method of separation of variables.

UNIT 5: Eigen Values and Eigen vectors.

TEXT BOOKS:

1. B.S. Grewal, "**Higher Engineering Mathematics**" Khanna Publishers, 43rd Edition, 2013, ISBN: 9788174091956.
2. H. K. Dass, Er. Rajnish Verma, "**Higher Engineering Mathematics**", 3rd Edition, 2014, ISBN: 9788121938907.

REFERENCES BOOKS:

1. B.V.Ramana, "**Higher Engineering Mathematics**", Tata Mc Graw-Hill, 2006, ISBN: 9780070634190.
2. N.P. Bali & Manish Goyal, "**A text book of Engineering Mathematics**", Laxmi Publications, 8th Edition, 2011, ISBN: 9788131808320.
3. Murray Spiegel, Schaum's Outline of "**Advanced Mathematics for Engineers and Scientists**" McGraw-Hill, 1971, ISBN: 9780070602168.
4. R.K. Jain & S.R.K. Iyengar, **Advanced Engineering Mathematics**, Narosa Publishing House, 2002, ISBN: 8173194203.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

| Bloom's Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 30 | 10 | 05 | 05 |
| Remember | 10 | | | 01 |
| Understand | 10 | 05 | 01 | 01 |
| Apply | 10 | 05 | 02 | 01 |
| Analyze | | | 02 | 02 |
| Evaluate | | | | |
| Create | | | | |

***AAT 1– Alternate Assessment Tool 1: Quiz**

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-------------------------|
| Remember | 10 |
| Understand | 20 |
| Apply | 5 |
| Analyze | 5 |
| Evaluate | 10 |
| Create | |

ENGINEERING CHEMISTRY

Course code: CHY12/22
L: P: T: S: 4: 0: 0: 0
Exam Hours: 03
Total Hours: 52

Credits: 04
CIE Marks: 50
SEE Marks: 50

Course Objectives:

To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the following fields.

1. To study the various chemical energy sources and significance of renewable sources of energy.
2. To study the fundamentals of conversion of chemical energy to electrical energy and applications in daily life as batteries
3. To study the various methods of protecting metal structure from Corrosion
4. To appreciate the properties and applications of few important Polymers
5. To evaluate the purity and usage of Water for industrial and domestic purposes.
6. To study the different methods of synthesis of Nanomaterials and their applications

Course Outcomes: After completion of the course, the graduates will be able to

| | |
|------------|--|
| CO1 | Apply the knowledge in production and industrial consumption of energy by utilizing the solar energy for different applications. |
| CO2 | Solve different electrochemical problems; differentiate the types of electrodes, electrochemical cells in modern batteries and fuel cells. |
| CO3 | Illustrate the types of corrosion and their control by various methods including metal finishing techniques like electroplating and electroless plating. |
| CO4 | Discriminate the different types of polymers and study their applications. |
| CO5 | Analyze the boiler troubles, sewage treatment and desalination of sea water. |
| CO6 | Formulate the synthesis, properties and applications of nanomaterials. |

Mapping of Course outcomes to Program outcomes:

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

| Unit | Course Content | Hours | COs |
|------|---|-------|-----|
| 1 | <p>ENERGY SOURCES</p> <p>Non renewable Energy Sources: Introduction, classification of chemical fuels, calorific value-gross and net calorific values, determination of calorific value of a fuel using bomb calorimeter, numerical problems. Cracking: Introduction, fluidized catalytic cracking, Synthesis of petrol by Fischer Tropsch process. Octane number. Gasoline knocking and its mechanism, anti- knocking agents, unleaded petrol, power alcohol, biodiesel.</p> <p>Renewable Energy Sources: Introduction, photovoltaic cells-construction and working. Advantages and disadvantages of PV cells. Production of solar grade silicon (Union carbide process). Purification of silicon (zone refining). Wind Energy and Geothermal Energy.</p> | 12 | CO1 |
| 2 | <p>ELECTROCHEMICAL CELLS AND BATTERY TECHNOLOGY</p> <p>Electrochemistry: Introduction, Derivation of Nernst equation for electrode potential. Types of electrodes: Metal-Metal ion, Metal-Metal insoluble salt, gas, amalgam, redox & ion selective. Reference electrodes: Introduction, SHE-demerits, Construction, Working and applications of</p> | 10 | CO2 |

| | | | |
|---|---|----|-----|
| | <p>calomel and Ag-AgCl electrodes. Construction and working of glass electrode, determination of pH using glass electrode. Electrolyte concentration cells, numerical problems on electrode potential, emf of cells and concentration cells.</p> <p>Battery Technology: Introduction, classification-primary, secondary and reserve batteries. Characteristics-cell potential, current, capacity, energy density, power density, energy efficiency, cycle life and shelf life. Construction, working and applications of Zinc-Air, Nickel-metal hydride batteries. Lithium batteries: Introduction, Construction, working and applications of Li-ion battery.</p> <p>Fuel Cells: Introduction, Construction & Working of Hydrogen-Oxygen fuel cell.</p> | | |
| 3 | <p>CORROSION SCIENCE AND METAL FINISHING</p> <p>Corrosion: Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium-pH, conductivity and temperature. Types of corrosion-differential metal and differential aeration corrosion.</p> <p>Corrosion control: Inorganic coatings-Anodizing of Al. Metal coating-Galvanization and Tinning. Cathodic protection: Sacrificial anodic and impressed current methods.</p> <p>Metal Finishing: Introduction, Technological importance, Electroplating: Introduction, principles governing-polarization, decomposition potential and overvoltage. Factors influencing the nature of electro-deposit: current density, concentration of metal ion & electrolyte, pH, temperature & throwing power of plating bath, additives-complexing agents, brighteners and levelers. Surface pre-treatment and Electroplating of chromium. Electroless plating: Introduction, distinction between electroplating and electroless plating of Copper</p> | 10 | CO3 |

| | | | |
|---|--|----|------------|
| 4 | <p>POLYMERS</p> <p>Polymers: Introduction, types of polymerization: addition and condensation, mechanism of polymerization-free radical mechanism taking ethylene as an example. Molecular weight of polymers: Number average and weight average, numerical problems. Glass transition temperature (T_g): Significance of T_g, Factors influencing T_g –Flexibility, inter molecular forces, molecular mass, branching & cross linking, and stereo regularity.</p> <p>Elastomers: Introduction, synthesis, properties and applications of Silicone rubber. Adhesives: Introduction, synthesis, properties and applications of Epoxy resin. Polymer Composites: Introduction, synthesis, properties and applications of Kevlar.</p> <p>Conducting polymers: Introduction, Polyaniline, Poly pyrrole and their applications.</p> | 10 | CO4 |
| 5 | <p>WATER TECHNOLOGY AND NANO-MATERIALS</p> <p>Water Technology: Introduction, boiler feed water, boiler troubles with disadvantages-scale and sludge formation, boiler corrosion (due to dissolved O₂, CO₂ and MgCl₂). Determination of DO and COD. Numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis and electro dialysis (ion selective).</p> <p>Nano Materials: Introduction, size dependent properties, Synthesis-bottom up approach (sol-gel, chemical vapour condensation, hydrothermal processes). Nano scale materials, properties of fullerenes, carbon nano-tubes, nano-wires, nano-rods and nano-composites.</p> | 10 | CO5 CO6 |

Self study component:

Note:

1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Unit 1: Doping of silicon-diffusion technique (n & p types). Various methods of tapping solar energy.

Unit 2: Measurement of standard electrode potential using calomel electrode.

Unit 3: Estimation of corrosion rate by different techniques- Weight loss method, Potentiodynamic polarization method. Pitting and stress corrosion cracking (caustic embrittlement in boilers). Phosphating and chromating. Electroless plating of copper on Printed Circuit Board.

Unit 4: Synthesis, properties and applications of PMMA (plexi glass), Teflon, polyurethane. Mechanism of conduction in Polyaniline.

Unit 5: Determination of BOD, methods of purification of portable water (bacteria removal using Silver nanoparticles). Applications of Nanomaterials.

TEXT BOOKS:

1. P.L.Timmanagoudar, SunilKumarK.Patil, "**Engineering Chemistry**", Eastern book promoters, Belgaum.
2. R.V.Gadag&A.NityanandaShetty., "**Engineering Chemistry**", I K International Publishing House Private Ltd. New Delhi.
3. P.C.Jain& Monica Jain., "**Engineering Chemistry**", DhanpatRai Publications, New Delhi. "Wiley Engineering Chemistry", Wiley India Pvt. Ltd. New Delhi. Second Edition.
4. B.S.JaiPrakash, R.Venugopal, Sivakumaraiah&PushpaIyengar. "**Chemistry for EngineeringStudents**", Subhash Publications, Bangalore.

REFERENCE BOOKS:

1. O.G.Palanna, "**Engineering Chemistry**", Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.
2. G.A.Ozin& A.C. Arsenault, "**Nanochemistry-A Chemical Approach to Nanomaterials**", RSC publishing, 2005.
3. V.R.Gowariker, N.V.Viswanathan&J.Sreedhar., "**Polymer Science**", Wiley- Eastern Ltd.
4. M.G.Fontana., "**Corrosion Engineering**", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

| Bloom's Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 30 | 10 | 05 | 05 |
| Remember | 05 | -- | 02 | -- |
| Understand | 10 | 05 | 01 | 01 |
| Apply | 05 | -- | -- | |
| Analyze | 05 | 05 | 02 | 02 |
| Evaluate | 05 | | | 02 |
| Create | | | | |

*AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Technical writing

SEE –Semester End Examination Theory (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-------------------------|
| Remember | 10 |
| Understand | 10 |
| Apply | 10 |
| Analyze | 10 |
| Evaluate | 10 |
| Create | |

PROGRAMMING IN C

Course code:16PIC13/16PIC23

L: P: T: S: 3: 0: 0: 0

Exam Hours: 03

Total Hours: 40

Credits: 03

CIE Marks: 50

SEE Marks: 50

Course Objectives:

1. Understand the basics of problem solving techniques.
2. Formulate the solution to the problem & implement the same using C programming.
3. Enhance the programming skills by designing and developing real time applications.
4. Learn the representation of data in memory by using various data structures.

Course Outcomes: After completion of the course, the graduates will be able to

| | |
|------------|---|
| CO1 | Analyze and Understand different programming concepts like data types, variables, data structures, operators, expressions, loops and functions. |
| CO2 | Design and write the algorithms, flow charts for solving problems. |
| CO3 | Implement conditional statements, loops and functions in C programming. |
| CO4 | Develop programs using built-in functions. |
| CO5 | Use pointers for dynamic memory allocation. |
| CO6 | Illustrate the basic data structures like Arrays, structures, unions with sample use. |

Mapping of Course outcomes to Program outcomes:

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

| Unit | Course Content | Hours | COs |
|------|---|-------|------------|
| 1 | <p>Introduction to C Language:Introduction to C language, Algorithm & Flowchart, Structure of C program, C Tokens and Data types.</p> <p>Operators and Expression:Types Of Operators: Arithmetic Operator, Logical Operator, Relational Operator, Conditional or Ternary Operator, Bitwise Operator, Increment & Decrement Operator, Assignment Operator, Unary Operator, Special Operator, Type casting and Type conversion,Operator Precedence and Associativity, Evaluation of Expression.</p> | 08 | CO1 CO2 |
| 2 | <p>Formatted & Unformatted Input & Output statements:printf (), scanf(), getchar(), gets(), getch(), putchar(), puts(),putchar().</p> <p>Branching and Looping:Two way selection: if, if-else, nested if-else, switch statement, goto statement, Loops: for, while-do, do-while, break and continue.</p> | 08 | CO3 |
| 3 | <p>Functions:Introduction to functions, function prototype,Types of Functions, Function Definition, Function Call, Function Declaration, Categories of Functions, Actual & Formal parameters, call by value & call by reference.</p> <p>Recursion:Definition, general functioning of recursive functions, programs using recursive functions: Fibonacci series, factorial of given number.</p> | 08 | CO4 |
| 4 | <p>Arrays and Strings:Introduction, Declaration & Initialization of 1D array,Reading and printing of arrays 1 D array ,Bubble sort, Linear & Binary search,Reading and printing of 2D array, programs on Matrix operations: addition, subtraction, multiplication, transpose.</p> <p>Introduction to Strings: Declaration & Initialization of String Handling functions: strlen(), strcpy(), strcat(), strev(),strcmp(),strncmp(), strncpy(), strlwr(),strupr()</p> | 08 | CO6 |
| 5 | <p>Structures: Introduction to Structures, declaration and Initialization of structures, accessing members of structure, Array of structure, passing</p> | 08 | CO5 |

| | | | |
|--|---|--|--|
| | structure to function. Pointers: Introduction to Pointers, Declaration of pointers, Initialization of pointer, pointer arithmetic, Pointer to an array, functions using pointers. | | |
|--|---|--|--|

Self study component:

Note:

1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

UNIT 1:Study ofEscape sequences and Types of Constants.

UNIT2: Study ofexit function and explore the header files: math.h, stdio.h, conio.h, stdlib.h

UNIT 3:Demonstration of local & Global scope of variables.

UNIT 4:Implementation of string handling functions without using string library functions.

UNIT 5:Study ofUnions, differences between structure& Unions. Passing structure to function using pointers.

TEXT BOOKS

1. Behrouz A. Forouzan, Richard F. Gilberg, “**Computer Science: A Structured Programming Approach Using C**”, (3rd Edition).
2. Somashekara “, **Problem solving with C** “, PHI Learning, 2015.

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, “**The C Programming Language**”, 2nd Edition, PHI, 2012.
2. Vikas Gupta, “**Computer Concepts and C Programming**”, Dreamtech Press 2013.
3. R. S.Bichkar, “**Programming with C**”, University Press, 2012.
4. V. Rajaraman, “**Computer Programming in C**”, PHI, 2013.
5. E .Balagurusamy, “**Programming in ANSI C** “. 4th Edition.
6. Jacqueline Jones & Keith Harrow, “**Problem Solving with C**”, 1st Edition, Pearson 2011.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

| Bloom's Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 30 | 10 | 05 | 05 |
| Remember | 05 | -- | -- | -- |
| Understand | 05 | 05 | 01 | 01 |
| Apply | 10 | 05 | 02 | 01 |
| Analyze | 05 | -- | 02 | 02 |
| Evaluate | -- | -- | -- | -- |
| Create | 05 | -- | -- | 01 |

*AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-------------------------|
| Remember | 10 |
| Understand | 10 |
| Apply | 10 |
| Analyze | 10 |
| Evaluate | -- |
| Create | 10 |

| |
|---|
| COMPUTER AIDED ENGINEERING DRAWING |
|---|

Course code: CED14/24
L: P: T: S: 1: 4: 0: 0
Exam Hours: 03
Total Hours: 65

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course Objectives:

1. To study the standards and conventions used in Engineering Drafting
2. To use drafting software to create engineering drawing.
3. To draw the views of points and lines using orthographic projection technique in their respective quadrants.
4. To create orthographic projections of inclined plane surface
5. To interpret orthographic views and draw Isometric projection of solids.

Course Outcomes: After completion of the course, the graduates will be able to

| | |
|------------|--|
| CO1 | Understand the Standards and conventions used in Engineering Drafting |
| CO2 | Use drafting software to create engineering drawing. |
| CO3 | Draw the views of points and lines using orthographic projection technique in their respective quadrants. |
| CO4 | Create orthographic projections of inclined plane surface |
| CO5 | Construct orthographic projections of different types of solids inclined with respect to horizontal and vertical planes. |
| CO6 | Interpret orthographic views and draw Isometric projection of solids. |

Mapping of Course outcomes to Program outcomes:

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

| Unit | Contents of Unit | Hours | COs |
|------|---|-------|--------------------------|
| 1 | <p>Introduction to Computer Aided Sketching: Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity, Dimensioning, line conventions, material conventions and lettering.</p> | 10 | CO1 |
| 2 | <p>Orthographic Projections: Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems).</p> <p>Orthographic Projections of Plane Surfaces (First Angle Projection Only)</p> <p>Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates).</p> | 20 | CO1 CO2 CO3 CO4 |
| 3 | <p>Projections of Solids (First angle Projection only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders, and cones in different positions (No problems on octahedrons and combination of solid).</p> | 20 | CO1 CO2 CO5 |

| | | | |
|----------|--|-----------|----------------------------|
| 4 | Isometric Projection (Using Isometric Scale only) Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three solids). | 15 | CO1 CO2 CO6 |
|----------|--|-----------|----------------------------|

TEXT BOOKS

1. **Computer Aided Engineering Drawing**- DSCE publications, 2015
 2. N.D. Bhatt & V.M. Panchal, **Engineering Drawing**, Charotar Publishing House, Gujarat, 48th edition, 2005.
 3. A Primer on **Computer Aided Engineering Drawing**, Published by VTU, Belgaum, 2006
- Reference Books:**
4. S. Trymbaka Murthy, **Computer Aided Engineering Drawing** - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
 5. K.R. Gopalakrishna, **Engineering Graphics**, Subash Publishers Bangalore, 32nd edition, 2005.

Assessment Pattern

CIE-Continuous Internal Evaluation Theory (50)

| Blooms Category | Test | Assignment | AAT1 | AAT2 |
|--------------------------|-----------|------------|------|------|
| Marks (out of 50) | 25 | 25 | | |
| Remember | 5 | 5 | | |
| Understand | 5 | 5 | | |
| Apply | 10 | 10 | | |
| Analyze | 5 | 5 | | |
| Evaluate | | | | |
| Create | | | | |

SEE-Semester End Examination Theory (50)

| Blooms Category | Marks Theory(50) |
|------------------------|-------------------------|
| Remember | 05 |
| Understand | 10 |
| Apply | 20 |
| Analyze | 15 |
| Evaluate | |
| Create | |

| Unit | Course Content | Hours | COs |
|------|--|-------|-------------------|
| 1 | <p>Semiconductor Diode and Applications: p-n junction diode, Characteristics and Parameters, DC load line analysis, Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Rectifier with Capacitor filter circuit, Zener diode, Numerical examples as applicable.</p> <p>Bipolar Junction Transistors: BJT-Physical structure and operation, BJT Voltages and Currents, amplification, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples as applications.</p> | 08 | CO1 CO2 CO3 |
| 2 | <p>Devices (Construction, Operation and Characteristics): Field Effect Transistor, FET characteristics, MOSFET's, Types of MOSFET's, Silicon Controlled Rectifiers (SCR), Uni-Junction Transistor (UJT), Light Emitting Diode (LED).</p> | 08 | CO1 CO2 |
| 3 | <p>Introduction to Operational Amplifiers: Introduction, Block diagram representation of OPAMP, Schematic symbol and pin configuration, Ideal OPAMP, practical characteristics, Virtual ground concepts, Inverting and Non Inverting OPAMP circuits, OPAMP applications: voltage follower, addition, Numerical examples as applicable.</p> | 08 | CO1 CO2 CO4 |
| 4 | <p>Digital Concepts and Number Systems: Introduction to Number Systems, 1's and 2's complement method and their arithmetic.</p> <p>Boolean Switching Algebra: Binary logic functions, Boolean algebra, Universality of NAND and NOR gate, Reduction of Boolean equations using Boolean algebra, Realization of Boolean functions using basic gates and Universal gates, Designing of Half adder and Full adder.</p> | 08 | CO1 CO2 CO5 |
| 5 | <p>Communication Systems: Introduction, Elements of Communication Systems, Modulation, Amplitude Modulation, Demodulation, Frequency Modulation (no derivation). Amplitude and Frequency Modulation: A comparison, Numerical examples as applicable.</p> <p>Block diagram and Principle of Optical Fiber Communication, Advantages and Applications of Optical Fiber communication.</p> | 08 | CO1 CO2 CO6 |

Self study component:

Note:

- 1. Questions for CIE and SEE not to be set from self-study component.**
- 2. Assignment Questions should be from self-study component only.**

UNIT 1: Derivations on Bridge rectifier, Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator, Diode approximations, BJT Biasing: DC Load line and Bias Point.

UNIT 2: TRIAC and DIAC, Photo diode and Solar Cell, Seven Segment Displays.

UNIT 3: Subtraction, integration, differentiation, Complex Numerical Problems.

UNIT 4: Introduction, digital analog-Basic concepts. Positional number Systems, Number Systems conversions.

UNIT 5: Derivations on Frequency modulation, Mobile Telephone (Cellular Telephone), Super heterodyne receiver.

TEXT BOOKS

1. David A. Bell, “**Electronic Devices and Circuits**”, Oxford University Press, 5th Edition, 2008.
2. Ramakant A. Gayakwad, “**Op-amps and linear integrated circuits** “, 4th Edition Prentice-Hall Learning, New Delhi, 2002.
3. John M Yarbrough, “**Digital Logic-Application and Design**”, Brooks/Cole Cengage Learning, India Edition.
4. George Kennedy, **Electronic Communication Systems**, TMH, 4th Edition.

REFERENCE BOOKS

1. Robert Boylested and Louis Nashelsky, “**Electronic Devices and Circuit Theory**”, Pearson Education, 9th Edition, 2007.
2. Thomas Floyd, “**Electronic Devices**”, Prentice Hall of India, New Delhi 2009.
3. Charles H Roth, Jr; “**Fundamentals of Logic Design**”, Thomson Learning, 2004.
4. U B MahadevaSwamy, “**A simplified approach to Basic Electronics**”, Sanguine Technical Publications, Bengaluru, 2015

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

| Bloom's Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 30 | 10 | 05 | 05 |
| Remember | 10 | -- | 02 | 01 |
| Understand | 10 | 05 | 01 | 02 |
| Apply | 10 | 05 | 02 | 02 |
| Analyze | -- | -- | -- | -- |
| Evaluate | -- | -- | -- | -- |
| Create | -- | -- | -- | -- |

*AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-------------------------|
| Remember | 20 |
| Understand | 20 |
| Apply | 10 |
| Analyze | -- |
| Evaluate | -- |
| Create | -- |

COMPUTER PROGRAMMING LABORATORY

Course code: 16CPL16/16CPL26

L: P: T: S: 1: 2: 0: 0

Exam Hours: 03

Total Hours: 30

Credits: 02

CIE Marks: 50

SEE Marks: 50

Course Objectives:

1. Learn various features available in C.
2. Understand the implementation techniques in C language.
3. Enhance programming skills with practical knowledge of analysis & design of programs for the specific applications.
4. Gain experience on structured programming.

Course Outcomes: After completion of the course, the graduates will be able to

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

| | |
|------------|--|
| CO1 | Use various editor environments to compile and run C programs. |
| CO2 | Design flow chart and write code in C to solve given problems. |
| CO3 | Develop and debug programs in C language. |
| CO4 | Execute basic commands effectively in LINUX and Windows environments. |
| CO5 | Apply library functions and build systems to solve real-time computing problems. |

Mapping of Course outcomes to Program outcomes:

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

| Program No | Course Content | Hours | COs |
|-------------------|---|--------------|--|
| 1 | Design and develop a C program for the following: a) To read a year as an input and find whether it is leap year or not. (Also consider end of the centuries). b) To find the largest of three numbers using Ternary Operator. | 03 | CO1 CO2 CO3 CO4 |
| 2 | Design and develop a C program that accepts three coefficients (a, b, and c) of a Quadratic equation ($ax^2 + bx + c = 0$) as input and compute all possible roots and print the possible roots for a given set of coefficients. Also print the message in case of Zero valued coefficient/s. | 03 | CO1 CO2 CO3 |
| 3 | Design and develop a C program to find the reverse of an integer number NUM and check whether it is PALINDROME or NOT. Implement a C program for the developed algorithm that takes an integer number as input and output the reverse of the same with suitable messages. Ex: Num: 1234, Reverse: 4321, Not a Palindrome. | 03 | CO1 CO2 CO3 |
| 4 | Design and develop a C program that reads N integer numbers and arrange them in ascending order using Bubble Sort. | 03 | CO1 CO2 CO3 |
| 5 | Design and develop a C program that reads N integer numbers and search a key element using Binary searching Technique. | 03 | CO1 CO2 CO3 |
| 6 | Design and develop a C program that reads two matrices A (m x n) and B (p x q) and Compute product of matrices A and B. Read matrix A and matrix B in row major order. Print both the input matrices and resultant matrix appropriately. | 03 | CO1 CO2 CO3 |
| 7 | Design and develop a C program to implement the following operations without using library functions. Display the results after every operation. a. Read STRING s1 = "Dayananda" b. Read STRING s2 = "Sagar" c. Output the concatenated string STIRNG s3 = "DayanandaSagar" | 03 | CO1 CO2 CO3 |
| 8 | Design and develop a C function isprime (num) that accepts an integer argument and returns 1 if the argument is prime, 0 otherwise. Write a C program that invokes this function to generate prime numbers between the | 03 | CO1 CO2 CO3 |

| | | | |
|-----------|--|-----------|----------------------------|
| | given ranges. | | |
| 9 | Design and develop a C program to create a structure called Employee to maintain a record of details using an array of structures with four fields (Emp_name, Emp_id, Emp_age and Emp_sal). Assume appropriate data type for each field. Print the Employee details in Tabular Format. | 03 | CO1 CO2 CO3 |
| 10 | Write a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers. | 03 | CO1 CO3 CO5 |

REFERENCE BOOK

1. Computer Programming Laboratory Manual, Dept. of CSE, DSCE.
2. ReemaThareja, “**Computer Fundamentals and Programming in C**”, Oxford Press, 2012.

Assessment Pattern:

CIE –Continuous Internal Evaluation Lab (50 Marks)

| Bloom’s Category | Performance (Day To Day) | Internal Test |
|--------------------------|--------------------------|---------------|
| Marks (Out of 50) | 25 | 25 |
| Remember | 05 | 05 |
| Understand | 05 | 05 |
| Apply | 05 | 05 |
| Analyze | 05 | 05 |
| Evaluate | -- | -- |
| Create | 05 | 05 |

CIE: 50 Marks -> 25 Marks from continuous evaluation in every lab (10 Marks - record completion + 05 Marks - viva/ quiz + 10 Marks - conduction) + 25 Marks from final lab CIE conduction (05 Marks - Write up + 15 Marks - execution + 05 Marks – Viva)

SEE –Semester End Examination Lab (50 Marks)

| Bloom’s Category | Lab Marks(50) |
|------------------|---------------|
| Remember | 05 |
| Understand | 05 |
| Apply | 20 |
| Analyze | 10 |
| Evaluate | -- |
| Create | 10 |

1. All laboratory experiments are to be included for practical examination.
2. Students are allowed to pick one experiment from the lot.
 3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
 4. Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.

| Experiment No. | Course Content | Hours | COs |
|----------------|---|-------|-----|
| 1. | Estimation of copper by using Colorimeter | 03 | CO1 |
| 2. | Conductometric estimation of strength of an acid mixture using standard NaOH solution | 03 | CO1 |
| 3. | Determination of pKa value of a weak acid using pH meter | 03 | CO1 |
| 4. | Determination of viscosity coefficient of a given organic liquid using Ostwald's Viscometer | 03 | CO1 |
| 5. | Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution | 03 | CO1 |
| 6. | Determination of percentage of Copper in brass using standard sodium thiosulphate solution | 03 | CO2 |
| 7. | Determination of Iron in the given sample of Haematite ore solution using potassium dichromate crystals by external indicator method. | 03 | CO2 |
| 8. | Determination of Calcium Oxide in the given sample of cement by Rapid EDTA method | 03 | CO2 |
| 9. | Determination of Total Hardness of a sample of water using disodium salt of EDTA. | 03 | CO3 |
| 10. | Determination of Chemical Oxygen Demand of the given industrial waste Water sample. | 03 | CO3 |
| 11. | Determination of Dissolved Oxygen in the given water sample by Winkler's method | 03 | CO3 |
| 12. | Estimation of Sodium & Potassium by Flame photometric method. | 03 | CO3 |

REFERECE BOOKS

1. DSCE laboratory manual.
2. J. Bassett, R.C. Denny, G.H. Jeffery, A. I. Vogel, **Text book of quantitative inorganic analysis**, 4th Edition.
3. O. P. Vermani & Narula, "**Theory and Practice in Applied Chemistry**" New Age International Publisher
4. Gary D. Christian, "**Analytical chemistry**" 6th edition, wiley India

Scheme of Examination:

1. One instrumental and one volumetric experiment shall be set.
2. Different experiments shall be set under instrumental (Part A) and a common Experiment under volumetric (Part B).

Assessment Pattern:

CIE –Continuous Internal Evaluation Lab (50 Marks)

| Bloom's Category | Performance (Day To Day) | Internal Test |
|--------------------------|-------------------------------------|----------------------|
| Marks (Out of 50) | 25 | 25 |
| Remember | 05 | 05 |
| Understand | 05 | 05 |
| Apply | 05 | 05 |
| Analyze | 05 | 05 |
| Evaluate | -- | -- |
| Create | 05 | 05 |

SEE –Semester End Examination Lab (50 Marks)

| Bloom's Category | Lab Marks(50) |
|-------------------------|----------------------|
| Remember | 05 |
| Understand | 05 |
| Apply | 20 |
| Analyze | 10 |
| Evaluate | -- |
| Create | 10 |

| Unit | Course Content | Hours | CO's |
|-------------|---|--------------|--------------------------|
| 1 | <p>Environment - components of Environmental Eco system, Human activities Food, Shelter, Economic and Social Security.</p> <p>Impacts of Agriculture & Housing impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development.</p> | 6 | CO1 CO2 |
| 2 | <p>Natural Resources - Water resources, Availability and quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth.</p> <p>Energy - Different types of energy, Electra-magnetic radiation. Conventional and Non-Conventional sources - Hydro Electric, Fossil fuel based Nuclear, Solar, Biomass and Biogas. Hydrogen as an alternative future source of energy.</p> | 6 | CO3 CO4 |
| 3 | <p>Environmental Pollution and their effects, Water pollution, Land pollution, Noise pollution, Public Health aspects.</p> <p>Global Environmental issues: Population Growth, urbanization, land management, waterandwastewatermanagement.</p> | 6 | CO4 |
| 4 | <p>Air pollution and automobile pollution: Definition, effects- Global warming Acid Rain, &Ozone layer depletion, controlling measures.</p> <p>Solid waste management- Waste management & Biomedical waste management-sources, characteristic sanddisposalmethods.</p> | 6 | CO5 |
| 5 | <p>Introduction to GIS and Remote Sensing, Application of GIS & Remote Sensing in Sensing Environmental Engineering.</p> <p>Environmental Acts & Regulations - Role of Government, Legal aspects, role of Non-Governmental Organizations (NGO).</p> | 6 | CO6 |

Self study component:

Note:

1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

UNIT 1:Cement: Environmental Indicators.

UNIT2:Energy auditing in buildings.

UNIT 3:Urban lake pollution.

UNIT 4:Effect of air pollution to source and climate, e-waste.

UNIT 5:Other applications in GIS, Environmental Education.

TEXT BOOKS

1. Ranjit Daniels R.J. and Jagdish Kirshnaswamy, (2009), "**Environmental Studies**", Wiley India Private Ltd., New Delhi
2. Rajagopalan R. (2005), "**Environmental Studies - From Crisis to Cure**", Oxford University Press
3. Aloka Debi, "**Environmental Sciences and Engineering**" Universities press (India) Pvt Ltd, 2012
4. Erach Bharucha (2005), "**Text Book of Environmental Studies**", for UGC, University Press.

REFERENCE BOOKS

1. Raman Sivakumar, (2005), "**Principles of Environmental Science and Engineering**", Second Edition, Cengage learning, Singapore.
2. Meenakshi P. (2006), "**Elements of Environmental Science and Engineering**", Prentice Hall of India Private Limited, New Delhi.

Assessment Pattern:

CIE: Continuous Internal Evaluation Pattern for theory: (50 Marks)

| Blooms Category | Tests | Assignments | AAT1 | AAT2 |
|-------------------|-------|-------------|------|------|
| Marks (out of 50) | 30 | 05 | 05 | 10 |
| Remembrance | 10 | | 02 | |
| Understand | 10 | | 02 | |
| Apply | 10 | 03 | 01 | 05 |
| Analyze | | 02 | | 05 |
| Evaluate | | | | |
| Create | | | | |

*AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE – Semester End Examination Theory (50 Marks)

| Blooms Category | Marks Theory (50) |
|------------------------|--------------------------|
| Remembrance | 10 |
| Understand | 20 |
| Apply | 10 |
| Analyze | 10 |
| Evaluate | |
| Create | |

BIOLOGY FOR ENGINEERS

Course code: BIE18/28
L: P: T: S: 2: 0: 0: 0
Exam Hours: 90 min
Total Hours: 30

Credits: 02
CIE Marks: 50
SEE Marks: 50

Course Objectives:

1. Understanding of the basic organization (Structure and functioning) of organisms.
2. Graduates will be able to analyze the various phenomena in the cell and extrapolate it to engineering fields.
3. They will also be responsible for understanding the link existing between engineering concepts and living bodies and bring in the influences from one field to another.
4. Optimising the basic designing in engineering for various biological systems applications
5. Allow students to engage in deeper study of specific areas of interest and to engage in cross-disciplinary study
6. They will also be able to derive a solution for biological problem using engineering expertise

Course Outcomes: After completion of the course, the graduates will be able to

| | |
|------------|--|
| CO1 | Graduates would be educated with the basic structural and functional aspects of the living organisms |
| CO2 | Tend to apply the theoretical perspectives of living organisms to other systems |
| CO3 | Utilisation of the various techniques in various fields |
| CO4 | Optimization of the existing systems to the biological field |
| CO5 | Helps in creating awareness to the students and tend to develop interest among students to learn various subjects |
| CO6 | Planning and execution for solving complex problems at a atomic level and will encourage students to perform various minor projects and models |

Mapping of Course outcomes to Program outcomes:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO 1 | 3 | - | 1 | - | - | 2 | - | 2 | - | - | - | 1 |
| CO 2 | 3 | 2 | 1 | 2 | 1 | - | - | 2 | 2 | 1 | - | 1 |
| CO 3 | 3 | 2 | 3 | 2 | 1 | - | - | 2 | 2 | 1 | - | 1 |
| CO 4 | 2 | 2 | 2 | 3 | - | - | - | 2 | 2 | 1 | - | 1 |
| CO 5 | 1 | 3 | 3 | 2 | 2 | - | - | 2 | 2 | 1 | - | 1 |
| CO 6 | 3 | 3 | 3 | 3 | 2 | 2 | - | 2 | 2 | 2 | 1 | 1 |

| Unit | Course Content | Hours | COs |
|----------|---|----------|-----------------|
| 1 | CELL BIOLOGY Cell theory; Overview of Cell; comparison of cell types; Cell Structure and Function, cell division; Homoeostasis. | 6 | CO1 |
| 2 | BIOCHEMISTRY Genetic information flow; Biological Diversity; Chemistry of life; Enzymes: various enzymes & their applications in industries & other fields. | 6 | CO1, CO6 |
| 3 | MUSCULOSKELETAL SYSTEM AND ITS APPLICATIONS Human muscular system; Human skeletal; joints and types of movements in human body | 6 | CO2 |
| 4 | NEURAL SYSTEM AND ITS APPLICATIONS Nervous system; neuromuscular junction; action potential. | 6 | CO3 |
| 5 | CELL SIGNALING General principles of cell signalling in a plant cell, animal cell and microbial cell. | 6 | CO4 CO5 |

Self study component:

Note:

1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Cell reproduction and differentiation

UNIT 2: Tissue engineering & its applications

UNIT 3: Applications – Mechatronics.

UNIT 4: Application of Neural networks; data mining/optical character recognition

UNIT 5: Cell signalling in immune system.

TEXT BOOKS

1. **“Biology for engineers”** S. Thyagarajan, N. Selvamurugan, M.P.Rajesh, R.A.Nazeer, Richard W. T, S. Bharathi and M.K. Jagannathan, TMH, New Delhi 2012.
2. **“Biology for engineers”** Arthur T. Johanson, CRC Press 2010.
3. **“Ross and Wilson’s Anatomy and physiology in Health and Illness”** Anne Waugh and Allison Grant 3rd edition, Churchill livingstone publication.

REFERENCE BOOKS

1. **“Handbook of General Anatomy”** B.D. Churasia, 4th edition CBS Publisher.
2. **Essentials of Medical Physiology**, K. Sembulingam & Prema Sembulingam, Jaypee Publications, 2004

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

| Bloom's Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 30 | 10 | 05 | 05 |
| Remember | -- | -- | 02 | 01 |
| Understand | 10 | -- | 01 | 01 |
| Apply | 10 | 05 | -- | 01 |
| Analyze | 05 | 05 | 02 | 02 |
| Evaluate | 05 | | | |
| Create | | | | |

***AAT 1– Alternate Assessment Tool 1: Quiz**

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-------------------------|
| Remember | 10 |
| Understand | 10 |
| Apply | 10 |
| Analyze | 10 |
| Evaluate | 10 |
| Create | |

| Unit | Contents of the Module | Hours | CO's |
|------|---|-------|---------|
| 1 | <p>LINEAR DIFFERENTIAL EQUATIONS WITH CONSTANT COEFFICIENTS:</p> <p>Second and higher order linear ordinary Differential Equations with constant coefficients- General solution of Homogeneous Equations, Method of finding Particular Solution- Inverse Differential operator Method.</p> | 12 | CO1 |
| 2 | <p>LINEAR DIFFERENTIAL EQUATIONS WITH VARIABLE COEFFICIENTS:</p> <p>Solution of Cauchy and Legendre Differential Equations.</p> <p>PARTIAL DIFFERENTIAL EQUATIONS:</p> <p>Formation of PDE by elimination of arbitrary constants and arbitrary functions. Solution of Linear Partial Differential Equations of First Order-Method of grouping, Method of multipliers. Solution of Non homogenous Partial Differential Equations by direct integration method.</p> | 10 | CO2 |
| 3 | <p>INTEGRAL CALCULUS:</p> <p>Reduction formulae: $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \sin^m x \cos^n x dx$, where n and m are positive integers, evaluation of the integrals with standard limits $(0, \frac{\pi}{2})$. Beta and gamma functions.</p> | 10 | CO3 |
| 4 | <p>MULTIPLE INTEGRALS:</p> <p>Evaluation of double Integrals, Change of order in double Integral, Change of Variables in Double Integral, Evaluation of Triple Integrals, Application of Double Integrals.</p> | 10 | CO4 |
| 5 | <p>LAPLACE TRANSFORMS:</p> <p>Definition and Laplace Transforms of Elementary functions, Laplace Transforms of $e^{at}f(t)$, $t^n f(t)$ and $\frac{f(t)}{t}$, Periodic functions, Unit step function.</p> <p>Inverse Laplace Transforms:</p> <p>Inverse Laplace Transforms- By the method of Partial Fractions, Logarithmic and Trigonometric functions, Convolution Theorem(statement only)-problems. Solution to Linear Differential Equations by Laplace Transform.</p> | 10 | CO5,CO6 |

Self-study component:**Note:****1. Questions for CIE and SEE not to be set from self-study component.****2. Assignment Questions should be from self-study component only.****UNIT 1:** Method of variation of parameters.**UNIT 2:** Power Series solution of differential Equation.**UNIT 3:** Definite integrals-Limit as a sum.**UNIT 4:** Application of Triple Integrals.**UNIT 5:** Unit impulse function.**TEXT BOOKS:**

1. B.S. Grewal, “**Higher Engineering Mathematics**” Khanna Publishers, 43rd Edition, 2013, ISBN: 9788174091956.
2. H. K. Dass, Er. RajnishVerma, “**Higher Engineering Mathematics**”, S. Chand Publishers, 3rd Edition, 2014, ISBN: 9788121938907.

REFERENCES BOOKS:

1. B.V.Ramana, “**Higher Engineering Mathematics**”, Tata McGraw-Hill, 2006; ISBN: 9780070634190.
2. N.P. Bali & Manish Goyal, “**A text book of Engineering Mathematics**”, Laxmi Publications, 8th Edition; ISBN: [9788131808320](#).
3. Murray Spiegel, Schaum's Outline of “**Advanced Mathematics for Engineers and Scientists**” McGraw-Hill, 1971; ISBN: 9780070602168.
4. R.K. Jain & S.R.K. Iyengar, **Advanced Engineering Mathematics**, Narosa Publishing House, 2002; ISBN: 8173194203.

Assessment Pattern:**CIE –Continuous Internal Evaluation Theory (50 Marks)**

| Bloom’s Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 30 | 10 | 05 | 05 |
| Remember | 10 | | | 01 |
| Understand | 10 | 05 | 01 | 01 |
| Apply | 10 | 05 | 02 | 01 |
| Analyze | | | 02 | 02 |
| Evaluate | | | | |
| Create | | | | |

AAT 1– Alternate Assessment Tool 1: Quiz*AAT 2 - Alternate Assessment Tool 2: Surprise Test**

SEE –Semester End Examination Theory (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-----------------------------|
| Remember | 10 |
| Understand | 20 |
| Apply | 5 |
| Analyze | 5 |
| Evaluate | 10 |
| Create | |

ENGINEERING PHYSICS

Course Code : PHY12/22

L:P:T:S : 4:0:0:0

Exam Hours : 3

Credits : 4

CIE Marks : 50

SEE Marks : 50

Course Outcomes: At the end of the course, students will be able to:

| | |
|------------|--|
| CO1 | Get a brief understanding of the principles of Classical Physics and Modern Physics. |
| CO2 | Know the properties of materials according to Quantum Physics. |
| CO3 | Apply the Principles of Physics to solve the problems in different related topics. |
| CO4 | Analyze different materials for various scientific applications. |
| CO5 | Adapt the acquired knowledge Physics and Nanoscience for future applications . |
| CO6 | Evaluate the theories in the context of Semiconductors, Thin films and Nano-materials. |

Mapping of Course outcomes to Program outcomes:

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

| Unit | Course Content | Hours | COs |
|------|---|-------|---|
| 1 | <p>Modern Physics: Black body radiation spectrum, Weins law, Rayleigh Jeans law, Planck's Law, Derivation of Weins law and Rayleigh Jeans law from Planck's law, Wave Particle dualism, de-Broglie hypothesis, Compton effect and its Physical significance. Matter waves and their characteristic properties.</p> <p>Quantum Mechanics: Heisenberg's uncertainty principle and its physical significances and proof of non-existence of electrons in the nucleus. Wave function, properties and physical significances of wave function, Probability density and Normalization of wave function. Setting up of one dimensional time independent Schrodinger wave equation. Eigen values and Eigen functions. Application of Schrodinger wave equation: Energy Eigen values for a particle in a potential well of infinite depth.</p> | 10 | <p>CO1</p> <p>CO2</p> <p>CO3</p> |
| 2 | <p>Electrical Properties: Free electron theory concept, Definitions: drift velocity, mean collision time, mean free path, relaxation time. Derivation for current in a conductor in terms of drift velocity and collision time. . Assumptions of classical free electron theory, Failures of classical free electron theory. Assumptions of quantum free electron theory, Fermi factor and density of states concept. Variation of Fermi factor with temperature and energy. Merits of quantum free electron theory.</p> <p>Semiconductors: Conductivity of semi conducting materials, Concentration of electrons and holes in intrinsic semiconductors (derivations). Fermi level in an intrinsic Semiconductor, Proof of $E_F = E_g/2$, Hall effect, Hall coefficient derivation.</p> <p>Superconductors :Temperature dependence of resistivity in superconducting materials. Effect of magnetic field (Meissner effect). Type I and Type II superconductors with examples. BCS theory, Hightemperature superconductors. Application of superconductors in MAGLEV vehicles.</p> | 12 | <p>CO1</p> <p>CO2</p> <p>CO3</p> <p>CO4</p> <p>CO6</p> |

| | | | |
|---|---|----|--|
| 3 | <p>LASERS: Einstein's coefficients; expression for energy density (derivation). Requisites of a Laser system. Conditions for laser action. Principle, construction and working of CO₂ laser and explanation based on energy level diagram. Construction and working of a semiconductor Laser. Industrial applications of Laser: Laser welding, cutting and drilling.</p> <p>Optical fibers: Propagation mechanism in optical fibers. Angle of acceptance and Numerical aperture (derivation). Types of optical fibers and modes of propagation. Attenuation (qualitative). Application of optical fiber: Block diagram of point to point communication: explanation and advantages.</p> | 10 | <p>CO2 CO3 CO4 CO6</p> |
| 4 | <p>Crystal structures: Introduction; Amorphous and crystalline materials, Space lattice, Unit cell, Bravais lattice, Lattice parameters. Various crystal systems with one example each. Miller indices. Expression for inter planar spacing (derivation). Co-ordination number, atomic packing factor. Bragg's law derivation. Determination of crystal structure using Bragg's X-ray diffractometer.</p> <p>Dielectrics: Dielectric materials, static dielectric constant, electronic, ionic, space charge and orientation polarizations with examples. Frequency dependency of dielectric constant, Internal field or local fields in solids and liquids, Lorentz field in cubic materials, ClausiusMossotti relation-derivation.</p> | 10 | <p>CO3 CO4</p> |

| | | | |
|----------|---|-----------|--------------------------|
| 5 | <p>Thin film technology: Thin films, Stages of thin film growth: nucleation, agglomeration and continuous film with diagrams. Thin film deposition: Block diagrams of thin film unit, Brief descriptions with diagrams: Pirani gauge, Penning gauge, rotary pump, diffusion pump, Quartz crystal thickness monitor. Any one application of thin film: solar cells or any other.</p> <p>Nanoscience: Introduction to Nano Science, Mesoscopic state, Density of states in 0D, 1D, 2D and 3D structures. Synthesis: Top-down and Bottom-up approach examples: Ball Milling and Sol-Gel methods explanations with diagrams. Carbon nano tubes: Types, properties and applications.</p> | 10 | CO5 CO6 |
|----------|---|-----------|--------------------------|

Self study component:

NOTE : 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Self study component: Group velocity and phase velocity.

UNIT 2: Self study component: SQUID.

UNIT 3: Self study component: Applications of LASER in atmospheric pollutant analysis.

UNIT 4: Self study component: Ferroelectric materials and applications.

UNIT 5: Self study component: Synthesis of Carbon nano tubes.

TEXT BOOKS

1. **Engineering Physics**, Text book series, Wiley India Private Ltd., New Delhi.
2. S. O. Pillai, **Solid State Physics**, revised edition, New Age International Publishers.
3. **Engineering Physics**, S. P. Basavaraju, Subhas Stores, Bangalore.
4. **Engineering Physics**, N.H. Ayachit and P.K. Mittal, IK International Publishing house Pvt. Ltd.

REFERENCE BOOKS

1. S. M. Sze, **Semiconductor devices, Physics and Technology**, Wiley.
2. C. Kittel, **Introduction to Solid State Physics**, 7th edition, John Wiley Student Edition, New York.
3. K.L. Chopra, **Thin film Phenomena**, McGraw Hill, New York.
4. Milton Ohring, **Materials Science of Thin Films**, 2nd Edition.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

| Bloom's Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 30 | 10 | 05 | 05 |
| Remember | 10 | | | 01 |
| Understand | 10 | 05 | 01 | 01 |
| Apply | 10 | 05 | 02 | 01 |
| Analyze | | | 02 | |
| Evaluate | | | | 02 |
| Create | | | | |

*AAT – Alternate Assessment Tool

SEE –Semester End Examination Theory (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-------------------------|
| Remember | 10 |
| Understand | 10 |
| Apply | 10 |
| Analyze | 10 |
| Evaluate | 10 |
| Create | |

| Unit | Content of the Module | Hours | Co's |
|------|--|-------|-------------------|
| 1 | <p>Introduction to Civil Engineering & Engineering Mechanics</p> <p>Introduction to Civil Engineering: Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.</p> <p>Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural Development.</p> <p>Introduction to Engineering Mechanics: Force and its characteristics, Classification of force systems, Principle of physical independence, superposition, transmissibility of forces, Couple, Moment of a force, Equivalent force - Couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system.</p> | 8 | CO1 CO2 CO3 |
| 2 | <p>Analysis of Force Systems- Concurrent and Non-Concurrent Systems</p> <p>Concurrent force system: Definitions, Composition and resolution of forces, Resultant, Composition of coplanar -concurrent force system, Numerical problems on composition of coplanar concurrent force systems.</p> <p>Non-Concurrent force system: Composition of coplanar non-concurrent force system, Varignon's principle of moments.</p> | 8 | CO2 CO3 |
| 3 | <p>Equilibrium of forces and Friction</p> <p>Equilibrium of concurrent and non-concurrent forces: Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar.</p> <p>Support Reactions: Beams, Types of Loads and Supports, statically determinate beams, Numerical problems on support reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed loads and Moments.</p> <p>Friction: Definitions, Types of friction, Laws of static friction,</p> | 8 | CO2 CO3 CO4 |

| | | | |
|----------|--|----------|------------|
| | Limiting friction, Angle of friction, Angle of repose; Impending motion on horizontal and inclined planes; Numerical Problems on single planes. | | |
| 4 | <p>Centroids and Moments of Inertia</p> <p>Centroid: Introduction to the concept, centroid of area, centroid of basic geometrical figures, computing centroid for composite sections and engineering composite sections – L, I, Numerical problems.</p> <p>Moment of Inertia: Definition, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of triangle, rectangle and circle from first principles, Radius of gyration, Numerical problems.</p> | 8 | CO5 |
| 5 | <p>Dynamics</p> <p>Definitions – Displacement – Average velocity – Instantaneous velocity – Speed – Acceleration Average acceleration – Variable acceleration–Numerical problems.</p> | 8 | CO6 |

Self study component:

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1:Effect of the infrastructural facilities on socio-economic development of a country.

UNIT2:Numerical problems on composition of coplanar non-concurrent force systems.

UNIT 3:Numerical Problems on Concurrent and non-concurrent force systems, two blocks on inclined planes.

UNIT 4:Circular section, computing moment of Inertia for angle and I-sections.

UNIT 5:Acceleration due to gravity, Newton's Laws of Motion, Rectilinear Motion.

TEXT BOOKS

1. **Elements of Civil Engineering and Engineering Mechanics**, by Kolhapure B. K., Eastern Book Publishers, Belgaum, 2013.
2. **Engineering Mechanics-Statics and Dynamics** by A Nelson, Tata McGraw Hill Education Private Ltd, New Delhi, 2009.
3. **Elements of Civil Engineering** (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition 2009.

REFERENCE BOOKS

1. **Engineering Mechanics** by S.Timoshenko,D.H.Young, and J.V.Rao, TATA McGraw-Hill Book Company, New Delhi.
2. Beer FP and Johnson ER, “**Mechanics for Engineers- Dynamics and Statics**”- 3rd SI Metric edition, Tata McGraw Hill. – 2008.
3. Shames IH, “**Engineering Mechanics – Statics & Dynamics**”- PHI – 2009.

Assessment Pattern:

CIE: Continuous Internal Evaluation Pattern for theory: (50 Marks)

| Blooms Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (out of 50) | 30 | 05 | 05 | 10 |
| Remembrance | 10 | | 02 | |
| Understand | 10 | | 02 | |
| Apply | 10 | 03 | 01 | 03 |
| Analyze | | 02 | | 03 |
| Evaluate | | | | |
| Create | | | | 04 |

*AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE – Semester End Examination Theory (50 Marks)

| Blooms Category | Marks Theory (50) |
|------------------------|--------------------------|
| Remembrance | 10 |
| Understand | 20 |
| Apply | 10 |
| Analyze | 10 |
| Evaluate | |
| Create | |

| Unit | Contents of Unit | Hours | COs |
|------|---|-------|------------|
| 1 | <p>Steam and Turbines</p> <p>Steam Formation and Properties: Steam formation, Types of steam. Steam properties specific volume, enthalpy and internal energy (Simple numerical on properties of steam)</p> <p>Turbines: Classification, Principle operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine. (No compounding of turbines).</p> <p>Water turbines: Classification, Principles and operations of Pelton wheel, and Kaplan turbine.</p> | 8 | CO1 |
| 2 | <p>Internal Combustion Engines: Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, and specific fuel consumption, [numerical on IC Engines].</p> | 8 | CO2 |
| 3 | <p>Lathe: Components of Lathe, Classification, Principle of operation, Lathe operations: Turning, facing, knurling, thread cutting, Taper Turning by swiveling compound rest. Specification of lathe.</p> <p>Drilling machine: Components of Drilling machine, Classification, principle of operation bench drilling machine, radial drilling machine, operations on drilling machine- Boring, Reaming, Tapping, Counter Sinking, Counter Boring, spot facing, specification of drilling machine.</p> | 8 | CO3 |
| 4 | <p>Joining processes and Robotics</p> <p>Soldering and Welding: Definitions, Classification and method of soldering and welding. Differences between soldering and Welding. Description of Electric Arc Welding and Oxy-Acetylene Welding.</p> <p>Robotics: Introduction, Classification based on robots configuration; Polar, cylindrical, Cartesian coordinate and spherical. Application, Advantages, and disadvantages.</p> | 8 | CO4 CO5 |
| 5 | <p>Refrigeration: Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration.</p> <p>Refrigerants: Properties of refrigerants, list of commonly used refrigerants. Principle and working of vapor compression refrigeration and vapor absorption.</p> | 8 | CO6 |

Self study component:

Note:

1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Unit-1: Francis turbine, Gas turbines: Classification, working principles and Operations of Open cycle and closed cycle gas turbines.

Unit-2: Study of Different Types of I.C. engines like V-engine, Radial Engine, Inline Engine and its applications.

Unit-3: Milling machines and its Operations.

Unit-4: Principles of different types of Brazing.

Unit-5: Air Conditioning: Principles and applications of air conditioning systems, Room air conditioner.

TEXT BOOKS

1. “**Elements of Mechanical Engineering**”, DSCE publications,2015.
2. V.K.Manglik, “**Elements of Mechanical Engineering**”, PHI Publications,2013.
3. K.R.Gopalkrishna, “**A text Book of Elements of Mechanical Engineering**”Subhash Publishers, Bangalore,2014
4. Kestoor Praveen, M.R. Ramesh, “ **Elements of Mechanical Engineering**”, Suggi publications, Bangalore,2014

REFERENCE BOOKS

1. S. Trymbaka Murthy, “**A Text Book of Elements of Mechanical Engineering**”, Universities Press (India) Pvt Ltd, Hyderabad, 4th Edition2006.
2. K.P. Roy, S.K. HajraChoudhury, Nirjhar Roy, “**Elements of Mechanical Engineering**”, Media Promoters & Publishers Pvt Ltd,Mumbai,7thEdition,2012
3. Pravin Kumar, “**Basic Mechanical Engineering**”, 2013 Edition,Pearson.

Assessment Pattern:

CIE-Continuous Internal Evaluation Theory (50)

| Blooms Category | Test | Assignment | AAT1 | AAT2 |
|-------------------------|-------------|-------------------|-------------|-------------|
| Marks(out of 50) | 30 | 10 | 5 | 5 |
| Remember | 10 | | 2 | |
| Understand | 10 | 5 | 2 | |
| Apply | 10 | 5 | 1 | 3 |
| Analyze | | | | 2 |
| Evaluate | | | | |
| Create | | | | |

SEE-Semester End Examination Theory (50)

| Blooms Category | Marks Theory(50) |
|------------------------|-----------------------------|
| Remember | 20 |
| Understand | 20 |
| Apply | 10 |
| Analyze | |
| Evaluate | |
| Create | |

BASIC ELECTRICAL ENGINEERING

Course Code: 16ELE 15/25

L:P:T:S: 3:0:0:0

Exam Hours: 03

Total hours: 40

Credits: 03

CIE Marks: 50

SEE marks: 50

Course Objectives:

1. To study the basic concepts of Magnetic and AC circuits.
2. To study the construction, working principle and characteristics of DC machines.
3. To study the construction and working principle of AC machines, transformers, measuring instruments and wiring schemes.

Course Outcomes: After completion of the course, the graduates will be able to

| | |
|-------------|---|
| CO 1 | Apply the knowledge of basic laws to analyze the series ,parallel and series-parallel circuits and distinguish between different inductances and emfs' induced. |
| CO 2 | Apply the knowledge of basic concepts of sinusoidal waveforms to analyze the different combination of single phase a.c circuits. |
| CO 3 | Apply the basic knowledge of three phase a.c circuits to obtain the relationship between line & phase values of different connections and can measure the power by two wattmeter method |
| CO 4 | Discuss the different types of domestic wiring ,Protective devices/element and precautions against shock. |
| CO 5 | Identify and explain the construction, working principle of operation of different electrical machines viz: D.C. Machines, Transformers, Synchronous generators and Induction motors. |
| CO 6 | Classify different types of electrical machines and solve the basic problems of different electrical machines with the acquired knowledge on e.m.f equation and torque equation. |
| CO 7 | Discuss the characteristics and applications of different electrical machines, efficiency and regulation of transformer and starters for d.c motor & three phase induction motor. |

Mapping of Course Outcomes to Program Outcomes:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - |
| CO3 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - |
| CO4 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - |
| CO5 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - |
| CO6 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - |
| CO7 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - |

| Unit | Course Content | Hours | CO's |
|------|---|-------|------|
| 1 | <p>Magnetic Circuits:</p> <p>Basic definitions, Magnetic field due to electric current flow, force on a current carrying conductor placed in a magnetic field, Faradays laws of electromagnetic induction, Lenz's law, Fleming's rules and its applications. Statically and dynamically induced EMF'S. Self and mutual inductance. Numerical Problems on mutual inductance and coefficient of coupling.</p> | 8 | CO 1 |
| 2 | <p>Single-phase A.C Circuits:</p> <p>Principle and Generation of sinusoidal voltage, definition of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis, with phasor diagrams, of R, L, C, and series R-L-C circuits, real power, reactive power, apparent power and power factor. Illustrative examples.</p> | 8 | CO2 |

| | | | |
|---|---|---|-------------|
| 3 | <p>Three Phase A.C Circuits: Necessity and advantages of three phase systems, generation of three phase power, definition of Phase sequence, balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Measurement of power by two-wattmeter method. Illustrative examples.</p> <p>Basic Instruments: Introduction, classification of instruments, Principle, Construction & Operation of dynamometer type Wattmeter, Single phase Induction type energy meter.</p> <p>Domestic Wiring: Two-way and three-way control of a lamp, Electric shock, precautions against electric shock, Earthing: Pipe and Plate.</p> | 8 | CO3, CO4 |
| 4 | <p>DC motors: Construction of DC machine, DC motor working principle, Back EMF and its significance. Torque equation, Problems on Torque equation, Characteristics of DC motors, applications, Necessity of starter.</p> <p>Synchronous Generators: Principle of operation. Types and constructional features, EMF equation. Concept of winding factor (excluding derivation of distribution and pitch factors) Illustrative examples on EMF equation.</p> | 8 | CO5, CO6 |
| 5 | <p>Introduction to Transformers: Definition, need and classification, Construction, Working principle, EMF equation, losses, Regulation and efficiency, problems on EMF equation and efficiency.</p> <p>Induction motors: Construction of induction motor, working principle, types, Slip and its significance, applications, necessity of starter, Star-Delta starter, Illustrative examples on slip calculation.</p> | 8 | CO5, CO7 |

Self Study component:

Note:

- 1. Questions for CIE and SEE not to be set from self-study component.**
- 2. Assignment Questions should be from self-study component only.**

Unit 1:DC Circuits: Introduction to DC circuits, active and passive two terminal elements, ohms law, behaviour of resistor, inductor, capacitor, Kirchhoff's laws, mesh analysis in simple DC circuits excited by independent voltage sources, concept of power and energy. Illustrative examples, analogy between electric and magnetic circuits, Energy stored in magnetic field.

Unit-2: Analysis, with phasor diagrams of R-L, R-C circuits, Illustrative examples on series parallel circuits.

Unit-3:Operating principles, essential features of measuring instruments (basics only), Moving coil permanent magnet (PMMC) instruments, Basics of moving iron ammeters and voltmeters, concept of extension of range of ammeter, voltmeter (shunt and multiplier). Service mains, meter board and distribution board. Types of wiring- Cleat, Casing & Capping and conduit (concealed) wiring, Elementary discussion on fuse and Miniature Circuit Breaker (MCB's).

Unit-4:DC Generators: Principle and operation of DC generators. Types of DC generators, EMF equation of DC generator, basics of armature reaction, commutation, Interpoles, 3 point starter.

Unit-5:Phasor diagram of Single-phase Transformer on no-load. Concept of rotating magnetic field.

TEXT BOOKS

1. “**Basic Electrical Engineering**”, D.P. Kothari & I.J. Nagrath, Tata McGraw Hill Education.
2. “**Basic Electrical Engineering**” D. C. Kulshreshtha, TMH 1st Edition, Revised.

REFERENCE BOOKS :

1. “**Problems in Electrical Engineering**”, S.S. Parker Smith & NN Parker Smith.
2. “**Basic Electrical Engineering**”, Jimmie J.Cathey, Syed A. Nasar, Schaum's Outline Series in Engineering, McGraw-Hill Book Company.
3. “**Electrical & Electronics Technology**”, E.Hughes, PHI Publishers, 10th Edition.

Assessment Pattern:

CIE – Continuous Internal Evaluation (50 Marks)

| Bloom's Category | Tests | Assignments | AAT 1 | AAT 2 |
|--------------------------|--------------|--------------------|--------------|--------------|
| Marks (out of 50) | 30 | 10 | 5 | 5 |
| Remember | 5 | | 1 | 1 |
| Understand | 5 | | 1 | 1 |
| Apply | 8 | 4 | 1 | 1 |
| Analyze | 6 | 2 | 1 | 1 |
| Evaluate | 4 | 4 | | 1 |
| Create | 2 | | 1 | |

*AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE- Semester End Examination (50 Marks)

| Bloom's Category | Marks Theory (50) |
|-------------------------|--------------------------|
| Remember | 10 |
| Understand | 10 |
| Apply | 10 |
| Analyze | 8 |
| Evaluate | 8 |
| Create | 4 |

| Unit | Contents of Unit | Hours | COs |
|-------------|--|--------------|------------|
| 1 | Introduction: Demonstration on use of hand Tools used in fitting: V-block, Marking Gauge, files ,Hacksaw, drill taps , use of surface plate . | 3 | CO1 |
| 2 | Welding: Study of electric arc welding tools & equipment. Models: Butt Joint, Lap joint L-joint & T- joint.(4 models) | 12 | CO2 |
| 3 | Sheet metal & soldering work: Development & soldering of the models: Frustum of cone, prism (hexagon & pentagon), Truncated square prism. Funnel and tray. (6 models) | 21 | CO3 |
| 4 | Study and demonstration of power tools in Mechanical Engineering | 3 | CO1 |

Note :

No mini Drafters and drawing boards required .Drawings (Developments) can be done on sketch sheets using scale , pencil and geometrical Instruments

SEE EXAMINATION :

Sheet Metal Work :30 Marks

Welding :10 Marks

Viva Voce: 10 Marks

TOTAL MARKS :50 Marks

REFERENCE BOOKS

1. **Workshop Lab Manual**, Mechanical Engineering Department , 2016-17.
2. S k HajraChoudhry, A K Hajrachoudry , “ **Elements of Workshop Technology**

Assessment Pattern:
CIE-Continuous Internal Evaluation Lab (50)

| Blooms Category | Model | Record | Test | Total |
|-------------------------|--------------|---------------|-------------|--------------|
| Marks(out of 50) | 25 | 15 | 10 | 50 |
| Remember | 2 | 5 | 1 | 8 |
| Understand | 3 | 10 | 2 | 15 |
| Apply | 20 | | 7 | 27 |
| Analyze | | | | |
| Evaluate | | | | |
| Create | | | | |

SEE-Semester End Examination Lab (50)

| Blooms Category | Marks Theory(50) |
|------------------------|-------------------------|
| Remember | 10 |
| Understand | 10 |
| Apply | 30 |
| Analyze | |
| Evaluate | |
| Create | |

ENGINEERING PHYSICS LAB

Course Code : PHY17/27

L:P:T:S : 0:3:0:0

Exam Hours : 3

Credits : 2

CIE Marks : 50

SEE Marks : 50

Course objectives:

1. To give hands on experience on various experiments.
2. To acquire knowledge in various techniques and working principles in Physics.
3. To impart knowledge in the field of semiconductors and their applications.
4. To train students in techniques and principles related to various devices or components.
5. To acquire ability to use measuring instruments.
6. To assess the importance of Optics, Modern Physics and Engineering.

Course Outcomes: After completion of the course, the graduates will be able to

| | |
|------------|---|
| CO1 | Acquire hands on experience on optics, electrical, electronics and Modern Physics experiments. |
| CO2 | Utilize basic Physics concepts for practical applications such as working components like capacitors, diodes and transistors. |
| CO3 | Develop the ability to use various measuring instruments like ammeters, voltmeters and signal generators. |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | - | 1 | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | 1 | - | 1 | - | - | - | - | - | - | - |
| CO3 | 3 | 3 | 1 | - | 1 | - | - | - | - | - | - | - |

Mapping of Course outcomes to Program outcomes:

| Unit | Course content | Hours | COs |
|------|--|-------|-------------------|
| 1 | <p>List of Experiments:</p> <ol style="list-style-type: none"> 1. Determination of Planck's constant using LEDs. 2. Newton's Rings (Determination of radius of curvature of plano convex lens). | 06 | CO1 |
| 2 | <p>List of Experiments:</p> <ol style="list-style-type: none"> 3. Characteristics of a Transistor (Study of Input and Output characteristics and calculation of input resistance, output resistance and amplification factor). 4. Determination of resistivity of a semiconductor using a four probe technique. 5. Photo Diode Characteristics (Study of I-V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage and intensity). 6. I-V Characteristics of a Zener Diode. (Determination of knee voltage and Zener voltage). 7. Determination of Fermi energy. (Measurement of Fermi energy in copper). | 15 | CO2 CO3 |
| 3 | <p>List of Experiments:</p> <ol style="list-style-type: none"> 8. Diffraction grating (Measurement of wavelength of laser source using diffraction grating). | 03 | CO1 |
| 4 | <p>List of Experiments:</p> <ol style="list-style-type: none"> 9. Dielectric constant (Measurement of dielectric constant using charging and discharging of a capacitor). 10. Series and parallel LCR Circuits (Determination of resonant frequency and quality factor). | 6 | CO2 CO3 |
| 5 | <p>List of Experiments:</p> <ol style="list-style-type: none"> 11. Determination of energy gap of a semiconducting thin film. 12. Determination of type of majority carriers in a semiconductor. | - | CO1 CO2 CO3 |

- Ten experiments compulsory (Expt. Nos. 1-10).

REFERENCE BOOKS

1. **Lab Manual**, Department of Physics, DSCE.
2. **Engineering Physics**, N.H. Ayachit and P.K. Mittal, IK International Publishing house Pvt. Ltd.

Assessment Pattern:

CIE –Continuous Internal Evaluation Lab (50 Marks)

| Bloom's Category | Performance (Day To Day) | Internal Test |
|--------------------------|---------------------------------|----------------------|
| Marks (Out of 50) | 25 | 25 |
| Remember | 05 | 05 |
| Understand | 05 | 05 |
| Apply | 05 | 05 |
| Analyze | 05 | 05 |
| Evaluate | 05 | 05 |
| Create | | |

SEE –Semester End Examination Lab (50 Marks)

| Bloom's Category | Marks Theory(50) |
|-------------------------|-------------------------|
| Remember | 10 |
| Understand | 10 |
| Apply | 15 |
| Analyze | 10 |
| Evaluate | 05 |
| Create | |

CONSTITUTION OF INDIA & PROFESSIONAL ETHICS

Course Code : CIP19/29

L:P:T:S : 2:0:0:0

Exam Hours : 2

Credits : 2

CIE Marks : 50

SEE Marks : 50

Course Objectives:

1. To provide basic information about supreme law of the land.
2. To have an Illustration of present judicial pronouncements of fundamental rights.
3. To demonstrate the constitutional provisions for education & special provisions.
4. To make use of government polices related information technology.
5. To identify individual's role in engineering profession.
6. To distinguish the ethical responsibility of engineers towards society.

Course Outcomes: After Completion of the course, the graduates will be able to

| | |
|------------|---|
| CO1 | Acquire basic knowledge of legal literacy. |
| CO2 | Interpret & utilize the constitutional rights. |
| CO3 | Understand the importance of nation's law & fundamental duties. |
| CO4 | Recognize electoral process & special provisions. |
| CO5 | Compare engineering ethics and responsibilities of engineers. |
| CO6 | Develop individual's role and ethical responsibility towards society. |

Mapping of Course outcomes to Program outcomes:

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

| Unit | Course content | Hours | COs |
|------|---|-------|-------------------|
| 1 | Constitution: Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution. Preamble to the Indian Constitution Fundamental Rights & important case laws. | 6 | C01 C02 |
| 2 | Rules and duties: Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties. Union Executives – President, Prime Minister, Parliament and Supreme Court of India. | 5 | C01 C02 C03 |
| 3 | Governments: State Executives – Governor, Chief Minister, State Legislature, High Court of State. Amendment Procedures, 42nd, 44th, 74th, 76th, 86 th & 91 st Amendments. | 5 | C03 C04 |
| 4 | Privileges: Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions, Electoral Process in India and Human rights. | 5 | C01 C03 C04 |
| 5 | Engineering Ethics: Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering. | 5 | C05 C06 |

Self study component:

Note:

1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

UNIT 1: Citizen, law & media.

UNIT 2: Law making, role of Union Executive and cyber laws.

UNIT 3: Role of Governor, conflicts between Government & Executive.

UNIT 4: Implementation & execution of provisions.

UNIT 5: Conflict of interest & engineers.

TEXT BOOKS

1. Durga Das Basu: “**Introduction to the Constitution on India**”, (Students Edn.) Prentice – Hall EEE, 19th / 20th Edn., 2001.
2. Charles E. Haries, Michael S Pritchard and Michael J. Robins “**Engineering Ethics**” Thompson Asia, 2003.
3. G.B.Reddy, **Constitution of India and Professional Ethics**, IK International Publishing house Pvt. Ltd., 2006.
4. C.S.V. Murthy, **Indian Constitutional and Professional Ethics**, Himalaya Publishing House, 2006.

REFERENCE BOOKS

- 1 “**An Introduction to Constitution of India**”, Vikas Publishing, 2002.
2. M. Govindarajan, S. Natarajan, V. S. Senthilkumar, “**Engineering Ethics**”, Prentice –Hall of India Pvt. Ltd.New Delhi, 2004.
3. Durga Das Basu: **Introduction to the Constitution of India** -New Delhi: Wadhwa and Company Law Publishers, 2002.
4. M. P. Jain, **Outlines of Indian Legal and Constitutional History**, Lexis Nexis, 6th edition, 2010.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

| Bloom’s Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|-----------|-------------|------|------|
| Marks (Out of 50) | 40 | 10 | - | - |
| Remember | 10 | 05 | | |
| Understand | 30 | 05 | | |
| Apply | | | | |
| Analyze | | | | |
| Evaluate | | | | |

*AAT – Alternate Assessment Tool

SEE –Semester End Examination Theory (50 Marks)

| Bloom’s Category | Marks Theory (50) |
|------------------|-------------------|
| Remember | 20 |
| Understand | 30 |
| Apply | |
| Analyze | |
| Evaluate | |
| | |
| Create | |

KANNADA KALI (Only for Non-Karnataka Students)

(Non Credit Mandatory Course)

Course Code : KAN10/20
L:P:T:S : 2:0:0:0
Exam Hours : -

Credits : Pass Grade
CIE Marks : 50
SEE Marks : -

Course objectives:

1. To initiate the importance of the Kannada literary works.
2. To express thoughts and ideas in the local language.
3. To introduce the rich and cultural heritage of Karnataka.
4. To utilize the vernacular language in a day to day life.
5. To establish an amicable relation with the localities.
6. To gain knowledge of a novel language and use it effectively.

Course Outcomes: After completion of the course, the graduates will be able to:

| | |
|------------|---|
| CO1 | Make use of Kannada words in regular context. |
| CO2 | Demonstrate effective communication skills with the local language. |
| CO3 | Identify Karnataka as a source of rich culture and heritage. |
| CO4 | Develop an association of well-being with the people of Karnataka. |
| CO5 | Appraise the moral values and social behaviour in Karnataka. |
| CO6 | Recognize the importance of Kannada poets and writers. |

Mapping of Course outcomes to Program outcomes:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|
| C01 | 2 | 2 | - | - | - | 1 | - | - | - | 1 | - | - |
| C02 | 2 | 2 | - | - | - | 1 | - | - | - | 1 | - | - |
| C03 | 2 | 2 | - | - | - | 1 | - | - | - | 1 | - | - |
| C04 | 2 | 2 | - | - | - | 1 | - | - | - | 1 | - | - |
| C05 | 2 | 2 | - | - | - | 1 | - | - | - | 1 | - | - |
| C06 | 2 | 2 | - | - | - | 1 | - | - | - | 1 | - | - |

| Unit | Course content | Hours | COs |
|------|--|-------|-------------------|
| 1 | Usage: Introducing each other – 1. Personal Pronouns, Possessive forms, Interrogative words. Introducing each other – 2. Personal Pronouns, Possessive forms, Yes/No Type Interrogation Enquiring about a room for rent. Qualitative and quantitative adjectives. | 6 | CO1 CO2 |
| 2 | Communication: Enquiring about the college. Predicative forms, locative case. In a hotel-dative case defective verbs. Planning for a picnic. Imperative, Permissive, hortative. | 5 | CO2 CO3 CO4 |
| 3 | Conversation: Conversation between Doctor and the patient. Verb- iru, negation – illa, non – past tense. Doctors advise to Patient. Potential forms, no–past continuous. About Brindavan Garden. Past tense, negation. | 5 | CO2 CO5 |
| 4 | Activities: About routine activities of a student. Verbal Participle, reflexive form, negation. Telephone conversation. Past and present perfect past continuous and their negation. About Halebidu, Belur. Relative, principle, negation. | 5 | CO2 CO4 |
| 5 | Lessons for reading: Kannada Bhaashe (Lesson for reading) ManataruvaSangatialla (Lesson for reading) BekuBedagalu (lesson for reading) | 5 | CO5 CO6 |

Self study component:

Note :

1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1:About Ramayana. Possessive forms of nouns, dubietive question, Relative nouns.

UNIT 2:Vegetable market. Numeral, plurals.

UNIT 3:Discussing about a film. Past tense, negation.

UNIT 4: Discussing about examination and future plan. Simple conditional and negative.

UNIT 5: About Karnataka.

Text books:

1. H K LakappaGowda, **Sahitya: BahumukhaChintane**, IBH Prakashana.
2. Vivek Rai, **Kannada Nudinadeya Barahagalu**, Sapna Books.
3. K V Narayana, **Kannada AdunudiyaSollarime**, Pragathi Publishers.
4. RahamathTharikeri, **MaradolaganaKichchu**, Abhinava Publishers.

Note:

Each student admitted to the B.E program needs to register for these mandatory courses. There is no Semester End Examination (SEE) for the mandatory courses. The Pass Grade / Not Passed will be awarded to the student based on the performance in the Continuous Internal Evaluation (CIE). Students who do not secure the Pass Grade for the mandatory courses are not eligible for the award of the degree.

Assessment Pattern:**CIE –Continuous Internal Evaluation Theory (50 Marks)**

| Bloom's Category | Tests | Assignments | AAT1 | AAT2 |
|--------------------------|--------------|--------------------|-------------|-------------|
| Marks (Out of 50) | 40 | 10 | - | - |
| Remember | 10 | 05 | | |
| Understand | 10 | 05 | | |
| Apply | 20 | | | |
| Analyze | | | | |
| Evaluate | | | | |
| Create | | | | |

*AAT – Alternate Assessment Tool

KANNADA MANASU (Only for Karnataka Students)

(Non Credit Mandatory Course)

Course Code : KAN10/20

L:P:T:S : 2:0:0:0

Exam Hours : -

Credits : Pass Grade

CIE Marks : 50

SEE Marks : -

Course Objectives:

1. To initiate the importance of the Kannada literary works.
2. To express thoughts and ideas in the local language.
3. To introduce the rich and cultural heritage of Karnataka.
4. To utilize the vernacular language in a day to day life.
5. To establish an amicable relation with the localities.
6. To gain knowledge of a novel language and use it effectively.

Course Outcomes: After completion of the course, the graduates will be able to

| | |
|-----|---|
| CO1 | Make use of Kannada words in regular context. |
| CO2 | Demonstrate effective communication skills with the local language. |
| CO3 | Identify Karnataka as a source of rich culture and heritage. |
| CO4 | Develop an association of well-being with the people of Karnataka. |
| CO5 | Appraise the moral values and social behaviour in Karnataka. |
| CO6 | Recognize the importance of Kannada poets and writers. |

Mapping of Course outcomes to Program outcomes:

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

| Course Content | Hours |
|---|-------|
| <p style="text-align: center;">ಕನ್ನಡ ಮನಸು</p> <p>೦. ಶ್ಲಾವಣ (ಕವನ) ದ. ರಾ. ಬೇಂದ್ರೆ. ೧. ಡಾ. ನಿಶ್ಲೇಷ್ಠರಯ್ಯ ವ್ಯಕ್ತಿ ಮತ್ತು ಬಿಹಿಷ್ಯ (ವ್ಯಕ್ತಿಚಿತ್ರ) ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್. ೨. ದೋಣಿ ಸರಿನೋಬುರಳಿ (ಪ್ರವನ ಕಥನ), ಶಿವರಾಮ ಕಾರಂತ. ೩. ಅಣ್ಣವನ ರೇಷ್ಮೆ ಕಾಂಬಲಿ (ಪ್ರಬಂಧ) ಕುವೆಂಪು. ೪. ನಮ್ಮ ಎಮ್ಮೆಗೆ ಮಾತು ತಿಳಿಯುವುದೇ (ನಿರೋಧ), ನೋರೂರು ರಾಮಸ್ವಾಮಿ ಅಯ್ಯಂಗಾರ್. ೫. ಅನೇಕಳಲ್ಲಿ ಸುಡುಗಿಯರು (ನಿಷ್ಕಾಂತ ಬೇಟೆ) ಜಿ. ಜಿ. ಎಲ್ ನ್ನಾಮಿ. ೬. ಬೆಡ್ ನಂ. ಬಟು (ಕಥೆ) ತ್ರೀನೇಣಿ ೭. ರೋಷ್ಣಿ ಮತ್ತು ಕೋಡಿ (ಕವನ) ನು. ರಂ. ಎಕ್ಕುಂಡಿ. ೮. ಗುಬ್ಬಿ ದೂಡು (ಅಂಕಂ ಬರಹ), ಬಂಕೇಶ್. ೯. ಚಿಂತ್ರ ಮೇಷ್ಟ್ರಿ ಮತ್ತು ಸಾವು ಮೀನು (ಪರಿನರ ಬೇಟೆ), ಕೆ. ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ. ೧೦. ಧಾಂಧಿ (ಕಥೆ), ಬೆನರಸಳ್ಳಿ ರಾಮಣ್ಣ ೧೧. ಬೆಟ್ಟಿಯ ಸಾಡು (ಕವನ), ಶಿವಲಿಂಗಯ್ಯ. ೧೨. ಎಲ್ಲ ಸುಡುಗಿಯರ ಕವನ (ಕವನ), ನವಿತಾ ವಾರಭೂಷಣ. ೧೩. ನೀರು (ಕಥೆ), ಬನವರಾಜ ಕುಕ್ಕರಸಳ್ಳಿ. ೧೪. ಕರ್ನಾಟಕ ನಂದ್ಯತಿಯ ವ್ಯರೂಪ (ಪರಿಚಯ ಬೇಟೆ), ರಸಮತ ತರೀಕೆರೆ.</p> | 26 |

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