**Rashtreeya Sikshana Samithi Trust**

# R.V.COLLEGE OF ENGINEERING

**(Autonomous Institution Affiliated to VTU, Belagavi)**

**R.V. Vidyaniketan Post, Mysore Road**

**Bengaluru – 560 059**

# Bachelor of Engineering (B.E)

**Scheme and Syllabus**

# (2016 Scheme)

## I & II Semester
## (Common to all Programs)

# Abbreviations

| Sl. No. | Abbreviation | Meaning |
|---|---|---|
| 1 | **CIE** | Continuous Internal Evaluation |
| 2 | **CS** | Computer Science and Engineering |
| 3 | **CV** | Civil Engineering |
| 4 | **ECE** | Electronics and Communication Engineering |
| 5 | **EE** | Electrical and Electronics Engineering |
| 6 | **HSS** | Humanities and Social Sciences |
| 7 | **ME** | Mechanical Engineering |
| 8 | **SEE** | Semester End Examination |
| 9 | **SS (EL)** | Self Study (Experiential Learning) |

# Vision

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology

# Mission

- To deliver outcome based Quality education, emphasizing on experiential learning with the state of the art infrastructure.
- To create a conducive environment for interdisciplinary research and innovation.
- To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
- To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
- To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.

# Quality Policy

Achieving Excellence in Technical Education, Research and Consulting through an Outcome Based Curriculum focusing on Continuous Improvement and Innovation by Benchmarking against the global Best Practices.

## Credits Distribution as per UGC/VTU

| Sl. No. | Category | Percentage (%) | Minimum No. of credits | 2016 scheme | |
|---|---|---|---|---|---|
| | | | | Without Mini Project | With Mini Project |
| 1 | Humanities | 5-10 | 10 | 9+2 | 9+2 |
| 2 | Basic Science | 15-20 | 30 | 30 | 30 |
| 3 | Engineering Science | 15-20 | 30 | 30 | 30 |
| 4 | Professional Core Courses (PC) | 30-40 | 60 | 78+3=81<br>(3 credits core in place of Minor project in 7th semester) | 81-3=78<br>(3 Credits for minor project in 7th semester) |
| 5 | Professional Elective Courses | 10-15 | 20 | 20 | 20 |
| 6 | Other Electives | 5-10 | 10 | 10 | 10 |
| 7 | Project Work | 10-15 | 20 | 16+2<br>Major project +Tech. Seminar | 16+2+3<br>Major project +Tech. Seminar +Mini Project |
| | | | | 200 | 200 |

**R.V. College of Engineering, Bengaluru- 560059**
**(Autonomous Institution Affiliated to VTU, Belagavi)**
**FIRST SEMESTER CREDIT SCHEME FOR PHYSICS CYCLE**

| (COMMON TO ALL PROGRAMS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **BoS** | **CREDIT ALLOCATION** | | | | **Total Credits** |
| | | | | **Lecture** | **Tutorial** | **Practical** | **SS (EL)** | |
| **1** | **16MA11** | **Applied Mathematics-I** | **Maths** | **3** | **1** | **0** | **1** | **5** |
| **2** | **16PH12** | **Engineering Physics (Theory and Practice)** | **Physics** | **4** | **0** | **1** | **0** | **5** |
| **3** | **16CV13** | **Elements of civil Engineering** | **CV** | **4** | **1** | **0** | **0** | **5** |
| **4** | **16ME14** | **Computer Aided Engineering Drawing (Theory and Practice)** | **ME** | **1** | **0** | **2** | **0** | **3** |
| **5** | **16EE15** | **Elements of Electrical Engineering** | **EE** | **4** | **0** | **0** | **1** | **5** |
| **6** | **16HSC16** | **Constitution of India and Legal Studies for Engineers** | **HSS** | **2** | **0** | **0** | **0** | **2** |
| **7** | **16HSK17*** | **Kannada*** | **HSS** | **1** | **0** | **0** | **0** | **0** |
| | | **Total No. of Credits** | | | | | | **25** |
| | | **No. Of Hrs.** | | **19** | **04** | **6** | **8**** | **29** |

***Mandatory Audit course 1 Hr per week**

**** Non contact hours**

**R.V. College of Engineering, Bengaluru- 560059**
**(Autonomous Institution Affiliated to VTU, Belagavi)**
**FIRST SEMESTER CREDIT SCHEME FOR CHEMISTRY CYCLE**

| (COMMON TO ALL PROGRAMS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sl.No | Course Code | Course Title | BoS | CREDIT ALLOCATION | | | | Total Credits |
| | | | | Lecture | Tutorial | Practical | SS (EL) | |
| 1 | 16MA11 | Applied Mathematics-I | Maths | 3 | 1 | 0 | 1 | 5 |
| 2 | 16CH12 | Engineering Chemistry (Theory and Practice) | Chemistry | 4 | 0 | 1 | 0 | 5 |
| 3 | 16CS13 | Programming in C (Theory and Practice) | CS | 4 | 0 | 1 | 0 | 5 |
| 4 | 16EC14 | Basics of Electronic Engineering | ECE | 4 | 0 | 0 | 1 | 5 |
| 5 | 16ME15 | Basics of Mechanical Engineering (Theory and Practice) | ME | 4 | 0 | 1 | 0 | 5 |
| 6 | 16HSE16* | Professional Practice-I (Communicative English) | HSS | 2 | 0 | 0 | 0 | 0 |
| | | Total No. of Credits | | | | | | 25 |
| | | No. Of Hrs. | | 21 | 2 | 6 | 8** | 29 |

***Mandatory Audit course 2 Hrs per week**

**** Non contact hours**

**1Hr. Theory= 1 credit** **2Hrs. Practical=1credit** **2Hrs. Tutorial=1 credit** **4Hrs. SS(EL) = 1 Credit**

**R.V. College of Engineering, Bengaluru- 560059**
**(Autonomous Institution Affiliated to VTU, Belagavi)**
**SECOND SEMESTER CREDIT SCHEME FOR PHYSICS CYCLE**

| (COMMON TO ALL PROGRAMS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **BoS** | **CREDIT ALLOCATION** | | | | **Total Credits** |
| | | | | **Lecture** | **Tutorial** | **Practical** | **SS (EL)** | |
| **1** | **16MA21** | **Applied Mathematics-II** | **Maths** | **3** | **1** | **0** | **1** | **5** |
| **2** | **16PH22** | **Engineering Physics (Theory and Practice)** | **Physics** | **4** | **0** | **1** | **0** | **5** |
| **3** | **16CV23** | **Elements of civil Engineering** | **CV** | **4** | **1** | **0** | **0** | **5** |
| **4** | **16ME24** | **Computer Aided Engineering Drawing (Theory and Practice)** | **ME** | **1** | **0** | **2** | **0** | **3** |
| **5** | **16EE25** | **Elements of Electrical Engineering** | **EE** | **4** | **0** | **0** | **1** | **5** |
| **6** | **16HSC26** | **Constitution of India and Legal Studies for Engineers** | **HSS** | **2** | **0** | **0** | **0** | **2** |
| **7** | **16HSK27*** | **Kannada*** | **HSS** | **1** | **0** | **0** | **0** | **0** |
| | | **Total No. of Credits** | | | | | | **25** |
| | | **No. Of Hrs.** | | **19** | **04** | **6** | **8**** | **29** |

***Mandatory Audit course 1 Hr per week**

****** Non contact hours**

**R.V. College of Engineering, Bengaluru- 560059**
**(Autonomous Institution Affiliated to VTU, Belagavi)**
**SECOND SEMESTER CREDIT SCHEME FOR CHEMISTRY CYCLE**

| SEMESTER (COMMON TO ALL PROGRAMS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sl.No | Course Code | Course Title | BoS | CREDIT ALLOCATION | | | | Total Credits |
| | | | | Lecture | Tutorial | Practical | SS (EL) | |
| 1 | 16MA21 | Applied Mathematics-II | Maths | 3 | 1 | 0 | 1 | 5 |
| 2 | 16CH22 | Engineering Chemistry (Theory and Practice) | Chemistry | 4 | 0 | 1 | 0 | 5 |
| 3 | 16CS23 | Programming in C (Theory and Practice) | CS | 4 | 0 | 1 | 0 | 5 |
| 4 | 16EC24 | Basics of Electronic Engineering | ECE | 4 | 0 | 0 | 1 | 5 |
| 5 | 16ME25 | Basics of Mechanical Engineering (Theory and Practice) | ME | 4 | 0 | 1 | 0 | 5 |
| 6 | 16HSE26* | Professional Practice-I (Communicative English) | HSS | 2 | 0 | 0 | 0 | 0 |
| | | Total No. of Credits | | | | | | 25 |
| | | No. Of Hrs. | | 21 | 2 | 6 | 8** | 29 |

***Mandatory Audit course 2 Hrs per week**

**** Non contact hours**

**1Hr. Theory= 1 credit** **2Hrs. Practical=1credit** **2Hrs. Tutorial=1 credit** **4Hrs. SS (EL) = 1 Credit**

| Semester: I | | |
|---|---|---|
| **Course Title: APPLIED MATHEMATICS - I** | | |
| **Course Code: 16MA11** | | **CIE Marks: 100** |
| **Hrs/Week: L:T:P:S: 3:2:0:4** | | **SEE Marks: 100** |
| **Credits: 05** | | **SEE Duration: 3Hrs** |
| **Course Learning Objectives: The students will be able to** | | |
| **1** | Understand the existence of polar coordinates as possible 2-D geometry, curves in polar coordinates and to approximate a function of single variable in terms of infinite series. | |
| **2** | Gain knowledge of multivariate functions, types of derivatives involved with these functions, Jacobian as transformation factor and their applications. | |
| **3** | Enhance the knowledge level to visualize integrals in higher dimensional and different curvilinear systems, possible representation and evaluation of geometrical and physical quantities in terms of multiple integrals. | |
| **4** | Interpret concepts of vector functions, vector fields, differential calculus of vector functions in Cartesian coordinates, and apply them for various engineering problems. | |
| **5** | Appreciate the significance of vector integration and its applicability to Electromagnetic theory, Mechanics and other allied areas. | |
| **6** | Use mathematical IT tools, to analyze and visualize various concepts. | |

| **UNIT-I** | |
|---|---|
| **DIFFERENTIAL CALCULUS I**<br>Basics of polar coordinates, polar curves, angle between radius vector and tangent, p-r equation(pedal equation) of polar curves, Curvature, radius of curvature – Cartesian, parametric forms and problems. Taylor series, Maclaurin's series. Indeterminate forms- evaluation using L'Hospital's rule. | **08 Hrs** |
| **UNIT-II** | |
| **DIFFERENTIAL CALCULUS II**<br>Partial Differentiation – Basics, total derivatives-composite and implicit functions, Jacobians- properties, Maxima and minima of two variables. | **08 Hrs** |
| **UNIT-III** | |
| **INTEGRAL CALCULUS**<br>Orthogonal curvilinear coordinates –Introduction, arc, area and volume elements, cylindrical polar and spherical polar coordinate systems(only mention of orthogonality), Jacobians of these systems.<br>Multiple integrals-Double integrals – introduction, direct evaluation, change of order of integration, change of variables. Triple integrals – introduction and direct evaluation, change of variables.<br>Applications – Area, surface area, volume of solids and Center of gravity using double and triple integrals. | **09 Hrs** |
| **UNIT-IV** | |
| **VECTOR DIFFRENTIATION**<br>Scalar and vector fields, vector differentiation, velocity and acceleration vectors, gradient, divergence, curl and Laplacian of scalar/vector fields, solenoidal and irrotational fields, physical interpretations, simple problems involving practical situations. Vector identities and problems. | **08 Hrs** |
| **UNIT-V** | |
| **VECTOR INTEGRATION**<br>Line, surface and volume integrals. Green's theorem(with proof), Stoke's and Gauss Divergence theorems(without proof), solenoidal fields and irrotational fields. | **07 Hrs** |

| Expected Course Outcomes: After completing the course, the students will be able to | |
|---|---|
| 1 | Demonstrate the understanding of the basics of polar coordinates and p-r equations, partial differentiation, multiple integrals, vector fields and vector differentiation. |
| 2 | Solve problems on radius of curvature, total derivatives of functions, elements of different dimensions in curvilinear coordinates, double integrals by changing order of integration, velocity and acceleration vectors, line, surface and volume integrals. |
| 3 | Apply acquired knowledge to find infinite series form of functions, Jacobians, multiple integrals by changing variables, different operations using Del operator and to verify integral theorems. |
| 4 | Estimate extremal points of functions of two variables, area, volume using multiple integrals, solenoidal and irrotational fields. |

| Text Books | |
|---|---|
| **1.** | B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007, ISBN: 81-7409-195-5. |
| **2.** | B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2008, ISBN: 13-978-07-063419-0; ISBN: 10-0-07-063419-X. |
| **Reference Books** | |
| **1.** | Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition, 2007, ISBN: 978-81-265-3135-6. |
| **2.** | James Stewart, Calculus- Early transcendental, Cengage learning, 7th Edition 2012, ISBN:10- 0538497904, ISBN:13- 9780538497909. |

| **Continuous Internal Evaluation (CIE)<br>( Theory – 100 Marks)** | |
|---|---|
| Evaluation method | Course with Self-study |
| Quiz -1 | 10 |
| Test -1 | 25 |
| Quiz -2 | 10 |
| Quiz -3 | 10 |
| Test -2 | 25 |
| Self-study (EL) | 20 |
| Total | 100 |

| **Semester End Evaluation<br>Theory (100)** | |
|---|---|
| **Part- –A**<br>**Objective type questions** | **20** |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1**, **UNIT-4** and **UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** |

| Total | 100 |
|---|---|

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO10** | **PO11** | **PO12** |
| **CO1** | **H** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |
| **CO2** | **H** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |
| **CO3** | **H** | **H** | **L** | **L** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |
| **CO4** | **H** | **H** | **L** | **L** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |

**High-3 : Medium-2 : Low-1**

| Semester: I/II | | |
|---|---|---|
| **Course Title: ENGINEERING PHYSICS ( Theory and practice)** | | |
| **Course Code:16PH12/16PH22** | | **CIE Marks:100+50=150** |
| **Hrs/Week: L:T:P:S: 4:0:2:0** | | **SEE Marks:100+50=150** |
| **Credits:05** | | **SEE Duration( Theory) : 3 Hrs**<br>**SEE Duration(Laboratory) : 3 Hrs** |

| **Course Learning Objectives: The students will be able to** | |
|---|---|
| **1** | Understand the working principles of lasers & optical fibers and apply them in science and technology. |
| **2** | Implement the principles of quantum mechanics to various atomic phenomena. |
| **3** | Solve differential equations of harmonic oscillators to analyze experimental situations applicable to technical field. |
| **4** | Analyze the electrical properties of the conductors and semiconductors. |
| **5** | Explain the dielectric and thermal properties of solids. |

| **UNIT-I** | |
|---|---|
| **Lasers and Optical Fibers**<br><br>Basic principles of Laser: Absorption and emissions, Einstein's coefficients. Energy density in terms of Einstein coefficients, conditions and requisites of laser. Types of lasers: Helium -Neon Laser, Semiconductor diode Laser. Characteristics of laser beam. Industrial applications of lasers: laser cutting, welding and drilling, measurements of pollutants in atmosphere.<br><br>Principle of Optical fibers: propagation mechanism, condition for propagation, acceptance angle and numerical aperture. Modes of propagation, types of optical fibers. Attenuation: Absorption, scattering and radiation loss, attenuation coefficient. Application of optical fiber in point to point communication, advantages of optical fiber communication over electrical mode of communication. | **08 Hrs** |
| **UNIT-II** | |
| **Quantum Mechanics**<br>Black body radiation spectrum, Laws of black body radiation spectrum, Planck's quantum theory, Review of Photoelectric effect and Compton effect. Wave - particle duality, de-Broglie hypothesis. Matter waves: properties of matter waves, wave packet, group velocity, phase velocity and their relations. Application of matter waves: Scanning Electron Microscope (SEM) - construction and working. Uncertainty principle: Illustrations – Non-confinement of electron inside the nucleus and broadening of spectral lines. Setting up of one dimensional time independent Schrodinger's wave equation- wave function, physical significance of wave function, Eigen function, Eigen values. Application of Schrodinger's wave equation: Free particle, Particle in a one dimensional potential well of infinite depth. Problems. | **11 Hrs** |
| **UNIT-III** | |

| | |
|---|---|
| **Oscillations and Waves**<br>Simple Harmonic Motion, Characteristics of Simple harmonic motion. Un damped / Free vibrations, differential equations of un damped / free vibrations and solutions. Examples of Simple harmonic oscillators a) Spring and Mass system, b) Torsional Pendulum. Damped vibrations: Differential equations of damped vibrations and solutions. Forced vibrations: Differential equations of forced vibrations and solutions, Resonance. Examples of forced vibrations- LCR circuits. Problems. | **09 Hrs** |
| **UNIT-IV** | |
| **Electrical conductivity in metals and semiconductors**<br><br>Review of Classical free electron theory, Quantum free electron theory. Fermi energy and Fermi factor in metals, variation of Fermi factor with temperature. Density of states and carrier concentration in metals. Hall effect-Determination of number and sign of charge carriers. Band theory of solids, (qualitative approach).<br>Intrinsic semiconductors: carrier concentration, concept of effective mass (qualitative), derivation of electron and hole concentration, intrinsic carrier concentration, Fermi level in intrinsic semiconductors, Expression for the energy gap of intrinsic semiconductors.<br>Extrinsic semiconductors: Types of extrinsic semiconductors, doping methods (qualitative). Variation of carrier concentration in extrinsic semiconductors with temperature, variation of Fermi level in extrinsic semiconductors with temperature and impurity concentration. Hall effect in semiconductors. | **10 Hrs** |
| **UNIT-V** | |
| **Dielectrics and Thermal conductivity**<br>Dielectrics: Electric dipole, Dipole moment, Field due to electric dipole at a point in a plane. Polarization of dielectric materials: Types of polarizations, frequency dependence of polarization mechanisms, dielectric loss. Internal field in solids: for one dimensional infinite array of dipoles (Lorentz field), Clausius - Mossotti equation.<br><br>Thermal conductivity: conduction of heat in solids, steady state, coefficient of thermal conductivity, thermal conductivity of a good conductor by Searle's method and thermal conductivity of a poor conductor by Lee's and Charlton's method. | **09 Hrs** |
| **LAB EXPERIMENTS** | |
| 1. Verification of Stefan's law<br>2. Determination of Planck's constant using LED's of different wavelengths<br>3. Analysis of the frequency response of Series LCR circuits and determination of inductance of the given inductor.<br>4. Using four probe to determine the resistivity of given semi conductors.<br>5. Determination of moment of inertia of an irregular body by Torsional oscillations.<br>6. Determination of energy gap of given thermally sensitive resistors.<br>7. Determination of Fermi energy of conductors<br>8. Identification of the nature of the given semiconductors and determination of their Hall coefficient and carrier concentration of given materials.<br>9. Determination of Dielectric constant by charging and discharging of a capacitor.<br>10. Using Searle's method to find the thermal conductivity of good conductors<br>11. Thermal conductivity of a poor conductor by Lee's and Charlton's method<br>12. Determination of divergence angle of a laser beam<br>13. Determination of numerical aperture of an optical fiber | |

| | |
|---|---|
| **Note:** | **Each student has to perform 13 experiments in a semester.**<br>**10 Experiments are GUIDED experiments**<br>**03 Experiments involving experiential learning.** |
| **Course Outcomes: After completing the course, the students will be able to** | |
| CO1 | Understand the fundamental concepts of Optical Physics, Quantum mechanics, wave theory and conductivities |
| CO2 | Apply the concepts of Optical Physics, Quantum mechanics, wave theory and conductivities in Engineering domain. |
| CO3 | Analyze the theoretical concepts and investigate in the laboratory. |
| CO4 | Demonstrate team work and effective reporting |
| **Text Books** | |
| **1** | Dr. M N Avadhanulu, Dr. P. G. Kshirsagar, A Text book of Engineering Physics S. Chand & Company Private limited. Revised edition 2015. |
| **2** | R K Gaur and S L Gupta, Engineering Physics, Dhanpat Rai Publications, Revised edition 2011. |
| **Reference Books** | |
| **3** | Haliday & Resnic & Walker, Fundamentals of Physics, John Wiley & Sons 2010, ISBN: 9971-51-330-7. |
| **4** | Hitendra K Malik and A K Singh, Engineering Physics, Tata McGraw Hill Education Private Limited, 2009, ISBN:978-0-07-067153-9. |

| **Continuous Internal Evaluation (CIE)** | | | | |
|---|---|---|---|---|
| **( Theory – 100 Marks)** | | **(Laboratory- 50 Marks)** | | **Total (150)** |
| **Evaluation method** | **Course with assignment** | | | |
| Quiz -1 | 10 | Performance of the student in the laboratory, every week | 40 | |
| Test -1 | 30 | | | |
| Quiz -2 | 10 | | | |
| Quiz -3 | 10 | Test at the end of the semester | 10 | |
| Test -2 | 30 | | | |
| Assignments | 10 | | | |
| Total | **100** | **Total** | **50** | **150** |

| Semester End Evaluation (SEE) | | | | |
|---|---|---|---|---|
| **Theory (100 Marks)** | | **Laboratory(50 Marks)** | | **Total (150)** |
| **Part- –A**<br>**Objective type questions** | **20** | **Experiment Conduction with proper results** | 40 | |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1, UNIT-4 and UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** | **Viva** | 10 | |
| **Total** | **100** | **Total** | **50** | **150** |

## CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | H | M | L | - | - | - | - | - | - | - | M |
| CO2 | L | H | H | L | - | - | - | - | - | - | - | M |
| CO3 | L | H | H | H | - | - | - | - | - | - | - | M |
| CO4 | L | H | M | L | - | M | - | - | M | M | - | M |

**High-3: Medium-2: Low-1**

| Semester: I / II | | |
|---|---|---|
| **Course Title: ELEMENTS OF CIVIL ENGINEERING** | | |
| **Course Code: 16CV13/23** | | **CIE Marks:100** |
| **Hrs/Week: L:T:P:S: 4:2:0:0** | | **SEE Marks:100** |
| **Credits::05** | | **SEE Duration: 3 hrs** |

**Course Learning Objectives: The students will be able to**

| | |
|---|---|
| 1 | Objective of this course is to make every engineering student understand the importance of civil engineering, so that they can use their domain knowledge and apply to civil engineering. |
| 2 | Identify the components and materials used for building construction. |
| 3 | Interpret the behavior of rigid and deformable bodies to solve engineering problems. |
| 4 | Apply principles of mechanics for solving Civil Engineering problems. |

| **UNIT-I** | |
|---|---|
| **Introduction**: Scope of different fields of Civil Engineering; need for Civil Engineering for various engineering domains.<br>Building materials – Properties and Engineering applications of Stones, Bricks, Cement, Concrete, Concept of Reinforced Cement Concrete (RCC).<br><br>**Building components.**<br>Concept of Sub Structure Components- Masonry Foundation; Isolated RCC footing ; Raft Foundation , End bearing piles and friction piles.<br>Concept of Super structure components– Components and types of walls, Doors, Windows, Roofs, Flooring and stairs. | **9Hrs** |
| **UNIT-II** | |
| **Introduction to Engineering Mechanics**<br>Force- Concepts, Characteristics, Force systems and types, Principle of Transmissibility of force, Principle of Superposition, Moment of a force, Couple, characteristics of couple, Resolution and composition of forces, Varignon's theorem, resultant of coplanar concurrent and non-concurrent force systems by method of resolution.- Numerical problems.<br>**Equilibrium of force systems:** Free body diagram, conditions of equilibrium of Co planar concurrent and non-concurrent force systems, Lami's Theorem.- Numerical Problems. | **9 Hrs** |
| **UNIT-III** | |
| **Beams:** Types of Loads, Supports for beams; Statically determinate and Indeterminate Beams, Numerical Problems on Statically determinate beams subjected to concentrated load , Uniformly Distributed Load, Uniformly Varying Load, Moment and their combinations.<br><br>**Friction –** Types of friction, Laws of static friction, limiting friction, Angle of friction, Impending motion on horizontal and inclined planes, wedge friction, ladder friction – Numerical problems. | **9Hrs** |
| **UNIT-IV** | |
| **Centroid**: Concept of center of gravity, centroid, Axes of symmetry, Location of centroid of Rectangle, Triangle, Semicircle, Quadrant and sector of a circle by method of integration; Numerical problems on Centroid of composite sections (not | |

| | |
|---|---|
| more than three sub-sections).<br>**Second Moment of Area**: Concept of Second moment of area, Radius of gyration, Polar moment of inertia, Perpendicular axis theorem and Parallel axes theorem; Second moment of area of rectangular, circular and triangular sections by method of integration; Numerical problems on composite sections (not more than three sub-sections). | **8 Hrs** |
| **UNIT-V** | |
| **Simple Stresses and strains** :Hooke's law, Stress Strain behavior of mild steel and concrete; Analysis of bars of uniform and varying cross sections, Tapering and stepped bars ; Analysis of Simple and Composite bars of equal and unequal lengths ; Elastic constants and their Interrelationships, Volumetric strain.- Numerical problems. | **9Hrs** |

**Expected Course Outcomes:** After completing the course, students will be able to

| | |
|---|---|
| 1 | Describe fundamental concepts of Civil Engineering structures, mechanics and materials.(L1) |
| 2 | Discuss components of building, behavior of rigid and deformable bodies. (L2) |
| 3 | Apply the concepts of mechanics and materials used in Construction for engineering problems. (L3) |
| 4 | Demonstrate the applications of fundamentals for solving engineering problems.(L4) |

**Text books:**

| | |
|---|---|
| 1 | S. Ramamrutham , "Strength of Materials",Dhanpat Rai Publishing Company, 18thEdition, 2014, ISBN-10: 9384378267 , ISBN-13: 9789384378264. |
| 2 | Ferdinand P.Beer and E.Russel Johnston Jr, "Mechanics for Engineers – Statics", McGraw Hill book Inc., U.S.A, 4th Edition, 2009, ISBN- 007100135. |
| 3 | Sushil Kumar, "Building Construction", Standard Publishers ,20th Edition, 2016, ISBN: 9788180141683. |

**Reference books:**

| | |
|---|---|
| 1 | A.Nelson, "Engineering Mechanics,Statics and Dynamics", Tata McGraw Hill Publication, 1st Edition, 2010, ISBN -10-0-07-014614-4, ISBN-13: 978-0-07-014614-3. |
| 2 | S. S Bhavikatti, "Strength of Materials", Vikas Publishing house pvt. Ltd.-Noida, 3rd Edition, 2013,ISBN-10: 8125927913, ISBN-13:9788125927914 |

| **Continuous Internal Evaluation (CIE)<br>( Theory – 100 Marks)** | |
|---|---|
| **Evaluation method** | **Course with assignment** |
| Quiz -1 | 10 |
| Test -1 | 30 |
| Quiz -2 | 10 |
| Quiz -3 | 10 |
| Test -2 | 30 |
| Assignments | 10 |
| **Total** | **100** |

| Semester End Evaluation<br>(Theory -100 Marks) | |
|---|---|
| **Part- –A**<br>**Objective type questions** | **20** |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1, UNIT-4 and UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** |
| **Total** | **100** |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| **CO1** | M | L | - | - | - | M | M | L | L | - | - | M |
| **CO2** | M | M | - | - | - | L | - | - | L | - | - | L |
| **CO3** | M | M | L | - | - | M | M | - | L | - | - | M |
| **CO4** | M | M | L | - | - | M | - | - | - | - | - | L |

**High-3 : Medium-2 : Low-1**

| Semester: I / II | | |
|---|---|---|
| **Course Title: COMPUTER AIDED ENGINEERING DRAWING ( Theory and practice)** | | |
| **Course Code: 16ME14/24** | | **CIE Marks: 50** |
| **Hrs/ week: L:T:P:S: 2:0:2:0** | | **SEE Marks: 50** |
| **Credits:03** | | **SEE Duration: 3 hours** |

| **Course Learning Objectives: The students will be able to** | |
|---|---|
| **1** | Familiarize with the conventions and standards used in Engineering Drawing and principles of orthographic and isometric projections for visualization of three dimensional objects |
| **2** | Apply the principles of orthographic projections to draw elevation, plan and profile views of lines, planes and solids |
| **3** | Apply the principles of projection of lines to find solutions to practical problems involving distances and inclinations |
| **4** | Apply the fundamentals of solid geometry and develop lateral surfaces of solids |
| **5** | Develop competence in Solidworks as an effective tool for Engineering Graphics |

| **Part A (Manual Drawing)** | |
|---|---|
| **Conventions and Standards:** Standard sizes of drawing sheets, Lines, Dimensioning, Scales, conventions for materials<br>Orthographic Projection**,** Principal planes - HP, VP, RPP and LPP, Orthographic views, Quadrants, First, Second, third and fourth Angle of Projection<br>**Projection of points** in four quadrants<br>**Projection of Straight lines (First Angle Projection)** - True and Apparent lengths and inclinations Application problems on projections of straight lines<br>**Projection of Planes (Laminae)** (First Angle of Projection) - Projection of Triangular, Rectangular, pentagonal, hexagonal and Circular plane surfaces by change of position method | **13 Hrs** |
| **Part B (Manual and Computer Aided Drawing)** | |
| **Projection of solids** - Projection of right regular solids - cubes, tetrahedrons, prisms, pyramids, cylinders and cones (with axis inclined to both HP and VP) by change of position method, Section of solids (cube, prism, pyramid, cone and cylinder) using cutting plane inclined to HP only.<br>**Development of surfaces** – Parallel line and Radial line methods - Development of lateral surfaces of prisms, pyramids, cylinders, cones and truncated solids<br>**Isometric Projection:** Tetrahedron, hexahedron, prisms, pyramids, cylinders, cones, spheres, hemispheres and combination of co-axial solids, Conversion of Isometric projection to Orthographic views | **20 Hrs** |

| **Expected Course Outcomes: After completing the course, the students will be able to** | |
|---|---|
| **1** | Demonstrate competence in the basics of Orthographic Projections of points, lines, planes and Solids for their presentation in the three Principal Views (L1, L2) |
| **2** | Apply the principles of orthographic projections to find solutions to real life problems involving distances and inclinations (L3) |
| **3** | Analyze Orthographic projections of solids for drawing Isometric Projections (L4) |
| **4** | Develop lateral surfaces of solids, create isometric projections of solids of combination(L4) |

| **Text Book** | |
|---|---|
| **1** | K R Gopalakrishna; "Engineering Graphics";Subhash Publishers, Bangalore ; 32nd Edition;2011 |

| Reference Books | |
|---|---|
| **2** | N D Bhatt & V M Panchal, 'Engineering Drawing', Charutha Publishing House , Gujarat, 48th Edition , 2005, ISBN:9380358178 |
| **3** | Luzadder Warren J, Duff John, "Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics of Design and Production", Prentice Hall of India Pvt. Ltd, New Delhi, Eastern Economy Edition, 2005;ISBN:8120308859 |

| **Continuous Internal Evaluation (CIE)** | |
|---|---|
| **Evaluation method** | **Course with assignment** |
| Manual drawing and print out of exercises evaluated for | 30 |
| Test | 20 |
| **Total** | **50** |

| **Semester End Evaluation** | |
|---|---|
| **Part- –A**<br>Students have to answer TWO full questions from Part A (Manual Drawing) of 10 marks each | **20** |
| **Part –B**<br>TWO Questions from Part B of 15 marks each (Computer aided drawing) | **30** |
| **Total** | **50** |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO10** | **PO11** | **PO12** |
| **CO1** | H | L | M | L | M | - | - | - | - | - | - | - |
| **CO2** | H | M | M | M | M | - | - | - | - | - | - | - |
| **CO3** | H | M | M | M | M | - | - | - | - | - | - | - |
| **CO4** | M | M | M | M | M | - | - | - | - | - | - | - |

**High-3 : Medium-2 : Low-1**

| Semester: I/II | | |
|---|---|---|
| **Course Title: ELEMENTS OF ELECTRICAL ENGINEERING** | | |
| **Course Code: 16EE15/25** | | **CIE Marks:100** |
| **Hrs/Week: L:T:P:S: 4:0:0:4** | | **SEE Marks:100** |
| **Credits:05** | | **SEE Duration:03 Hrs** |

**Course Learning Objectives: The students will be able to**

| | |
|---|---|
| **1** | Analyze the basic concepts of the electrical ac and dc circuits |
| **2** | Demonstrate the principles of ac & dc machines |
| **3** | Develop the concepts of domestic wiring. |
| **4** | Develop an awareness of various energy sources (conventional & non conventional) available. |
| **5** | Apply the basic electrical concepts in their chosen field. |

| **UNIT-I** | |
|---|---|
| **Need to study elements of electrical engineering or engineering students**<br>**Analysis of D.C. Circuits:** Ohm's law and Kirchhoff's laws, Applications for the analysis of series, parallel and series- parallel circuits excited by independent voltage sources, Concept of mesh current analysis, Network reduction methods including star-delta conversion, Illustrative examples.<br><br>**Electromagnetism:** Faraday's laws, Lenz's law, Fleming's rules, statically and dynamically induced EMFs, concept of self and mutual inductances, concept of coefficient of coupling, energy stored in magnetic field, illustrative examples.<br><br>**Single Phase A.C Fundamentals :** Generation of sinusoidal AC voltage, instantaneous value , average value, R.M.S value, form factor and peak factor of sinusoidal voltage and current, concept of phase and phase difference of alternating quantities represented by sinusoidal wave, phasor representation. | **07 Hrs** |
| **UNIT-II** | |
| **Single Phase Circuits:** Definition of real power, reactive power, apparent power and power factor. Analysis of R, L, C, R-L, R-C, R-L-C circuits along with phasor diagram. Analysis of series, parallel and series - parallel circuits with illustrative examples. Concept of power factor improvement.<br><br>**Three Phase Circuits:** Generation of three phase balance A.C and advantages of, phase sequence, relationship between line and phase quantities for balanced star and delta connections, measurement of three phase power using two watt meters, effect of PF on wattmeter readings. Illustrative examples | **08 Hrs** |
| **UNIT-III** | |
| **Transformers:** Principle of operation and construction of single phase transformers (core and shell types). EMF equation, principle of working on no-load and load (UPF, lagging and leading PF loads), losses and efficiency, definition of voltage regulation, illustrative examples.<br><br>**Induction Motors:** Concept of rotating magnetic field, principle of operation types, constructional features and applications, slip and it's significance. Illustrative examples (only on slip calculations). Torque - slip characteristics, necessity of a starter, Y - Δ Starter. | **08Hrs** |

| UNIT-IV | |
|---|---|
| **D.C Machines:** Working principle of DC machine as a generator and as a motor. Constructional features, EMF equation, No load characteristics of generator. Back EMF and torque equation of DC motors. Types of DC motors, characteristics and applications, Illustrative examples. Necessity of a starter.<br><br>**Synchronous Generators:** Principle of operation, types and constructional features of a generator, E.M.F equation, synchronization of alternators with bus bar. | **07 Hrs** |
| **UNIT-V** | |
| **Electric Wiring :** Two-way and three way control of lamp, Necessity and types of earthing, elementary idea of Fuses and MCB, Indian standards of wire gauges and specification wiring diagram of a residential buildings, working of incandescent, fluorescent, sodium vapor lamps. CFL and LED lighting, Decorative Series lighting.<br><br>**Non-Conventional Energy:** Definition of Renewable and non renewable energy systems and explanation with block diagram approach of different types of conventional energy systems (Hydel, Thermal, Nuclear). Explanation with block diagram approach of different types of non conventional energy systems (wind, solar). Comparison of conventional and non conventional energy sources.<br><br>**Self Study**<br>Case study, Design and Emerging Technologies to be discussed pertaining to the course. | **06 Hrs**<br><br>**12 Hrs** |

| **Expected Course Outcomes: After completing the course, the students will be able to** | |
|---|---|
| **1** | Understand the fundamentals of AC, DC, electromagnetism, AC circuits, transformers, induction motors, DC machines, synchronous machines, electric wiring and non conventional energy sources. |
| **2** | Analyze AC, DC circuits, working and construction of AC and DC machines, transformers, induction motors, DC machines and synchronous machines, |
| **3** | Evaluate the performance of AC and DC machines, transformers, Induction motors, DC machines, synchronous machines and various non conventional energy sources for different applications. |
| **4** | Design and plan the layout of electrical wiring scheme for a residential building |

| **Reference Books** | |
|---|---|
| **1** | E.Hughes, 'Electrical Technology', International Students, Pearson, 2005, 9th Edition, ISBN: 0131143972 |
| **2** | G.D.Rai , 'Non conventional energy sources', Khanna Publishers , 2006, 4th edition, ISBN:0471223719 |

| **Text Books** | |
|---|---|
| **1** | V.N Mittle and Aravind Mittal, 'Basic Electrical Engineering', 2006, Tata Mc Graw Hill Publishing Company Ltd., 2nd Edition, ISBN-10: 0070593574. |
| **2** | Rajendra Prasad,' Fundamentals Of Electrical Engineering',2009, PHI Learning, ., 2nd Edition, ISBN 10: 8120339282 ISBN 13: 9788120339286 |

| Continuous Internal Evaluation (CIE)<br>( Theory – 100 Marks) | |
|---|---|
| **Evaluation method** | **Course with Self-study** |
| Quiz -1 | 10 |
| Test -1 | 25 |
| Quiz -2 | 10 |
| Quiz -3 | 10 |
| Test -2 | 25 |
| Self-study (EL) | 20 |
| **Total** | **100** |

| Semester End Evaluation<br>Theory (100 Marks) | |
|---|---|
| **Part- –A**<br>**Objective type questions** | **20** |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1, UNIT-4 and UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** |
| **Total** | **100** |

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/ PO** | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 |
| **CO1** | M | L | L | - | - | L | - | - | - | L | - | - |
| **CO2** | M | H | L | L | - | L | - | - | L | L | - | - |
| **CO3** | H | H | M | M | - | M | M | L | L | L | - | M |
| **CO4** | H | M | H | H | - | M | M | - | L | L | - | L |

**High-3 : Medium-2 : Low-1**

| I /II Semester | | |
|---|---|---|
| **CONSTITUTION OF INDIA & LEGAL STUDIES FOR ENGINEERS** | | |
| **Course Code:12HSC16/26** | | **CIE Marks: 50** |
| **Hrs/Week: L:T:P:S: 2: 0: 0: 0** | | **SEE Marks: 50** |
| **Credits:02** | | **SEE Duration: 2Hrs** |

**Course Learning Objectives: The students will be able to**

| | |
|---|---|
| **1** | Apply the knowledge of the constitutional literacy to become aware of the fundamental rights and duties in their role as Engineers |
| **2** | Understanding of ethical and legal aspects of advertising, consumer problems and their redressal mechanism related to product and service standards. |
| **3** | Demonstrate an advanced and integrated understanding of the nature and extent of the corporate entity principle and to understand how this principle applies to corporate groups |
| **4** | Critically evaluate the extent and application of the Corporate Law. |

| **UNIT-I** | |
|---|---|
| **Salient features of Indian Constitution:** Preamble to the Constitution of India. Scope & Extent of Fundamental Rights under Part III. Right to Information Act with Case studies | **06 Hrs** |
| **UNIT-II** | |
| **Directive Principles of State Policy** - Its meaning and Significance. Fundamental Duties, Executive of the Union and State, Parliament & State Legislature. Union Judiciary & State Judiciary. | **04 Hrs** |
| **UNIT-III** | |
| **Ethical and Legal Dimensions of Law -**Corporate Social Responsibility, Statutory Provision regarding prohibition and prevention of Sexual Harassment at work place, Anti –Ragging Provisions, Human Rights & Human Rights Commissions. | **04 Hrs** |
| **UNIT-IV** | |
| **Companies Act 2013**: Incorporation and Management - Certificate of Incorporation, Memorandum and Articles of Association, Doctrine of Ultra Vires, Doctrine of Indoor Management, Directors; Types of Companies- Private Company, Public Company and One Person Company' (OPC). | **05 Hrs** |
| **UNIT- V** | |
| **Consumer Protection Act, 1986**- Rights of Consumers. Unfair Trade Practice, Restrictive Trade Practice, Defect in goods, Deficiency in service: Medical, Lawyering, Electricity, Housing, Postal services etc. Enforcement of Consumer Rights- Consumer Forum | **05 Hrs** |
| **Activities Recommended**-Videos, Mock activities, visit to consumer forum/court | |

**Expected Course Outcomes: After completing the course, the students will be able to**

| | |
|---|---|
| **CO1** | Understand process of ethical and moral analysis in decision making scenarios and inculcate ethical behavior as a trait for professional development. |
| **CO2** | Apply the knowledge to solve practical problems with regard to personal issues & business enterprises. |

| | |
|---|---|
| **CO3** | Identify the conflict management in legal perspective and judicial systems pertaining to professional environment, strengthen the ability to contribute to the resolution of human rights & Ragging issues and problems through investigative and analytical skills. |
| **CO4** | Demonstrate the citizen's fundamental Rights, duties & consumer responsibility and capability and to take affirmative action as a responsible citizen. |

| **Text Books** | |
|---|---|
| **1** | Dr. J. N Pandey, Constitutional Law of India, Central Law Agency, 53rd Edition, 2016 |
| **2** | Avtar Singh: Law of Consumer Protection: Principles and Practice, 4th Edition, Eastern Book Company, 2005, ISBN 8170128544, 9788170128540 |
| **3** | Avtar Singh, Company Law, 16th Edition Eastern Book Company, 2015 Lucknow. |

| **Continuous Internal Evaluation (CIE)** | |
|---|---|
| **Evaluation method** | **Course with assignment** |
| **Quiz -1** | 05 |
| **Test -1** | 15 |
| **Quiz -2** | 05 |
| **Quiz -3** | 05 |
| **Test -2** | 15 |
| **Assignment** | 05 |
| **Total** | **50** |

| **Semester End Evaluation (SEE)**<br>**Theory (50 Marks)** | |
|---|---|
| **Part- –A**<br>**Objective type questions** | **10** |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 8 Marks.<br><br>The **UNIT-1, UNIT-4 and UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice. Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **40** |
| **Total** | **50** |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO / PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | | | | | | H | | H | | L | | M |
| **CO2** | | | | | | H | L | H | H | L | | M |
| **CO3** | | | | | | H | L | M | M | L | | H |
| **CO4** | | | | | | | | H | H | H | | H |

**High-3: Medium-2: Low-1**

| I /II Semester | | |
|---|---|---|
| **KANNADA KALI (Spoken Kannada)**<br>**(To those students who does not know Kannada)** | | |
| **Course Code:12HSK17/27** | | **CIE Marks: 50** |
| **Hrs/Week: L:T:P:S: 1: 0: 0: 0** | | **SEE Marks:** |
| **Credits : Audit** | | **SEE Duration:** |

| **Course Learning Objectives: The students will be able to** | |
|---|---|
| **1** | Introduce spoken Kannada to those students who does not know Kannada **(Kannada Kali)** |
| **2** | Introduce to reading & writing to those students who know only speaking Kannada **(Kannada Lipi)** |
| **3** | Introduce to students who have already studied Kannada **(Kannada Anubhava)** |

**1. namaskaara**
Introducing the self, enquiring about mother tongue, native place, profession etc., interrogative particles

**2. niivu cennaagiddiiraa?**
Enquiring about the welfare, personal pronouns, possessive forms

**3. nimage eenu beeku?**

**4. nimage kannada gottaa?**

**5. nanage meeshTra kelasa ishTa**
'yes'/'no'/'not' type of interrogative and assertive sentences, modal verbs and negations.

**6. oLLeya *college***
Qualitative and quantitative adjectives

**7. aakaaSada baNNa niili**
Locative case markers, post positions and colours

**8. ivattu eshTane taariikhu?**
Cardinal numbers, numeral adjectives, ordinal numbers, human numerals, weekdays and kinship words

**9. *College* bassu eshTu ganTege ide?**
Dative case markers,

**10. naanu bengaLuuralli iddiini**
Present tense, habitual future tense form of verb root IRU,

**11. *RV college*alli ooduttiini**
Introducing few frequently used verb forms like nooDu, maaDu, hoogu, koDu, keeLu, kuDi, hoDi, bari etc.,. Simple present tense and habitual future tense form of human and non-human verbs.

**12. *Record* bariibeeku**
Definitive, permissive and prohibitive form of verbs

**13. bengaLuurige yaavaaga bandri?**
Past tense form of verbs(human and non-human)

**14. dina nityada sambhaashaNe**
Few simple conversations related to day-to-day activities

**15.** Few ritual words/sentences which are frequently used in spoken Kannada

**Note**: Introducing few ritualistic words/sentences/phrases in each lesson.

**MODILITY**

To understand and converse in Kannada at places/situations like canteen, mess, hotel, hostel, while travelling in auto/bus/train/bus station/railway station/post office/bank; conversing with general public, over phone etc.,.

| I /II Semester | | |
|---|---|---|
| **KANNADA LIPI**<br>**(To those students who know only speaking and does not know reading & writing)** | | |
| **Course Code:12HSK17/27** | | **CIE Marks: 50** |
| **Hrs/Week: L:T:P:S: 1: 0: 0: 0** | | **SEE Marks:** |
| **Credits : Audit** | | **SEE Duration:** |

Introduction of Kannada alphabets (primary letters);
Combination of secondary symbols of vowels with consonants (‘kaaguNita’);
Secondary symbols of consonants and its combination with other consonants (both homogenous and heterogeneous).

**MODILITY**

To read Kannada script.

| I /II Semester | | |
|---|---|---|
| ಕನ್ನಡಅನುಭವ (ಕನ್ನಡಕಲಿತವರಿಗೆ) | | |
| **Course Code:12HSK17/27** | | **CIE Marks: 50** |
| **Hrs/Week: L:T:P:S: 1: 0: 0: 0** | | **SEE Marks:** |
| **Credits : Audit** | | **SEE Duration:** |

ಪರಿವಿಡಿ

೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ (ಇತಿಹಾಸ)
– ಡಾ. ಎಂ.ಚಿದಾನಂದ ಮೂರ್ತಿ
೨. ವಿಜ್ಞಾನ ಬರವಣಿಗೆಗಳ ಭಾಷಾಂತರ(ವಿಜ್ಞಾನ ಸಾಹಿತ್ಯ)
– ಜಿ. ಆರ್. ಲಕ್ಷ್ಮಣರಾವ್
೩. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ (ಕಾವ್ಯ)
– ಡಾ. ಡಿ.ವಿ. ಗುಂಡಪ್ಪ
೪. ರಾಧಾಕೃಷ್ಣನ್ (ವ್ಯಕ್ತಿಚಿತ್ರ)
– ಎ. ಎಸ್. ಮೂರ್ತಿರಾವ್
೫. ಕುವೆಲಸ ಭಾಗ್ಯ (ಸಣ್ಣಕಥೆ)
– ಮಾಸ್ತಿ ವೆಂಕಟೇಶಅಯ್ಯಂಗಾರ್
೬. ಎದೆಯಿಂದ ಹಾಡಿದೆನು (ಕಾವ್ಯ)
– ಡಾ. ಜಿ. ಎಸ್ ಶಿವರುದ್ರಪ್ಪ
೭. ? ? ? (ಮುಕ್ತ ಪ್ರಬಂಧ)
– 'ಗೌತಮ'
೮. ಮೂಲಿಗರರಾಜ್ಯದಲ್ಲಿ (ಜನಪದಕಥೆ)
೯. ವಚನ ಸಾಹಿತ್ಯ ಮತ್ತುದಾಸ ಸಾಹಿತ್ಯ
– ಸರ್ವಶ್ರೀ ಬಸವಣ್ಣ ಮತ್ತು ಪುರಂದರದಾಸರು
೧೦. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ (ವ್ಯಕ್ತಿಚಿತ್ರ)
– ಎಸ್. ರಾಮಮೂರ್ತಿ
೧೧. ರತ್ನನ್ ಪರ್ಯಂಟನ (ಪದ್ಯ)
– ಜಿ. ಪಿ.ರಾಜರತ್ನಂ
೧೨. ಶಲ್ಯ ಪರ್ವ (ಮಹಾಭಾರತದಒಂದು ಪ್ರಸಂಗ)
– ಎ. ಆರ್. ಕೃಷ್ಣಶಾಸ್ತ್ರಿ
೧೩. ಆಡಳಿತ ಕನ್ನಡ
– ಎಚ್. ಜಿ. ಶ್ರೀನಿವಾಸ ಪ್ರಸಾದ್

**MODILITY**

ಕನ್ನಡದ ಸಾಹಿತ್ಯದಲ್ಲಿನ ವಿವಿಧ ಪ್ರಕಾರಗಳನ್ನು ಪರಿಚಯಿಸಿಕೊಳ್ಳುವುದು; ಕನ್ನಡಓದು. ಬರಹದಪ್ರಾವೀಣ್ಯವನ್ನು ವಿಸ್ತರಿಸಿಕೊಳ್ಳುವುದು; ವಿವಿಧ ತಂತ್ರಜ್ಞಾನಗಳ ಕುರಿತುಬರಸಾಮರ್ಥ್ಯಗಳಿಗೆಅವಶ್ಯವಾಗುವಂತೆಕನ್ನಡದಲ್ಲಿ ಲೇಖನಗಳನ್ನು ಬರೆಯುವುದು; ಕನ್ನಡದ ಕೆಲವು ಸಾಹಿತಿಗಳನ್ನು ಪರಿಚಯಿಸಿಕೊಳ್ಳುವುದು; ಉತ್ತಮ ಮೌಲ್ಯಗಳನ್ನು ಬದುಕಿನಲ್ಲಿ ಅಳವಡಿಸಿಕೊಂಡು ಭವಿಷ್ಯವನ್ನು ರೂಪಿಸಿಕೊಳ್ಳುವುದು.

| Semester: II | | |
|---|---|---|
| **APPLIED MATHEMATICS - II** | | |
| **Course Code: 16MA21** | | **CIE Marks: 100** |
| **Hrs/Week: L:T:P:S: 3:1:0:4** | | **SEE Marks: 100** |
| **Credits: 05** | | **SEE Duration: 3Hrs** |

| **Course Learning Objectives: The students will be able to** | |
|---|---|
| **1** | Develop the knowledge of Differential and Integral calculus to functions of complex variable and thereby to be able to understand field problems in engineering. |
| **2** | Recognize and model differential equations, apply analytical techniques to compute solutions for engineering problems. |
| **3** | Learn to investigate the finding of approximate solutions using numerical methods in the absence of analytical solutions of various systems of equations. |
| **4** | Use mathematical IT tools, to analyze and visualize various concepts. |

| **UNIT-I** | |
|---|---|
| **COMPLEX ANALYSIS - I – COMPLEX DIFFERENTIATION**<br>Functions of complex variables, limit, continuity and differentiability, analytic function, Cauhy-Riemann(C-R) equations in Cartesian and polar forms, consequences, construction of analytic function – Milne-Thomson method (Cartesian and polar forms). Definition of conformal transformations, discussion of $w = z^2$, $e^z$ and $z + a^2/z$, $z \neq 0$ and bilinear transformations. | **08 Hrs** |

| **UNIT-II** | |
|---|---|
| **COMPLEX ANALYSIS - II – COMPLEX INTEGRATION**<br>Line integral, Cauchy's theorem (with proof), corollaries, Taylor's and Laurent's series, singularities, poles, calculation of residues, Residue theorem – problems. | **08 Hrs** |

| **UNIT-III** | |
|---|---|
| **LINEAR ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER**<br>Standard form of higher order linear differential equation with constant coefficients, concept of different types of solutions. Solution of homogeneous equations – complementary functions. Non homogeneous equations- Concept of Inverse differential operator ,methods of finding particular integral based on input function(force function), method of variation of parameters. Equations with functional coefficients – Cauchy and Legendre equations, solutions. Applications-Simple harmonic motion, LRC circuits. | **09 Hrs** |

| **UNIT-IV** | |
|---|---|
| **NUMERICAL METHODS - I**<br>Algebraic and Transcendental equations – roots of equations, intermediate value property, Regula-Falsi, Newton-Raphson and modified Newton-Raphson methods.<br>Methods of solving first order ordinary differential equation(ODE) – Taylor series method, modified Euler method, $4^{th}$ order Runge-Kutta metod, Milne predictor –corrector method. | **07 Hrs** |

| UNIT-V | |
|---|---|
| **NUMERICAL METHODS - II**<br>Finite differences, concept of forward and backward differences, introduction to interpolation(extrapolation). Newton-Gregory(N-G) forward and backward interpolation formulae, Lagrange interpolation formula, application oriented problems. Numerical differentiation based on N-G forward and backward interpolation, simple applications – velocity, acceleration.<br>Numerical integration- Newton-Cotes approach – Simpson'a $1/3^{rd}$ , $3/8^{th}$ rules and Weddle's rule. Gauss Quadrature approach – 2-point and 3-point formulae. | **08 Hrs** |

| **Expected Course Outcomes: After completing the course, the students will be able to** | |
|---|---|
| 1 | Demonstrate the understanding of properties of complex functions and define conformal transformation, classification and types of solutions of higher order linear differential equations, necessity of numerical methods and few basic definitions. |
| 2 | Solve homogeneous linear differential equations, use CR equations and related properties of complex functions, Cauchy's theorem and corollaries, interpolate data using finite differences and use intermediate value property. |
| 3 | Apply acquired knowledge to construct analytic function, use Cauchy integral formula and find Laurent's series, find derivatives and integrals of numerical data and solve differential equations numerically. |
| 4 | Estimate singularities and residues, solve problems using conformal transformations and applications of differential equations using both analytical and numerical methods. |

| **Text Books** | |
|---|---|
| 1. | B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, $40^{th}$ Edition, 2007, ISBN: 81-7409-195-5. |
| 2. | B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, $^{th}$ Edition, 2008, ISBN: 13-978-07-063419-0, ISBN: 10-0-07-063419-X. |
| **Reference Books** | |
| 1. | Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, $9^{th}$ Edition, 2007, ISBN: 978-81-265-3135-6. |
| 2. | M. K. Jain & S.R.K. Iyengar, Numerical Methods for Scientific and Engineering Computation, New Age International, $4^{th}$ Edition, ISBN: 81 -224 -1461-3. |

| **Continuous Internal Evaluation (CIE)<br>( Theory – 100 Marks)** | |
|---|---|
| Evaluation method | Course with Self-study |
| Quiz -1 | 10 |
| Test -1 | 25 |
| Quiz -2 | 10 |
| Quiz -3 | 10 |
| Test -2 | 25 |
| Self-study (EL) | 20 |
| Total | 100 |

| Semester End Evaluation<br>Theory (100) | |
|---|---|
| **Part- –A**<br>**Objective type questions** | **20** |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1**, **UNIT-4** and **UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** |
| **Total** | **100** |

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO10** | **PO11** | **PO12** |
| **CO1** | **H** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |
| **CO2** | **H** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |
| **CO3** | **H** | **H** | **M** | **L** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |
| **CO4** | **H** | **H** | **M** | **L** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **L** |

**High-3 : Medium-2 : Low-1**

| Semester: I/II | | |
|---|---|---|
| **Course Title: ENGINEERING CHEMISTRY ( Theory and practice)** | | |
| **Course Code: 16CH12/22** | | **CIE Marks: 100+50** |
| **Hrs/Week: L:T:P:S: 4:0:2:0** | | **SEE Marks:100+50** |
| **Credits:05** | | **SEE Duration(Theory) : 3hrs**<br>**SEE Duration(Lab) : 3hrs** |

**Course Learning Objectives: The students will be able to**

| | |
|---|---|
| **1** | Appreciate the basic concepts of chemistry behind the development of futuristic materials and their applications in Engineering and technology |
| **2** | Explain the Chemistry and processes involved in development of alternate and sustainable energy sources. |
| **3** | Learn to apply the knowledge of behaviour of materials that play a vital role in selection of materials and design of products in Engineering. |
| **4** | Understand the importance of natural resources and aim at solutions for sustenance of life. |
| **5** | Motivate to gain the knowledge of analytical techniques involved in the analysis and characterization of materials. |

**UNIT-I**

| | |
|---|---|
| **Natural Sources and their Chemistry**<br>**Water Technology:** Introduction, specification of potable water, Water analysis - Dissolved oxygen, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and numerical problems. Determination of different parameters-Hardness, alkalinity and fluoride. Numerical problems on hardness and alkalinity. Purification of Water- Desalination of water by Reverse Osmosis. Membrane technology: Use of polysulfone and polyurethane membranes for desalination process.<br>**Chemical Fuels:** Introduction, Definition, classification and importance of hydrocarbons as fuel, Calorific Value - Gross calorific value (GCV) and Net calorific value (NCV), Units. Determination of calorific value of a solid/liquid fuel using Bomb calorimeter and numerical problems. Alternate liquid Fuels - Biodiesel, Power Alcohol. Knocking - Meaning, reasons for Knocking and its prevention methods-Unleaded Petrol. Octane number, Cetane number. | **09 Hrs** |

**UNIT-II**

| | |
|---|---|
| **Electrochemical energy systems**<br>Introduction, Electrode Potential – Origin of Single Electrode Potential, Galvanic Cell - Signs & Conventions. Nernst Equation and numerical problems. Applications of Nernst equation- Potentiometric Titrations, $P^H$ determination.<br>Types of Electrodes - Metal-Metal-ion, Metal-gas, metal insoluble salt, Redox electrode, Ion selective electrode.<br>Construction and Working of Calomel electrode and Glass electrode. Determination of pH using Glass electrode and numerical Problems.<br>Applications of electrochemistry in biological systems: Nerve conduction.<br>**Battery Technology** – Characteristics and Classification – primary, secondary and Reserve batteries. Construction and Working of Lithium batteries- $LiCoO_2$.<br>**Fuel cells–** Classification based on electrolyte. Construction and working of Methanol-Oxygen fuel cell | **09 Hrs** |

**UNIT-III**

| | |
|---|---|
| **Corrosion Science and control**<br>**Corrosion Science**: Introduction, types, Dry corrosion & Wet corrosion with | **09** |

| | |
|---|---|
| examples, Electrochemical theory of corrosion with respect to Fe. Galvanic Series, Types of corrosion-Differential Metal Corrosion, Differential aeration corrosion, Pitting corrosion and Water line corrosion. Stress corrosion- Caustic embrittlement. Factors affecting the rate of corrosion- nature of metals, corrosion product, pH of the medium, Temperature, Polarization, Relative anodic & cathodic areas.<br>**Corrosion Control:**<br>Coating techniques: Chemical conversion coating, organic coating and Metallic coating. Chemical conversion coating-Phosphating, Anodising. Organic coating-Paints, Enamels, and Lacquers. Metallic coating-Introduction-anodic and cathodic coating, Technological importance.<br>**Electroplating** - Introduction, Principle, Factors influencing nature of deposition, Chrome Plating.<br>**Electroless plating**- Introduction, Principle, Distinction between electro plating and electroless plating.<br>Application: Electroless plating of Cu-Fabrication of PCB. | **Hrs** |
| **UNIT-IV** | |
| **Nanomaterials Chemistry**<br>Introduction to Nanomaterials/Science/Technology, Defining nano dimensional materials –Atom, cluster, nano materials, micro materials, and bulk. Properties of Nanomaterials in comparison to bulk: Surface area, Optical, Magnetic, Electrical. Mechanical etc.<br>**Synthesis of Nanomaterials**: SCS for metal oxide, Sol-Gel- for $TiO_2$ nanoparticles Carbon Nano materials:<br>**Carbon nanotubes**: Introduction, different forms, doping, preparation, functionalization, properties and applications.<br>**Graphene**: Introduction, Preparation, properties and applications.<br>**Nano materials for Energy conversion devices**: Semiconductor nanostructure like $TiO_2$, CdS for photovoltaics and photo electrochemical cells, Optical properties, Band gap Modulation with nano size with above examples.<br>**Nanomaterials for LED**: Introduction, Construction and working of inorganic/organic LED with nanomaterials. | **09 Hrs** |
| **UNIT-V** | |
| **Polymeric materials**<br>Introduction to polymer, Methods of Polymerisation, glass transition temperature, factors affecting Tg.<br>**Thermo plastic polymers**: Polycarbonate, ABS preparation, and specific applications in industries.<br>**Thermosetting polymers**: Epoxy resin, phenol formaldehyde synthesis, properties and applications<br>**Biodegradable polymers:** Introduction and their requirements.<br>Properties and synthesis of Poly lactic acid and poly caprolactum.<br>Applications of biodegradable polymers in medical industry.<br>**Smart Polymeric materials**<br>**Conducting polymers:** Introduction, requirements for conducting polymers, mechanism of conduction, synthesis of poly aniline and polypyrrole, use of conducting polymers in energy harvesting, sensing and defence applications.<br>**Photo conducting polymers:** Synthesis of poly vinyl carbazole applications of photo-conducting polymers in printing.<br>**Synthetic Fibres:** Synthesis of carbon fibre from PAN, applications of carbon fibre in polymer composites. | **09 Hrs** |

| PRACTICALS | |
|---|---|
| **Volumetric Analysis and Preparations**<br>1. Determination of hardness of water sample.<br>2. Determination of calcium oxide in the given sample of cement solution (Rapid EDTA method)<br>3. Estimation of percentage of copper in brass.<br>4. Estimation of iron in the given sample of haematite ore.<br>5. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.<br>6. Determination of Dissolved Oxygen in the given water sample by Winkler's method.<br>7. Preparation of polystyrene by bulk polymerization method.<br>8. Preparation of MgO by solution combustion method.<br>**Instrumental methods of Analysis**<br>1. Determination of pKa of a weak acid using pH meter.<br>2. Potentiometric titration – Estimation of FAS using standard $K_2Cr_2O_7$ solution.<br>3. Colorimetric estimation of copper.<br>4. Conductometric estimation of HCl using standard NaOH solution.<br>5. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer (density of the liquid to be given).<br>6. Flame photometric estimation of sodium in the given solution.<br>7. Determination of relative and kinematic viscosities of a given lubricating oil at different temperatures using Redwood Viscometer.<br>8. Determination of $T_g$ of polymer using DSC. | |

| **Expected Course Outcomes: After completing the course, the students will be able to** | |
|---|---|
| **1** | Explain the principles of Chemistry in Engineering. (L1) |
| **2** | Apply the knowledge of Chemistry in solving societal problems related to public health, safety and environmental issues. (L2, L3) |
| **3** | Identify, analyze and interpret engineering problems associated with chemistry to achieve solutions. (L3,L4) |
| **4** | Develop solutions for problems associated with water, fuel, corrosion, battery, nonmaterial and polymer technologies. (L4) |
| **Text Books** | |
| **1** | R V Gadag and A Nityananda Shetty, "Engineering Chemistry", I K Internation publishing house, Second Edition. ISBN- 9380578598, 9789380578590 |
| **2** | Jain & Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 15th Edition -2007. ISBN: 13:9788-19041-0861. |
| **3.** | Satyanarayana S and H C Shashidhara, Engineering Chemistry" Himalaya Publishing house" Edition-2011, ISBN-9789350514986 |
| **Reference Book** | |
| **1** | Shubha Ramesh et.al., "Engineering Chemistry", Wiley India, 1st Edition, 2011, ISBN: 978-81-265-1988-0. |

| Continuous Internal Evaluation (CIE) | | | | |
|---|---|---|---|---|
| **( Theory – 100 Marks)** | | **(Laboratory- 50 Marks)** | | **Total (150)** |
| **Evaluation method** | **Course with assignment** | | | |
| Quiz -1 | 10 | Performance of the student in the laboratory, every week | 40 | |
| Test -1 | 30 | | | |
| Quiz -2 | 10 | | | |
| Quiz -3 | 10 | Test at the end of the semester | 10 | |
| Test -2 | 30 | | | |
| Assignments | 10 | | | |
| **Total** | **100** | **Total** | **50** | **150** |

| Semester End Evaluation (SEE) | | | | |
|---|---|---|---|---|
| **Theory (100 Marks)** | | **Laboratory(50 Marks)** | | **Total (150)** |
| **Part- –A**<br>**Objective type questions** | **20** | **Experiment Conduction with proper results** | **40** | |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1, UNIT-4 and UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** | **Viva** | **10** | |
| | | **Total** | **50** | **150** |
| **Total** | **100** | | | |

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | H | | | | | | | | | | | |
| **CO2** | H | | | | | M | M | | | L | | |
| **CO3** | | H | | M | | | | | | | | M |
| **CO4** | | | H | | | L | L | | | | | M |

**High-3: Medium-2: Low-1**

| Semester: I/II | | |
|---|---|---|
| **Course Title: PROGRAMMING IN C (Theory and practice)** | | |
| **Course Code:16CS13/23** | | **CIE Marks: 100 + 50** |
| **Hrs/Week: L:T:P:S: 4:0:1:0** | | **SEE Marks: 100 + 50** |
| **Credits:05** | | **SEE Duration(Theory):3Hrs**<br>**SEE Duration(Laboratory):3Hrs** |

| **Course Learning Objectives: The students will be able to** | |
|---|---|
| **1** | Develop arithmetic reasoning and analytical skills to apply knowledge of basic concepts of programming in C to complex engineering problems |
| **2** | Learn basic principles of problem solving through programming. |
| **3** | Write C programs using appropriate programming constructs adopted in programming. |
| **4** | Solve complex problems using C programming. |

| **UNIT-I** | |
|---|---|
| **Introduction to Reasoning, Algorithms and Flowcharts**<br>Skill development – Examples related to Arithmetical Reasoning and Analytical Reasoning. Fundamentals of algorithms and flowcharts. | **04 Hrs** |
| **Introduction to C programming**<br>Programming paradigms, Basic structure of C program, Process of compiling and running a C program, Features of C language, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types. | **03 Hrs** |
| **Handling Input and Output operations**<br>Reading a character, Writing a character, Formatted input/output functions, Unformatted input/output functions. | **03 Hrs** |
| **UNIT-II** | |
| **Operators and Expressions**<br>Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and decrement operators, Conditional operators, Bit-wise operators, Special operators, Arithmetic expressions, evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity. | **03 Hrs** |
| **Programming Constructs**<br>**Decision Making and Branching**<br>Decision making with 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, The '*?:'* operator, The '*goto'* statement.<br>**Decision making and looping** The while statement, the do statement, The 'for' statement, Jumps in loops**.** | **06 Hrs** |
| **UNIT-III** | |
| **Arrays**<br>One dimensional arrays, Declaration of one dimensional arrays. Initialization of one dimensional arrays, Two dimensional arrays, Initializing two dimensional arrays. | **05 Hrs** |
| **Character Arrays and Strings**<br>Declaring and Initializing String Variables, Reading Strings from Terminal, Writing strings to screen, Arithmetic Operations on characters, String operations using with and without String handling functions. | **04 Hrs** |
| **UNIT-IV** | |
| **User-defined functions**<br>Need for User Defined Functions, A Multi-Function program, Elements of user defined functions, Definition of functions, Return values and their types, | **05 Hrs** |

| | |
|---|---|
| Function calls, Function declaration, Category of functions, Nesting of functions, Functions with arrays, Storage classes. | |
| **Structures and Unions**<br>Introduction, Structure definition, Declaring structure variables, Accessing structure members, Structure initialization, Copying and comparing structure variables, Arrays of structure, Arrays within structures, Structure within structures, Structures and functions, Unions, Pre-processor directives. | **05 Hrs** |
| **UNIT-V** | |
| **Pointers and Dynamic Memory Allocation**<br>Introduction , Accessing the address of a variable, Declaring and initializing of pointer variables, Accessing a variable using pointers, Chain of pointers, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Dynamic memory allocation methods. | **05 Hrs** |
| **File Managements in C**<br>Basic concepts of files, Defining and opening a file, closing of a file, Input/Output operations on files.<br>**Introduction to Data Structures:** Linear and Non-Linear data structures, Definition and applications of Stacks, Queues. | **05 Hrs** |

| **Expected Course Outcomes: After completing the course, the students will be able to** | |
|---|---|
| **1** | Understand and explorethe fundamental computer concepts and basic programming principles like data types, input/output functions, operators, programming constructs and user defined functions. |
| **2** | Analyze and Develop algorithmic solutions to problems. |
| **3** | Implement and Demonstrate capabilities of writing 'C' programs in optimized, robust and reusable code. |
| **4** | Apply appropriate concepts of data structures like arrays, structures, stacks and Queues to implement programs for various applications. |
| **Text Books** | |
| **1** | P. Dey, M. Ghosh, "Programming in C", Oxford University press, First Edition, 2007, ISBN (13): 9780195687910. |
| **2** | Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", Second Edition, Prentice Hall, 2005, ISBN (13): 9780131101630. |
| **Reference Books** | |
| **3** | Yashavant P. Kanetkar. "Let Us C", BPB Publications, 14th edition, 2016, ISBN-13: 9788183331630. |
| **4** | H. Schildt, Turbo C: The Complete Reference, Mcgraw Hill Education, 4th Edition, 2000, ISBN-13: 9780070411838. |
| **5** | Yashavant P. Kanetkar, "Understanding Pointers in C", BPB publications, 4thedition, 2003, ISBN-13: 978-8176563581. |

**Laboratory Component:**

**Part - A**

1. Write a C program to find and output all the roots of a given quadratic equation, for non-zero coefficients. (Using *if…else* statement).
2. Write a C program to simulate a simple calculator that performs arithmetic operations like addition, subtraction, multiplication, and division only on integers. Error message should be reported, if any attempt is made to divide by zero. (Using *switch* statement).

3. Write a C program
   i) To check whether a given integer number is a Palindrome number or not.
   ii) To check whether a given integer number is an Armstrong number or not.

   Output the given number with suitable message (using looping constructs).
4. Write a C program
   i) To generate and print first N Fibonacci numbers
   ii) To find GCD and LCM of two integer numbers.
5. Write a C program to generate Pascal's triangle and Floyd's Triangle.
6. Write a C program to input N integer numbers into a single dimension array. Sort them in ascending order using bubble sort technique. Print both the given array and the sorted array with suitable headings.
7. Write a C program to read two matrices A (M x N) and B (P x Q) and compute the product of A and B after checking compatibility for multiplication. Output the input matrices and the resultant matrix with suitable headings and format. (Using two dimension arrays where array size M, N, P, Q $\leq$ 3).
8. Write a C program to read a matrix A(M x N) and to find the following
   i) Sum of the elements of the row
   ii) Sum of the elements of the column
   iii) Sum of all the elements of the matrix
   iv) Sum of both diagonal elements of a matrix
   v) Transpose of a matrix.

   Output the computed results with suitable headings.
9. Write C user defined functions
   i) To input N real numbers into a single dimension array.
   ii) Compute their mean.
   iii) Compute their variance
   iv) Compute their standard deviation
10. Write a C program
    i) To check whether a given input string is a palindrome or not.
    ii) To find the number of vowels, consonants, digits and white space in a string.
11. Write C user defined functions
    i) To input N integer numbers into a single dimension array.
    ii) To conduct a Binary search.

    Using these functions, write a C program to accept the N integer numbers & given key integer number and conduct a Binary search. Report success or failure in the form of a suitable message.
12. Write C user defined functions
    i) To input N integer numbers into a single dimension array.
    ii) To sort the integer numbers in descending order using selection sort technique.
    iii) To print the single dimension array elements.

    Using these functions, write a C program to input N integer numbers into a single dimension array, sort them in ascending order, and print both the given array & the sorted array with suitable headings.
13. Create a structure called student with the following members student name, roll-no, marks in three tests. Write a C program to create N records and
    i) Search on roll-no and display all the records
    ii) Average marks in each test
    iii) Highest in each test.

14. Write a C program to copy a string using pointers, to compare two strings using pointers and to concatenate two strings using pointers.
15. Write a C program to count no of lines, blank lines and comments in a given program using files.

**Part – B**

Students have to execute application programs related to the following topics such as:

(a) Arrays
(b) Structures
(c) Pointers
(d) Files
(e) Stacks
(f) Queues
(g) Recursion
(h) Strings

<table>
<tr><th colspan="2">Continuous Internal Evaluation<br>( Theory – 100 Marks)</th><th colspan="2" rowspan="2">Continuous Internal Evaluation<br>(Laboratory- 50 Marks) *</th><th rowspan="2">Total<br>(150)</th></tr>
<tr><th>Evaluation method</th><th>Course with assignment</th></tr>
<tr><td>Quiz -1</td><td>10</td><td rowspan="3">Performance of the student in the laboratory,every week</td><td rowspan="3">40</td><td rowspan="6"></td></tr>
<tr><td>Test -1</td><td>30</td></tr>
<tr><td>Quiz -2</td><td>10</td></tr>
<tr><td>Quiz -3</td><td>10</td><td rowspan="2">Testat the end of the semester</td><td rowspan="2">10</td></tr>
<tr><td>Test -2</td><td>30</td></tr>
<tr><td>Assignment</td><td>10</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Total</td><td>100</td><td>Total</td><td>50</td><td>150</td></tr>
</table>

** The lab component consists of two parts( Part A and Part B). Students will be given one program each from the above Part A list and Part B list. In Part B, students may get any one application program from the topics such as Arrays, Structures, Pointers, Files, Stacks and Queues, Recursion and Strings. Students have to execute both the programs. The total marks for solving two programs are 40 marks. 70% of the total marks (40) will be for Part-A programs and 30% of the total marks (40) will be for Part-B programs. Viva voce will be for 10 marks .The total marks will be 50. Marks obtained will be reduced to 10 marks. The Continuous Internal Evaluation (CIE) will be for 40 marks. So the total marks will be 50.*

<table>
<tr><th colspan="5">Semester End Evaluation (SEE)</th></tr>
<tr><th colspan="2">Theory (100)</th><th colspan="2">Laboratory(50) **</th><th>Total (150)</th></tr>
<tr><td>Part- –A<br>Objective type questions</td><td>20</td><td>Experiment Conduction with proper results</td><td>40</td><td rowspan="4"></td></tr>
<tr><td rowspan="2">Part –B<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br>The UNIT-1, UNIT-4 and UNIT-5 should not have choice.<br><br>The UNIT-2 and UNIT-3 should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom’s taxonomy level.</td><td rowspan="2">80</td><td>Viva</td><td>10</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Total</td><td>100</td><td>Total</td><td>50</td><td>150</td></tr>
</table>

*** The lab component consists of two parts( Part A and Part B). Students will be given one program each from the Part A list and Part B list. In Part B, students may get any one application program from the topics such as Arrays, Structures, Pointers, Files, Stacks and Queues, Recursion and Strings. Students have to execute both the programs. The total marks for solving two programs are 40 marks. 70% of the total marks (40) will be for Part-A programs and 30% of the total marks (40) will be for Part-B programs. Viva voce will be for 10 marks .The total marks will be 50.*

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO10** | **PO11** | **PO12** |
| **CO1** | H | M | M | M | L | - | - | - | - | M | - | L |
| **CO2** | H | M | M | M | M | - | - | - | M | L | - | L |
| **CO3** | H | M | M | M | M | L | L | - | M | M | L | M |
| **CO4** | H | H | H | M | M | L | L | - | M | M | L | M |

**High-3: Medium-2: Low-1**

| Semester: I/II | | |
|---|---|---|
| **Course Title: BASICS OF ELECTRONICS ENGINEERING** | | |
| **Course Code: 16EC14/24** | | **CIE Marks: 100** |
| **Hrs/Week: L:T:P:S : 4:0:0:4** | | **SEE Marks: 100** |
| **Credits: 05** | | **SEE Duration : 03 Hrs** |

**Course Learning Objectives: The students will be able to**

| | |
|---|---|
| **1** | Explain the operation of simple devices like Diode, Bipolar Transistor, MOSFET, Zener diode based on physical principles and Analyze simple circuits using diodes, transistors and MOSFETS. |
| **2** | Design simple rectifier, Zener regulator circuits, biasing circuits for obtaining the desired operating point to meet the required specifications. |
| **3** | Analyze how a transistor could be used as an amplifier and as an oscillator. |
| **4** | Evaluate the advantages of providing negative feedback in amplifiers and Design simple circuits like amplifiers, comparators and summers using operational amplifiers. |
| **5** | Analyze the block diagram of a general communication system and explain different types of modulation techniques. |
| **6** | Compile the different building blocks in digital electronics and Implement simple logic functions after simplifying logic expressions. |

**UNIT-I**

| | |
|---|---|
| **Introduction to Electronics:** Inventions and Technology growth.<br>**Digital Logic:**<br>Boolean Algebra, Simplification of logic expressions, Basic and Universal Logic gates, Half/Full adder, Multiplexer/De-multiplexer and Encoder/Decoder.<br>**Semiconductor Diodes:**<br>P-N junction diode, V-I characteristics, Diode parameters, Concept of load line, Temperature effects and Small signal equivalent circuit. Numerical examples. | **09 Hrs** |

**UNIT-II**

| | |
|---|---|
| **Diode Applications**: Block diagram of a DC Power supply, Line & load regulations, Bridge rectifier analysis with and without Capacitor Filter. Numerical examples.<br>Operation and V-I Characteristic of Zener diode. Voltage Regulator using a Zener diode. Numerical Examples.<br>Working Principles and Applications of Photo diodes and LEDs.<br>**Bipolar Junction Transistor:**<br>Bipolar Junction Transistor, input and output characteristics, DC load line and Operating Point. Design of Fixed base current and Voltage divider biasing circuits. Bias Stability and Stabilization factor, S($I_{CO}$). | **09 Hrs** |

**UNIT-III**

| | |
|---|---|
| **Transistor Applications**: Small signal equivalent circuit, Transistor as a switch and as an amplifier in CE configuration. Gain in dBs, Frequency response and Bandwidth.<br>Numerical Examples.<br>**MOSFET:**<br>MOSFET Enhancement type, operation and characteristics, small signal equivalent, MOSFET as an amplifier and as a switch, CMOS Inverter and CMOS NAND.<br>**Feedback and Oscillators:** | **09 Hrs** |

| | |
|---|---|
| Advantages of Negative Feedback, Barkhausen criterion for oscillations, RC phase shift and Crystal oscillator circuits. Numerical Examples. | |
| **UNIT-IV** | |
| **Operational Amplifiers:**<br>Characteristics of an Ideal Op Amp, Typical parameters of a practical op amp. Applications: Inverting and Non Inverting amplifiers, Voltage follower, Summer, Integrator, Differentiator, Difference amplifier, Instrumentation amplifier Comparator and Schmitt trigger. Numerical Examples.<br>**Data Acquisition Systems:**<br>Block Diagram of a Data Acquisition System, Sensors, Operating principles of Resistive, Piezo-electric, Capacitive and Thermo-electric Sensors.<br>Principles of Data converters (Analog to Digital and Digital to Analog converters). | **09 Hrs** |
| **UNIT-V** | |
| **Communication Systems:**<br>Electromagnetic spectrum, General block diagram of a communication system, Need for modulation, Significance of bandwidth, AM and FM systems.<br>Numerical examples.<br>Basics of Digital Communication, Keying techniques, Pulse Modulation techniques, Block diagram of a Digital Signal Processing and applications. | **09 Hrs** |

**Expected Course Outcomes: After completing the course, the students will be able to**

| | |
|---|---|
| **1.** | Understand the operation and the characteristics of the semiconductor devices, Operational Amplifiers, Communication Systems and Digital logic for various applications. |
| **2.** | Apply and analyze circuits for applications like rectifiers, Zener regulators, DC power supply, amplifiers, oscillators, summers, comparators and electronic systems. |
| **3.** | Conduct investigation through experiential learning and literature survey to bring out safety, societal and environmental considerations. |
| **4.** | Evaluate the performance of the electronic circuits to meet given specifications using modern IT tools and present the outcomes. |

| **Text Books** | |
|---|---|
| **1** | Robert L Boylestad, Louis Nashelsky; "Electronic Devices and Circuit Theory"; Prentice Hall India Publication; 10th Edition; 2009; ISBN: 978-81-317-2700-3 |
| **2** | Louis E. Frenzel, "Principles of Electronic Communication Systems", McGraw Hill Education Publication; 6th Edition; 2012; ISBN-13: 978-0-07-066755-6 |
| **Reference Books** | |
| **1** | D.V.S Murthy, "Transducers & Instrumentation", Prentice Hall Publication, 2nd Edition, 2008, ISBN:978-81-203-3569-1 |
| **2** | Morris Mano; "Digital Logic and Computer Design"; Prentice Hall Publication; 54th Edition; 2007; ISBN: 978-81-317-1450-8 |

| Continuous Internal Evaluation (CIE)<br>(Theory – 100 Marks) | |
|---|---|
| **Evaluation method** | **Course with Self-study** |
| Quiz -1 | 10 |
| Test -1 | 25 |
| Quiz -2 | 10 |
| Quiz -3 | 10 |
| Test -2 | 25 |
| Self-study (EL) | 20 |
| **Total** | **100** |

| Semester End Evaluation<br>(Theory-100 Marks) | |
|---|---|
| **Part- –A**<br>**Objective type questions** | **20** |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1, UNIT-4 and UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** |
| **Total** | **100** |

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | H | M | M | - | L | - | - | - | - | - | - | - |
| **CO2** | M | H | H | M | L | - | - | - | - | - | - | - |
| **CO3** | L | H | L | H | M | - | H | - | M | - | - | H |
| **CO4** | L | M | L | M | H | - | - | - | - | H | - | - |

**High-3: Medium-2: Low-1**

| Semester: I / II | | |
|---|---|---|
| **Course Title: BASICS OF MECHANICAL ENGINEERING (Theory and Practice)** | | |
| **Course Code: 16ME15/25** | | **CIE Marks:100+50** |
| **Hrs/ week: L:T:P:S: 4:0:2:0** | | **SEE Marks:100+50** |
| **Credits:05** | | **SEE Duration(Theory): 3 Hrs**<br>**SEE Duration(Laboratory): 3 Hrs** |

**Course Learning Objectives: The students will be able to**

| | |
|---|---|
| **1** | Understand conventional methods of generation of energy and functions of different subsystems of energy generation cycles |
| **2** | Compute the properties of steam in different phases and estimate the performance parameters of IC Engines |
| **3** | Familiarize with the working of steam turbines, hydraulic turbines, gas turbines, IC Engines, Refrigeration cycles, Machine tools, belt and gear drives, soldering and welding |
| **4** | Develop models involving machining, Build sheet metal models and demonstrate soldering and welding skills |

| **UNIT I** | |
|---|---|
| **Properties of Steam and Steam turbines :** Steam generation, properties of steam in different phases, computation of properties of steam using steam tables - Numericals, Classification of steam turbines (Impulse and Reaction turbines), working of steam turbines, comparison of steam turbines.<br>**Hydraulic Turbines and Gas turbines:** Working of Pelton, Francis and Kaplan turbines and their comparison, working of gas turbine cycles, Simple Brayton cycle for gas turbines, Open and Closed gas turbine cycles, Functions of gas turbine cycle components such as turbine, combustion chamber, compressor and condenser | **9 Hrs** |
| **UNIT –II** | |
| **Internal Combustion Engines:** Classification, Working of two stroke and four stroke petrol and diesel engines, Otto cycle, Diesel cycle, computation of performance parameters such as Brake Power, Indicated Power, Mean Effective Pressure, Brake thermal efficiency, Indicated thermal efficiency and specific fuel consumption - Numericals<br>**Refrigeration:** Refrigeration effect, working of vapour compression and vapour absorption refrigeration systems, CoP, Ton of refrigeration, comparison of vapour compression system with vapour absorption system, Refrigerants and their properties | **9 Hrs** |
| **UNIT -III** | |
| **Machine Tools -** Classification of lathe, Specifications of lathe, Lathe operations - thread cutting, knurling and drilling<br>**Drilling** - Classification of drilling machines, working of radial drilling machine, drilling operations Concept of CNC machines, Advantages of CNC machines over Conventional Machines | **9 Hrs** |
| **UNIT -IV** | |
| **Milling** - Classification of Milling machines, working of horizontal milling machine, milling operations, **Grinding** - Classification of grinding machines, working of surface, | **9 Hrs** |

| | |
|---|---|
| **Joining Processes:** Classification of welding processes, working of arc welding and gas welding processes. Soldering, types of solders and fluxes cylindrical and centre less grinding machines | |
| **UNIT -V** | |
| **Power Transmission** - Types of Belt drives, Flat belt drive, open and cross belt drive, Derivation for length of belt in open and cross belt drives, Derivation for ratio of tension in belts, velocity ratio, creep, slip and idler pulley - Numericals<br>**Gear Drives** - Classification of Gears, simple and compound gear train - Numericals | **8 Hrs** |

| **Mechanical Engineering Practice Lab** | |
|---|---|
| **Lathe operations:** Preparation of models using MS rods - Plain Turning, Step turning, taper turning, Knurling - Three Models | **13 Hrs** |
| **Sheet metal work:** Preparation of sheet metal models - Cone, cylinder, prism, pyramid and their frustums with soldering | **12 Hrs** |
| **Arc Welding:** Preparation of Lap and Butt joints | **02 Hrs** |
| **Demonstration:** IC Engines and Hydraulic Turbines, Fitting | **02 Hrs** |
| **Expected Course Outcomes: After completing the course, the students will be able to** | |
| **1** | Explain conventional methods of generation of energy and functions of different subsystems of energy generation cycles and working principles of machine tools, energy generation and refrigeration systems (L2) |
| **2** | Analyze properties of steam in different phases, Examine performance parameters of IC Engines, compute parameters such as length and tension of belt drives (L3, L4) |
| **3** | Build sheet metal models and demonstrate soldering and welding skills (L3) |
| **4** | Develop models involving machining. (L5) |
| **Text Book** | |
| **1** | Gopalakrishna K R, "A Text Book of Elements of Mechanical Engineering", 30th Edition, Subhash Publishers, ISBN - 13, 1234567153375, |
| **Reference Books** | |
| **1** | Trymbaka Murthy S, "A Text Book of Elements of Mechanical Engineering", I K International Publishing House Pvt. Ltd., III New Edition, 2008, ISBN: 9380578571 |
| **2** | Choudhury S K H, Coudhury A K H and Nirjhar Roy, "Elements of Workshop Technology", Vol. 1, Media Promoters and Publishers, XIII Edition, 2013 |
| **3** | Groover M P, Zimmer E W, "CAD / CAM",Pearson Education Ltd., V Edition, ISBN: 5788177584165, 2008 |

| **Continuous Internal Evaluation (CIE)** | | | | |
|---|---|---|---|---|
| **( Theory – 100 Marks)** | | **(Laboratory- 50 Marks)** | | **Total (150)** |
| **Evaluation method** | **Course with assignment** | | | |
| Quiz -1 | 10 | Performance of the student in the laboratory, every week | 40 | |
| Test -1 | 30 | | | |
| Quiz -2 | 10 | | | |
| Quiz -3 | 10 | Test at the end of the semester | 10 | |
| Test -2 | 30 | | | |
| Assignments | 10 | | | |
| **Total** | **100** | **Total** | **50** | **150** |

| Semester End Evaluation (SEE) | | | | |
|---|---|---|---|---|
| **Theory (100)** | | **Laboratory(50)** | | **Total (150)** |
| **Part- –A**<br>**Objective type questions** | **20** | **Experiment Conduction with proper results** | **40** | |
| **Part –B**<br>There should be five questions from five units. Each question should be for maximum of 16 Marks.<br><br>The **UNIT-1, UNIT-4 and UNIT-5** should not have any choice.<br><br>The **UNIT-2 and UNIT-3** should have an internal choice.<br>Both the questions should be of the same complexity in terms of COs and Bloom's taxonomy level. | **80** | **Viva** | **10** | |
| **Total** | **100** | **Total** | **50** | **150** |

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO10** | **PO11** | **PO12** |
| **CO1** | H | M | M | - | - | L | - | - | - | - | - | - |
| **CO2** | M | M | M | M | - | - | - | - | - | - | - | - |
| **CO3** | H | H | M | L | - | - | - | - | - | - | - | - |
| **CO4** | H | H | M | M | - | - | - | - | - | - | - | - |

**High-3: Medium-2: Low-1**

| Semester: I/II | | |
|---|---|---|
| **Course Title: PROFESSIONAL PRACTICE-I (COMMUNICATIVE ENGLISH)** | | |
| **Course Code:16HSE16/26** | | **CIE Marks: 50 marks** |
| **Hrs/Week: L:T:P:S : 2 hrs** | | **SEE Marks: 50 marks** |
| **Credits: Audit** | | **SEE Duration** |

| Course Learning Objectives: To enable the students in concepts and application of English language skills | |
|---|---|
| 1 | Techniques of effective reading, effective reading techniques (Skimming, Scanning and Detailed) |
| 2 | Interpreting factual information, interpreting gist/summary |
| 3 | Listening techniques to comprehend spoken English in various accents |
| 4 | English speaking in contextual scenarios |
| 5 | Explaining a process, Exchanging information, Comparing and contrasting and Making an inquiry. |
| 6 | POWER technique to compose and edit messages for given context with proper vocabulary and punctuation |
| 7 | Identify fossilized errors in spoken and written English and help them to identify areas of improvement |

| **UNIT-I** | |
|---|---|
| Formal and informal introduction method of introducing oneself; formal, neutral and informal writing styles; applying techniques to express about oneself through spoken and written forms. Applying reading skills to interpret visual data; applying listening skills to recall specific information; Sentence corrections. | 4 Hrs |
| **UNIT-II** | |
| Techniques to improve listening and reading skills; applying the techniques learnt in contextual exercises. Skimming and scanning techniques in reading comprehension; Usage of tenses; parallel construction; homophones and usage of right words in the given contexts. | 4 Hrs |
| **UNIT-III** | |
| Fossilization errors in spoken English; POWER- technique of writing; Pronoun errors and misplaced modifiers. Commonly used terms in business; structure of emails and its key elements; subject verb agreement; Practice exercises to apply the techniques learnt. | 4 Hrs |
| **UNIT-IV** | |
| Applying speaking skills to present a product; structure of formal letter; usage of modal verbs. Expressions during collaborative discussions; commonly used business vocabulary; expressions related to degree of possibility. | 4 Hrs |
| **UNIT-V** | |
| Practice exercises for listening and phonetics. | 2 Hrs |

| **Expected Course Outcomes:** After completing the course, the students will be able to | |
|---|---|
| CO1 | Describe techniques of effective reading |
| CO2 | Interpreting factual information and gist/summary |
| CO3 | Apply reading techniques in practice exercises |
| CO4 | Apply listening techniques to comprehend spoken English in various accents |
| CO5 | Apply English speaking skills in contextual scenarios |
| CO6 | Demonstrate power technique to compose and edit messages for given context with proper vocabulary and punctuation |
| **Text Books** | |
| 1 | Mark Ibbotson, Professional English in Use - Technical English for Professionals, 1st ed. Cambridge: UK, Cambridge University Press, 2009. |
| 2 | Leo Jones and Richard Alexander, New International Business English Workbook, 2nd ed.(revised), Cambridge: UK, Cambridge University Press, 1996 |
| 3 | Simon Sweeny, English For Business Communication, 2nd ed., Cambridge: UK, Cambridge University Press, 2003 |
| 4 | Murphy, Intermediate English Grammar - With Answers, 2nd ed., Asia, Cambridge University Press, 2007 |

| **Scheme of Continuous Internal Evaluation (CIE)** |
|---|
| CIE consists of three tests each for 25 marks (10 marks or grammar & Vocabulary, 5 arks or Reading, 5 marks for speaking and 5 marks for listening) out of which best of two will be considered. The tests component will have 25 marks in CIE. |

| **Scheme of Semester End Evaluation (SEE)** |
|---|
| The question paper consists of 5 parts that is Reading, Speaking, Writing and Grammar each for 10 marks. For grammar part the questions will be multiple choice questions, for reading part a comprehension along with the questions related to that would be given. For listening audios will be played and questions related to that will be given. For speaking each student will be provided with a topic. |

| **CO-PO Mapping** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/PO** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| **CO1** | | | | | | | | | | H | | |
| **CO2** | | | | | | | | | | H | | |
| **CO3** | | | | | | | | | | H | | |
| **CO4** | | | | | | | | | | H | | |
| **CO5** | | | | | | | | | | H | | |
| **CO6** | | | | | | | | | | H | | |

**High-3 : Medium-2 : Low-1**