# Dr. Ambedkar Institute of Technology

## Department of Industrial Engineering and Management

The Enclosed Document is Verified and Approved.

**HOD**

**Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY**
**BANGALORE - 56**
**AIDED BY GOVERNMENT OF KARNATAKA**
**&**
**AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,**



**PROPOSED SYLLABUS**

**For**

**III & IV Semester**
**(FOR THE ACADEMIC YEAR 2021-2022)**
**(Batch 2020)**

**Department of Industrial Engineering & Management**

**Website: www.drait.edu.in**                    **e-mail id: principal@drait.edu.in**
**Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY**
**BANGALORE - 56**
**AIDED BY GOVERNMENT OF KARNATAKA**
**&**

**AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,**

*Vision*

- To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

*Mission*

- To offer state-of-the-art undergraduate, postgraduate and doctoral programs in the fields of Engineering, Technology And Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industry requirements.
- To install moral and ethical values with social and professional commitment.

# Department of Industrial Engineering & Management

*Objective*

- ➢ To maintain a Comprehensive curriculum that enables students to become leading engineers and creative researchers in the global marketplace.

- ➢ To collaborate with private and public sectors in the search of methodologies and creative solutions to problems that contributes to the advancement of education, technology and professional development.

- ➢ To contribute to the profitable growth of industrial economic sectors by using IE analytical tools, effective computational approaches, and systems thinking methodologies.

- ➢ To maintain high standards of professional and ethical responsibility.

- ➢ To provide a broad education necessary to determine the impact of engineering solutions in a global economic, environmental, a societal context.

*Vision:*

- ✚ To be globally recognized as a leader in industrial engineering education, research and enhance the application of technical knowledge to benefit the society.

*Mission:*

- ✚ To offer globally recognized programs that equip graduates with strong problem solving ability in the design, analysis and implementation of integrated systems in manufacturing and service sectors.

- ✚ Create state-of-the-art infrastructure for research and training in Industrial Engineering

- ✚ Promoting collaboration with academia, industries and Research organizations at national and international levels for socioeconomic development

# Program Outcomes (POs)

1. Ability to apply knowledge of mathematics, science and engineering.

2. Ability to design and conduct experiments related to deterministic or stochastic systems, as well as to analyze and interpret data.

3. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

4. Ability to identify, formulate and solve Industrial and Management Systems Engineering problems.

5. Student will be able to use modern industrial Engineering and management tools necessary for engineering practice.

6. Ability to determine the impact of engineering solutions in a global, economic, environmental, and societal context.

7. Determine the major environmental, social and economic drivers pertaining to the necessity of developing sustainable operations.

8. Student will exhibit professionalism and ethical responsibility.

9. Effectively collaborate and function on multidisciplinary teams.

10. Student will be able to communicate orally and verbally with different sections of society.

11. Manage Project and Finance to satisfy customer expectations.

12. Engage in life-long learning and appreciate the need for continual self-development.

# Program Educational Objectives

**PEO 1**: Have a strong foundation in Mathematics, Science and Engineering fundamentals that prepare them for a successful career in Industrial Engineering, Management and allied fields.

**PEO 2**: Function at a technically competent level in designing a system within realistic constraints such as economic, environmental, social, political, ethical, manufacturability, health and safety and sustainability.

**PEO 3**: To effectively and economically utilize the resources of the Enterprise using various optimization techniques.

**PEO 4**: Exhibit professionalism, good oral & written communication skills, team work and develop an attitude for lifelong learning.

# Department of Industrial Engineering & Management

**Faculty List:**

| 1 | Dr.N.Mohan | Professor and Head |
|---|---|---|
| 2 | Dr. S. K. Rajendra | Associate Professor |
| 3 | Dr. Rajeshwari P | Associate Professor |
| 4 | Dr. C R Mahesha | Assistant Professor |
| 5 | Mrs. Suprabha R | Assistant Professor |
| 6 | Mr. Chetan N | Assistant Professor |
| 7 | Mr. Rajesh K | Assistant Professor |
| 8 | Mrs. Sarvamangala S P | Assistant Professor |

**III SEMESTER**

| Sl. No | Course and Course Code | | Course Title | Teaching Department | Teaching Hours /Week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | **L** | **T** | **P** | | | | | |
| 1 | BC | 18MA31 | Transforms and Boundary Value Problems | Mathematics | 2 | 2 | -- | 03 | 50 | 50 | 100 | 3 |
| 2 | PC | 18IM31 | Mechanical Measurements and Metrology | | 3 | 0 | -- | 03 | 50 | 50 | 100 | 3 |
| 3 | PC | 18IM32 | Material Science and Metallurgy | | 3 | 0 | -- | 03 | 50 | 50 | 100 | 3 |
| 4 | PC | 18IM33 | Thermal and Fluids Engineering | | 3 | 2 | -- | 03 | 50 | 50 | 100 | 4 |
| 5 | PC | 18IM34 | Manufacturing Technology | | 3 | 0 | -- | 03 | 50 | 50 | 100 | 3 |
| 6 | PC | 18IM35 | Mechanics of Materials | | 2 | 2 | -- | 03 | 50 | 50 | 100 | 3 |
| 7 | PC | 18IM36 | PYTHON Programming | | 2 | 0 | -- | 03 | 50 | 50 | 100 | 2 |
| 8 | PC | 18IML37 | PYTHON Programming Laboratory | | -- | --- | 2 | 03 | 50 | 50 | 100 | 1 |
| 9 | PC | 18IML38 | Manufacturing Technology Laboratory | | -- | --- | 2 | 03 | 50 | 50 | 100 | 1 |
| 10 | HS | 18HS31/32 | Constitution of India Professional Ethics and Human Rights/ / Env. Studies | HS/ CV | 1 | -- | -- | 02 | 50 | 50 | 100 | 1 |
| 11 | MC | 18HS33 | Soft skills (MC) | Humanities | 02 | - | -- | 02 | 50 | - | 50 | 0 |
| | | | **TOTAL** | | **21** | **06** | **04** | **31** | **550** | **500** | **1100** | **24** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs** | | | | | | | | | | | | |
| 12 | MC | 18MAD31 | Basic Engg. Mathematics - I | Mathematics | 02 | 01 | -- | 03 | 50 | | 50 | 0 |
| | | | | | | | | | | | | |
| **Note: BC: Science Course, PC: Professional Core. HS: Humanities, MC: Mandatory Course.** | | | | | | | | | | | | |

**IV SEMESTER**

| Sl. No | Course and Course code | | Course Title | Teaching Department | Teaching Hours /Week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | | | | | |
| 1 | BC | 18MA41 | Numerical Methods & Applied Statistics | Mathematics | 2 | 2 | -- | 03 | 50 | 50 | 100 | 3 |
| 2 | PC | 18IM41 | Work-study and Ergonomics | | 4 | 0 | -- | 03 | 50 | 50 | 100 | 4 |
| 3 | PC | 18IM42 | Theory of Machines | | 2 | 2 | -- | 03 | 50 | 50 | 100 | 3 |
| 4 | PC | 18IM43 | Engineering Economy | | 2 | 2 | -- | 03 | 50 | 50 | 100 | 3 |
| 5 | PC | 18IM44 | Statistics for Engineers | | 4 | 0 | -- | 03 | 50 | 50 | 100 | 4 |
| 6 | PC | 18IML45 | Computer Aided Machine Drawing | | 2 | 0 | 2 | 03 | 50 | 50 | 100 | 3 |
| 7 | PC | 18IML46 | Work-study and Ergonomics Laboratory | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| 8 | PC | 18IML47 | Mechanical Measurements and Metrology Laboratory | | -- | --- | 2 | 03 | 50 | 50 | 100 | 1 |
| 9 | PC | 18IML48 | Material Testing Laboratory | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| 10 | HS | 18HS41/42 | Constitution of India Professional Ethics and Human Rights/ Env. Studies | HS/ CV | 1 | -- | -- | 02 | 50 | 50 | 100 | 1 |
| 11 | MC | 18HS43 | Employability skills (MC) | Humanities | 02 | - | -- | 03 | 50 | – | 50 | 0 |
| | | | | **TOTAL** | **19** | **06** | **08** | **32** | **550** | **500** | **1050** | **24** |
| **Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs** | | | | | | | | | | | | |
| 12 | MC | 18MAD41 | Basic Engg. Mathematics - II | Mathematics | 02 | 01 | -- | 03 | 50 | | 50 | 0 |

**Note: BC: Science Course, PC: Professional Core. HS: Humanities, NCMC: Non-Credit Mandatory Course.**
**ENV: Environmental Studies, CIP: Constitution of India Professional Ethics and Human Rights**

| SUBJECT TITLE: TRANSFORMS & BOUNDARY VALUE PROBLEMS | | |
|---|---|---|
| **Subject Code :18MA31** | **Number of Credits: 3 = 2: 1: 0 (L–T– P)** | **No of lecture hours per week: 04 (L=2 + T=2)** |
| **Exam Duration: 3 Hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Lecture hours: 52** |

**Course objective:** This course is proposed to impart to the students the skills to identify and solve problems in their field of study involving the application of transforms and boundary value conditions.

| Unit No. | Syllabus content | No. of hours | |
|---|---|---|---|
| | | **Theory** | **Tutorial** |
| 1 | **Laplace Transforms:** Definition. Transforms of some standard functions. Basic properties, transforms of derivatives and integrals (no proofs). Periodic function and unit impulse functions-problems. Inverse Laplace Transforms-Properties (no proofs). Inverse transforms by using partial fractions, convolution theorem (no proof) and unit step functions-problems. | 06 | 05 |
| 2 | **Fourier Transforms:** Infinite Fourier transforms. Fourier sine and cosine transforms. Inverse Fourier transforms (no properties)simple functions.<br>**Initial & Boundary value problems**: Solving ODEs by using Laplace transforms. Solving one dimensional heat, one dimensional wave and vibrations of beam using Laplace transforms. Application of Fourier transform to boundary value problems. | 06 | 05 |
| 3 | **Statistical Techniques:** Curve fitting by method of least squares: $y=ax+b$, $y=ax^2+bx+c$ and $y=ab^x$. Correlation–Karl Pearson's coefficient of correlation, Regression analysis –lines of regression (without proof)- problems. | 05 | 05 |
| 4 | **Fourier Series Solution**: Classification of second order PDE'sproblems. One dimensional heat equation-ends of the bar are kept at zero temperature and insulated. Insulated at one end-problems.<br>**Special functions:** Series solution of Bessel's and Legendre's differential equation of first kind. | 05 | 05 |
| 5 | **Bessel's and Legendre's Solution:** Solution of two-dimensional Laplace equation. The Laplacian in plane polar, cylindrical and spherical coordinates, solutions with Bessel functions and Legendre functions. D' Alembert's solution of the wave equation. Duhamel's principle for wave equation. | 05 | 05 |

Course Outcomes:

After the successful completion of the course, the students are expected to:

**CO1** analyze the basic concepts of integral transforms, statistical techniques and boundary value problems.  **CO2:** apply appropriate statistical technique to solve problems connected to mechanical and industrial engineering.

**CO3:** apply the least squares method of curve fitting to a set of experimental data points connected to solid and fluid mechanical problems.

**CO4:** use Bessel's and Legendre's functions in partial differential equations and obtain series solution of ordinary differential equations.

**CO5:** solve boundary value problems involving heat conduction and diffusion using Laplace equations.

**Course Outcomes (CO) Mapping with Programme Outcomes (PO)**

CO1: PO1, PO2
CO2: PO1, PO2
CO3: PO1, PO2
CO4: PO1, PO4
CO5: PO1, PO2

**TEXTBOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics (44$^{th}$ Edition), Khanna Publishers, New Delhi.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill publications, New Delhi, 11th Reprint, 2010.
3. H. C. Taneja, Advanced Engineering Mathematics, Volume I & II, I.K. International Publishing House      Pvt. Ltd., New Delhi.

**REFERENCE BOOKS:**

1. Erwin Kreyszig, Advanced Engineering Mathematics (10$^{th}$ Edition, 2016), Wiley Publishers, New Delhi.
2. Dennis G, Zill Michael R, Gullen, Advanced Engineering Mathematics (2$^{n}$Edition), CBS Publishers &     Distributors, New Delhi-110 002 (India)
3. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value      Problem, 4th Ed., Prentice Hall, 1998.
4. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press,      Second Edition, 2010.

**QUESTION PAPER PATTERN:**

The Semester End Examination (SEE) is for 100 marks.

1. There shall be five full questions (one question for each unit) carrying 20 marks each and all are Compulsory.

2. There shall be internal choice in all the Units.

| Subject Title | : MECHANICAL MESUREMENTS AND METROLOGY | |
|---|---|---|
| Sub Code : 18IM31 | No of Credits : 3 | No of lecture hours/week : 3 |
| Exam Duration : 3 Hrs. | CIE + SEE = 50+ 50 =100 | Total No. of Contact Hours : 39 |

| Course Objectives: |
|---|
| 1. To understand the Measurement standards and systems. |
| 2. To understand and apply the calibration procedure of different instruments. |
| 3. To classify various types and use of gauges, projectors, comparators and transducers |

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **Measurements and measurement systems:** Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, Mechanical Transducers: Spiral springs, Torsion Bars, Diaphragms & Bellows, Electrical Transducer: Resistive Transducer, Electronic Transducer, advantages of each transduce | 05 |
| 2 | **Measurement of force, torque and pressure:** Principle, analytical balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer. Pressure measurements, principle, use of elastic members, , McLeod gauge,<br>**Temperature and strain measurement:** Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, Total radiation pyrometer, Optical Pyrometer, Strain measurement, Mechanical strain gauge, preparation and mounting of strain gauges, gauge factor, Basic Wheatstone resistance bridge and methods of strain measurement ( Deflection method and null method). | 06 |
| 3 | **Standards of measurement:** Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-112), Numerical problems on building of slip gauges. | 06 |

| 4 | **System of Limits, Fits, Tolerance and Gauging:** Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS919-1963), geometrical tolerance, positionaltolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Types of gaugesplain plug gauge, ring gauge, snap gauge, limit gauge and gauge material, simple problems on limits & fits | 11 |
|---|---|---|
| 5 | **Comparators and Angular measurement:** Introduction to comparators, characteristics, classification of comparators, mechanical comparatorsJohnson Microkator, dial indicator, optical comparator-principle, Zeiss ultraoptimeter, electric comparator-principles, LVDT,. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numerical on building of angles). <br> **Interferometer and screw thread, gear measurement:** Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size wire. | 11 |

**Note 1:**
- **SEE question paper shall contain 10 questions having internal choice in each unit. Students shall answer one question from each unit.**

**Note 2:**
- **Assignments are evaluated for 5 marks. ☐ CIE shall be evaluated for 20 marks**

| Course Outcome: |
|---|
| After the completion of the above course students will be able to <br> 1. Define and classify Measurements and measurement systems <br> 2. Distinguish and sketch different measurement of force, torque, pressure and temperature, strain measuring instruments. <br> 3. Define standards of measurement and solve problems on building of slip gauges. <br> 4. Illustrate and define Indian Standards, principles of limits of size and tolerances and solve problems on limits and fits. <br> 5. Classify comparators and determine gear parameters and solve problems on building of angles. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO2,PO3,PO5,PO12 |
| CO2 | PO1,PO2,PO7,PO12 |
| CO3 | PO1,PO2,PO7,PO12 |
| CO4 | PO1,PO2,PO7,PO12 |
| CO5 | PO1,PO2,PO7,PO12 |

**TEXT BOOKS:**
1. **Mechanical Measurements,** Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology,** R.K. Jain, Khanna Publishers, 1994.
3. **Mechanical Measurements,** R.K. Jain

**REFERENCE BOOKS:**
1. **Engineering Metrology,** I.C. Gupta, Dhanpat Rai Publications, Delhi.
2. **Industrial Instrumentation,** Alsutko, Jerry. D. Faulk, Thompson Asia Pvt. Ltd.2002.
3. **Measurement Systems Applications and Design,** Ernest O. Doblin, McGraw Hill Book Co.

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| Subject Title | : MATERIAL SCIENCE AND METALLURGY | | |
|---|---|---|---|
| Sub Code | : 18IM32 | No of Credits : 3:0:0 | No of lecture hours/week : 3 |
| Exam Duration : 3 Hrs. | | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

**Course Objective :**

1. To classify different materials and state their properties
2. To identify the structure of materials and imperfections with different mechanisms
3. To study different types of material testing methods and heat treatment process
4. To understand the characteristics and applications of composite and Nano materials process

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **Introduction to Materials**: Ferrous and Non-Ferrous Materials and Alloys, Metals, Production, General Properties, and Applications.<br>**Crystal Structure:** BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. (Problems)<br>**Atomic Diffusion:** Phenomenon, Flick's I & II laws of diffusion, and Factors affecting diffusion. (Problems) .<br>**Mechanical Behavior of Materials:** Stress-strain diagram showing ductile and brittle behavior of materials, linear and non-linear elastic behavior and properties.<br>**Mechanical Properties of Materials:** Yield Strength, Offset Yield Strength, Ductility, Malleability, Stiffness, Resilience, Rigidity, Ultimate tensile strength and Toughness. | 10 |
| 2. | **Testing of Materials-** Tensile and Compression testing, **Impact testing-** Izod and Charpy Impact testing.<br> **Fatigue testing**- Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and SN diagram **Torsion Testing:** Types of Torsion failure.<br>**Creep:** Description of the phenomenon with examples. Three stages of creep, creep properties, stress relaxation, other related testing methods.<br>**Hardness Testing:** Brinell hardness, Rockwell hardness and Vickers hardness testing of materials, Micro hardness and Nano indentation.<br>**Fracture of Materials:** Fundamentals of fracture, Brittle, Ductile and shear type of fracture (Type I, Type II and Type III). (Problems) | 10 |
| 3 | **Phase Diagram I:** Solid solutions and its types and intermediate phases - Hume Rothery's rule - solidification of metals and alloys, cooling curves, concepts of phase diagrams. Gibbs Phase rule. Coring and segregation as applied to various binary systems, ternary systems.<br><br> **Phase Diagram II:** Construction of equilibrium diagrams involving complete and partial solubility, Lever rule. Iron-carbon equilibrium diagram description o f phases. (Problems) | 07 |

| 4 | **Heat-treatment of steels:** TTT curves, Continuous Cooling Transformation Curves (CCT) diagrams, bainitic transformation, martensitic transformation. **Annealing and its types.** Normalizing, Hardening, Tempering, Mar tempering, Austempering, Harden ability. **Surface hardening:** Carburizing, Cyaniding, Nitriding, Flame hardening and Induction hardening. | 06 |
|---|---|---|
| 5 | **Advanced Material Processing Technology:** Introduction to Composite material, FRP composites – Fiber types-, properties, Strength and Elastic Modulus of Reinforced Plastics ,Rule of Mixtures and Problems **Matrices:** Matrices type and properties, lamina, laminate. **Introduction, properties and applications-** Metal matrix composites , Ceramic matrix composites, Nano Material, shape memory alloys, High strength alloys, Super alloys. (Problems). | 06 |

**Note 1:**
- **SEE question paper shall contain 10 questions having internal choice in each unit. □ Students shall answer one question from each unit. Note 2:**
- **Assignments are evaluated for 5 marks. □ CIE shall be evaluated for 20 marks**

| **Outcome:** |
|---|
| After the completion of the above course students will be able to 1. Distinguish between different materials and their properties 2. Test materials for impact, fatigue, torsion, creep, hardness and fracture 3. Construct phase diagrams 4. Explain different types of heat treatment processes 5. Discuss advanced material processing technology, characterization techniques. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO3,PO6,PO8,PO10 |
| CO2 | PO3,PO4,PO7,PO10,PO11 |
| CO3 | PO3,PO4,PO7,PO10,PO11 |
| CO4 | PO6,PO10,PO11 |
| CO5 | PO6,PO8,PO10 |

**Text books:**
1. Raghavan V., „Physical Metallurgy - Principles and Practice", 2nd Edition, Prentice - Hall of India, 2007.
2. Avner S.H., „Introduction to Physical Metallurgy", 2nd edition, Tata McGraw Hill, 2008
3. Derek Hull, „Introduction to Dislocations", Pergamon, 2nd Edition, 1981

**Reference books:** 1. Dieter G. E., „Mechanical Metallurgy", 1st Edition, McGraw Hill Co- Koga, 2002

2. Suryanarayana AVK, „Testing of Metallic Materials", 2nd Edition, BS Publications, 2007. 3. Mein Schwartz., "Composite Materials Handbook", McGraw Hill, 1992

4. Autar K.Kaw, "Mechanics of Composite Materials", CRC Press, 2005.

5. "ASM Hand book on Composites", Volume 21, 2001

6. Vanviack L.H, "Physical Ceramics for Engineers", Addison Wesley Publication, 1964.

7. Schwartz. M. M., „Composite Materials", Prentice Hall, 1977

8. Broutman K. J., Krock R.H., „Modern Composite Materials", Addison Wesly Publishing, 1967

9. Billmeyer F., „Textbook of Polymer Science", Wiley Interscience, 1994

10.       Manufacturing Engineering and Technology, Serope Kalpakjian & Steven R. Schmid.

| Subject Title | : Thermal and Fluids Engineering | | |
|---|---|---|---|
| Sub Code | : 18IM33 | No of Credits: 3:2:0 (L:T:P) | No of lecture hours/week : 5 |
| Exam Duration : 3 Hrs. | CIE + SEE = 50 + 50 =100 | | Total  No. of Contact Hours :65 |

| Course Objective : |
|---|
| 1. To Understand the nature and role of various thermodynamic properties and heat transfer in  Engineering Systems |
| 2. Recognize the different forms of energy and restrictions imposed by the first law of thermodynamics on conversion from one form to another; |
| 3. To study the  implications of the second law of thermodynamics and limitations placed by the second law on the performance of thermodynamic systems; |
| 4. To understand the working of Internal combustion engines, their performance analysis, and the importance of air standard cycles. |
| 5. Illustrate the basic concepts of fluid mechanics and determine the velocity and flow rate measurement techniques |

| Unit No. | Syllabus | No of Hours |
|---|---|---|
| | | |
| 1 | **Fundamental Concepts and Definitions:** Microscopic and Macroscopic approaches. Engineering thermodynamics; definition, some practical applications of engineering thermodynamic. System (Closed system) and Control Volume (open system); Characteristics of system boundary and control surface, examples. Thermodynamic properties; intensive and extensive properties. Thermodynamic process; Thermodynamic equilibrium; diathermic wall, Zeroth law of thermodynamics, Temperature: concepts, scales, measurement. Related numerical problems<br>**Work and Heat:** Thermodynamic definition of work; examples, sign convention. Displacement work, expressions for displacement work in various processes through p-v diagrams (Excluding other types of work). Heat: definition, units and sign convention, misconceptions about heat. Related numerical problems. | 9+5(T) |
| 2 | **First Law of Thermodynamics:** Joules experiments, equivalence of heat and work. Statement of the First law of thermodynamics, extension of the First law to non - cyclic processes, energy, energy as a property, modes of energy, two-property rule, Specific heat at constant volume, enthalpy, specific heat at constant pressure. Related numerical problems<br>**Extension of the First law to control volume**: Steady State-Energy equation, important applications.Related numerical problems. (Unsteady processes not included). | 8+5(T) |
| 3 | **Second Law of Thermodynamics:**Thermal reservoir. Direct heat engine; schematic representation and efficiency. Devices converting work to heat in a theromodynamic cycle; reversed heat engine, schematic representation, coefficients of performace. Kelvin - Planck statement of the Second law of Thermodynamics; PMM I and PMM II, Clausius statement of Second law of Thermodynamics; Equivalence of the two statements; Reversible and irrevesible processes; factors that make a process irreversible, reversible heat engines, | 7+5(T) |

| | | | |
|---|---|---|---|
| | Carnot cycle, Corollories of Carnot cycle (only statement), Related numerical problems | | |
| 4 | **Properties of Fluids:** Introduction, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, Related numerical problems <br> **Fluid Dynamics:** Euler's equation of motion, Bernoulli's equation from first Euler's equation. Fluid Flow Measurements: Venturimeter, orificemeter, pitot-tube. Related numerical problems (No Derivations in Fluid Flow Measurements) | 8+5(T) | |
| 5 | **Gas power cycle:** Air Standard cycles: Carnot, Otto, Diesel, and Dual cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures (No derivation for MEP), Comparison of Otto and Diesel cycles, Related numerical problems <br> **I.C.Engine**: Testing of two stroke and four stroke SI and CI engines for performance, heat balance, Morse test, Related numerical problems | 8+5(T) | |

| Course Outcome (CO): |
|---|
| After the completion of the above course students will be able to |

1. Estimate the various fluid properties, thermodynamic properties, work transfer and heat transfer.
2. Analyze the different forms of energy and restrictions imposed by the first law of thermodynamics on conversion from one form to another.
3. Analyze the performance of refrigeration and heat pump systems.
4. Assess the working of internal combustion engines and their performance analysis.
5. Determine the velocity and flow rate measurement techniques for flow through pipes.

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1,PO3 |
| CO2 | PO1,PO2 |
| CO3 | PO3,PO4 |
| CO4 | PO2,PO3, PO4 |
| CO5 | PO3,PO4,PO6 |

**Text books:**

1. **Applications of Thermodynamics,** V. Kadambi, T. R. Seetharam and K. B. Subramanya Kumar, Wiley, 1st Edition, 2019.
2. **Basic and Applied Thermodynamics**, P. K. Nag, Tata McGraw-Hill Education Pvt. Ltd, 2nd Edition, 2010
3. **A Textbook of Fluid Mechanics and Hydraulic Machines**, Dr. R.K Bansal, Lakshmi Publications, 9th Edition, 2010 (Reprint 2015)

**Reference books:**
1. **Thermodynamics: An Engineering Approach**, Yunus A. Cengel, Michael A. Boles, McGraw Hill Education, 8th Edition, 2015
2. **Fluid Mechanics,** Frank M. White, McGraw Hill Publications (SIE), 7th Edition, 2011.

Note 1: SEE Question paper contains total ten Questions and student should answer any one question from each Unit and answer five full questions.

Note 2: Two assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2.

Assignment - 2 from units 3, 4 and 5.

| Sub Title : MANUFACTURING TECHNOLOGY | | |
|---|---|---|
| **Sub Code: 18IM34** | **No. of Credits:3 =3 : 0 : 0** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hours** | **CIE + SEE = 50+ 50 =100** | **Total No. of Contact Hours : 39** |

**Course objectives:**
1. Outline the importance of manufacturing processes and their industrial applications Understand and apply the concept of metal casting.
2. Study the principles of welding technology.
3. Understand the basic concepts of Metal cutting and cutting tool parameters.
4. Study the importance of conventional and semiautomatic machining processes.

| Unit No | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction:** Concept of Manufacturing process and its importance. Classification of Manufacturing processes. Introduction to Casting process & steps involved. Varieties of components produced by casting process. Advantages Limitations and application of casting process. **Patterns:** Materials and classification of patterns, various pattern allowances and their importance and colour coding of pattern. **Sand Moulding:** Types of base sand, Method used for sand moulding, such as Green sand, dry sand and skin dried moulds. **Binder**: Definition and Types of binder **Additives**: Need, Types of additives used. **Cores:** Definition, Need, Types. Method of making cores, Binders used, core sand moulding. **Concept of Gating & Rising.** Principle and types. **Moulding Machines** and its types | 8 Hrs |
| 2 | **Welding process:** Definition, Principles, Classification, Application, Advantages & limitations of welding. Arc Welding: Principle, Metal Arc welding (MAW), Flux Shielded Metal Arc Welding (FSMAW), Tungsten Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding processes. (AHW) **Principles of soldering & brazing:** Parameters involved & Mechanism. Different Types of Soldering & Brazing Methods. | 8 Hrs |
| 3 | **Theory of metal cutting:** Single point tool nomenclature, geometry, orthogonal & oblique cutting, mechanism of chip formation, types of chips, Merchants analysis, shear angle relationship. Tool wear & tool failure effects of cutting parameters, Tool life criteria, Taylor's tool life equation, problems on Merchants analysis & tool life evaluation<br>**Cutting tool materials:** Desired properties, types of cutting tool materials- HSS carbides, coated carbides, ceramics. Cutting fluids- properties, types & selection. Machinability, factors affecting machinability. | 8 Hrs |
| 4 | **Production lathes**: Engine lathe, Capstan & turret lathes-constructional features. **Drilling machines:** Classification, constructional features. Types of drill, drill bit nomenclature, geometry of twist drill. Drilling & related operations. Problems on calculating the machining time. | 7 Hrs |
| 5 | **Milling machines:** Classification, constructional features. Milling cutters & | 8 Hrs |

nomenclatures.

**Milling operations** - up milling & down milling concepts. Indexing: Purpose of indexing, indexing methods. Problems on indexing.

**Grinding machines:** Types of Abrasives, Bonding process, classification, constructional features of surface, cylindrical & centre less grinding machines & operations.

**Note 1:**
▪ **SEE question paper shall contain 10 questions having internal choice in each unit.** ☐ **Students shall answer one question from each unit. Note 2:**
▪ **Assignments are evaluated for 5 marks.** ☐ **CIE shall be evaluated for 20 marks**

**Outcome:**

After the completion of the above course students will be able to
1. Describe the primary and secondary manufacturing processes and industrial applications in different sectors.
2. Explain the concepts of sand moulding methods and metal melting process and also testing of casting and to produce defect free products.
3. Classify different metal joining methods through welding technologies.

4. Illustrate the characteristics of cutting tool materials.
5. Learns the principles and concepts of conventional and semiautomatic machines

| Cos | Mapping with POs |
|-----|-----------------|
| CO1 | PO1,PO2,PO3,PO7,P11 |
| CO2 | PO2,PO4,PO6,PO7,PO8,P11 |
| CO3 | PO2,PO4,PO6,PO7,PO8,P11 |
| CO4 | PO2,PO4,PO6,PO7,PO8,P11 |
| CO5 | PO1, PO2, PO2, PO7, PO8, P11. |

**Text books**:

Hajra Choudhury, "Elements of Workshop Technology, Vol. I and II", Media Promotors Pvt Ltd., Mumbai, 2001.

S.Gowri, P.Hariharan, and A.Suresh Babu, "Manufacturing Technology 1&2 ", Pearson Education, 2008. 3. Nadkarni S.V. "Modern Arc Welding Technology", 1st Edition, IBH Publishing, 2005

4. **Workshop Technology,** Hajra Choudhry, Vol-II, Media Promoters & Publishers Pvt. Ltd. 2004
5. **Production Technology,** R.K.Jain, Khanna Publications, 2003.
6. **Production Technology,** HMT, Tata McGraw Hill, 2001.
7. **A text book of Manufacturing Technology**, Rajput R.K, Lakshmi Publications, 20074.

**Reference Books**:
1. Roy A Lindberg, Process and Materials of Manufacturing, 4th Ed. Pearson Edu. 2006.
2. Serope Kalpakjian, Steuen. R. Sechmid "Manufacturing Technology",Pearson Education Asia, 5th Ed. 2006.
3. P N Rao, Manufacturing Technology – "Foundry, Forming, and Welding", 4th edition, McGraw Hill Education (India) Private Limited, 2013, ISBN-13: 978-1-25-9606257-5 and ISBN-10: 1-25-906257-0
4. Mikell P. Groover, "Fundamentals of modern manufacturing: materials, processes and systems", JOHN WILEY & SONS, INC., 4th Edition, 2010, ISBN: 978-0470-467002 5. G.S Sawhney, "Manufacturing Science – I, Forming, Casting and Welding", 2015, I.K. International Publishing House Pvt. Ltd. ISBN: 978-93-82332-53
6. Amitabha Ghosh and Mallik, Manufacturing Science, affiliated East West Press, 2003.
7. G. Boothroyd, Fundamental Machining and Machine Tools, McGraw Hill, 2000
8. P.N. Rao "Manufacturing Technology", Metal Cutting and Machine Tools, Tata McGraw – Hill, New Delhi, 2003.
9. P.C. Sharma, "A Text Book of Production Engineering", S.Chand and Company Ltd, Fourth Edition, 1993.
10. Milton C.Shaw, "Metal Cutting Principles", Oxford University Press, 2nd Edition, 2005.
11. Philip F.Ostwald and Jairo Munoz, "Manufacturing Processes and systems", John Wiley and Sons, 9th Edition, 2002

| Subject Title | : MECHANICS OF MATERIALS | |
|---|---|---|
| Sub Code : 18IM35 | No of Credits : 4 | No of lecture hours/week : 4 |
| Exam Duration : 3 Hrs. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 52 |

**Course Objectives:**

1. To apply the fundamentals of strength of materials as related to concepts of stress, strain, bending, torsion, stability, and deflection of deformable bodies to applications concerning bars, shafts, beams, columns, and pressure vessels.
2. To discuss the fundamentals of applying equilibrium, compatibility of deformations, and force-deformation relationships in solving problems.
3. To equip with the proficiency in calculating stresses and strains in bars and beams subjected to axial forces and torsional, bending moments,
4. To analyze external and internal forces and moments; calculating deflections of beams; calculating angles of twist of shafts etc.

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **Simple Stress and Strain:** Introduction, Stress, strain, mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain relation - behavior in tension for Mild steel, cast iron and non ferrous metals. Extension/ Shortening of a bar, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), Elongation due to self weight, Principle of super position.          **Stress in Composite Section:** Volumetric strain, expression for volumetric strain, elastic constants, simple shear stress, shear strain, temperature stresses (including compound bars). | 8+6(T) |
| 2 | **Thick and Thin Cylinder** Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume). Thick cylinders Lame's equation (compound cylinders not included). | 4+4(T) |
| 3 | **Bending Moment and Shear Force in Beams**: Introduction, Types of beams, loads and reactions, shear forces and bending moments, rate of loading, sign conventions, relationship between shear force and bending moments. Shear force and bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams. | 8+3(T) |
| 4 | **Bending and Shear Stresses in Beams**: Introduction, Theory of simple bending, assumptions in simple bending. Bending stress equation, relationship between bending stress, radius of curvature, relationship between bending moment and radius of curvature. Moment carrying capacity of a section. Shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections.  (Composite beams not included). | 6+6(T) |
| 5 | **Torsion of Circular Shafts**: Introduction. Pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts. Power transmitted by solid and hollow circular shafts. | 4+4(T) |

**Note 1:**
- SEE question paper shall contain 10 questions having internal choice in each unit. □ Students shall answer one question from each unit. **Note 2:**
- **Assignments are evaluated for 5 marks.**
- **CIE shall be evaluated for 20 marks**

| Outcome: |
|---|
| After the completion of the above course students will be able to |
| 1. Analyze two dimensional basic stress, strain, and effect of temperature on the axially loaded members |
| 2. Interpret the effect of pressure on thin and thick cylinders |
| 3. Evaluate the basic design of mechanical part under shear and bending and torsional load of different cross section of beams and column. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1,PO3,PO4,PO12 |
| CO2 | PO1,PO3,PO4,PO12 |
| CO3 | PO1,PO3,PO4,PO12 |

**Text books:**
1. **."Strength of Materials",** S.S.Bhavikatti, Vikas publications House -1 Pvt. Ltd., 2nd Ed., 2006
2. **"Strength of Materials",** S.S. Rattan, Tata McGraw Hill, 2009
3. " Strength of Materials", Surya Patnayak Elsevier publication Ist Edition 2003
4. **"Mechanics of materials",** B C Punmiaand & Ashok kumar Jain Laxmi Publication 2001

**Reference books:**
1. **"Engineering Mechanics of Solids**", Egor.P. Popov, Pearson Edu. India, 2nd, Edison, 1998
2. **"Mechanics of materials",** in S.I. Units, Ferdinand Beer & ussell Johnson, TATA Mc GrawHill- 2003
3. **"Mechanics of Materials",** James M. Gero and Barry J. Goodno Cengage learning 8th edition 2014.
4. **" Mechanics of Materials"** William F R ley and Loven W zachery wiley india publication 2018

<table>
<tr><td colspan="3" align="center">**Subject Title    :  PYTHON Programming**</td></tr>
<tr><td>**Sub Code :  18IM36**</td><td>**No of Credits: 2 : 0 : 0 (LT-P)**</td><td>**No of lecture hours/week :2**</td></tr>
<tr><td>**Exam Duration :  3 Hrs.**</td><td>**CIE + SEE = 50 +  50 =100**</td><td>**Total  No. of Contact Hours : 28**</td></tr>
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| **Objective:** |
| --- |
| 1. To learn Syntax and Semantics and to create functions in Python. |
| 2. To handle strings and files in Python. |
| 3. To understand Lists, Dictionaries and Regular expressions in Python. |
| 4. To implement Object oriented programming concepts in Python. |
| 5. To implement data structure and to organize the data using Python |

| Unit No | Syllabus | No of Hours |
| --- | --- | --- |
| 1 | **Introduction to Python:** The basic elements of Python - Data types,  variables, expressions, operators, Sequence, control-flow statements,  Algorithms, building blocks of algorithms. Functions, Scoping and Abstraction – Functions and scoping, Decomposition and Abstraction, Keyword Arguments, Specifications, Recursion, Modules, Inductive Reasoning, Global Variables, System Functions and Parameters. Programming examples. | 8 |
| 2 | **Tuples and Lists:** Tuples, Lists, List Operations, Mutation, Aliasing, Cloning – Dictionaries: Functions as Objects, Dictionaries. <br> **Debugging:** Programming Challenges, Classes of Tests, Bugs, Debugging and Debugging Examples. <br> Assertions and Exceptions, Assertions, Exceptions, Exception Examples | 7 |
| 3 | **Classes and Inheritance:** Why Object Oriented Programming, Classes & Objects, Classes & Methods, Abstract Data Types and Classes, Encapsulation and Information Hiding, Class Instances, Overloading, Composition, Inheritance, Programming examples. | 7 |
| 4 | **Files and exception:** text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, programming examples. | 6 |
| 5 | **Files and exception**: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, programming examples. | 6 |

**Note 1:**
- **SEE question paper shall contain 10 questions having internal choice in each unit.**  Students shall answer one question from each unit. **Note 2:**
  - **Assignments are evaluated for 5 marks.**
  - **CIE shall be evaluated for 20 marks**

**Course Outcome:**
After learning the course, the student will be able:

1. Develop and execute algorithmic solutions to simple computational problems with python programs.
2. Decompose a Python program into functions.
3. To be able to understand the various data structures available in Python programming language and apply them in solving computational problems.
4. To be able to do testing and debugging of code written in Python.
5. Ability to Text Processing scripts.

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**Text Books / Reference Books:**
1. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher, Revised and Expanded version.
2. Python Programming using problem solving Approach by Reema Thareja, Oxford University, Higher Education Oxford University Press; First edition.
3. Fundamentals of Python first Programs by Kenneth A Lambert, Copyrighted material Course Technology Inc. 1st edition.

| | | Subject Title: PYTHON PROGRAMMING LAB | |
|---|---|---|---|
| **Sub Code** : **18IML37** | | **No of Credits : 0:0:1** | **No. of Hrs / Week : 2** |
| **Exam Duration : 3 Hrs.** | | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 13** |

| | | Course Objectives: | |
|---|---|---|---|
| | | • To write, test, and debug simple Python programs. <br> • To implement Python programs with conditionals and loops. <br> • Use functions for structuring Python programs. <br> • Represent compound data using Python lists, tuples and dictionaries. <br> • Read and write data from/to files in Python. | |
| | | Programs List | No. of Hours |
| 1 | a | Write a program that declares 3 integers, determines and prints the largest and smallest in the group. | |
| | b | Write a program that accepts 'n' numbers from the user and print their sum. | |
| | | | |
| 2 | a | Write a program to find factorial of a given number. | |
| | b | Write a program to print Fibonacci Series. | |
| | | | |
| 3 | a | Write a program to implement linear search and binary search. | |
| | b | Write a program to <br> • Determine whether the given string is a palindrome or not using slicing and without using slicing <br> • Find the number of Vowels and Consonants in a given string | |
| | | | |
| 4 | a | Write a program to find that given number is Armstrong or not. | |
| | b | Write a program to convert decimal number into binary numbers. | |
| 5 | a | Write a program for generation of pyramid. <br><br> Pyramid 1    Pyramid 2 <br> \*     1 <br> \*    \*        1 2 <br> \*    \* \*     1 2 3 <br> \*    \* \* \*   1 2 3 4 | |
| | | | |
| 6 | a | Write a Python program to get the largest and smallest number from a list. | |
| | b | Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding. | |
| | | | |

| 7 | a | Write A Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File. |
|---|---|---|
|   | b | Write A Program to Read a Text File and Print all the Numbers Present in the Text File |
|   |   |   |
| 8 | a | Write a Python script to sort (ascending and descending) a dictionary by value |
|   | b | Create a dictionary for words and their meanings. Write functions to add a new entry (word : meaning), search for a particular word and retrieve meaning, given meaning find words with same meaning, remove an entry, display all words sorted alphabetically. |
|   |   |   |
| 9 | a | Write A Program to Find the Area of a Rectangle Using Classes |
|   | b | Write A Program to Create a Class and Compute the Area and the Perimeter of the Circle |
|   |   |   |
| 10 |   | Write A Program to Append, Delete and Display Elements of a List Using Classes |
|   |   |   |
| 11 |   | Write a Python program to simulate ATM transactions by including the following operations:<br>a) Check for correctness of the ATM pin.<br>b) Perform Balance, Withdraw and Deposit Operations.<br>The above operations should be menu-driven and display appropriate messages after performing each of these operations. |

| Subject Title   : MANUFACTURING TECHNOLOGY LAB | | |
|---|---|---|
| **Sub Code   : 18IML38** | **No of Credits   : 0: 0:1= 1** | **No. of Hrs / Week : 2** |
| **Exam Duration :  3 Hrs.** | **CIE + SEE = 50 +  50 =100** | **Total  No. of Contact Hours : 12** |

| **Objective:** |
|---|
| 1.To demonstrate the importance of sand properties in preparing moulds |
| 2.To give hands on practice in preparing moulds using 2 box, split pattern and cores |
| 3.To give hands on practice in preparing forging models using open – hearth furnace |

| Machine Shop Practice | |
|---|---|
| **1** | Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning. |
| **2** | Cutting of V Groove/ dovetail / Rectangular groove using a shaper. |
| **3** | Cutting of Gear Teeth using Milling Machine. |
| **Testing of Molding sand and Core sand** | |
| Preparation of sand specimens and conduction of the following tests: | |
| **1** | Compression, Shear and Tensile tests on Universal Sand Testing Machine. |
| **2** | Permeability test |
| **3** | Core hardness & Mould hardness tests. |
| **4** | Sieve Analysis to find Grain Finest number of Base Sand |
| **5** | Clay content determination in Base Sand |
| **Foundry Practice** | |
| **1** | Use of foundry tools and other equipments. |
| **2** | Preparation of moulds using two molding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes). |
| **3** | Preparation of one casting (Aluminum or cast iron-Demonstration only) |
| **Forging Operations** | |
| **1** | Calculation of length of the raw material requited to do the model. |
| **2** | Preparing minimum three forged models involving upsetting, drawing and bending operations. |
| **3** | Out of these three models, at least one model is to be prepared by using Power Hammer |

| **Outcome:** |
|---|
| After the completion of the above course students will be able to |
|     1.  The students will be able to utilize foundry and forging  tools for various applications |
|     2.  Will be able to develop different foundry & forging models |
|     3.  Will be able to determine different properties of sand |

| COs | Mapping with POs |
|-----|------------------|
| CO1 | PO3,PO5 |
| CO2 | PO2,PO9,PO12 |
| CO3 | PO2,PO3 |

**Scheme of Examination:**

One question is to be set from Testing of Molding sand and Core sand    :  10 marks

One question is to be set from either Foundry or Forging          :  30 marks

                            Viva-Voce                          :  10 marks.

                            **Total**                          **:  50 marks.**

| Subject Title: CONSTITUTION OF INDIA & PROFESSIONAL ETHICS | | |
|---|---|---|
| Subject Code: 18HS31 | No. of Credits: 1 | No of lecture hours per week: 2 Hrs |
| Exam Duration: 2 Hrs | Exam Marks: 50 | Total No. of lecture hours: 16 hrs per week |

**Total Text Objectives:**

Constitution of India and professional Ethics taught to the students to enable them an insight into the constitution and enlighten them about the fundamental rights, Protection of rights through enforcement of writs. Functions of judiciary, knowledge and importance of election in democratic country procedure of elections to the post of president, members of parliament and state legislative assembly and the function of Parliament, legislative Assembly and their powers. Professional ethics- The duties and basic responsibilities of engineers towards society and their employer, apply of new ideas and protection of those ideas.

**Course Objective**

1. The objective of part-I of the syllabus is to know how the Constitution of India was framed and the basic structure of Indian Constitution and the rights given by the Constitution to their Citizens.
2. The objective of part-II. To inculcate knowledge on election commission in the democratic system. The functions of judiciary in upholding of the Indian Constitution
3. The objective of part-III. Is enlightening them about the system of government adopted in both Central and State and Method of election of representative of Parliament and State

Assembly their powers and function and also enlighten them about the term democracy

4. The Objective of part IV. To create awareness on Professional ethics and Human Values
5. The objective of part-V. To inculcate knowledge and exposure on Safety and Risk, Risk Benefit Analysis and have an idea about the Collective Bargaining, Confidentiality, Professional, Employee, Intellectual Property Rights

| UNIT NO | SYLLABUS CONTENTS | No. of hours |
|---|---|---|
| 1 | INTRODUCTION: Framing of India Constitution, Salient Features of the Constitution, Basic Structure, Preamble of the Constitution, Fundamental Rights- Article (12-35), Art 32 &226, Restrictions under Constitution Fundamental Duties Art (51A). | 8 |
| 2 | Directive Principles Of State Policy Election commission Judiciary system-Role of Supreme Court of India and High Court of State | 3 |
| 3 | UNION GOVERNMENT Executive - President, Prime Minister, council of ministers Legislature- Parliament, Lok-Sabha , Rajya-Sabha STATE GOVERNMENT Executive – Governor, Chief Minister, Council of Ministers. Legislative- Legislative Assembly , Legislative Council | 5 |

| | | | |
|---|---|---|---|
| 4 | HUMAN VALUES& PROFESSIONAL ETHICS: Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence. | | 5 |
| 5 | SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) Piracy and plagiarism. | | 4 |

## Course Outcomes

1.  Students come to know that who are all take part in the framing of Indian Constitution and how it was framed, what it contained. The Rights they can enjoy as a citizen of India.  Case law gives detailed knowledge to the students about their fundamental rights.  Procedure of enforcement of fundamental rights.

2.  . Student gets the knowledge about procedure of conducting of election by the election commission, its duties and powers along with powers and functions of judiciary.

3.  Student comes to know regarding system of parliamentary form of government .and how the representative of Central and State Government are elected their powers and functions

4.  Student comes to know the correct meaning of ethics and their ethical duties and responsibilities and using of honesty in their profession, and the decision making ability.

5.  Student gets the knowledge of using the intellectual property rights and its protection and its application in their profession.

**TEXT BOOKS:**

1.  INTRODUCTION TO THE CONSTITUTION OF INDIA by DURGA DAS BASU. (Students Edition) Prentice – Hall EEE, 19th/20th Edn. 2001.

2.  ENGINEERING ETHICS by CHARLES E. HARIES, MICHAEL.S.PRITCHARD AND MICHAEL J. ROBINS THOMPSON ASIA, 2003-08-05

**Reference Books:**

1 An Introduction to Constitution of India by M.V.Pylee, Vikas Publishing, 2002.

2. Constitution of India by B S Raman

2 Engineering Ethics by M.Govindarajan, S. Natarajan, V.S.Sendilkumar, Prentice – Hall of India Private Ltd, New Delhi, 2004.

3 Constitution of India and Professional Ethics—K R Phaneesh

4 Introduction to the Constitution of India—Brij Kishore Sharma

| Subject Title : Environmental Studies | | |
|---|---|---|
| Sub Code : 18HS32 | No of Credits: 1 | No. of Hrs / Week : 2 |
| Exam Duration : 3 Hrs. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 16 |

**Objectives:**

1. To create awareness among the students about impacts of developmental and human activities on natural resources, remedial measures and life support systems viz. land, water, air etc.
2. It makes how to conserve natural resources for sustainable development.
3. To understand the importance of environmental protection and sustainable development.

| Unit. No | Syllabus | No of Teaching Hours |
|---|---|---|
| 1 | Introduction: Concept of environmental studies. Definition of environment, components of the environment and structure of the atmosphere.<br>Study of different ecosystems.<br>Human Activities And Its Effect On Environment: Agriculture, Industry, Mining, Transportation, & Urbanization. | 04 hours |
| 2 | Natural Resources: Forest Resources, Water Resources, Mineral Resources, Food Resources and Land Resources<br>ENERGY: Definition of energy and energy resources, different types of energy-conventional and non-conventional energies (Classification only). | 03 hours |
| 3 | Environmental Pollution And Effects: Air pollution, Water pollution "water born and water induced disease", Soil pollution and Noise pollution.<br>Current Environmental Issues Of Importance: Population Growth, Climate | 03hours |
| 4 | ENVIRONMENTAL Episodes: Episodes (Los Angeles smog, Minamata disease in Japan 1945, Bhopal (India) gas tragedy 1984)- Brief Description Legislation to control and protect the environment, about environmental awareness.<br>Environmental Impact Assessment And Sustainable Development. | 03 hours |

**Text Books**

1. Ranjit Daniels R.J. and Jagdish Kirshnaswamy, (2009), "Environmental Studies", Wiley India
Private Ltd., New Delhi
2. Benny Joseph (2005), "Environmental Studies", Tata McGraw - Hill Publishing Company Limited
3. Rajagopalan R. (2005), "Environmental Studies – From Crisis to Cure", Oxford Univesity Press

**References**

1. Raman Sivakumar, (2005), "Principles of Environmental Science and Engineering", Second Edition, Thomson Learning, Singapore

2. Meenakshi P. (2006), "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi
3. Prakash S.M. (2007), "Environmental Studies", Elite Publishers, Mangalore
4. Erach Bharucha (2005), "Text Book of Environmental Studies", for UGC, Universities Press
5. Tyler Miller Jr. G. (2004), "Environmental Science – Working with the Earth", Tenth Edition, Thomson Brooks/Cole
6. Tyler Miller Jr. G. (2006), "Environmental Science – Working with the Earth", Eleventh Edition, Thomson Brooks/Cole
7. www.iitg.ernet.in>rkbc>presentation
8. www.nptel.org.in
9. http://books.google.co.in

**Course Outcomes:**
CO1. The students will be introduced and refreshed about the ecology and ecosystem in general and understand the effect of human activities on environment.
CO2. The students will be able to analyze the importance of natural resources and its protection.
CO3. The students will understand the value of environment protection by studying past episode. CO4. The students will acquire the skill to adopt the suitable method for sustainable development through environmental impact assessment and rainwater harvesting.

| SOFT SKILLS -III semester | | |
|---|---|---|
| Subject Code: 18HS33 | Mandatory Course | No of lecture hours per week: 2 Hrs |
| Exam Duration: | Exam marks: NIL | Total No. of lecture hours: 26 hrs per semester |

**COURSE OBJECTIVES:**

1. The lessons under unit 1 is to help students to recognize oneself as an individual being aware of one's knowledge, personality, environment and lifestyle, through different base and measures like SWOC analysis, personal developments.
2. The lessons under this unit make students to understand the importance of soft skills and hard skills and how to think critically and also learn the importance of creative thinking.
3. The lessons under this unit make students to understand the importance of attitude, time, and also learn to manage them.
4. The objective of this unit is to help a student to learn the art of goal setting and being motivated in achieving his goal in spite of all the hardships with different problems along with teamwork, and leadership qualities.
5. The unit 5 aims at teaching the students about importance of handwriting, punctuation marks, spellings, which helps them, improve in writing skills.

| UNIT NO | SYLLABUS CONTENT | HRS /COS |
|---|---|---|
| 1 | a. SWOC ANALYSIS<br>b. SELF – AWARENESS AND PERSONAL DEVELOPMENT<br>c. ETTIQUTTE AND MANNERS | 5<br>CO1 |
| 2 | d. INTRODUCTION TO SOFT SKILLS AND HARD SKILLS<br>e. CREATIVITY<br>f. CRITICAL THINKING | 5<br>CO2 |
| 3 | g. ATTITUDE<br>h. ADAPTABILITY<br>i. TIME MANAGEMENT/ PRIORITY<br>j. STRESS MANAGEMENT | 5<br>CO3 |
| 4 | k. GOAL SETTING<br>l. MOTIVATION<br>m. TEAM WORK<br>n. PROBLEM SOLVING<br>o. LEADERSHIP | 5<br>CO4 |
| 5 | p. GUIDELINES FOR HANDWRITING<br>q. PUNCTUATION MARKS<br>r. SPELLING<br>s. VISUAL NARRATIVES( Ramayana, Mahabharata, Short Stories, films and advertisements) | 6<br>CO5 |

**COURSE OUTCOME:**

1. After the completion of this unit students will know about their self assessments and personality that how to handle various situations in a positive way.
2. At the end of this unit student will be able to see how important it is to consider things carefully and from different angles, something one sees, hears, experiences or reads in

order to understand it fully. The student will also have understood the importance of soft skills and thinking creatively.

3. After the completion of this unit students will have learnt about attitude and adaptability and also how to deal with problems and stress in the present world.
4. At the end of this unit students will have learnt some simple ways of planning to achieve his dream and also feel enthusiastic about doing something individually and as well in team.
5. After the completion of this unit students writing skills will have improved.

**REFERENCE:**

1. English for Job Seekers (Language and Soft Skills for the Aspiring) by Geetha Rajeevan, C.L.N. Prakash et al.) Cambridge University Press Pvt. Ltd.
2. New International Business English by Leo Jones and Richard Alexander. Cambridge University Press Pvt. Ltd.
3. Business Benchmark by Norman Whitby. Cambridge University Press pvt,Ltd
4. Grammar practice Activities (practical guide for teachers) Cambridge University Press Pvt. Ltd.

For THIRD Semester B.E. (Lateral Entry: Common to all branches)

| Subject Title: BASIC ENGINEERING MATHEMATICS-I | | |
|---|---|---|
| **Subject Code : 18MAD31** | **No. of Credits: 00** | **No of lecture hours per week: 04** |
| | | **Total No. of lecture hours: 50** |
| **Course objective:** To develop a basic Mathematical knowledge required for higher semesters with few examples of its engineering applications. | | |

| Unit No. | Syllabus content | No. of hours |
|---|---|---|
| 1 | **Differential Calculus:** Polar curves, angle between polar curves and condition for orthogonality. Pedal equation for polar curves, Radius of curvature–in Cartesian, parametric, polar and pedal forms (with proof)-problems. Taylor's and Maclaurin's expansions. | 10 |
| 2 | **Partial Differentiation:** Partial derivatives, Homogeneous functions, Euler's theorem (with proof and no extended theorem). Total differential and differentiability, Derivatives of composite and implicit functions, change of variables. | 10 |
| 3 | **Integral Calculus:** Reduction formulae for $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int \sin^m x \cos^n x\, dx$ . Evaluation of the integrals using reduction formula with standard limits-Problems. Tracing of curves in Cartesian and Polar forms (Cissoid, Astroid, Cardioid and Lemniscate). | 10 |
| 4 | **Multiple Integrals:** Double integrals in Cartesian and polar coordinates, Change of order of integration, Area enclosed by plane curves, Change of variables in double integrals, Area of a curved surface. Triple integralsVolume of solids. | 10 |
| 5 | **Differential Equations:** Solution of homogeneous, Linear and Exact differential equations and its reductions. Solutions of Linear differential equations of higher order with constant coefficients-inverse differential operator. | 10 |

*Course Outcomes:*

After the successful completion of the course, the students are able to
**CO1:** analyze the basic concepts of calculus like differentiation and integration
**CO2:** apply the concepts of partial differentiation and differential equations arising in a variety of engineering applications

**CO3:** assess the practical importance of polar curves, Jacobians and radius of curvature **CO4:** apply the concepts in problem solving and relate the solutions to the various engineering streams

**CO5:** use the skills in understanding Mathematical knowledge

**Course Outcomes (CO) Mapping with Programme Outcomes (PO)**
CO1: PO1, PO2
CO2: PO1, PO2
CO3: PO1, PO2
CO4: PO1
CO5: PO1

**TEXTBOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition), Khanna Publishers, New Delhi.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill publications, New Delhi, 11th Reprint, 2010

**REFERENCE BOOKS.**
1. Erwin Kreyszig, Advanced Engineering Mathematics (Latest Edition), Wiley Publishers, New Delhi.
2. H. C. Taneja, Advanced Engineering Mathematics, Volume I & II, I.K. International Publishing House Pvt. Ltd., New Delhi.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East– West press, Reprint 2005.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

# IV Semester IEM

| Subject Title: NUMERICAL METHODS & APPLIED STATISTICS | | |
|---|---|---|
| **Subject Code: 18MA41** | **Number of Credits: 3 = 2 : 1 : 0 (L–T– P)** | **No of lecture hours per week: 04 (L=2+T=2)** |
| **Exam Duration: 3 Hrs** | **Exam Marks: CIE + SEE = 50 + 50 = 100** | **Total No. of Lecture hours: 52** |

**Course objective:** This course is proposed to impart to the students the skills to identify and solve problems in their field of study involving the application of numerical methods and principles of variational calculus.

| Unit No. | Syllabus content | No. of hours | |
|---|---|---|---|
| | | **Theory** | **Tutorial** |
| 1 | **Solutions of Algebraic and Transcendental Equations:** Regula-Falsi method and Newton-Raphson method. **Interpolation:** Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals- Newton's divided difference and Lagrange's formulae. | 05 | 05 |
| 2 | **Numerical Differentiation, Integration and Solutions of ODE'S:** Numerical differentiation using Newton's forward and backward difference formulae. Numerical Integration-Simpson's $1/3^{rd}$, $3/8^{th}$ rules and Weddle's rule. Solutions of first order ODE's-Euler's modified method, Runge- Kutta fourth order method. | 06 | 05 |
| 3 | **Numerical Solutions of Partial Differential Equations:** Solutions of Laplace and Poisson equations-Jacobi's method, Gauss-Seidel method and Relaxation method. One dimensional heat equation-Bender-Schmitt method and Crank-Nicholson method. Wave equation-Finite difference method. | 06 | 05 |
| 4 | **Tests of Hypothesis:** Review of random variables. Introduction to sampling distributions, standard error, Type-I and Type-II errors. Large sample test based on normal distribution for single mean and difference of means. Small samples tests based on t, $F$ and $\chi^2$-distributions. | 05 | 05 |
| 5 | **Calculus of Variations:** Variation of a function and a functional, Euler's equation-standard variational problems and the Brachistochrone problem. Isoperimetric problems. Rayleigh Ritz method -problems. | 05 | 05 |

**Course Outcomes:**
After the successful completion of the course, the students are expected to:
**CO1:** analyze the basic concepts of calculus of variations, numerical and statistical methods.
**CO2:** construct finite element models using calculus of variations for problems connected to solid and fluid mechanics.
**CO3:** apply numerical methods to identify and solve problems related to fluid mechanics, gas dynamics, heat and mass transfer, thermodynamics, vibrations, automatic control systems, kinematics, design etc.
**CO4:** understand the basics of hypothesis testing.
**CO5:** implement a variety of statistical techniques to solve problems of engineering connected to industrial production, quality management and design of experiment.

**Course Outcomes (CO) Mapping with Programme Outcomes (PO)**
CO1: PO1, PO2
CO2: PO1, PO2
CO3: PO1, PO2
CO4: PO1, PO4
CO5: PO1, PO2

**TEXTBOOKS:**
1. B.S. Grewal, Higher Engineering Mathematics (44th Edition), Khanna Publishers, New Delhi.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill publications, New Delhi.

**REFERENCE BOOKS:**
1. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,
    2010.
3. Erwin Kreyszig, Advanced Engineering Mathematics (10th Edition, 2016), Wiley Publishers, New Delhi.
4. M. K. Venkataraman, Higher Engineering Mathematics for Engineering & Science, -National publishing co., Chennai. .
5. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

**QUESTION PAPER PATTERN:**
The Semester End Examination (SEE) is for 100 marks.
1.  There shall be five full questions (one question for each unit) carrying 20 marks each and all are Compulsory.
2. There shall be internal choice in all the Units.

| Sub Title: WORKSTUDY AND ERGONOMICS | | |
|---|---|---|
| **Sub Code : 18IM41** | **No of Credits : 4:0:0** | **No of Lecture hours/week : 04** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 52** |

**Objectives:**
1. To understand the definition of productivity and the factors affecting productivity.
2. To apply the concept of work study and its related issues.
3. To study the Method study through various charts.
4. To identify work measurement and Time study techniques for better production.
5. To describe the importance and application of ergonomics, man-machine system.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **PRODUCTIVITY:** Definition, reasons for low productivity, methods to improve productivity, work-study and productivity <br> **HUMAN FACTOR IN WORK-STUDY**: Relationship of work-study man with management, supervisor & workers, qualities of a work-study man. | **07** |
| 2 | **METHOD-STUDY:** Definition, objectives, step-by-step procedure, questioning techniques, charts and diagrams for recording data. Like outline process charts, flow process charts, multiple activity charts, two handed process chart, string diagram, travel chart, cycle graph, Chrono-cycle graph, | **10** |
| 3 | **MICRO AND MEMO MOTION STUDY:** Charts to record movements at work place – principles of motion economy, Therbligs, and classification of movements, SIMO chart, and micro motion study. Development, definition and installation of the improved method, brief concept about synthetic motion studies | **07** |
| 4 | **INTRODUCTION TO WORK MEASUREMENT:** Definition, objective and benefit of work measurement. <br> **Work measurement techniques:** WORK SAMPLING, need, confidence levels, sample size determinations, random observation, and conducting study with the simple problems. <br> **STOP WATCH TIME STUDY:** Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors affecting rate of working, allowances and standard time determination. Predetermined Motion Time Study (PMTS) .Method Time Measurement (MTM) | **14** |
| 5 | **ERGONOMICS:** Introduction, Areas of study under Ergonomics, System approach to Ergonomics model, Man-Machine System. Components of Man-Machine System and Their functions – Work capabilities of Industrial Worker, Study and Development of Stress in Human body and their consequences. Computer based ergonomics. <br> **DESIGN OF MAN-MACHINE SYSTEM:** Fatigue in industrial workers. Quantitative, qualitative representation and alphanumeric displays. Controls and their design criteria, control types, relation between controls and displays, layouts of panels and machines. Design of work places, influence of climate on human efficiency. Influence of noise, vibration and light. | **14** |

## Outcome:

After the completion of the above course, students will be able to
1. Describe the concept of productivity and the importance of productivity.
2. Analyze the existing methods of working for a particular job and develop an improved method through questioning technique.
3. Construct the various charts use recording techniques for improving productivity.
4. Provide appropriate allowances for the jobs under analysis.
5. Analyze and calculate the level of risk of the job causing stress, fatigue and musculoskeletal disorders among the employees of an organization.

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO3,PO6,PO8PO10 |
| CO2 | PO3,PO4,PO7,PO10,PO11 |
| CO3 | PO3,PO4,PO7,PO10,PO11 |
| CO4 | PO6,PO10,PO11 |
| CO5 | PO6,PO8,PO10 |

**TEXT BOOKS:**
1. ILO, Introduction to work study - III Revised Edition, 1981
2. Motion and Time study - Ralph M Barnes; John Wiley, 8th Edition, 1985.
3. Engineered work Measurement - Wledon, ELBS , 1991

**REFERENCES BOOKS:**
1. Human Factors in Engineering Design - S Sanders and E J McCormick, 6th Edition, Mc Graw Hill
2. Work Study and Ergonomics - S Dalela and Sourabh, – Chand Publishers, 3rd edition.
3. Industrial Engineering Hand book Maynard

| Subject Title : THEORY OF MACHINES | | |
|---|---|---|
| Sub Code : 18IM42 | No of Credits: 2:2:0 | No of lecture hours/week : 4 |
| Exam Duration : 3 Hrs. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 52 |

| Objective: |
|---|
| 1. To define the layout of linkages in the assembly of a system/machine |
| 2. To identify various principles involved in assessing the displacement, velocity and acceleration at any point in a link of a mechanism |
| 3. To analyze the motion resulting from a specified set of linkages in a mechanism. |
| 4. To illustrate the design and application of gears |
| 5. To evaluate the design and application of cams |

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **Introduction:** Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine. **Kinematic Chains and Inversions**: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain. | 8+2(T) |
| 2 | **Mechanisms:** Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Straight-line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph. | 8+3(T) |
| 3 | **Spur Gears:** Gear terminology, law of gearing, Characteristics of involute action, Path of contact. Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. | 7+3(T) |
| 4 | **Gear Trains:** Simple gear trains, Compound gear trains for large speed reduction, Epicyclical gear trains, Algebraic and tabular methods of finding velocity ratio of epicycle gear trains(Simple Problems with tabular column method only). Tooth load and torque calculations in epicyclic gear trains. **Velocity Analysis by Instantaneous Center Method:** Definition, Kennedy's Theorem, Determination of linear and angular velocity using instantaneous center method | 12+5(T) |
| 5 | **Klein's Construction**: Analysis of velocity and acceleration of single slider crank mechanism. **Cams:** Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion. | 12+5(T) |

❖ Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself

**Note 1:**

- **SEE question paper shall contain 10 questions having internal choice in each unit.**
- **Students shall answer one question from each unit.**

**Note 2:**
- **Assignments are evaluated for 5 marks.**
- **CIE shall be evaluated for 20 marks**

| Outcome: |
|---|
| After the completion of the above course students will be able to |

1. Discuss the common mechanisms used in machines and everyday life.
2. Calculate mobility (number of degrees-of-freedom) and enumerate rigid links and types of joints within mechanisms.
3. Analyze the complete (translational and rotational) mechanism velocity and acceleration graphically.
4. Classify gear mechanism and analyze gear train, and interpret gear standards and specification in design.
5. Explain cam mechanism and cam motion profiles, and calculi the velocity and acceleration of cam.

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1,PO2,PO3 |
| CO2 | PO1,PO2,PO3 |
| CO3 | PO1,PO2,PO3 |
| CO4 | PO2,PO3,PO5,PO8,PO9,PO12 |
| CO5 | PO2,PO3,PO5,PO8,PO9,PO12 |

TEXT BOOKS:
1. **"Theory of Machines",** Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. **"Theory of Machines",** Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006
3. **"Theory of mechanisms and machine" Amithaba Gose and Asok kumar malik Third edition, east west press, 2006**

REFERENCE BOOKS:
1. **"Theory of Machines & Mechanisms**", J.J. Uicker, G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. **Mechanism and Machine theory**, Ambakar. A G ,PHI learning 2007
3. **Theory of machine,** Joseph Edward Shigley, OXFORD PRESS.

| Sub Title : ENGINEERING ECONOMY | | |
|---|---|---|
| Sub Code : 18IM43 | No. of Credits:3 =2 : 2 : 0 (L-T-P) | No. of lecture hours/week : 4 |
| Exam Duration : 3 hr. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 52 |

| Course Objectives : |
|---|
| 1. To Prepare Students to analyze cost or Revenue Data |
| 2. To apply engineering economic decision making to realistic problems. |
| 3. To justify or reject alternatives or Projects on an Economic basis |
| 4. To apply the Replacement analysis as part of maintenance aspects for better decision making |
| 5. To learn estimation and costing of the manufactured products as part of financial aspect for profit maximization or minimization of losses in the business |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION:** Engineering Decision- Makers, Engineering and Economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy. Interest and Interest factors: Interest rate, simple interest, Compound interest, Cash- flow diagrams, Exercises and Discussion. | 08 |
| 2 | **PRESENT WORTH COMPARISON:** Conditions for present worth comparisons, Basic Present worth comparisons, Present worth equivalence, Net Present worth, Assets with unequal lives, infinite lives, Future worth comparison, Pay – back comparison, Exercises, Discussions and problems. Equivalent annual worth comparisons: Equivalent Annual Worth Comparison methods, Situations for Equivalent Annual Worth Comparison, Consideration of asset life, Comparison of assets with equal and unequal lives, Use of sinking fund method, Annuity contract for guaranteed income, Exercises, Problems. | 14 |
| 3 | **RATE OF RETURN CALCULATIONS:** Rate of return, Minimum acceptable rate of return, IRR, IRR misconceptions, Cost of capital concepts, replacement models. <br> **Depreciation**: Causes of Depreciation, Basic methods of computing depreciation charges**.** Structural analysis of alternatives: Identifying and Defining alternatives, IRR analysis of mutually exclusive alternatives, Capital Budget view point, Ranking criteria. | 14 |
| 4 | **REPLACEMENT ANALYSIS:** Introduction, reasons for replacement**,** Individual Replacement of machinery or equipment with/without value of money, Group Replacement Policies, Problems. <br> **EFFECTS OF INFLATION:** Causes, consequences and control of inflation. After tax actual cash flow comparisons, Lease/ Buy decisions. | 07 |
| 5 | **ESTIMATING & COSTING:** Components of costs such as Direct Material Cost, Direct Labor Cost, Fixed, Over – Heads, Factory Costs, Administrative – Over Heads, First Cost, Marginal Cost, Selling price, Estimation for simple components. Break-even analysis: Basic Concepts Linear & non-linear break even analysis. | 09 |

**Note 1:**
- **SEE question paper shall contain 10 questions having internal choice in each unit.**
- **Students shall answer one question from each unit.**

- **Assignments are evaluated for 5 marks.**
- **CIE shall be evaluated for 20 marks**

| Outcome: |
| --- |
| By the end of the course students will be able to |

1. Perform and evaluate present worth, future worth and Annual worth analyses on one of more economic alternatives.
2. Assess the payback period and capitalized Cost on one or more economic alternatives.
3. Carry out and estimate the benefit/cost, life cycle.
4. Interpret breakeven analyses on one or more economic alternatives

| Cos | Mapping with POs |
| --- | --- |
| CO1 | PO2,PO4,PO5,PO7,PO11 |
| CO2 | PO4,PO5,PO6,PO7,PO11,PO12 |
| CO3 | PO4,PO6,PO7,PO11,PO12 |
| CO4 | PO6,PO7,PO11,PO12 |

**TEXT BOOKS:**
1. **Engineering economics** - RIGGS J.L. McGraw Hill, 2015.
2. **Engineering economy** - PAUL DEGARMO, Macmillan Pub, Co. 2006.
3. **Engineering Economy** - Naidu, Babu and Rajendra, New Age International Pvt. Ltd. - 2006
**REFERENCE BOOKS:**
1. **Financial Management** - I M PANDAY, Vikas Publishing House 2016.
2. **Engineering economy -** THUESENH.G. PHI, 9th edition, 2012
3. **Engineering Economics –** Tara Chand, 9th edition, 2012

| Sub Title : STATISTICS FOR ENGINEERS | | |
|---|---|---|
| Sub Code : 18IM44 | No. of Credits:4=4 : 0 : 0 (L-T-P) | No. of lecture hours/week : 4 |
| Exam Duration : 3 hr. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 52 |

| Course Objectives: |
|---|
| 1. Apply the basic fundamental concepts of Statistics to engineering problems and the importance of Data summary and Display. |
| 2. Evaluate the application of discrete probability distribution to various manufacturing problems. |
| 3. Evaluate the application of Continuous probability distribution to various manufacturing problems. |
| 4. Explain the hypothesis to random experiments of manufacturing processes. |
| 5. Test the statistical parameters by regression and correlation. and test for variance |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **THE ROLE OF STATISTICS IN ENGINEERING (DATA SUMMARY AND PRESENTATION):** Statistical Thinking, Collecting data, Statistical Modeling Frame work, measure of central tendency and variance, Importance of Data summary and Display, Tabular and Graphical display | 08 |
| 2 | **DISCRETE RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS:** Discrete Random variables, Probability distributions and Probability mass functions, Cumulative distribution functions, Mean and Variance of a discrete random variable, Discrete uniform distribution, Binominal distribution, Hyper Geometric distribution, Poisson distribution and their Applications. | 08+ 02(T) |
| 3 | **CONTINUOUS RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS:** Continuous random variables, Probability distributions and probability density functions, cumulative distribution functions, Mean and Variance of a continuous random variable, uniform distribution, Normal distribution, Normal approximation to Binominal and Poisson distribution, Exponential distribution and their Applications. | 08+ 02(T) |
| 4 | **ESTIMATION THEORY:** Statistical Inference, Random sampling, Properties of Estimators, Sampling distribution, Sampling distribution of mean, variance and proportion. Introduction to confidence intervals. **STATISTICAL INFERENCE FOR A SINGLE SAMPLE AND TWO SAMPLES:** Hypothesis testing, Inference on the mean of a population (variance known and unknown), Inference on the variance of a normal population, Inference on a population proportion. Testing for Goodness of Fit, Inference for a difference in Means, Variances known, Inference for a difference in means of two normal distributions, Variances unknown, Inference on the Variances of two normal populations, Inference on two population proportions. | 10+ 02(T) |
| 5 | **SIMPLE LINEAR REGRESSIONS AND CORRELATION:** Simple Linear Regression, Properties of Least square Estimators and | 10+2(T) |

| | Estimation of variances, Common abuses of regression, Prediction of new observations, Assessing the adequacy of regression model, Transformations to a straight line, Introduction to multiple regression (no problems), Correlation. **DESIGN OF EXPERIMENTS:** Strategy of experimentation, completely randomized single - factor experiment, Tests on individual treatment means, the random effects model, the randomized complete block design, one way analysis of variance and two way analysis of variance. | |

**Note 1:**
- **SEE question paper shall contain 10 questions having internal choice in each unit.**
- **Students shall answer one question from each unit.**

**Note 2:**
- **Assignments are evaluated for 5 marks.**
- **CIE shall be evaluated for 20 marks**

## Outcome:

At the end of the course students will be able to
1. Apply the statistical data in the form of Tabular and Graphical display.
2. Identify discrete type of probability and solve the various engineering problems.
3. Solve Continuous type of probability and solve the various engineering problems
4. Estimate the hypothesis and give inference to random experiments.
5. Evaluate the statistical parameters by estimation.

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO1,PO2,PO12 |
| CO2 | PO1,PO2,PO3,PO12 |
| CO3 | PO1,PO2,PO3,PO12 |
| CO4 | PO1,PO2,PO3,PO4,PO12 |
| CO5 | PO1,PO2,PO3,PO5,PO9,PO12 |

**TEXT BOOKS:**
1. **Applied statistics and Probability for Engineers** – Douglas C Montgomery, George C Runger, 2nd Edition, John Wiley and Sons, ISBN-0-471-17027-5
2. **Statistics for Management -** Richard I Levin, David S Rubin, 6th Edition, Prentice Hall India, ISBN-81-203-0893-X

**REFERENCE BOOKS:**
1. **Probability and Statistics in Engineering** - William W Hines, Douglas C Montgomery, 2nd Edn, John Wiley and Sons
2. **Business Statistics for Management and Economics** - Daniel, Terrell, 6th Edn, Houghton Mifflin Company, ISBN-0-395-62835-0
3. **Probability and Statistics** - Walpole & Mayer, MacMillan Publishing Company, 1989.

| Subject Title : **COMPUTER AIDED MACHINE DRAWING** | | |
|---|---|---|
| **Sub Code : 18IML45** | **No of Credits : 3** | **No. of Hrs / Week : 4** |
| **Exam Duration : 3 Hrs.** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 13** |

| **Objective:** |
|---|
| 1. To visualize an object and convert it into a drawing.<br>2. To train the students to use commercial solid modeling software package<br>3. To explain the basic concept and to draw the views of section of solids, orthographic projections and threaded fasteners<br>4. To gain knowledge of conventional representation of mechanical Components<br>5. This course will give an insight to design, creation of an assembly and detailed drawing of machine components |

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **Introduction:** Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.<br>**Sections of Solids:** Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on, axis inclinations, spheres and hollow solids). True shape of sections.<br>**Orthographic Views:** Conversion of pictorial views into orthographic projections of simple machine parts with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. Precedence of lines. | 8 |
| 2 | **Geometric Dimensions and Tolerances:** Drafting, tolerance and geometrical symbols used in machine drawing.<br>**Fasteners:** Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly)<br>**Riveted Joints:** Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). | 08 |
| 3 | Assembly Drawings(Part drawings should be given)<br>1. Screw jack (Bottle type)<br>2. Machine vice<br>3. Plummer block<br>4. I.C. Engine connecting rod | 18 |

Note 1: SEE Question paper contains total six Questions (two questions from each unit) and student should answer any one question from Unit I and Unit II and III ( student shall answer total 3 questions).

**Course Outcomes:**
After the completion of the above course students will have the
1. Ability to use standard software tools to create part assemblies
2. Ability to create fully constrained solid models that can be quickly modified using standard software tools
3. Ability to identify and explain standard features in solid modeling including protrusion, revolution, cutouts and patterns.
4. Ability to use standard software tools to create engineering drawings to describe the geometries and dimensions of parts
5. Ability to create computer aided drawings by interpreting and applying drafting standards.

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO2,PO11 |
| CO2 | PO2,PO11 |
| CO3 | PO2,PO3,PO11 |
| CO4 | PO2,PO3,PO11 |
| CO5 | PO2,PO3,PO11 |

**Text books:**

1. **'Machine Drawing'**, K.R. Gopala Krishna, Subhash Publication
2. **'Machine Drawing'**, N.D.Bhat & V.M.Panchal

**Reference books:**
1. **'A Primer on Computer Aided Machine Drawing - 2007'**, Published by VTU, Belgaum.

Suitable Software Used: Solid Edge

| **Scheme of Examination:** | |
|----------------------------|-----------|
| ONE question from Unit 1 | 10 Marks |
| ONE question from Unit 2 | 10 Marks |
| ONE question from Unit 3 | 30 Marks |
| **Total** | **50 Mark** |

| Subject Title : WORKSTUDY AND ERGONOMICS LAB | | |
|---|---|---|
| Sub Code : 18IML46 | No. of Credits:1 | No. of lecture hours/week : 2 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 13 |

### PART – A (METHOD STUDY)

**Objectives:**
1. To apply the basic fundamental concepts of Industrial engineering shall in Serial experimental problems.
2. To construct various charts using recording techniques
3. Application and development of different plant layouts
4. Analysis and practice of performance rating experiments.
5. To test the statistical parameters by regression and correlation.

**Recording Techniques:** Preparing the following charts and diagrams (Minimum 3 Charts) - Outline process chart, Multiple Activity chart, Flow process chart and Flow diagram, String diagram.

Experiments on the Application of principle of motion economy, Two handed process chart.

Exercises on conducting method study for assembling simple components and office work.

Development of Layout plans using SLP technique.

### PART – B (WORK MEASUREMENT)

| 1 | Rating practice using: walking simulator, pin board assembly, dealing a deck of cards and marble collection activity |
|---|---|
| 2 | Determining the standard time for simple operations using stopwatch time study |
| 3 | Exercises on estimating standard time using PMTS. |
| 4 | Measurement of parameters (heart beat rate, calorie consumption) using walking simulator |
| 5 | Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergometer |
| 6 | Effect of Noise, Light, Heat on human efficiency in work environments. |

**Outcome:**

After undergoing the machine shop practice will be able to
1. Use basic fundamental concepts of Industrial engineering to practical applications.
2. Construct various charts and diagrams for manufacturing activities to minimize the delays and unnecessary activities.
3. Draw and develop different plant layouts for feasibility check.
4. Perform rating experiments for good observation.
5. Test the statistical parameters by regression and correlation.

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1,PO9,PO12 |
| CO2 | PO1,PO2,PO5,PO12 |
| CO3 | PO2,PO3,PO5,PO6,PO7,PO12 |
| CO4 | PO1,PO3,PO4,PO12 |
| CO5 | PO1,PO2,PO4,PO6,PO12 |

### Scheme of Examination:

One question is to be set Part A    : 10 marks

One question is to be set from Part B  : 30 marks

Viva-Voce         : 10 marks.

**Total**         **: 50 marks.**

| Subject Title    : MECHANICAL MESUREMENTS AND METROLOGY LAB | | |
|---|---|---|
| Sub Code    : 18IML47 | No of Credits   : 0:0:1 | No. of Hrs / Week : 2 |
| Exam Duration :  3 Hrs. | CIE + SEE = 50  +  50 =100 | Total  No. of Contact Hours : 12 |

| Objective: |
|---|
| 1.  To study the Measurement standards available and to apply. |
| 2.  To study and learn the calibration procedure for different instruments. |
| 3.  To provide hands on experience and to study the various types of gauges, projectors, comparators and transducers. |
| 4.  To know and learn the applications of different measuring instruments used in manufacturing / production industries for inspection and calibration. |

| MECHANICAL MEASUREMENTS | |
|---|---|
| 1 | Calibration of  Pressure Gauge |
| 2 | Calibration of  Thermocouple |
| 3 | Calibration of  LVDT |
| 4 | Calibration of  Load cell |
| 5 | Determination of modulus of elasticity of a mild steel specimen using strain gauges |
| **METROLOGY** | |
| 1 | Measurements using Optical profile Projector and Toolmaker Microscope. |
| 2 | Measurement of straightness using Autocollimator, measurement of angle using Sine Center / Sine bar / bevel protractor |
| 3 | Measurement of cutting tool forces using              Lathe tool Dynamometer              Drill tool Dynamometer. |
| 4 | Measurement of Screw threads Parameters using Two wire or Three-wire method. |
| 5 | Measurement of surface roughness using Talysurf. Linear measurements using Mechanical Comparator, Electronic comparator. |
| 6 | Measurement of gear tooth profile using gear tooth Vernier /Gear tooth micrometer |
| 7 | Calibration of Micrometer using slip gauges |
| 8 | Measurement using Optical Flats |

| Outcome: |
|---|
| After the completion of the above course students will be able to |
| 1.  Will be able to demonstrate standard operational procedures of different measuring instruments |
| 2.  Able to Calibrate Precision Instruments |
| 3.  Able to identify the different operating and instrument errors for calibration |
| 4.  Able to plot and interpret the operation characteristic and learning curves and also can give remedies/ suggestions for improvement that can be error free instrument. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1, PO3, PO4 |
| CO2 | PO1, PO2, PO12 |
| CO3 | PO5, PO12 |
| CO4 | PO4, PO5, PO12 |

**Scheme of Examination:**

| | |
|---|---|
| ONE question from Mechanical Measurements | 20 Marks |
| ONE question from Metrology | 20 Marks |
| Viva –Voce | 10 Marks |
| **Total** | **50 Marks** |

| Subject Title | : MATERIAL TESTING LAB | | |
|---|---|---|---|
| Sub Code : 18IML48 | No of Credits : 0:0:1 | | No. of Hrs / Week : 3 |
| Exam Duration : 3 Hrs. | CIE + SEE = 50 + 50 =100 | | Total No. of Contact Hours : 13 |

**Objective**

1. To learn and demonstrate the basic principles in the area of strength and mechanics of materials through a series of experiments.
2. To provide hands on experience in measuring loads, deflection and strains.

| Expt. No | Description |
|---|---|
| 1 | Preparation of specimen for Metallographic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites. **(Only Demonstration)** |
| 2 | Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples. **(Only Demonstration)** |
| 3 | To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters. **(Only Demonstration)** |
| 4 | Non-destructive test experiments like, **(Only Demonstration)**<br>   (a). Ultrasonic flaw detection<br>   (b). Magnetic crack detection<br>   (c). Dye penetration testing. To study the defects of Cast and   Welded specimens. |
| 5 | Tensile, shear and compression tests of metallic and non metallic specimens using  Universal Testing Machine |
| 6 | Torsion Test |
| 7 | Bending Test on metallic and nonmetallic specimens. |
| 8 | Izod and Charpy Tests on M.S, C.I Specimen. |
| 9 | Brinell, Rockwell and Vickers's Hardness test. |

**Outcome:**

After the completion of the above course students will be able to use
   1. Demonstrate the Nondestructive testing methods
   2. Experiment and compute loads, deflection, strains and hardness and various other parameters using basic material testing equipment's.
   3. Evaluate the strengths of metallic specimens using UTM

| Cos | Mapping with POs |
|---|---|
| CO1 | PO3,PO12 |
| CO2 | PO1,PO2,PO6,PO12 |
| CO3 | PO1,PO2,PO6,PO12 |

**Scheme of Examination:**

Two  question (one from 1,2,3 and 4 and one from 5 , 6, 7, 8, 9)  :        15 +25 Marks

Viva -Voice:                                                                          :          10  Marks

                                                                    Total        :          50 Marks

| Subject Title: CONSTITUTION OF INDIA & PROFESSIONAL ETHICS | | |
|---|---|---|
| Subject Code: 18HS41 | No. of Credits: 1 | No of lecture hours per week: 2 Hrs |
| Exam Duration: 2 Hrs | Exam Marks: 50 | Total No. of lecture hours: 16 hrs per week |

**Total Text Objectives:**

Constitution of India and professional Ethics taught to the students to enable them an insight into the constitution and enlighten them about the fundamental rights, Protection of rights through enforcement of writs. Functions of judiciary, knowledge and importance of election in democratic country procedure of elections to the post of president, members of parliament and state legislative assembly and the function of Parliament, legislative Assembly and their powers.

Professional ethics- The duties and basic responsibilities of engineers towards society and their employer, apply of new ideas and protection of those ideas.

**Course Objective**

1. The objective of part-I of the syllabus is to know how the Constitution of India was framed and the basic structure of Indian Constitution and the rights given by the Constitution to their Citizens.

2. The objective of part-II.. To inculcate knowledge on election commission in the democratic system. The functions of judiciary in upholding of the Indian Constitution

3. The objective of part-III. Is enlightening them about the system of government adopted in both Central and State and Method of election of representative of Parliament and State Assembly their powers and function and also enlighten them about the term democracy

4. The Objective of part IV. To create awareness on Professional ethics and Human Values

5. The objective of part-V. To inculcate knowledge and exposure on Safety and Risk, Risk Benefit Analysis and have an idea about the Collective Bargaining, Confidentiality, Professional, Employee, Intellectual Property Rights

| UNIT NO | SYLLABUS CONTENTS | No. of hours |
|---|---|---|
| 1 | INTRODUCTION<br>Framing of India Constitution, Salient Features of the Constitution, Basic Structure, Preamble of the Constitution,<br>Fundamental Rights- Article (12-35), Art 32 &226, Restrictions under Constitution Fundamental Duties Art (51A). | 8 |
| 2 | Directive Principles Of State Policy<br>Election commission<br>Judiciary system-Role of Supreme Court of India and High Court of State | 3 |
| 3 | UNION GOVERNMENT<br>Executive - President, Prime Minister, council of ministers<br>Legislature- Parliament, Lok-Sabha , Rajya-Sabha<br>STATE GOVERNMENT<br>Executive – Governor, Chief Minister, Council of Ministers.<br>Legislative- Legislative Assembly , Legislative Council | 5 |
| 4 | HUMAN VALUES& PROFESSIONAL ETHICS:<br>Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence. | 5 |

| 5 | SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) Piracy and plagiarism. | 4 |
|---|---|---|

**Course Outcomes**

1. Students come to know that who are all take part in the framing of Indian Constitution and how it was framed, what it contained. The Rights they can enjoy as a citizen of India. Case law gives detailed knowledge to the students about their fundamental rights. Procedure of enforcement of fundamental rights.

2. Student gets the knowledge about procedure of conducting of election by the election commission, its duties and powers along with powers and functions of judiciary.

3. Student comes to know regarding system of parliamentary form of government .and how the representative of Central and State Government are elected their powers and functions

4. Student comes to know the correct meaning of ethics and their ethical duties and responsibilities and using of honesty in their profession, and the decision making ability.

5. Student gets the knowledge of using the intellectual property rights and its protection and its application in their profession.

**TEXT BOOKS:**

1. INTRODUCTION TO THE CONSTITUTION OF INDIA by DURGA DAS BASU. (Students Edition) Prentice – Hall EEE, 19th/20th Edn. 2001.

2. ENGINEERING ETHICS by CHARLES E. HARIES, MICHAEL.S.PRITCHARD AND MICHAEL J. ROBINS THOMPSON ASIA, 2003-08-05

**Reference Books:**

1 An Introduction to Constitution of India by M.V.Pylee, Vikas Publishing, 2002.

2. Constitution of India by B S Raman

2 Engineering Ethics by M.Govindarajan, S. Natarajan, V.S.Sendilkumar, Prentice – Hall of India Private Ltd, New Delhi, 2004.

3 Constitution of India and Professional Ethics—K R Phaneesh

4 Introduction to the Constitution of India—Brij Kishore Sharma

| Subject Title | : Environmental Studies | | |
|---|---|---|---|
| Sub Code : 18HS42 | No of Credits: 1 | | No. of Hrs / Week : 2 |
| Exam Duration : 3 Hrs. | CIE + SEE = 50 + 50 =100 | | Total No. of Contact Hours : 16 |

**Objectives:**
1. To create awareness among the students about impacts of developmental and human activities on natural resources, remedial measures and life support systems viz. land, water, air etc.
2. It makes how to conserve natural resources for sustainable development.
3. To understand the importance of environmental protection and sustainable development.

| Unit. No | Syllabus | No of Hours | |
|---|---|---|---|
| | | Teaching | Tutorial |
| 1 | **Introduction**: Concept of environmental studies. Definition of environment, components of the environment and structure of the atmosphere.<br>Study of different ecosystems.<br>**Human Activities And Its Effect On Environment:** Agriculture, Industry, Mining, Transportation, & Urbanization. | 04 hours | ------- |
| 2 | **Natural Resources:** Forest Resources, Water Resources, Mineral Resources, Food Resources and Land Resources<br>**ENERGY:** Definition of energy and energy resources, different types of energy-conventional and non-conventional energies (Classification only). | 03 hours | ------- |
| 3 | **Environmental Pollution And Effects:** Air pollution, Water pollution "water born and water induced disease", Soil pollution and Noise pollution.<br>**Current Environmental Issues Of Importance:** Population Growth, Climate | 03hours | ------- |
| 4 | **ENVIRONMENTAL Episodes:** Episodes (Los Angeles smog, Minamata disease in Japan 1945, Bhopal (India) gas tragedy 1984) - Brief Description Legislation to control and protect the environment, about environmental awareness.<br>**Environmental Impact Assessment And Sustainable Development.** | 03 hours | ------- |

**Text Books**
1. Ranjit Daniels R.J. and Jagdish Kirshnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi
2. Benny Joseph (2005), "Environmental Studies", Tata McGraw - Hill Publishing Company Limited
3. Rajagopalan R. (2005), "Environmental Studies – From Crisis to Cure", Oxford Univesity Press

**References**
1. Raman Sivakumar, (2005), "Principles of Environmental Science and Engineering", Second Edition, Thomson Learning, Singapore
2. Meenakshi P. (2006), "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi
3. Prakash S.M. (2007), "Environmental Studies", Elite Publishers, Mangalore
4. Erach Bharucha (2005), "Text Book of Environmental Studies", for UGC, Universities Press
5. Tyler Miller Jr. G. (2004), "Environmental Science – Working with the Earth", Tenth Edition, Thomson Brooks/Cole
6. Tyler Miller Jr. G. (2006), "Environmental Science – Working with the Earth", Eleventh Edition, Thomson Brooks/Cole

www.iitg.ernet.in>rkbc>presentation
www.nptel.org.in
http://books.google.co.in

**Course Outcomes:**
**CO1.** The students will be introduced and refreshed about the ecology and ecosystem in general and understand the effect of human activities on environment.
**CO2**. The students will be able to analyze the importance of natural resources and its protection.
**CO3**. The students will understand the value of environment protection by studying past episode.
**CO4**.The students will acquire the skill to adopt the suitable method for sustainable development through environmental impact assessment and rainwater harvesting.

| Subject Title: EMPLOYABILITY SKILLS | | |
|---|---|---|
| Subject Code: 18HS43 | Mandatory Course | No of lecture hours per week: 2 Hrs |
| Exam Duration: | Exam marks: NIL | Total No. of lecture hours: 26 hrs per semester |

**COURSE OBJECTIVE**:
1. According to the present day requirement, this unit is designed on job seeking topics, adopting a task based approach with activities and worksheets.
2. In this unit students will be taught to prepare project report effectively which is integral part of their academics by making use of referencing skills. And also they will be taught how to write an abstract and will be familiarized with research paper guidelines.
3. The unit 3 aims at preparing the student to face interviews confidently.
4. Under the topics like synonyms, antonyms and homophones students' vocabulary will be enhanced.
5. The lessons under this unit help students' to use idioms and phrases, decoding the analogies and the correct usage of collective nouns

| UNIT NO | SYLLABUS CONTENT | HRS/COS |
|---|---|---|
| 1 | a. Employability Skills<br>b. PRESENTATION SKILLS<br>c. RESUME WRITING<br>d. COVERING LETTER<br>e. E-MAIL WRITING | 8 CO1 |
| 2 | a. PROJECT REPORT<br>b. REFERENCING SKILLS<br>c. ABSTRACT WRITING<br>d. RESERCH PAPER GUIDELINE AND FORMAT | 2 CO2 |
| 3 | e. INTERVIEW SKILLS | 8 CO3 |
| 4 | f. SYNONYMS<br>g. ANTONYMS<br>h. HOMOPHONES | 4 CO4 |
| 5 | i. IDIOMS & PHRASES<br>j. ANALOGY<br>k. COLLECTIVE NOUNS | 4CO5 |

**COURSE OUTCOME:**
1. After the completion of this unit students will have learnt to make presentations both in formal and informal situations. And also will have learnt the art of resume writing.
2. After the completion of this unit student will have learnt how to do a project report using referencing skills. And also they will have learnt how to write abstract and will have been familiarized with research paper guidelines.
3. This unit will have helped student to communicate with various skills required for job interviews.
4. After the completion of this unit the students will have learnt the strategies of vocabulary.

5.  After the completion of this unit student will have learnt to use idioms and phrases in everyday conversation.

**REFERENCE:**

- English Skills for Technical Students by British Council, Orient Black Swan.
- A course in Grammar and Composition by Geetha Nagaraj, Cambridge University Press India Pvt. Ltd.
- Communication Skills for Professionals by Nira Konar, PHI learning Pvt. Ltd.
- Enhancing English and Employability Skills by State Board of Technical Education.

**For FOURTH Semester B.E. (Lateral Entry: Common to all branches)**

<table>
<tr><td colspan="3" align="center">**Subject Title: BASIC ENGINEERING MATHEMATICS-II**</td></tr>
<tr><td rowspan="2">**Subject Code : MADIP41**</td><td rowspan="2">**No. of Credits: 00**</td><td>**No of lecture hours per week: 04**</td></tr>
<tr><td>**Total No. of lecture hours: 50**</td></tr>
<tr><td colspan="3">**Course objective:** To develop a basic Mathematical knowledge required for higher semesters with few examples of its engineering applications.</td></tr>
<tr><td>**Unit No.**</td><td align="center">**Syllabus content**</td><td>**No. of hours**</td></tr>
<tr><td>1</td><td>**Partial Differential Equations:** Formation of Partial differential equations (PDE) by elimination of arbitrary constants/functions. Solution of non-homogeneous PDE by direct integration. Solution of homogeneous PDE involving derivative with respect to one independent variable only. Solution of PDE by the Method of separation of variables (first and second order equations).</td><td>10</td></tr>
<tr><td>2</td><td>**Vector Calculus I:**<br>Vector Differentiation: Scalar and vector point functions – Gradient, Directional derivative, Divergence, Curl, Solenoidal and Irrational vector fields. Vector identities involving Gradient, Divergence and Curl.<br>Applications-Velocity, acceleration, conservative, Solenoidal, irrational and angular momentum fields.</td><td>10</td></tr>
<tr><td>3</td><td>**Vector Calculus II:**<br>Vector Integration: Line, surface and volume integrals-simple problems, Green's theorem in a plane, Stoke's and Gauss divergence theorem (without proofs).<br>Applications-involving simple problems of triangles, cubes, rectangular parallelepipeds and solid figures.</td><td>10</td></tr>
<tr><td>4</td><td>**Functions of a Complex Variable:** Review of continuity, differentiability. Definition-analytic function, Cauchy-Riemann equations in Cartesian and polar forms. Harmonic and orthogonal properties of analytic function. Construction of analytic functions.</td><td>10</td></tr>
<tr><td>5</td><td>**Complex Integration:** Complex line integrals, Cauchy's theorem and Cauchy's integral formula. Taylor's and Laurent's series (without proof), Singularities, poles and residues, Residue theorem (without proof).<br>Applications- Contour integrals of the forms: $\int\limits_{0}^{2\pi} f(\sin\theta, \cos\theta) d\theta$</td><td>10</td></tr>
</table>

**Course Outcomes:** After the successful completion of the course, the students are able to

**CO1:** analyze the basic concepts of partial differential equations and their solutions through standard methods.

**CO2:** use the idea of gradient, divergence, curl involved in vector fields arising in fields and wave transmission theory.

**CO3:** assess the practical importance of Laplace and inverse Laplace transforms and their utility in network analysis, circuit theory and convection problems.

**CO4:** apply logical thinking to problem-solving in context and identify an appropriate solution for various engineering streams.

**CO5:** use the skills in understanding Mathematical knowledge.

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**Course Outcomes (CO) Mapping with Programme Outcomes (PO)**

CO1: PO1, PO2
CO2: PO1, PO2
CO3: PO1, PO2
CO4: PO1, PO4
CO5: PO1, PO2

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**TEXTBOOKS:**
1. B.S. Grewal, Higher Engineering Mathematics (44th Edition), Khanna Publishers, New Delhi.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill publications, New Delhi, 11th Reprint, 2010

**REFERENCE BOOKS.**
1. Erwin Kreyszig, Advanced Engineering Mathematics (Latest Edition), Wiley Publishers, New Delhi.
2. H. C. Taneja, Advanced Engineering Mathematics, Volume I & II, I.K. International Publishing House Pvt. Ltd., New Delhi.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.
5. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.

**Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY**
**BANGALORE - 56**
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**&**
**AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,**

**PROPOSED SYLLABUS**

**For**

**V Semester**
**(FOR THE ACADEMIC YEAR 2021-2022)**
**(Batch 2019)**

**Department of Industrial Engineering & Management**

**Website: www.drait.edu.in                    e-mail id: principal@drait.edu.in**
**Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY**
**BANGALORE - 56**
**AIDED BY GOVERNMENT OF KARNATAKA**
**&**

**AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,**

*Vision*

- To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

*Mission*

- To offer state-of-the-art undergraduate, postgraduate and doctoral programs in the fields of Engineering, Technology And Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industry requirements.
- To install moral and ethical values with social and professional commitment.

## Department of Industrial Engineering & Management

*Objective*

- ➢ To maintain a Comprehensive curriculum that enables students to become leading engineers and creative researchers in the global marketplace.

- ➢ To collaborate with private and public sectors in the search of methodologies and creative solutions to problems that contributes to the advancement of education, technology and professional development.

- ➢ To contribute to the profitable growth of industrial economic sectors by using IE analytical tools, effective computational approaches, and systems thinking methodologies.

- ➢ To maintain high standards of professional and ethical responsibility.

- ➢ To provide a broad education necessary to determine the impact of engineering solutions in a global economic, environmental, a societal context.

*Vision:*

- ♦ To be globally recognized as a leader in industrial engineering education, research and enhance the application of technical knowledge to benefit the society.

# Department of Industrial Engineering & Management

**Faculty List:**

| 1 | Dr.N.Mohan | Professor and Head |
|---|---|---|
| 2 | Dr. S. K. Rajendra | Associate Professor |
| 3 | Dr. Rajeshwari P | Associate Professor |
| 4 | Dr. C R Mahesha | Assistant Professor |
| 5 | Mrs. Suprabha R | Assistant Professor |
| 6 | Mr. Chetan N | Assistant Professor |
| 7 | Mr. Rajesh K | Assistant Professor |
| 8 | Mrs. Sarvamangala S P | Assistant Professor |

| Sl. No | Course and Course code | | Course Title | Teaching Department | Theory Lecture | Tutorial | Practical/ Drawing | Duration in hours | CIE Marks | SEE Marks | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **L** | **T** | **P** | | | | | |
| 1 | HS | 18HS51/52 | M&E / IPR (title as per BOS decision) | HS | 3 | - | -- | 03 | 50 | 50 | 100 | 3 |
| 2 | PC | 18IM51 | Operations Research | | 3 | 2 | -- | 03 | 50 | 50 | 100 | 4 |
| 3 | PC | 18IM52 | Computer Integrated Manufacturing | | 2 | 2 | -- | 03 | 50 | 50 | 100 | 3 |
| 4 | PC | 18IM53 | Design of Machine Elements | | 3 | 2 | -- | 03 | 50 | 50 | 100 | 4 |
| 5 | PC | 18IM54 | Quality Assurance and Reliability | | 2 | 2 | -- | 03 | 50 | 50 | 100 | 3 |
| 6 | PE | 18IM55X | Professional Elective -1 | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 7 | PC | 18IM56X | Open Elective- A | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 8 | PC | 18IML57 | Quality Engineering Laboratory | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| 9 | PC | 18IML58 | CIM Laboratory | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| | | | **TOTAL** | | **19** | **8** | **4** | **27** | **450** | **450** | **900** | **25** |

**V SEMESTER**

**Teaching Hours /Week**

**Examination**

**Note: HS: Humanities, PC: Professional Core, MC: Mandatory Course,**

**Electives**

| Course code | Professional Electives - 1 |
|---|---|
| | |

| 18IM551 | Advanced Machining Processes |
|---------|------------------------------|
| 18IM552 | Marketing Management |
| 18IM553 | Rapid Prototyping |
| 18IM554 | Enterprise Resource Planning and e- commerce |
| 18IM555 | Data Warehousing And Mining |

| Course code | Open Elective -A |
|-------------|------------------|
| 18IM561 | Operations Research |

| Sl. No | Course and Course code | | Course Title | Teaching Department | Teaching Hours /Week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | | | | | |
| 1 | HS | 18HS61/62 | M&E/IPR | HS | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 2 | PC | 18IM61 | Materials Management | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 3 | PC | 18IM62 | Facilities Planning and Design | | 2 | 2 | -- | 04 | 50 | 50 | 100 | 3 |
| 4 | PC | 18IM63 | Lean Manufacturing | | 2 | 2 | -- | 04 | 50 | 50 | 100 | 3 |
| 5 | PC | 18IM64 | Simulation Modelling and Analysis | | 2 | 2 | -- | 04 | 50 | 50 | 100 | 3 |
| 6 | PE | 18IM65X | Professional Elective -2 | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 7 | OE | 18IM66X | Open Elective -B | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 8 | PC | 18IML67 | Simulation Laboratory | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| 9 | MP | 18IMP68 | Mini-project | | -- | -- | 2 | 03 | 50 | 50 | 100 | 2 |
| 10 | INT | 18IMI69 | Industry Internship | (To be carried out during the intervening vacations of VI and VII semesters ) | | | | -- | -- | -- | -- | -- |
| | | | | **TOTAL** | **18** | **06** | **04** | **30** | **450** | **450** | **900** | **24** |

**Note: PC: Professional core, PE: Professional Elective, OE: Open Elective, MP: Mini-Project, INT: Internship.**

| Electives | |
|---|---|
| Course code | Professional Electives - 2 |
| **18IM651** | **Product Design and Development** |
| **18IM652** | **Maintenance and Safety Engineering** |
| **18IM653** | **Composite Materials** |
| **18IM654** | **Organizational Behavior** |
| **18IM655** | **Management Information System** |
| **18IM656** | **Advanced Manufacturing Technology** |

| Course code | Open Elective -**B** |
|---|---|
| 18IM661 | **Project Management** |

| Sub Title : MANAGEMENT & ENTREPRENEURSHIP | | |
|---|---|---|
| **Sub Code : 18HS51/ 52** | **No. of Credits:3=3: 0: 0 (L-T-P)** | **No. of lecture hours/week: 3** |
| **Exam Duration : 3 hrs** | **CIE + Assignment + Group Activity + SEE =100**<br>**40 + 5 + 5 + 50 = 100** | **Total No. of Contact Hours : 39** |

## Course Objectives:

1. To impart the knowledge about the Management concepts, evolution and Management functions.
2. To familiarize the student on Entrepreneurship and Entrepreneurial process.
3. To understand the role of SSI in economic development and gain an insight of funding agencies.
4. To have a clear understanding of concept of project, preparation of project & its screening.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **MANAGEMENT:** Introduction- Meaning, characteristics of management, functions of Management- POSDCORB, Levels and Skills of Management, Roles of Managers Management as science or an art or profession, Development of management thought -**Early management approaches (in brief)**- Psychological, Bureaucratic, Scientific and Administrative theory and Human Relations Movement, **Modern management approaches (in brief)**- Behavioral, Systems, Quantitative, and Contingency approach<br>**FUNCTIONS OF MANAGEMENT- PART I:**<br>**PLANNING:** Types of Plans: Single use & Standing plans, Steps in Planning process.<br>**ORGANIZING:** Types of organization (Line, Staff, Line & Staff, Matrix and Committee form) Departmentation (Functional, Product, Process, Territorial and Customer), MBO and MBE. | 08 |
| 2 | **FUNCTIONS OF MANAGEMENT – PART II**<br>**STAFFING:** Sources of recruitment, Process of selection, **DIRECTING:***Leadership***:** Definition, Leadership styles - Autocratic, Democratic, Charismatic, Laissez faire and Participative, *Motivation:*– Definition, Maslow, Herzberg & McGregor's Theory X & Y. *Communication*– Definition, types, communication process and barriers of communication, *CO-ORDINATION***:** importance, **CONTROLLING:** steps in controlling, **REPORTING**: importance, **BUDGETTING**: importance.<br>*Case study discussion with respect to Indian context* | 12 |

| | | |
|---|---|---|
| | **ENTREPRENEUR**: Definition &Meaning, Characteristics, types of entrepreneur, Difference between Entrepreneurs, Intrapreneur & Manager, Stages in Entrepreneurial process, barriers to entrepreneurs, Role of Entrepreneurs in economic development.<br>**Rural entrepreneurs** - Meaning & schemes.<br>**Women entrepreneurs** – Concept, challenges, women entrepreneurship in India, Institutional support & special bank scheme.<br>**Family Business:** Meaning, Roles & responsibility, types of family business, challenges faced by family business, reasons for failure of family business.<br>*Case study discussion with respect to Indian context.*<br>*Activity: Profile of successful entrepreneur.* | **10** |
| **3** | **ENTREPRENEUR**: Definition & Meaning, Characteristics, types of entrepreneurs- Imitative, Innovative, Fabian and drone and Others, Intrapreneur- meaning, Difference between Entrepreneurs, Intrapreneur & Manager, Stages in Entrepreneurial process, barriers to entrepreneurs, Role of Entrepreneurs in economic development and Business Pan.<br><br>**Rural entrepreneurship**– Definition, challenges & opportunities.<br>**Women Entrepreneurs** – Definition, challenges, and Institutional support to Women Entrepreneurs in India.<br>**Family Business:** Meaning and Definition, types of family business and reasons for failure of family business.<br>**Corporate Social Responsibility**- Meaning, definition and benefits.<br><br>*Case study discussion with respect to Indian context.*<br>*Activity: Profile of successful entrepreneur and Writing Business plan* | **12** |
| **4** | **MSME:** Definition of MSME (latest). **SMALL SCALE INDUSTRY**: Meaning, and definition, Characteristics, steps to startSSI, role of SSI in economic development, problems faced by SSI. Introduction to GATT, WTO &LPG, Sources of financing (brief), Forms of ownership - Sole proprietorship, Hindu Undivided Family, Partnership, and Cooperative.<br>**Institutional Support**: *Central level Institutions* – NBMSME, KVIC, NSIC, SIDBI, IIB, EDIand NABARD. S*tate level Institutions*- DIC, KSFC, KIADB,TECSOK.<br>**STARTUP COMPANIES**-Meaning and Challenges. Make in India concept and MUDRA Bank Initiative.<br>*Activity for students: Schemes for startup companies.* | **10** |
| **5** | **PREPARATION OF PROJECT:**<br>Project- Meaning, Classification of project, Project identification, Project selection, Project Appraisal, Project implementation. Project Report –Outline, Feasibility Study-Financial, Technical, Marketing, and Social Feasibility Study, PESTLE Analysis for Project and errors in preparation of  projectreport.<br>*Activity for students**: Preparation of project report* | |

Note: Every unit will have an internal choice question for SEE.

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**Course Outcomes:**

CO1: The students will gain domain knowledge on management concepts, evolution, management functions.

CO2: The students will be able to gain domain knowledge on Entrepreneurship, entrepreneurial process

CO3 : The students will get an in depth knowledge of entrepreneurial process & contribute to the betterment of the society.

CO4 : Students will be able to identify business opportunities & design a project report.

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**RECOMMENDED BOOKS:**

1. Entrepreneurship and Management- S Nagendra and V S Manjunath- Pearson Publication 4 /e 2009.
2. Principles of Management – PC Tripathi, and P N Reddy – Tata MacGrawHill.
3. Entrepreneurship Development – Poornima M Charanthimath Pearson Education 2<sup>nd</sup>Edition.

REFERENCE BOOKS:

1. Dynamics of Entrepreneurial Development and Management-Vasant Desai-Himalaya Publishing House. Latest edition.
1. Entrepreneurship and management - Shashi k Gupta- Kalyani publishers, Latestedition.
2. Financial Management- Shashi k Gupta- Kalyani publishers, Latestedition.

| Sub Title : Intellectual Property Rights | | |
|---|---|---|
| **Sub Code : 18HS51/ 52** | **No. of Credits: 3= 3: 0: 0 (L-T-P)** | **No. of lecture hours/week: 3** |
| **Exam Duration: 2 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours: 39** |

| **Objectives:** |
|---|
| The main objective of the IPR is |
| 1. To make the students aware of their rights for the protection of their invention done in their project work. |
| 2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act. |
| 3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's. |

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION TO IPR**: Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights, Introduction to TRIPS and WTO. Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge. | 03 |
| 2 | **PATENT RIGHTS AND COPY RIGHTS**: Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and license, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties. **COPY RIGHT**: Origin, Definition &Types of Copy Right, Registration procedure, Assignment & license, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software. | 10 |
| 3 | **TRADE MARKS**: Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Domain Names, Infringement & Remedies, and Offences relating to Trade Marks, Passing Off, and Penalties. | 04 |
| 4 | **DESIGN**- Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000. | 05 |
| 5 | **BASIC TENENTS OF INFORMATION TECHNOLOGY ACT**-2000- Cyber crimes, digital signature and E-Commerce. | 04 |

**Note 1:**
Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
**Note 2:**
Two assignments are evaluated for 5 marks.

11

**Course outcomes:**

1. The students once they complete their academic projects, they get awareness of acquiring the patent
2. They also learn to have copyright for their innovative works.
3. They also get the knowledge of plagiarism in their innovations which can be questioned legally.

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO7 |
| CO2 | PO7, PO12 |
| CO3 | PO7, PO12 |

*TEXT BOOKS:*

1. Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy
2. Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.Wadehra
3. IPR by P. Narayanan
4. Law of Intellectual Property, Asian Law House, Dresser. Myneni.

| Sub Title: OPERATIONS RESEARCH | | |
|---|---|---|
| Sub Code: 18IM51 | No. of Credits:4=3: 1: 0 (L-T-P) | No. of lecture hours/week: 4 |
| Exam Duration: 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours: 52 |

**Objectives:**
1. To Define and formulate the LPP for different product types with constraints.
2. Application of graphical, Simplex and Big M and Duality technique.
3. To Define and discuss the Transportation methods to find optimum cost.
4. To explain and define the concepts of queuing and Game theory.
5. Determine the Critical path and its duration, different types of floats using PERT/CPM.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION:** OR Methodology, Definition of OR, Application of OR to Engineering and Managerial Problems, Features of OR models, Limitation of OR. Models of OR.<br>**LINEAR PROGRAMMING, I:** Definition, Mathematical formulation, Standard form, solution space, Solution – Feasible, basic feasible, Optimal, Infeasible, Multiple, Optimal, Redundancy, Degeneracy, Graphical Method. | 08 |
| 2 | **LINEAR PROGRAMMING II:** Simplex method, variants of simplex algorithm – Artificial (Big-M method) basis techniques, Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simplex method. Application problems | 10+(2T) |
| 3 | **TRANSPORTATION PROBLEM:** Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method) Optimality Methods. Unbalanced transportation problem, Degeneracy in transportation problems, Variants in Transportation Problems, Applications of Transportation problems.<br>**ASSIGNMENT PROBLEM:** Formulation of the Assignment problem, unbalanced assignment problem<br>**TRAVELING SALESMAN PROBLEM** | 10+(2T) |
| 4 | **QUEUING THEORY:** Queuing system and their characteristics, The M/M/I Queuing system, Steady state performance analyzing of M/M/1 queuing model. M/M/K/ Model**.**<br>**GAME THEORY:** Formulations of games, Two persons zero sum game, games with and without saddle point, graphical solutions (2xn, mx2 game), and dominance property. Solution of game through LPP. | 8+(2T) |
| 5 | **PROJECT MANAGEMENT USING NETWORK ANALYSIS:** Network construction, determination of critical path and duration, CPM Structured approach, Calculations of schedules and floats, PERT-Estimation of project duration and variance. | 8+(2T) |

**Note 1:**

Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.

**Note 2:**

Two assignments are evaluated for 5 marks.

| Outcomes: |
|---|
| 1. Can formulate the LPP using constraints and solve by graphical method. |
| 2. Able to determine the optimum solution using Simplex method. |
| 3. Can find out the optimum transportation and assignment cost. |
| 4. Can identify and apply different queuing model to service and arrival pattern problems and solve the game problems by graphical method and dominance property rule. |
| 5. Able to determine the Critical path and its duration using PERT/CPM. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1, PO2, PO3, PO4, PO5, PO12 |
| CO2 | PO1, PO2, PO3, PO4, PO5, PO11, PO12 |
| CO3 | PO1, PO2, PO3, PO4, PO5, PO11, PO12 |
| CO4 | PO1, PO2, PO3, PO4, PO5, PO7 |
| CO5 | PO1, PO2, PO3, PO4, PO5, PO7, PO10, PO11 |

| TEXT BOOKS: |
|---|
| 1. **Operation Research and Introduction -**Taha H A, Prentice Hall of India, 6th edition, 1999 |
| 2. **Principles of Operations Research -**Philips, Ravindran and Solberg- – Theory and Practice, PHI, 2nd Edition, 2007 |
| 3. **Operations Research -**S.D. Sharma – Kedarnath, Ramnath &Co, 1996 |
| **REFERENCE BOOKS:** |
| 1. **Introduction to Operation Research -**Hiller and Libermann, McGraw Hill 5th edn, **Operations Research Theory and Application -**J K Sharma, Pearson Education Pvt Ltd ,4th Edn, 2009 ISBN-0333-92394-4 |

| Sub Title : **COMPUTER INTEGRATED MANUFACTURING** | | |
|---|---|---|
| **Sub Code: 18IM52** | **No. of Credits:3 =2 :1: 0 (L-T-P)** | **No. of lecture hours/week: 3** |
| **Exam Duration: 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours: 39** |

| **Objectives:** |
|---|
| 1. To study on automating the system, the use of computers in design and manufacturing. |
| 2. To define basic concepts of geometric modeling techniques, Design and exchange of data. |
| 3. To explain modern concepts of manufacturing using NC, CNC and DNC. |
| 4. To express basic concepts of programming for drilling, milling and turning operations. |
| 5. To outline basic concepts of industrial robotics and its applications to industries. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction**: Automation definition, Types, Automation Strategies, organization and information processing in manufacturing.<br>Fundamentals of CAD and CAM, product cycle and CAD/CAM, Design process, Applications of computers in design, creating the manufacturing database, Advantages & Disadvantages of CAD and CAM. | 9 |
| 2 | **Introduction to computer graphics:** Color CRT raster scan monitors, computer input devices, hard copy devices.<br>Software Configuration of a Graphics System, Functions of a Graphics Package, Construction of Geometry, Wire-Frame, Surface and Solid Modeling. Desirable modeling facilities. Geometric 2D and 3D transformations. | 9 |
| 3 | **Numerical control machines:** Introduction- basic components of an NC system-the NC procedure- NC coordinate system, NC motion control system, Applications of NC System, Advantages and limitations of NC Machines.<br>**Computer controls in NC:** Problems with conventional NC, CNC system, Functions and advantages of CNC System. Components of DNC system, Functions and advantages of DNC System.<br>**Computerized Manufacturing Planning System:**<br>Computer Aided Process Planning, retrieval types, Generative type.<br>**Group Technology**: Part families, part classification and coding, cellular manufacturing, Applications of GT. | 13 |
| 4 | **CNC Programming**: Manual part programming, Methods, Preparatory Functions, Miscellaneous Functions, Program Number, Tool Length Compensation, Canned Cycles, Cutter Radius Compensation, Drilling and milling exercises.<br>Turning Center programming: Axes System, General Programming Functions, Motion Commands, Exercises.<br>**CNC Machine Tools:** Overview of CNC machining centers, CNC turning centers Tool presetting, ATC. | 14 |
| 5 | **Introduction to Robotics**: Introduction, Robot configuration, Robot | 7 |

| | motions, End effectors, Robot Sensors, Robot applications. Programming the robots, Robot-Programming Languages. | |
|---|---|---|

**Note 1:** **Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.** **Note 2:** **Two assignments are evaluated for 5 marks.**

| **Outcomes:** |
|---|
| 1. Summarize the role of CAD/CAM in modern design and manufacturing |
| 2. Create and analyze the capabilities of Computer Aided Designing Systems for designing mechanical parts and elements in 2D and 3D dimensions. |
| 3. Compare and distinguish between the modern concepts of manufacturing using NC, CNC and DNC. |
| 4. Compile and illustrate manual part program to carryout drilling, milling, and turning operations on CNC machine tools. |
| 5. To demonstrate the concepts of industrial robotics and its applications to industries |

| **TEXT BOOKS:** |
|---|
| 1. Mikel P. Groover and Emory W. Zimmers - **CAD/CAM**, Jr Pearson Education Inc, 2017. |
| 2. P.N. Rao **– CAD/CAM Principles and Applications**, TMH, New Delhi - 2017. |
| **REFERENCE BOOKS:** |
| 1. Newman and Sproull – **Principles of Interactive Computer Graphics**, Tata McGraw Hill, 1995. |
| 2. Ibrahim Zeid –**CAD/CAM**, Tata McGraw Hill, 2016. |
| 3. P. N. Rao, N. K. Tewari and T. K. Kundra – **Computer Aided Manufacturing**, Tata McGraw Hill, 2016. |

| **Cos** | **Mapping with POs** |
|---|---|
| CO1 | PO5, PO6, PO7 |
| CO2 | PO3, PO4, PO5 |
| CO3 | PO3, PO5 |
| CO4 | PO3, PO5, PO6, PO7 |
| CO5 | PO3, PO5, PO6, PO7 |

| Sub Title: DESIGN OF MACHINE ELEMENTS | | |
|---|---|---|
| Sub Code: 18IM53 | No. of Credits:4=3: 1: 0 (L-T-P) | No. of lecture hours/week: 4 |
| Exam Duration: 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours: 52 |

| Objective: |
|---|
| 1. Explain the basic components of machinery. |
| 2. Select and size the components and achieve design goals in the construction of mechanical systems |
| 3. Choose the design parameters from Data Hand book to solve the design issues. |
| 4. Define the design issues in various engineering components. |
| 5. Determine the stress developed due to various types of loads. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Design for Static Strength**: static loads, static strength and factor of safety. Theories of failure: Maximum Normal Stress Theory, Maximum Shear Stress Theory, Distortion energy theory. Failure of Brittle & Ductile materials. Stress concentration. Determination of stress concentration factor. | 9+7(T) |
| 2 | **Design for Fatigue Strength**: Fatigue strength, S-N Diagram, low cycle and high cycle fatigue. Endurance limit. Modifying factors: Load, Size and Surface finish effects. Fatigue stress concentration factor. Combined study and Fluctuating stresses. Goodman and Soderberg Relationship. Stresses due to combined loading. | 7+4(T) |
| 3 | **Design of Springs:** Types of springs, stresses in coiled springs of circular and non-circular cross sections, tension and compression springs, stresses in leaf springs. | 7+4(T) |
| 4 | **Design of Mechanical joints:** Types of riveted joints, rivet materials, failures of riveted joints (Problems on longitudinal joint only). Types of welded joints, Strength of butt and fillet welds, Eccentrically loaded welds, Design of cotter and knuckle joints. | 9+6(T) |
| 5 | **Design of Gears:** Design of spur gear, Lewis equation, form factor, stresses in gear tooth, dynamic and wear load. | 7+5(T) |

  **Note 1:**
   **Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
  **Note 2:**
   **Two assignments are evaluated for 5 marks.**

| Outcome: |
|---|
| By the end of the course students will be able to |
| 1. Illustrate how the static and dynamic strength parameters affect the material and to know the concepts of factor of safety. |

| | |
|---|---|
| 2. | Conduct a failure analysis for the design of mechanical components subjected to cyclic load |
| 3. | Calculate the stress distribution for axial, shear forces and bending moments and torques in spring and joints using the "strength of materials" approach. |
| 4. | Explain the gear type and design the spur gear |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1, PO3, PO4, PO9 |
| CO2 | PO1, PO3, PO4, PO9 |
| CO3 | PO1, PO3, PO4, PO9 |
| CO4 | PO1, PO3, PO9 |

**TEXT BOOKS:**
1. Joseph Edward Shigley – **Mechanical Engineering Design**, Tata McGraw Hill, New Delhi, 1986.
2. VL. Maleev and Hartman **– Machine Design**, CBS Publishers and Distributors, Delhi, 1983.
3. V. B. Bahandari **– Design of Machine Elements**, Tata McGraw Hill, New Delhi, 2000.
4. C.S Sharma and Kamlesh purohit- Design of machine Elements, PHI learning Eastern economy edition.2009

**REFERENCE BOOKS:**
1. Robert. L. Norton – Machine Design, Pearson Education Asia, New Delhi, 2001.
2. Hall, Holowinko, Laughlin – Theory and Problems of Machine Design, Schaums Outline Series, 2002.
3. N. C. Pandey and C. S. Shah – Elements of Machine Design, 2002 – Chorotar Publishing house.

| Sub Title:  QUALITY ASSURANCE AND RELIABILITY | | |
|---|---|---|
| **Sub Code: 18IM54** | **No. of Credits:3=2 :1: 0 (L-T-P)** | **No. of lecture hours/week: 4** |
| **Exam Duration: 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours: 52** |

| Objectives: |
|---|
| 1.  To explain and define the basic concepts of Quality, Quality Assurance and discuss the ISO series. |
| 2.  To introduce the Statistical process control and process capability. |
| 3.  Application of control charts for variables and attributes. |
| 4.  To determine the customer's and producer's risk using sampling distribution. |
| 5.  To explain and define the concepts of failure models and reliability of the system. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION:** Definition of Quality, Quality function, Dimensions of Quality, Quality Engineering terminology, Brief history of quality methodology, Statistical methods for quality improvement, Quality costs – four categories costs and hidden costs. Brief discussion on sporadic and chronic quality problems. Introduction to Seven QC tools. <br> **QUALITY ASSURANCE**: Definition and concept of quality assurance, departmental assurance activities. Quality audit concept, audit approach etc. structuring the audit program, planning and performing audit activities, audit reporting, ingredients of a quality program. ISO Series.(BIS standards/ISO 9000 series standards) | **08** |
| 2 | **STATISTICAL PROCESS CONTROL:** Introduction to statistical process control – chance and assignable causes variation. Basic principles of control charts, choice of control limits, sample size and sampling frequency, rational subgroups. Analysis of patterns of control charts. Case Studies on application of SPC. Process capability – Basic definition, standardized formula, relation to product tolerance and six sigma concept of process capability. <br> **CONTROL CHARTS FOR VARIABLES:** Control charts for X bar and Range, Statistical basis of the charts, Development and use of X bar R charts, Interpretation of charts for X bar and Standard Deviation (S), Development and use of X bar S control charts with Variable sample size, Control charts for individual measurements, cumulative-sum chart, moving-range charts. | **12+(3T)** |

| 3 | **CONTROL CHARTS FOR ATTRIBUTES:** Controls chart for fraction non- conforming (defectives) development and operation of control chart, brief discussion on variable sample size. Control chart for non-conformities (defects) – development and operation of control chart for constant sample size and variable sample size. Choice between variables and attributes control charts. Guidelines for implementing control charts. | **08** |
|---|---|---|
| 4 | **SAMPLING INSPECTION:** Concept of accepting sampling, economics of inspection, Acceptance plans – single, double and multiple sampling. Operating characteristic curves – construction and use. Determinations of average outgoing quality, average outgoing quality level, average total inspection, producer risk and consumer risk. **USE OF PUBLISHED SAMPLING PLANS:** Gauge Repeatability & Reproducibility & Measurement system analysis. | **12+(3T)** |
| 5 | **RELIABILITY AND LIFE TESTING:** Failure models of components, definition of reliability, MTTF, MTBF, MTTR, Failure rate, common failure rate curve, types of failure, reliability evaluation in simple cases of exponential failures in series, paralleled and series-parallel device configurations, Redundancy and improvement factors evaluations. | **06** |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit. Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes: |
|---|
| 1. Able to identify the Quality products using dimensions of quality and be Aware of Quality Assurance and relate the ISO series |
|    2. Can determine six sigma and process capability and construct control charts for variables. |
|    3. Can determine control limits and construct control charts for attributes. |
|    4. Can evaluate the acceptance criteria using sampling distribution. |
|    5. Can Explain and evaluate the failure models and reliability of the system. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO3, PO5, PO6, PO7, PO8, PO9, PO12 |
| CO2 | PO1, PO2, PO3, PO5, PO8, PO9, PO12 |
| CO3 | PO1, PO2, PO3, PO5, PO8, PO9, PO12 |
| CO4 | PO1, PO2, PO3, PO5, PO8, PO9, PO12 |
| CO5 | PO1, PO2, PO3, PO5, PO8, PO9, PO12 |

**TEXT BOOKS**
**Introduction to statistical Quality Control -** D C Montgomery 3$^{rd}$ Edition, John Wiley and Sons.
**Statistical Quality Control** - Grant and Leavenworth, McGraw Hill, 6$^{th}$ Edition

**REFERENCE BOOKS**
1. **The QS9000 Documentation Toolkit** -Janet L Novak and Kathleen C Bosheers," Prenctice Hall PTR, 2$^{nd}$ Edition
2. **ISO 9000 a Manual for Total Quality Management** - Suresh Dalela and Saurabh, S Chand and Co. 1$^{st}$ Edition
3. **Total Quality Management** – NVR Naidu, KM Babu and G. Rajendra – New Age International Pvt. Ltd – 2006
4. **Quality Planning & Analysis** - J M Juran, Frank M Gryna; Tata McGraw Hill, 3$^{rd}$ edition

| Sub Title:  ADVANCED MACHINING PROCESSES | | |
|---|---|---|
| **Sub Code: 18IM551** | **No. of Credits:3 =3: 0: 0 (L-T-P)** | **No. of lecture hours/week: 3** |
| **Exam Duration: 3 hours** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours: 39** |

| Course objectives: |
|---|
| 1. Explain the basic concepts of Advanced Machining Process.<br>2. Determine the factors influencing process parameters and their performance and applications. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1. | **INTRODUCTION TO ADVANCED MACHINING PROCESS**-<br>Introduction to advanced machining, need for advanced machining process, Comparison between traditional and non-traditional machining, general classification of advanced machining processes, classification based on nature of energy employed in machining, selection of advanced machining processes, Specific advantages, limitations and applications of non-traditional machining processes. | 04 |
| 2 | **ULTRASONIC MACHINIG PROCESS, ABRASIVE JET MACHINING PROCESS AND WATER JET MACHINING (WJM):**<br>**Ultrasonic Machining Process:** Working Principles – equipment used and operations of Ultrasonic Machining, -USM Process Parameters-Amplitude and frequency and vibration, Effect of grain diameter, Effect of applied static load, Effect of slurry and tool and work material Applications, Advantages and Limitations of USM<br>**Abrasive Jet Machining Process:** AJM Variables and accuracy- carrier Gas Type of abrasive, Size of abrasive grain, velocity of the abrasive jet, Mean No. abrasive particles per unit volume of the carrier gas, Work material, standoff distance (SOD), shape of cut & surface finish**,** Nozzle wear, accuracy & surface finish. Applications, advantages & Limitations of AJM.<br>**Water Jet Machining (WJM):** Equipment & process, Operation, applications, advantages and limitations of WJM | 12 |
| 3 | **ELECTRIC DISCHARGE MACHINING PROCESS (EDM)-** Introduction, mechanism of metal removal, EDM equipment, dielectric medium- its functions & desirable Properties, electrode feed control system. Flushing types; pressure flushing, suction flushing, side flushing, pulsed flushing. EDM process parameters: Spark frequency, current & spark gap, surface finish, Heat Affected Zone. Advantages, limitations & applications of EDM. | 06 |
| 4 | **ELCETRO CHEMICAL AND CHEMICAL MACHINING PROCESS:**<br>Introduction, Principle of electro chemical machining: ECM equipment,  elements of ECM operation, Chemistry of ECM. Electrolytes functions and properties – MRR, accuracy, surface finish and Process Parameters. | 12 |

| | | |
|---|---|---|
| | Electrochemical grinding and electrochemical honing process. Advantages, disadvantages and application of ECG, ECH.<br>**CHEMICAL MACHINING (CHM)**<br>Elements of the process: Resists (maskants), Etchants. Types of chemical machining process-chemical blanking process, chemical milling process.<br>Process characteristics of CHM: material removal rate, accuracy, surface finish, advantages, limitations and applications of chemical machining process. | |
| 5 | **LASER BEAM MACHINING (LBM), ELECTRON BEAM MACHINING (EBM) AND PLASMA ARC MACHINING (PAM)**<br>Introduction, Principle, equipment and mechanism of metal removal, applications, advantages and limitations.<br>**Hybrid Manufacturing Process** and **Additive Manufacturing Process**<br>(Introduction aspects only) | **05** |

| Outcome: |
|---|
| 1. Explain the modern manufacturing process and define the concepts of non-conventional machining process.<br>2. Describe the working principle, process parameters and variables in mechanical energy-based machining process.<br>3. Define the concepts of electrical energy-based metal removal process.<br>4. Illustrate the process of chemical and electro chemical machining.<br>5. Explain the machining process of thermal energy-based machine tools. |

**Note 1:**

    **Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**

**Note 2:**

    **Two assignments are evaluated for 5 marks.**

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1, P03, PO8, P10, P11. |
| CO2 | PO1, P03, PO5, PO8, P10, P11. |
| CO3 | PO2, PO5, PO10, P11. |
| CO4 | PO1, P03, PO8, P10, P11. |
| CO5 | PO1, P03, PO5, PO8, P10, P11. |

| **TEXT BOOKS:** |
|---|
|     1. Modern machining process - PANDEY AND SHAH, TATA Mc Graw Hill 2000.<br>    2. New technology - BHATTACHARAYA 2000<br>**REFERENCE BOOKS:**<br>    1. **Production Technology**, by HMT TATA McGraw Hill 2001.<br>    2. **Modern Machining Process** - ADITYAN 2002.<br>    3. **Thermal Metal cutting processes** - B G Ranganath - I K International Publishing house Pvt. Ltd,<br>    4. **Fundamentals of Machining and Machine Tools** - R.K.Singal - I K International Publishing house Pvt Ltd,<br>    5. **Wohlers Report 2001-**Terry Wohlers, Wohlers Associates, 2008. |

| Sub Title:    MARKETING MANAGEMENT | | |
|---|---|---|
| Sub Code: 18IM552 | No. of Credits:3=3: 0: 0 (L-T-P) | No. of lecture hours/week: 3 |
| Exam Duration: 3 hrs. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours: 39 |

**Objectives:**
1. To understand the concepts of marketing management.
2. To comprehend marketing decisions, based upon the combination of product, price, promotion, and distribution elements.
3. Identify the roles of advertising, sales promotion, public relations, personal selling
4. To understand fundamental premise underlying advertising and sales promotion

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION TO MARKETING**<br>Introduction, Definitions of market and marketing, Selling Vs marketing, The Exchange Process, Elements of Marketing Concept, Functions of Marketing, Old Concept or Product oriented Concept, New or Modern or Customer- oriented Concept, Marketing Myopia, Marketing Environment analysis, (Micro and Macro), Marketing in the 21st century opportunities, challenges & Ethics.<br>**BUYER BEHAVIOUR ANALYSIS**<br>Meaning and Characteristics, Importance, Factors Influencing Consumer Behaviour, Consumer Purchase Decision Process, Buying Roles, Buying Motives. The black box model of consumer behaviour. B2B marketing Vs Consumer Marketing | 08 |
| 2 | **MARKET SEGMENTATION, TARGETING & POSITIONING (STP):**<br>Concept of Market Segmentation, Benefits, Requisites of Effective Segmentation, Bases for Segmenting Consumer Markets, Market Segmentation Strategies. Targeting - Bases for identifying target Customer target Marketing strategies, Positioning - Meaning, Product Differentiation Strategies, Tasks involved in Positioning. Branding - Concept of Branding, Types, Brand Equity, Branding strategies.<br><br>**Managing the Product:**<br>Pricing decisions, Marketing Channels, Promotion Strategy, Sales Promotion: Marketing<br>Planning, Case Study on "Facebook", Marketing Management Concept, product hierarchy, product line, product mix, product mix strategies, | 08 |
| 3 | **PRODUCT PLANNING AND DEVELOPMENT:** Product life cycle and its strategies, New Product Development, packing as a marketing tool, Role of labeling in packing.<br><br>Services Marketing & its Characteristics<br>**INTRODUCTION TO E-MARKETING:** Landscape – Past – Today – Future – Internet Marketing Paradigm, Internet Infrastructure Stack Business Models & Strategies: Strategic Planning , Strategy to Electronic Planning, Strategic Drivers of the Internet Economy, Business Models to E-Business Models. | 07 |

| 4 | **BRANDING :** Branding, Reasons for branding, functions of branding, features and types of brands, kinds of brand name. **LABELLING:** Types, functions, advantages and disadvantages **PACKAGING:** Meaning, growth of packaging, function of packaging, kinds of | 10 |
|---|---|---|
| | packaging. **PRICING:** Importance of Price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing, pricing strategies and decisions. **DISTRIBUTION:** Marketing channels – functions, types of channels of distribution, number of channel levels. Physical distribution – importance, total systems concept, strategy, use of physical distribution. | |
| 5 | **ADVERTISING AND SALES PROMOTION:** Objectives of advertisement function of advertising, classification of advertisement copy, advertisement media – kinds of media, advantages of advertising. Objectives of sales promotion, advantages sales promotion. **PERSONAL SELLING:** Objectives of personal selling, establishing the Sales force objectives, sales – force strategy, sales force structure and size, salesmanship, qualities of good salesman, types of salesman, major steps in effective selling. | 06 |

**Note 1:**
   Each unit has internal choice. Total of 10 questions i.e. 2 full questions from
   each unit.

**Note 2**:
- Assignments are evaluated for 5 marks comprising of the following:
- Analyze Product Life Cycle of few Products like-Electronic goods, Computers etc
- Study Packaging strategies used by FMCG companies
- Understand Marketing strategies, plans used by automobile, cosmetic, FMCG companies
- Marketing Games and quiz for Students

| .**Outcomes:** |
|---|
| 1. Develop an ability to assess the impact of the environment on marketing function. |
| 2. To use the STP model in marketing to analyze the product, its price. |
| 3. Identify and analyze the strategic elements of product development processes |
| 4. Understand the role of packaging, labeling, pricing and distribution in the brand-building process |
| 5. Understand the effectiveness of advertising and sales promotion. |

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO1,PO5 |
| CO2 | PO1,PO2, PO5,PO6, PO7,PO9, PO10,PO12 |
| CO3 | PO3,PO5, PO6, PO7, PO8, PO9, PO10,PO11, PO12. |
| CO4 | PO3, PO5, PO6, PO7, PO8, PO9, PO10,PO11, PO12. |

TEXT BOOKS:

1. Principles of Marketing - Philip Kotler , Prentice – Hall. 11th Edn.
2. Marketing Management - Philip Kotler , Prentice – Hall. 12th Edn.
3. Marketing Management: A South Asian Perspective–Kotler, Keller, Koshy & Jha, 14/e, Pearson Education, 2012.
4. Marketing- Lamb, Hair, Mc Danniel, 7/e, Cengage Learning 2012.
5. Marketing Management, Tapan Panda, 2/e, Excel Publication
6. Marketing Management – An Indian perspective – Prof. Vijay Prakash Anand

REFERENCE BOOKS:

1. **Fundamentals of Marketing -** Wiliam J Stanton, McGraw Hill, 1994
2. **Marketing Management** - S.A Sherlaker", 1999.
3. **Rajagopal, Marketing Management Text& Cases** - Vikas Publishing House, ISBN 81-2590773-4

| Sub Title: RAPID PROTOTYPING | | |
|---|---|---|
| Sub Code: 18IM553 | No. of Credits:3=3: 0: 0 (L-T-P) | No. of lecture hours/week: 3 |
| Exam Duration: 3 hours | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours: 39 |

**Course objectives:**
1. To understand the concept of Rapid Prototyping and its applications.
2. To comprehend various RP machining techniques and its applications.
3. To understand the different Rapid tooling.
4. To learn more about RP software and RP process optimization.

| UNIT No | Syllabus Content | No of Hours |
|---|---|---|
| 1 | Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems.<br>Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application. | 08 |
| 2 | Selective Laser Sintering: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications.<br>Fusion Deposition Modelling: Principle, Process parameter, Path generation, Applications | 08 |
| 3 | Solid Ground Curing: Principle of operation, Machine details, Applications.<br>Laminated Object Manufacturing: Principle of operation, LOM materials. Process details, applications.<br>Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5. | 08 |
| 4 | Rapid Tooling: Indirect Rapid tooling, Silicon rubber tooling, Aluminium filled epoxy tooling, Spray metal tooling, Cast kirksite, 3Q keltool, etc.<br>Rapid Tooling: Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling | 10 |
| 5 | Software For RP: STL files, Overview of Solid view, magics, Gimmicks, magic communicator, etc. Internet based software, Collaboration tools.<br>Rapid Manufacturing Process Optimization: factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, influence of build orientation | 05 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit. Note 2: Two assignments are evaluated for 5 marks.**

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

| | 1. Understand the Rapid Prototyping system, its applications and growth. |
|---|---|
| 2. | Analyse the Selective Laser Sintering and Fusion Deposition modelling technique and applications. |
| 3. | Learn the concepts of Solid Ground Curing, Laminated Object Manufacturing and the Concepts Modelers. |
| 4. | Explain the different Rapid tooling types. |
| 5. | Appreciate the rapid prototyping software and Rapid Manufacturing Process Optimization. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO2, PO3, PO5, PO6, PO7, PO9, PO12 |
| CO2 | PO1, PO2, PO3, PO6, PO7, PO9, PO12 |
| CO3 | PO1, PO2, PO3, PO6, PO7, PO9, PO12 |
| CO4 | PO4, PO5, PO7, PO8, PO9, PO10, PO12 |
| CO5 | PO4, PO5, PO7, PO8, PO9, PO10, PO12 |

**TEXT BOOK:**
1. Stereo Lithography and other RP & M Technologies, Paul F. Jacobs: SME, NY 1996.
2. Rapid Manufacturing, Flham D.T & Dinjoy S.S Verlog London 2001.

**REFERENCE BOOKS / WEBLINKS:**
1. Rapid Prototyping, Terry Wohlers Wohler's Report 2000" Wohler's Association 2000.
2. Rapid Prototyping Materials, Gurumurthi, IISc Bangalore.
3. Rapid Automated, Lament wood. Indus press New York

| Sub Title: ENTERPRISE RESOURCE PLANNING AND E-COMMERCE | | |
|---|---|---|
| Sub Code: 18IM554 | No. of Credits: 3= 3: 0: 0 (L-T-P) | No. of lecture hours/week: 3 |
| Exam Duration: 3hr | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours: 39 |

| Objectives: |
|---|
| 1. Review the transition from MRP to ERP; identify the levels of ERP maturity. |
| 2. Appraise how ERP is used to integrate business processes; define and analyze a process; create a process map and improve and/or simplify the process; apply the result to an ERP implementation. |
| 3. Identify the elements of a value chain, and explain how core processes relate; identify how the organizational infrastructure supports core business processes. |

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | Enterprise–An Overview: Introduction, Business Functions and Business Processes, Integrated Management Information, Role of Enterprise in Implementing the ERP System, Business modeling, Integrated Data Model. Introduction To ERP: Introduction, Common ERP Myths, A Brief History of ERP, Advantages of ERP, Reasons for the growth of the ERP market, Problems in ERP Implementation, Roadmap for successful ERP implementation. | 7 |
| 2 | **ERP and Related Technologies**: Introduction, Business Process Reengineering, Data Warehousing, Data Mining, On-line Analytical Processing, Product Life Cycle Management, Supply Chain Management, Customer Relationship Management, Geographical Information Systems, Intranet and Extranets, Advanced technology and ERP security, Middleware, Computer Crimes, Security and ERP, Crime and Security. **ERP Modules**: Introduction, Finance Management, Manufacturing Management, Marketing and Sales Distribution, Materials and Supply Chain Modules, Plant Maintenance, Quality Management, Human Resource. | 8 |

| 3 | ERP Implementation Life Cycle: Pre-evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, End user Training, Post implementation.<br>Vendor, Consultants and Users: Introduction, In-house implementation – Pros and Cons, Vendors, Consultants, End-users.<br>Future Direction in ERP: Introduction, New Markets, New Channels, Faster Implementation Methodologies, Easier Customization Tools, Business models and BAPIs, Application Platforms, New business segments, Need based applications, Reduction in Implementation Time, Open Source, Web enabled and Wireless Technologies, Enterprise Application Integration, Market Snapshot, Shifting Revenue Models, The SOA Factor. | 10 |
|---|---|---|
| 4 | History of E-Commerce and Indian Business Context : Worldwide Ecommerce Growth, Early Business Information Interchange Efforts, Emergence of Internet, Advantages and disadvantages of E-commerce, Transition to E-commerce in India, Ecommerce opportunities for industries, E-transition challenges for Indian corporate, The Information Technology Act 2000.<br>Business Models for E-Commerce: The Birth of Portals, E-business Models based on the relationship of Transaction Parties: B2C, B2B, C2C, C2B, E -business Models based on the relationship of Transaction Types | 8 |
| 5 | Advances in E-Commerce: Enabling Technologies of the World Wide Web, E-marketing, E-security, E-payment systems, E-CRM, E-SCM, EStrategy, Mobile commerce. | 6 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit. Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes: After the successful completion of the course, the students will be able to |
|---|
| Demonstrate the core interactions and dependencies that exist between the key functions of a business. |
| Appraise the role of information systems in the support of business functions and, particularly, cross-functional business processes |
| Explain the way Enterprise planning Systems have developed, their functional capabilities and the role of the underpinning technologies |
| Demonstrate an Determining of the foundations and importance of E-commerce |
| Analyze the impact of E-commerce on business models and strategy |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1, PO2, PO3, PO4, PO6, PO9 |
| CO2 | PO1, PO2, PO3, PO4, PO6, PO8 |
| CO3 | PO1, PO2, PO3, PO4, PO6, PO8, PO9 |

| CO4 | PO2, PO3, PO4, PO6, PO9 |
|-----|-------------------------|
| CO5 | PO2, PO3, PO4, PO6, PO9 |

| TEXT BOOKS: |
|-------------|
| 1. Alexis Leon, "Enterprise Resource Planning", 2$^{nd}$ Edition, Tata McGraw Hill Publishing Company Ltd., 2010, ISBN: 978-0-07-065680-2 |
| 2. P. T. Joseph, S.J., "E-Commerce An Indian Perspective", 2$^{nd}$ Edition, PHI, 2005, ISBN-81203-2788-8 |
| 3. Ravi Shankar and S. Jaiswal, "Enterprise Resource Planning", Galgotia Publication Pvt. Ltd., 1999, 1$^{st}$ Edition |
| 4. Thomas Volloman, etal, "Manufacturing Planning & Controls", Iwrin / McGraw hill, 1997 |

| Sub Title: DATA WAREHOUSING AND MINING | | |
|---|---|---|
| Sub Code: 18IM555 | No. of Credits: 3= 3: 0: 0 (L-T-P) | No. of lecture hours/week: 3 |
| Exam Duration: 3hr | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours: 39 |

**Objectives:**

1. To analyse the organization's business, and its requirements using current and historical data.
2. To understand the various concepts needed to design and develop a data warehouse.
3. To apply data mining and other tools for identifying pattern in large data sets.

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | OVERVIEW AND CONCEPTS: Need for Data Warehousing, Basic Elements of Data Warehousing, Trends in Data Warehousing.<br>PLANNING AND REQUIREMENTS: Project planning and management, collecting the requirements. | 7 |
| 2 | ARCHITECTURE AND INFRASTRUCTURE: Architectural components, Infrastructure and metadata.<br>DATA DESIGN AND DATA REPRESENTATION: Principles of dimensional modelling. Dimensional modelling advanced topics, data extraction, transformation and loading, data quality. | 10 |
| 3 | INFORMATION ACCESS AND DELIVERY: Matching information to classes of users, OLAP in data warehouse, Data warehousing and web.<br>IMPLEMENTATION AND MAINTENANCE Physical design process, data warehouse deployment, growth and maintenance. | 7 |
| 4 | MINING INTRODUCTION: Basics of data mining, related concepts, Data mining techniques.<br>DATA MINING ALGORITHMS: Classification, Clustering.<br>DATA MINING ALGORITHMS: Association rules. | 9 |
| 5 | KNOWLEDGE DISCOVERY: KDD process.<br>WEB MINING Web content mining, Web structure mining and Web usage mining. | 6 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes: After the successful completion of the course, the students will be able to |
|---|
| After going through this course the student will be able to<br>CO1: Explain different methods of preprocessing data.<br>CO2: Design and implement a simple data warehouse.<br>CO3: Develop simple data cubes for online analytical processing.<br>CO4: Evaluate data mining tools for various engineering applications. |

| Cos | Mapping with POs |
|---|---|

| CO1 | PO1, PO2, PO 3, PO 4, PO 5 |
| CO2 | PO 2, PO 3, PO 4, PO 5 |
| CO3 | PO 2, PO 3, PO 4, PO 5, PO 6 |
| CO4 | PO 2, PO 4, PO 5, PO 6, PO 11 |

TEXT BOOKS:

1. Data Warehousing Fundamentals - Paulraj Ponnian, John Wiley.- 1 st edition
2. Data Mining Introductory and advanced Topics - M.H. Dunham - Pearson education – 2002.
3. Data mining concepts and techniques - Han, Kamber - 2nd edition

REFERENCE BOOKS:

1. The Data Warehouse Lifecycle Toolkit - Ralph Kimball, John Wiley - 2nd edition.
2. Mastering Data Mining - M Barry and G. Linoff - John Wiley - 1st edition.
3. Building the Data warehouses - W. H. Inmon, Wiley Dreamtech - 1 st edition.
4. The Data Warehouse Toolkit - R. Kimball - John Wiley - 2nd edition.
5. Decision Support and Data warehouse systems - E.G. Mallach - TMH.- 2000.

| Sub Title | : OPERATIONS RESEARCH | | |
|---|---|---|---|
| **Sub Code : 18IM561** | **No. of Credits:3=3 : 0 : 0 (L-T-P)** | | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | | **Total No. of Contact Hours : 39** |

| Objectives: |
|---|
| 6. To Define and formulate the LPP for different product types with constraints. |
| 7. Application of graphical, Simplex and Big M and Duality technique. |
| 8. To Define and discuss the Transportation methods to find optimum cost. |
| 9. To explain and define the concepts of queuing and Game theory. |
| 10. Determine the Critical path and its duration, different types of floats using PERT/CPM. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION:** OR Methodology, Definition of OR, Application of OR to Engineering and Managerial Problems, Features of OR models, Limitation of OR. Models of OR.<br><br>**LINEAR PROGRAMMING I:** Definition, Mathematical formulation, Standard form, solution space, Solution – Feasible, basic feasible, Optimal, Infeasible, Multiple, Optimal, Redundancy, Degeneracy, Graphical Method. | 08 |
| 2 | **LINEAR PROGRAMMING II:** Simplex method, variants of simplex algorithm – Artificial (Big-M method) basis techniques, Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simplex method. Application problems | 10+(2T) |
| 3 | **TRANSPORTATION PROBLEM:** Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method) Optimality Methods. Unbalanced transportation problem, Degeneracy in transportation problems, Variants in Transportation Problems, Applications of Transportation problems.<br>**ASSIGNMENT PROBLEM:** Formulation of the Assignment problem, unbalanced assignment problem<br>**TRAVELING SALESMAN PROBLEM** | 10+(2T) |
| 4 | **QUEUING THEORY:** Queuing system and their characteristics, The M/M/I Queuing system, Steady state performance analyzing of M/M/1 queuing model. M/M/K/ Model.<br>**GAME THEORY:** Formulations of games, Two persons zero sum game, games with and without saddle point, graphical solutions (2xn, mx2 game), and dominance property. Solution of game through LPP. | 8+(2T) |
| 5 | **PROJECT MANAGEMENT USING NETWORK ANALYSIS:** Network construction, determination of critical path and duration, CPM Structured approach, Calculations of schedules and floats, PERT-Estimation of project duration and variance. | 8+(2T) |

**Note 1:** Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit. **Note 2:** Two assignments are evaluated for 5 marks.

| Outcomes: |
|---|
| 1. Can formulate the LPP using constraints and solve by graphical method. |
| 2. Able to determine the optimum solution using Simplex method. |
| 3. Can find out the optimum transportation and assignment cost. |
| 4. Can identify and apply different queuing model to service and arrival pattern problems and solve the game problems by graphical method and dominance property rule. |
| 5. Able to determine the Critical path and its duration using PERT/CPM. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1,PO2,PO3,PO4,PO5,PO12 |
| CO2 | PO1,PO2,PO3,PO4,PO5,PO11,PO12 |
| CO3 | PO1,PO2,PO3,PO4,PO5,PO11,PO12 |
| CO4 | PO1,PO2,PO3,PO4,PO5,PO7 |
| CO5 | PO1,PO2,PO3,PO4,PO5,PO7,PO10,PO11 |

**TEXT BOOKS:**

1. **Operation Research and Introduction -**Taha H A, Prentice Hall of India, 6$^{th}$ edition, 1999
2. **Principles of Operations Research -**Philips, Ravindran and Soleberg- – Theory and Practice, PHI, 2$^{nd}$ Edition, 2007
3. **Operations Research -**S.D. Sharma – Kedarnath, Ramnath &Co, 1996

**REFERENCE BOOKS:**

1. **Introduction to Operation Research -**Hiller and Libermann, McGraw Hill 5$^{th}$ edn,
2. **Operations Research Theory and Application -**J K Sharma, Pearson Education Pvt Ltd ,4$^{th}$ Edn, 2009 ISBN-0333-92394-4

| Sub Title : QUALITY ENGINEERING LAB | | |
|---|---|---|
| Sub Code : 18IML57 | No. of Credits:1 =1 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 12 |

**Objectives:**
1. To Explain and apply the basic fundamental concepts of Statistics to engineering problems.
2. Application of probability distributions to various manufacturing problems.
3. Application of hypothesis to random experiments of manufacturing processes.
4. To test the statistical parameters by regression and correlation.
5. To construct the Variable and attribute type of control charts.
6. To test the goodness of fit for various quality characteristics using different distribution.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | i).To test the Goodness of fit for the given quality characteristic using Normal distribution<br>ii).To test the Goodness of fit for the given quality characteristic using Poisson distribution<br>iii).,To test the Goodness of fit for the given quality characteristic using Binomial distribution<br>iv).To test the Goodness of fit for the given quality characteristic using Uniform distribution<br>v).Conduction of Repeatability and Reproducibility studies for appraiser and instrument using R&R Software<br>vi).Assessing Process Capability of the given manufacturing process using Normal Probability paper method and process capability indices<br>vii).Assessing Process Capability of the given manufacturing process using Digital Motorized multifunctional Height Gauge and SQC Display unit | 18 |
| 2 | i) Experiments on Application of 7 QC Tools as applied to Manufacturing and Service Operations.<br>ii).Construction of control chart for variable quality characteristic using Digital Motorized Multifunctional Height Gauge<br>iii).Construction of control chart for attribute quality characteristic<br>iv).Construction of control charts using Systat Software<br>v) Attribute sampling Plans – Single, Double and Multiple sampling plans.<br>vi)Experiments on correlation and Simple linear regressions<br>vii).Experiments on multiple linear regressions | 18 |

**Outcomes:**
1. Able to identify type of probability distribution and solve the various manufacturing problems.
2. Able to test the hypothesis and give inference to random experiments.
3. Can make use or test the statistical parameters by estimation.
4. Able to apply 7 QC tools

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO1,PO2,PO3,PO4,PO12 |
| CO2 | PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO10,PO12 |
| CO3 | PO1,PO2,PO3,PO4,PO12 |
| CO4 | PO1,PO2,PO3,PO4,PO5,PO12 |

| **Scheme of Examination:** |
|---|
| ONE question from Unit -1  : 20 marks<br>ONE question from Unit -2  : 20 marks<br>                    Viva-Voce:  10 marks. |
| **Reference Books:**<br>1. Introduction to statistical Quality Control D C Montgomery - 3rd Edition, John Wiley and Sons.<br>2. Quality Planning & Analysis- J M Juran, Frank M Gryna; Tata McGraw Hill, 3rd edn.,<br>3. Statistical Quality Control - Grant and Leavenworth, McGraw Hill |

| Sub Title : Computer Integrated Manufacturing Lab | | |
|---|---|---|
| **Sub Code : 18IML58** | **No. of Credits:1= 1 : 0 : 0 (L-T-P)** | **No. of lecture hours/week : 2** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 13** |

| Objective: |
|---|
| Develop and determine of the practical aspects of enabling computer aided technologies used in design and manufacturing. Develop a degree of competency in the development and application of modern CAD/CAM system through hands on experience in the solution of practical problems. Define to Operate and program industrial (manipulator) robots. |

| Unit No. | Syllabus content | Hrs |
|---|---|---|
| 1 | CNC part programming using CAM packages. Writing and execution of manual part program using ISO code for machining of simple parts, turning, taper turning, form turning, and thread cutting. Use radius compensation, canned cycles, macros etc. CNC milling: Writing and execution of part program for contour milling. | 18 |
| 2 | Simulation of Turning, Drilling, Milling operations. 3 typical simulations to be carried out using simulation packages like CADEM, or any equivalent software. | 15 |
| 3 | **(Only for Demo/Viva voce)** Robot programming: Using Teach Pendent to perform pick and place, stacking of objects in increasing or decreasing size, palletizing operations etc. | 03 |

| Outcome: |
|---|
| 1. Explain the concepts and modeling and the usage of models in different engineering applications. 2. Explain the benefits of a comprehensive and integrated CAD/CAM system. 3. Create accurate and precise geometry of complex engineering systems and use the geometric models in different engineering applications. 4. Compare the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development. 5. Use and assess state-of-the-art CAD/CAM codes efficiently, effectively and intelligently in advanced engineering applications.Use and Operate industrial (manipulator) robots. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO2,PO5,PO7,PO12 |
| CO2 | PO2,PO5,PO7,PO12 |
| CO3 | PO2,PO5,PO7,PO12 |
| CO4 | PO2,PO5,PO7,PO12 |
| CO5 | PO2,PO5,PO7,PO12 |

| Scheme of Examination: |
| --- |
| ONE question from Unit -1:  20 marks<br>ONE question from Unit -2: 20 marks<br>Viva-Voce                      :  10 marks |
| **Suggested software:**<br>1. Simulation Packages: Fanuc/ CNC Base (SLM/SLC)<br>2. Simulation Packages : CADEM, CAPStrun, CAPSmill<br>3. Robot Simulation Aristosim. |

# VI Semester IEM

| SUB TITLE : MANAGEMENT & ENTREPRENEURSHIP | | |
|---|---|---|
| Sub Code : 18HS61/62 | No. of Credits:3=3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total  No. of Contact Hours : 39 |

| COURSE OBJECTIVES: |
|---|
| 1.  To help students understand the Management concepts & its evolution. |
| 2.  To impart the knowledge about various Managerial functions. |
| 3.  To make the student learn the Entrepreneurial process. |
| 4.  To gain an insight of funding agencies & understand the role of SSI in economic development. |
| 5.  To have a clear understanding of various business opportunities & designing the Business plan. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **MANAGEMENT:** Introduction- Meaning, characteristics of management, scope, functions of management, Management as science or an art or profession, Management and Administration, Roles of managers. Levels of management, Development of management thought -Early management approaches, Modern management approaches. | **08** |
| 2 | **PLANNING:** Definition & Meaning, Types of Plans (Single use & Standing), Steps in Planning process.<br>**ORGANIZING:**  – Definition & Meaning, Types of organization.  Depart mentation, Committees, Centralization Vs Decentralization, Authority and responsibility, span of control, MBO and MBE. Decision Making: Definition, Decision Making Process.<br>**STAFFING:** Nature and importance of staffing, process of selection and recruitment.<br>**DIRECTING:** Meaning, Leadership: Definition, Leadership styles – Autocratic, Democratic, Charismatic, Laissez faire and Participative. Leadership theories – Trait, Behavioral and Contingency. *Introduction to motivation theories* – Maslow, Herzberg, & McGregor's Theory of X & Y. *Communication* – Meaning and importance, communication process, barriers of communication, overcoming barriers. *Co-ordination***:** Meaning and importance, stages of group forming, types of groups.<br>**CONTROLLING:** Meaning and steps in controlling, Types of control, Method of establishing control (in brief).<br>*Case study discussion with respect to Indian context.* | **12** |
| 3 | **ENTREPRENEUR**: Definition &Meaning, Characteristics, types of entrepreneur, Difference between Entrepreneurs, Intrapreneur & Manager, Stages in Entrepreneurial process, barriers to entrepreneurs, Role of Entrepreneurs in economic development.<br>**Rural entrepreneurs** - Meaning & schemes.<br>**Women entrepreneurs** – Concept, challenges, women entrepreneurship in India, Institutional support & special bank scheme.<br>**Family Business:** Meaning, Roles & responsibility, types of family business, challenges faced by family business, reasons for failure of family business.<br>*Case study discussion with respect to Indian context.* | **10** |

| | | |
|---|---|---|
| | *Activity: Profile of successful entrepreneur.* | |
| **4** | **MSME:** Definition & Concept of MSME, role & importance, current schemes for MSME.<br>**SMALL SCALE INDUSTRY**: Meaning, Characteristics, Steps to start an SSI, problems faced by SSI. Introduction to GATT, WTO & LPG. Sources of financing, forms of ownership.<br>**Institutional Support**: Different schemes. *Central level Institutions* – SIDBI, NABARD, HUDCO, TCO. *State level Institutions*- DIC, SFC, KIADB, TECKSOK.<br>**STARTUP COMPANIES**-Meaning and Challenges.<br>*Activity for students: Schemes for startup companies.* | **12** |
| **5** | **PREPARATION OF PROJECT:** Meaning, Project identification, Project selection, Project Appraisal, Project Report – Contents, Errors of project report, Feasibility Study-Market Feasibility Study, Technical Feasibility Study, Financial Feasibility Study, Social Feasibility Study. Business plan: Meaning, contents of business plan, reasons for failure of business plan.<br>*Activity for students***:** *Writing of a business plan.* | **10** |

**Note 1:** Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
**Note 2:** Two assignments are evaluated for 5 marks.

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**Course Outcomes :**
CO1: The students will gain knowledge on management concepts & its evolution.
CO2: The students will learn the application of managerial skills & attributes.
CO3: The students will get an in depth knowledge of entrepreneurial process & will be able to apply the entrepreneurial skills.
CO4: Students compile information & explore the sources of funding agencies.
CO5: Students will be able to identify business opportunities & prepare the business plan.

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| Cos | Mapping with POs |
|---|---|
| CO1 | PO4,PO5 |
| CO2 | PO5,PO7,PO11,PO12 |
| CO3 | PO4,PO7,PO10,PO11,PO12 |

**TEXT BOOKS:**
1. Entrepreneurship and Management- S Nagendra and V S Manjunath- Pearson Publication 4 /e, 2009.
2. Dynamics of Entrepreneurial Development and Management-Vasant Desai-Himalaya Publishing House.
3. Principles of Management – PC Tripathi, and P N Reddy – Tata Mc- Graw Hill.
4. Management and Entrepreneurship- N V R Naidu and T Krishna Rao. I K International Publishing house.

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**REFERENCE BOOKS:**
1. Entrepreneurship Development – Poornima M Charanthimath Pearson Education 2nd Edition.
2. Entrepreneurship and management - Shashi k Gupta- Kalyani publishers, Latest edition.
3. Organizational behavior, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, Pearson, 14/e, 2012.
4. Financial Management- Shashi k Gupta- Kalyani publishers, Latest edition.

| Sub Title : | Intellectual Property Rights | | |
|---|---|---|---|
| Sub Code : 18HS61/62 | No. of Credits: 2= 2 : 0 : 0 (L-T-P) | | No. of lecture hours/week : 2 |
| Exam Duration : 2 hrs | CIE + SEE = 50 + 50 =100 | | Total No. of Contact Hours : 26 |

| Objectives: |
|---|
| The main objective of the IPR is |
| 1. To make the students aware of their rights for the protection of their invention done in their project work. |
| 2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act. |
| 3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's. |

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION TO IPR**: Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights, Introduction to TRIPS and WTO. Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge. | 03 |
| 2 | **PATENT RIGHTS AND COPY RIGHTS**: Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and license , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties. <br> **COPY RIGHT**: Origin, Definition &Types of Copy Right, Registration procedure, Assignment & license, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software. | 10 |
| 3 | **TRADE MARKS**: Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Domain Names, Infringement & Remedies, and Offences relating to Trade Marks, Passing Off, and Penalties. | 04 |
| 4 | **DESIGN**- Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000. | 05 |
| 5 | **BASIC TENENTS OF INFORMATION TECHNOLOGY ACT**-2000- Cyber crimes, digital signature and E-Commerce. | 04 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Course outcomes: |
|---|
| 1. The students once they complete their academic projects, they get awareness of acquiring the patent |
| 2. They also learn to have copyright for their innovative works. |
| 3. They also get the knowledge of plagiarism in their innovations which can be questioned legally. |

| Cos | Mapping with POs |
|---|---|

| CO1 | PO7 |
|-----|-----|
| CO2 | PO7,PO12 |
| CO3 | PO7,PO12 |

**EXT BOOKS:**
Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy
Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.Wadehra
IPR by P. Narayanan
Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni.

| Sub Title : MATERIALS MANAGEMENT | | |
|---|---|---|
| Sub Code : 18IM61 | No. of Credits:3=3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

| Objective: |
|---|
| 1. Define the concepts of modern materials management and aims to increase profitability. |
| 2. Explain the purchasing principles and relationships with vendors. |
| 3. Define the Application of different systems of codification and analysis of stores management and selective control techniques. |
| 4. Determine basic concepts of Inventory management and their applications to industry. |
| 5. Develop inventory models for different manufacturing situations along with price breaks. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction:** Importance of Materials Management – Definition, scope, organization for Materials Management, Objectives of materials management, an overview of system concepts, Benefits of an integrated system approach.<br><br> **Materials Planning:** Making the materials plan work, the materials cycle and flow control system, Materials budget. | 07 |
| 2 | **Purchasing:** Purchasing Principles, Procedures and Practices, Fundamental Objectives of Purchasing**,** Scope, Preparation of forms and records for purchasing, Methods of Purchasing, reciprocity, Cost-Plus Contracts, Hedging, Sources of Supply and Supplier Selection, Legal Aspects of Purchasing, Law of Agency, Law of Contract, Vendor-Vendee Relations, Vendor Development, Vendor Rating. | 10 |
| 3 | **Stores Management and Operation:** Storage System, Stores Location and Layout, Development of Storing, Centralization and Decentralization of Stores. The Systems classification and Codification of Materials, ABC, FSND, VED analysis. Case studies on ABC Analysis | 07 |
| 4 | **Inventory Management: :** Definition of inventory, Need of inventory and its management, functions of inventory management, types of inventories, inventory control, cost elements, Economic Order Quantity, Max - Min system. Inventories and demand uncertainty. | 05 |
| 5 | **Deterministic Inventory models**: Dynamic inventory models, Instantaneous and finite rate of replenishment with and without shortage.<br>Models with Price breaks & quantity discounts, (Numerical Exercises on EOQ) Determining safety stock. Q-system & P-system. | 10 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcome: |
|---|
| 1. Explain the concepts and Importance of Integrated Materials Management |
| 2. Elaborate about the concepts of purchasing, types, objectives, procedure including vendor rating. |

3.  Design and layout for a stores, do codification, use selective control techniques to stock the items in stores.
4.  Explain the basic concepts on inventory, inventory costs, EOQ.
5.  Use the inventory models in practical applications.

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO3,PO9,PO10 |
| CO2 | PO4,PO8,PO9,PO12 |
| CO3 | PO3,PO4,PO9 |
| CO4 | PO2,PO3,PO4 |
| CO5 | PO2,PO3,PO4,PO9,PO11 |

**TEXT BOOK:**
1.  Materials Management, P. Gopalakrishnan, PHI Pvt. Ltd, New Delhi, 2002
2.  Materials Management, A.K. Datta., PHI Pvt. Ltd, New Delhi, 2001.
3.  Operations Research, Kanti Swaroop, S Chand & Co. 2003

**REFERENCE BOOK:**
1.  Handbook of Materials Management, P. Gopalakrishnan, PHI Pvt. Ltd, New Delhi, 2002.
2.  Operations Research, Taha, McMillan, 4th edtion.
3.  Gupta and hira, problems on operations reasearch

| Sub Title : | FACILITIES PLANNING AND DESIGN | |
|---|---|---|
| **Sub Code : 18IM62** | **No. of Credits: 3= 3 : 0 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 39** |

**Objectives:**
1. Explain the concepts of plant layout, layout planning and designing efficient facilities
2. Solve location and layout problems by considering the entire manufacturing and/or service systems within their supply chains.
3. Assess the role of facilities planning in reducing costs and increasing productivity and service level through selection of better material handling.
4. Elaborate on the concepts of computer-aided layout designs better facility design.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **PLANT LOCATION:** Factors influencing plant location, Theories of plant location and location economics. Location models: Selection of site by Break even analysis, Factor Rating method, Centre of gravity method (problems)<br>**Plant layout**-Objectives of plant layout, Principles of plant layout, types of plant layout, and their merits and demerits<br>**PLANT DESIGN:** Layout procedures: Immer, Nadler, Muther, Apple and Reed's approaches, systematic layout planning. | 10 |
| 2 | **MATERIAL HANDLING:** Objectives and principles of Material handling, Unit load concept, Material handling equipments, Selection of material handling equipments, Production line balancing. | 06 |
| 3 | **COMPUTERIZED LAYOUT PLANNING:** CRAFT, COFAD, PLANET, CORELAP, ALDEP | 05 |
| 4 | **SPACE DETERMINATION AND AREA ALLOCATION:** Factors for consideration in space planning, receiving, storage, production, shipping, tool room and tool crib, other auxiliary service actions, Establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column, area allocation procedure, the plot plan.<br>**CONSTRUCTION OF THE LAYOUT:** Methods of constructing the layout, evaluation of layout, efficiency indices. | 10 |
| 5 | **QUANTITATIVE APPROACHES TO FACILITIES PLANNING:** Deterministic models single and multi-facility location models, Location allocation problems – quadratic assignment problem, Warehouse layout models,<br>Evaluation, selection and implementation of facilities plan. | 08 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

**Outcomes:**

By the end of the course students will be able to
1. Solve facility location problems and prepare a facilities layout for the efficient flow of materials through a facility
2. Analyze material handling systems through different material handling equipment and material handling principles used in the warehousing, manufacturing
3. Plan the layout and evaluate facilities related problems using different layout planning algorithms
4. Identify activity, relationships and space requirements for various departments
5. Evaluate and select facilities plan

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO3,PO4 |
| CO2 | PO3,PO6 |
| CO3 | PO5,PO6 |
| CO4 | PO4,PO7 |
| CO5 | PO3,PO4,PO7 |

TEXT BOOKS:
1. Plant Layout and Material handling - James M Apple, 2<sup>nd</sup> Edition, John, Wiely and Sons
2. Facility layout and Location- Francies R L and White J A, Mc- Graw Hill 2<sup>nd</sup> edition

REFERENCE BOOKS:
1. Practical layout- Muther Richard, Mc- Graw Hill-1955.
2. Facilities Design, Sunderesh Heragu, PWS Publishing Company, ISBN-0-534-95183.
3. Plant Layout Design - James M Moore, Mc Millon Co.1962 LCCCN61- 5204.

| Sub Title : LEAN MANUFACTURING | | |
|---|---|---|
| Sub Code : 18IM63 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

**Objectives:**
1. To recall the history and the birth of Lean Manufacturing system.
2. To know the tools and techniques of lean manufacturing like stability, standardization etc.
3. To understand the concepts of the two pillars of TPS i.e. JIT and JIDOKA.
4. To appreciate the lean culture.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | ORIGIN OF LEAN PRODUCTION: Craft Production – Mass Production – Ford System – Growing Dysfunction – Origin and History of Lean Production.<br>LEAN PRODUCTION SYSTEM: Necessity of Lean Production – Systems and Systems thinking – Construction of Lean Production: Lean image and Lean Activities – Muda and its types – Mura – Muri. | 08 |
| 2 | STABILITY: Standards in Lean System – Visual Management – 5S – Total Productive Maintenance: Key measures; Six Big Losses; Hidden Losses; Machine Loss Pyramid; Small group activity. | 06 |
| 3 | STANDARDIZED WORK: Comparison of Methods Engineering and Lean thinking – Elements to be managed - Necessity and prerequisites of Standardized work – Elements of Standardized work - Charts: Production capacity chart; Standardized combination table; Standardized work analysis chart – Man power reduction – Comparison of overall efficiency with individual efficiency – Kaizen – Common Layouts | 09 |
| 4 | JUST IN TIME (JIT): Definition - Principles of JIT: Continuous Flow; Pull – JIT system – Kanban – Six Kanban rules - Expanded role of conveyance – Production leveling – Three types of Pull Systems – Value Stream Mapping: Symbols; Current state VSM and Future state VSM.<br>JIDOKA: Development and necessity – Poke Yoke: Common errors – Inspection system and Zone control – Using Poke Yokes – Jidoka implementation. | 10 |
| 5 | LEAN INVOLVEMENT AND CULTURE: Necessity of involvement – Waste of Humanity – Activities supporting involvement – Kaizen Circle Activity – Practical Kaizen Training – Key factors in Practical Kaizen Training – Lean Culture – Standardization – Standards and abnormality control – 'Five Why' analysis. | 06 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

**Outcomes:**
After completing the course students re able to
1. Appreciate the birth of lean manufacturing and the history before it evolution.
2. Discuss and apply the various tools and techniques of lean manufacturing.
3. Know the concepts of JIT and JIDOKA.
4. Understand the Lean culture and its analysis.

| Cos | Mapping with POs |
|---|---|

| | |
|---|---|
| CO1 | PO3,PO5,PO8,PO10 |
| CO2 | PO3,PO5,PO8,PO10,PO11 |
| CO3 | PO3,PO5,PO8,PO10,PO11 |
| CO4 | PO10,PO11 |
| CO5 | PO5,PO8,PO10,PO11 |

**TEXT BOOKS:**
1. Devadasan S R, Mohan Sivakumar V, Murugesh R and Shalij P R, "Lean and Agile Manufacturing: Theoretical, Practical and Research Futurities", Prentice Hall of India Learning Limited, New Delhi, 2012.
2. Dennis P, "Lean Production Simplified: A Plain Language Guide to the World's Most Powerful Production System", Productivity Press, New York, 2007.
**REFERENCES:**
1. Gopalakrishnan N, "Simplified Lean Manufacture: Elements, Rules, Tools and Implementation", Prentice Hall of India Learning Private Limited, India, 2010.
2. Bill Carreira, "Lean Manufacturing that Works: Powerful Tools for Dramatically Reducing Wastes and Maximizing Profits", Prentice Hall of India Learning Private Limited, India, 2007.
3. Don Tapping, Tom Luyster and Tom Shuker, "Value Stream Management: Eight Steps to Planning, Mapping and Sustaining Lean Improvements", Productivity Press, New York, USA, 2002.

| Sub Title : SIMULATION MODELLING AND ANALYSIS | | |
|---|---|---|
| **Sub Code : 18IM64** | **No. of Credits: 2 : 1 : 0 (L-T-P)** | **No. of lecture hours/week : 4** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 52** |

| Objectives: |
|---|
| 1. Demonstrate the major capabilities and commonly encountered limitations of discrete-event simulation for modeling systems that industrial engineers commonly encounter. |
| 2. Be able to build and run simple discrete-event simulation models in practical situations |
| 3. Illustrate the main assumptions underlying these models; and Explain what can happen when these assumptions do not hold. |
| 4. Be able to communicate the results of the modeling process to management and other non-specialist users of engineering analysis. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction To Simulation:** Simulation, advantages & disadvantages, Areas of application, System environment, Components of a system, Model of a system, Types of models, Monte carlo simulation and Steps in a simulation study. | 6+2T |
| 2 | **Simulation Examples:** Simulation of Queuing systems, Simulation of Inventory Systems.<br>**General Principles:** Concepts in discrete - events simulation, event scheduling / Time advance algorithm | 8 + 4T |
| 3 | **Random Numbers:** Properties, Generations methods, Tests for Random number-Frequency test, Runs test, Auto correlation test, Gap test, Poker test | 6 + 4T |
| 4 | **Introduction To Probability Distributions:** Weibull and triangular distribution and their applications.<br>**Random Variate Generation:** Inverse Transform Technique- Exponential, Uniform, Weibull, Triangular distributions, Direct transformation for Normal and log normal Distributions, convolution methods- Erlang distribution, Acceptance – Rejection Techniques – Poisson Distribution, Gamma Distribution. | 6 + 4T |
| 5 | **Analysis Of Simulation Data:** Input Modeling: Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data. Verification and Validation of Model – Model Building, Verification, Calibration and Validation of Models<br>**Output Analysis:** Stochastic Nature of output data, Measures of Performance and their estimation. | 8 + 4T |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes: |
|---|
| After completion of the course the student will be able to |

After completion of the course the student will be able to
1. Illustrate basic concepts in modeling and simulation (M&S).
2. Classify various simulation models and give practical examples for each category.
3. Construct a model for a given set of data and motivate its validity.
4. Generate and test random number variates and apply them to develop simulation models.
5. Fit statistical distributions to input data, obtain parameter estimation and goodness of fit.

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1,PO2 |
| CO2 | PO2,PO3,PO4 |
| CO3 | PO4,PO6 |
| CO4 | PO4,PO5,PO6 |
| CO5 | PO1,PO2,PO4 |

**TEXT BOOKS:**

**1.Discrete Event system Simulation** – Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol, III Edition, Pearson Education, Asia,  ISBN - 81- 7808 – 505 - 4.

**2.Systems Simulation with Digital Computer** – Narsingh Deo; PHI Publication (EEE), ISBN – 0-87692-028-8

**3.Simulation Modelling & Analysis** – Averill M Law, W David Kelton; McGraw Hill International Editions – Industrial Engineering series, ISBN – 0-07-100803-9.

# Professional Elective – II

| Sub Title: PRODUCT DESIGN AND DEVELOPMENT | | |
|---|---|---|
| Sub Code : 18IM651 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE +Assignment + SEE = 45 + 5 + 50 =100 | Total No. of Contact Hours : 39 |

| Objectives: |
|---|
| The objective of this course is<br>1. To familiarize the student with the basic concepts of product design, design phases and product life cycle.<br>2. To formulate design problems, need for design requirement, its specification and constraints.<br>3. To optimize design configuration and understand the concept of Idea- Rack.<br>4. To explain the importance of design simplicity, complexity and richness and also decision making aspects.<br>5. To understand the concepts of Computer Aided Modelling. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | DESIGN AS A DISCIPLINE: mass production and professional designers-quality of life- get more, pay less- cost reduction and higher sophistication- products of dynamic culture.<br>PRODUCT LIFE CYCLE: various stages of product life cycle- design stage-manufacturing and marketing/ implementation- usage and maintenance- the death of a product.<br>DESIGN PHASES: design methodology- formulation- idea rack- short listing and selecting two idea- detailing- prototype preparation. | 08 |
| 2 | USER CENTRED DESIGN SURVEY: importance on problem formulation, primary focus on people, target domain, clients and users, interaction, integrated approach, kinds of knowledge, style and peer group, user centred feedback.<br>NEED STATEMENT AND DESIGN REQUIREMENTS: need statement, guidance for designers, independent of physical embodiment, major requirements and articulation.<br>SPECIFICATIONS AND CONSTRAINTS: quantitative and qualitative<br>Specifications and constraints, design space, refinement of design space, side stepping, various approaches like engineering, architectural, hybrid. | 08 |
| 3 | IDEA-RACK: seeking several concepts, usability considerations: flexibility, interdisciplinary design and interaction, design activities like original design, adaptive design, and variant design. Tools helpful in generating ideas like deep encounter, analogy, reversal, fusion of opposites, brainstorming, realizing new constraints.<br>OPTIMIZATION CONFIGURATION EXPLORATION: conventional optimization vs configuration optimization, thumb rules, yield to nature's forces, light weight components, use of standard parts, design for manufacturing, material selection. | 08 |
| 4 | SIMPLICITY, COMPLEXITY AND RICHNESS: axiom and KISS, value consideration, tools for simplification, simple and complex, richness, value for complexity.<br>DECISION MAKING: indecision is a negative act, delegating responsibilities, decisions on scanty data, important elements of decision making like analysis, synthesis, emotions, intuitions, risk and management of failures. | 07 |
| 5 | UNCOUPLED, DECOUPLED AND COUPLED DESIGNS: Functional domain and functional requirements, physical domain and design parameters, mathematical representation like design matrix and coupled design, uncoupled, decoupled. Additional expenditure.<br>PRODUCTS STATIC AND DYNAMIC SOCIETIES: Form, context and misfits, products of static societies, products of dynamic societies, products of dynamic cultures, short comings, | 08 |

| | comparison and middle path. | |
|---|---|---|

**Outcomes:**

After going through this course the student will be able to:

CO1: Understand the design phases

CO2: Formulate need statement and specifications

CO3: Apply decision making statement

CO4: Learn Computer Aided Modelling concepts.

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1, PO10 |
| CO2 | PO2, PO3, PO4, PO11 |
| CO3 | PO5, PO6, PO7, PO11, PO12 |
| CO4 | PO9, PO11 |

TEXT BOOKS:
1. Product Design, Prashant Kumar, PHI Learning Pvt. Ltd.,2012, ISBN:978
2. Product Design and Development , Karl.T.Ulrich, Steven D Eppinger, 8120344273 McGrawHill , 2000, ISBN 978 30078029066
3. Product Design and Manufacturing, A C Chitale and R C Gupta, 13: PH1, 13: 978 48120342828.
4. SOLIDWORKS 2018 for Designers , Sham Tickoo, CADCIM Technologies 3rd Edition, 2003. ISBNes,16th revised Edition Paperback, 2018.

| Sub Title : | MAINTENANCE & SAFETY ENGINEERING | | |
|---|---|---|---|
| Sub Code : 18IM652 | No. of Credits:3= 3 : 0 : 0 (L-T-P) | | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | | Total No. of Contact Hours : 39 |

**Objectives:**
1. To explain the basic concepts of maintenance system and maintenance of machinery.
2. To elucidate the economics of Maintenance and importance of computers in Maintenance management.
3. To describe the significance of Industrial Safety, fire prevention, and protection
4. To elaborate the importance of Industrial pollution control and to Define about the types and sources of Industrial pollution

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION TO MAINTENANCE SYSTEM:** Definition, Scope, Objective, Importance of maintenance system, Type of maintenance system, Break Down Maintenance system, Preventive Maintenance, Predictive Maintenance, design out Maintenance, corrective Maintenance, Planned Maintenance, total productive Maintenance, conditioning Maintenance. | 7 |
| 2 | **MAINTENANCE OF MACHINERY:** Causes of machine failure, performance evaluation, complete overhauling of lathes, Drilling machines, Drilling machines, Milling machines, shapers and Grinding machines, maintenance planning and scheduling, Repair order control man power equipment, Maintenance job analysis, spare parts control. | 10 |
| 3 | **ECONOMICS IN MAINTENANCE:** repair, replacement, Repair complexity, Finding out most optimal preventive frequency. <br> **COMPUTERS IN MAINTENANCE MANAGEMENT:** File data bank, storage of data such as break downs, spare parts, lubricating point, drawing of machine parts. | 6 |
| 4 | **INDUSTRIAL SAFETY:** Economic importance of accidents, Types of safety organizations, Analysis of accident safety standard for- Mechanical equipment, Electrical equipment and systems, Chemical hazards, Material Handling, exhaust systems, Plant housekeeping, building, Aisles passages, floors, tool cribs, washrooms. | 6 |
| 5 | **FIRE PREVENTION AND PROTECTION:** Condition favouring fire breakdown, preventing of firing methods, fire protection- Classification of fires, fire extinguishing system, fire alarms,fire fighting equipments, mock drills, emergency, response time. <br> **INDUSTRIAL POLUTION CONTROL:** Dust control- Fiber collectors, mechanical dust collectors, wet type collectors, Electro static precipitators, Noise pollution control-Noise measurement and control, Industrial vibration and its control, ILO conventions, Risk assessment. | 10 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

**Outcomes:**
1. Able to memorize types of maintenance systems
2. Able to evaluate machine failure and performance of the machines
3. Able to evaluate the economics of maintenance and express the use of computers in maintenance
4. Demonstrate and outline the Industrial safety through proper safety standards to reduce accidents.
5. Demonstrate and outline the Industrial pollution control and fire prevention and protection.

| Cos | Mapping with POs |
| --- | --- |
| CO1 | PO7,PO11,PO12 |
| CO2 | PO1,PO2,PO3,PO4,PO11,P12 |
| CO3 | PO1,PO2,PO3,PO4,PO11,P12 |
| CO4 | PO5,PO6,PO9,PO10,P12 |
| CO5 | PO6,PO9,PO10,P12 |

**TEXT BOOKS:**
1. Staniar-plant Engineering hand Book, 2$^{nd}$ Edition, Mc Graw Hill
2. Morrow, Lindley. R and Higgins-Maintenance Engineering hand Book, 3$^{rd}$ Edition McGrawHill-2001

**REFERENCE BOOKS:**
1. Frank Herbaty-Hand book of maintenance management, Crest Publishing house-2004
2. W. Grant Lerson & Eugene L. Grant-Hand book of Industrial Engg & Management, Prentice Hall
3. of India, 2$^{nd}$ Edition-1988
4. Herbert. F. Lund-Industrial Pollution control Hand Book, Mc Graw Hill
5. H. P. Garg-Industrial Maintenance, 3$^{rd}$ Edition-S.Chand publishers

| Sub Title : COMPOSITE MATERIALS | | |
|---|---|---|
| Sub Code : 18IM653 | No. of Credits:3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

| Objectives: |
|---|
| 1. To introduce composite materials and its different types. <br> 2. To explain the advanced methods of the manufacturing of composite material and different fabrication techniques. |

| Unit No | Syllabus | No of Hours |
|---|---|---|
| 1 | **Introduction To Composite Materials:** Definition-Classification and characteristics of composite materials- fibrous composites, laminated composites and particulate composites | **06** |
| 2 | **FIBER REINFORCED PLASTIC PROCESSING:** <br> **Primary and secondary manufacturing of composites** – Layup and curing, fabricating process-open and closed mould process-hand layup techniques-structural laminate bag molding, Autoclave Molding filament Winding, Pultrusion, Compression Molding, RTM, RIM, SRIM, machining, drilling and routing. | **08** |
| 3 | **FIBER REINFORCED PLASTIC PROCESSING:** Production procedures for bag molding- filament winding, pultrusion, pulforming, thermo-forming, injection, injection molding, liquid injection molding, blow molding. | **06** |
| 4 | **FABRICATION OF COMPOSITES:** Cutting, machining, drilling, mechanical fasteners and adhesive bonding, joining, computer aided design and manufacturing, tooling, fabrication equipment. | **08** |
| 5 | **METAL MATRIX COMPOSITES (MMC'S):** Reinforcement materials, types, characteristics, and selection base metals selection-Need for production MMC's and its application. <br> **CERAMIC MATRIX COMPOSITES** – Manufacturing routes and application | **09** |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcome: |
|---|
| 1. Students are able to explain the different concepts of manufacturing of fiber reinforced composites. <br> 2. Laminate design for different combinations of plies with different orientations of the fiber. <br> 3. To Explain the machining of composite materials <br> 4. To Explain the Manufacturing routes and application of Metal matrix and Ceramic matrix composites |

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO3,PO8,PO10 |
| CO2 | PO3,PO8,PO10 |
| CO3 | PO3 |
| CO4 | PO3,PO8,PO10 |

**TEXT BOOKS:**
1. .Mein Schwartz., "Composite Materials Handbook", McGraw Hill, 1992
2. Autar K.Kaw, "Mechanics of Composite Materials", CRC Press, 2005.
3. Gibson, R.F., "Principles of Composite Material Mechanics", McGraw-Hill, 1994, 2nd
Edition - CRC press in progress.
4. Hyer, M.W., "Stress Analysis of Fiber – Reinforced Composite Materials", McGraw-
Hill, 1998.

*REFERENCE* **BOOK:**
1. "ASM Hand book on Composites", Volume 21, 2001
2. Vanviack L.H, "Physical Ceramics for Engineers", Addison Wesley Publication, 1964.
3. Issac M. Daniel and OriIshai, "Engineering Mechanics of Composite Materials", Oxford
University Press, 2006, First Indian Edition, 2007.
4. Mallick, P.K., Fiber,"Reinforced Composites: Materials, Manufacturing and Design",
Maneel Dekker Inc, 1993.
5. Halpin, J.C., "Primer on Composite Materials, Analysis", Techomic Publishing Co., 1984.
6. Agarwal, B.D., and Broutman L.J., "Analysis and Performance of Fiber Composites",
John Wiley and Sons, New York, 1990.
7. Mallick, P.K. and Newman, S., "Composite Materials Technology: Processes and
Properties", Hansen Publisher, Munish, 1990.

| Sub Title : ORGANIZATIONAL BEHAVIOUR | | |
|---|---|---|
| **Sub Code : 18IM654** | **No. of Credits:3 =3 : 0 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 39** |

| Objectives: |
|---|
| 1. To introduce the scope and importance of Organization behavior. |
| 2. To Explain and study the different behaviors in organizations. |
| 3. To develop motivation and leadership power. |
| 4. To introduce the dynamics of Organization behavior. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction:** Organizational Behaviour: Introduction, definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities. **Management**: Introduction, Definition of management, Nature, Purpose and Functions, Levels and types of managers, managerial roles, skills for managers, evolution of management thought, Fayol's fourteen principles of management, Recent trends in management. | 6 |
| 2 | **INDIVIDUAL BEHAVIOUR:** Personality-types, factors influencing personality, theories, Defining, types of Definers, the Defining process, Defining theories, Organizational Behaviour modification, Misbehavior, types, Management Intervention, Emotions, Emotional labour, Emotional Intelligence, Theories. Attitudes, Characteristics, Components, Formation, Measurement, Values. Perception, Importance, Factors influencing perception, Interpersonal perception, Impression Management, Motivation- Importance Types, Effects on work Behaviour. | 10 |
| 3 | **GROUP BEHAVIOUR:** Organization structure, formation, groups in organization, influence, group dynamics, emergence of informal leader and working norms, group decision making techniques, team building, interpersonal relations, communication, control. | 10 |
| 4 | **MOTIVATION:** Maslow's hierarchy of needs, Douglas Mc Gregor Theory X &Theory Y, Chris Argyris pattern A & pattern B, Motivation Hygiene theory, Motivation and Satisfaction. **LEADERSHIP AND POWER:** Meaning, importance, leadership style, theories, leaders Vs managers, sources of power, power centers, power and politics. | 6 |
| 5 | **DYNAMICS OF ORGANIZATIONAL BEHAVIOUR:** Organizational culture and climate, factors affecting organizational climate-importance, job satisfaction, determinants, measurements, influence on behavior. organizational change, importance, stability Vs change, proactive vs reaction change, the change process, resistance to change, managing change, stress work, stressors, prevention and management of stress, balancing work and life. Organizational development, characteristics, objectives, organizational effectiveness. | 7 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO5,PO6,PO12 |
| CO2 | PO5,PO6,PO7.PO8,PO10,PO12 |
| CO3 | PO6,PO7,PO8,PO9,PO10,PO12 |
| CO4 | P05,PO6,PO7,PO8,PO9,PO10,PO12 |
| CO5 | PO3,PO5,PO6,PO7,PO8,PO9,PO12 |

TEXT BOOKS:
1. Organizational Behaviour, Stephen P Robbins, 15thEdn, 2015 Pearson Education Publications, ISBN–81–7808–561-5
2. Management of Organizational Behavious, Paul Henry and Kenneth H. Blanchard, Prentice Hall of India, 1996.
3. Organizational Behaviour – Fred Luthans, 9thEdn, McGraw Hill International Edition, ISBN–0–07– 20412–1
REFERENCE BOOKS:
1. Organization Behavior – Hellriegel, Srocum and woodman, Thompson Defineing, 9th Edition, Prentice HallIndia, 2010
2. Organizational Behavior – VSP Rao and others, Konark Publishers 2002.

| Sub Title : MANAGEMENT INFORMATION SYSTEM | | |
|---|---|---|
| Sub Code : 18IM655 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

**Objectives:**

1. Determine the importance of information systems for business and management;
2. Evaluate the role of the major types of information systems in a business environment and their relationship to each other;
3. Assess the impact of the Internet and Internet technology on business-electronic commerce and electronic business;

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Fundamentals of information system**: Fundamental roles of is in business, managerial challenges of it, types of information system, components of an IS, information system resources and activities, competitive strategy concepts, strategy uses of it, competitive advantages. | 10 |
| 2 | **Electronic business system**: Introduction, cross-functional enterprise application, enterprise application integration, transactional processing systems, enterprise collaboration systems, enterprise application architecture.<br>**Functional business systems**: Introduction, marketing information systems, manufacturing systems, human resource systems, accounting systems, financial management systems. | 10 |
| 3 | **Electronic commerce systems**: Introduction, the scope of ecommerce, essential of e-commerce process, electronic payment process. E-commerce applications and issues: ecommerce application trends, business-to customer ecommerce, web store requirement, business-to-business e-commerce. | 06 |
| 4 | **Security and ethical challenges**: Introduction, ethical responsibility of business professionals, computer crime, privacy issues, other challenges, health issues, societal solutions. Security management of it: introduction, internetworked security defenses, other security measures, system control and audits. | 06 |
| 5 | **Enterprise and global management of IT**: Managing IT, business/IT planning, managing and IT function. Failures of IT management: global IT management, cultural political and geo-economics challenges, global business/IT applications. | 07 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

**Outcomes:**

1. Able to determine and define the basic concepts and technologies used in the field of information systems for business operations.
2. Able to apply and operate E-business
3. Able to operate and extend the use of E-commerce
4. Able to summarize, judge the ethical, social, and security issues of information systems.
5. Able to understand global businesses planning functions and applications

| Cos | Mapping with POs |
|---|---|
| CO1 | PO4,PO5 ,PO11,PO12 |

| | |
|---|---|
| CO2 | PO11,PO12 |
| CO3 | PO3,PO5,PO8,PO10,PO11,PO12 |
| CO4 | PO8,PO11,PO12 |
| CO5 | PO4,PO5,PO7, PO11,PO12 |

**TEXT BOOKS:**
1. **Management Information system**- managing information technology in the internet worked enterprise- James. A O'Brien – Tata McGraw Hill publishing company limited, 2002.
2. **Management Information System** – Laudon & Laudon PHI ISBN 81-203-1282-1.1998.
3. **Kalakota and Whinston**, Frontiers of Electronic Commerce, Pearson education Inc. and Dorling Kindersley Publishing Inc, 7th Edition.

**REFERENCE BOOKS:**
1. **Management Information system**- S.Sadogopan.PHI 1998Edn. ISBN 81-203-1180-9
2. **Information systems for modern management** – G.R. Murdick PHI, 2$^{nd}$ Edition.
3. Turban E.F, Potter R.E, "Introduction to Information Technology"; Wiley, 2 004.
4. Jeffrey A.Hoffer, Joey F.George, Joseph S. Valachich, "Modern Systems Analysis and Design",    Third Edition, Prentice Hall, 2002.

| Sub Title :   ADVANCED MANUFACTURING TECHNOLOGY | | |
|---|---|---|
| **Sub Code: 18IM656** | **No. of Credits:3 =3 : 0 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration :** <br> **3 hours** | **CIE + SEE = 50  +  50 =100** | **Total  No. of Contact Hours : 39** |

**Course objectives:**
- Explain the basic concepts of Advanced Manufacturing Technology
- Discuss the  principles, methods, areas of usage, possibilities and limitations as well as environmental effects of the advanced  manufacturing technologies
- Be familiar with the characteristics of various materials that are used in advanced manufacturing.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1. | **ADVANCED CASTING TECHNOLOGY:** Expendable-Mold - shell mould casting, Vacuum Mould casing, investment casting, plaster-mold and ceramic-mold casting, Permanent-Mold casting processes - squeeze casting and semisolid metal casting, centrifugal casting, uses of Rapid Prototyping to produce pattern, process selection - dimensional tolerances for various casting processes and metals. | **08** |
| 2 | **ADDITIVE MANUFACTURING TECHNOLOGY**: Overview — History — Need-Classification -Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology — Tooling — Applications. | **07** |
| 3 | **LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS:** Classification — Liquid based system — Stereolithography Apparatus (SLA)- Principle, process, advantages and applications — Solid based system — Fused Deposition Modeling — Principle, process, advantages and applications, Laminated Object Manufacturing | **08** |
| 4 | **ADVANCED COMPOSITES   MANUFACTRUING:** Classification, binders, applications, manufacturing of plastic products by different processes like injection moulding, transfer moulding, blow moulding, expansion moulding, Fabrication of Particulate Composites Fabrication of Laminar Composites and Fabrication of Fiber-Reinforced Composites. | **09** |
| 5 | **GREEN MANUFACTURING- Introduction** to Green Manufacturing, Motivations and Barriers to Green Manufacturing, Environmental Impact of Manufacturing, Strategies for Green Manufacturing-Applications of Green Manufacturing. **DIGITAL MANUFACTURING-** Introduction to Digital Manufacturing and its Applications **SMART MANUFACTURING-** Introduction to Digital Manufacturing and its Applications, With some Case study. | **06** |

**Outcome:**
By the end of the course students will be able to
1. Explain the advanced manufacturing technologies and define the concepts of various manufacturing process.
2.  Describe the differences and of the application of a range of additive manufacturing processes
3.Describe the specific process characteristics of various advanced manufacturing technologies
 4. Understand the operating principles, capabilities, and limitations of liquid and solid based additive manufacturing system, including fused deposition modeling and stereolithography.
5.  Explain the various advanced manufacturing technologies and identify their possible applications.

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**

**Note 2: Two assignments are evaluated for 5 marks.**

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO1, P03, PO8, P10, P11. |
| CO2 | PO1, P03, PO5, PO8, P10, P11. |
| CO3 | PO2, PO5, PO10, P11. |
| CO4 | PO1, P03, PO8, P10, P11. |
| CO5 | PO1, P03, PO5, PO8, P10, P11. |

**TEXT BOOKS:**

1.Principles of Modern Manufacturing (SI Version), Mikell P Grove, 2014. John Wiley & Sons

2.Materials and Processes in Manufacturing, Paul DeGarmo E, Black J T and Ronald A Kohjer, 2011, John Wiley India

Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Third Edition, World Scientific Publishers, 2010.

Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2003.

5..Composite Manufacturing: Materials, Product and Process Engineering, Sanjay K Mazumdar, 2010, CRC Press.

**REFERENCE BOOKS:**

**1. Production Technology**, by HMT TATA McGraw Hill 2001.

**2. Modern Machining Process** - ADITYAN 2002.

3. **Principles of Modern Manufacturing** (SI Version), Mikell P Grove, 2014. John Wiley & Sons,

4. **Materials and Processes in Manufacturing**, Paul DeGarmo E, Black J T and Ronald A Kohjer, 2011, John Wiley India.

5. **Rapid Prototyping and Engineering applications**: A tool box for prototype development", Liou L.W. and Liou F.W., CRC Press, 2007.

6. **"Rapid Prototyping: Theory and practice**", Kamrani A.K. and Nasr E.A., Springer, 2006.

7. "**Rapid Tooling: Technologies and Industrial Applications**", Hilton P.D. and Jacobs P.F., CRC press, 2000.

8. **CAD and Protyping for Product Design**, 2014 Dougles Bryden,

9. **Fundamentals of Digital Manufacturing Science**, Zude Zhou, Shane Shengquan Xie, Dejun Chen, 2012, Springer publishers, ISBN: 978-0-85729-563-7, e-ISBN 978-0-85729-564-4.

**Open Elective –B**

| Sub Title :  PROJECT MANAGEMENT | | |
|---|---|---|
| Sub Code : 18IM661 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50  +  50 =100 | Total  No. of Contact Hours : 39 |

| Objectives: |
|---|
| 1.  To introduce concepts of project management with a strong emphasis on issues and problems associated with delivering successful projects. |
| 2.  To Define and study the project planning and estimating its cost. |
| 3.  To determine the elapsed time and idle time through project scheduling |
| 4.  To determine the critical path for the projects through project management tools and techniques. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **CONCEPTS OF PROJECT MANAGEMENT**:<br>Introduction, meaning of project, features of project, types of project, benefits of project management,, obstacles in project management, pm a prfession, pm and his role, project consultants, what is operation, difference between project and operation, what is process in project management and process groups, what is scope, difference between project group objectives and project scope<br>**PRODUCT LIFE CYCLE**:<br>Phases of project life cycle, project planning, project execution, project closure, project risks. | 06 |
| 2 | **PROJECT IDENTIFICATION:**<br>Sources of project ideas, purpose and need for project identification, steps of project identification, methodology for project identification, project identification for an existing company.<br> **FEASIBILITY STUDY AND PROJECT REPORT**:<br>Nature of project feasibility analysis, need for feasibility studies, components of feasibility study, commercial and economic feasibility, technical, financial, managerial,social feasibility. Format of feasibility report, checklist for feasibility report, project report. | 07 |
| 3 | **PROJECT PLANNING:**<br>Nature of project planning, need for project planning, functions of project planning, steps in project planning, project planning structure, project objectives and policies, tools of project planning.<br>**PROJECT SCHEDULING:**<br>Purpose of scheduling**,** time monitoring efforts, bounding schedules, project monitoring and implementation, situation analysis and problem definition, setting goals and objectives , implementation, project evaluation, importance and challenges in monitoring and project evaluation. | 06 |
| 4 | **PROJECT CONTROL:**<br>Projected control purposes, problems of projected control, Gantt Charts, Critical | 10 |

| | | |
|---|---|---|
| | Path Method (CPM), advantages of CPM, main obje4ctives of CPM, advantages of CPM, PERT, advantages of PERT, differences in PERT and CPM.<br><br>**PROJECT RISK:**<br>Risk, Riskvs Uncertainty,  types of risk, Risk Analysis, objectives, activities involved in risk analysis, risk assesment, risk management. | |
| 5 | **PROJECT MANAGEMENT SOFTWARE:**<br>Project management softwares general factors, factors influencing price of project software, Insta Plan III, Yojana, Prism project manager, Primavera, Agile methods, Scanner Master.<br><br>**ENVIRONMENTAL IMPACT ASSESMENT AND ENVIRONMENT ANALYSIS :**<br>EIA in different countries, Environmental analysis, components of environmental analysis, economic environment, political, governmental, legal environment, social and cultural environment, natural, global, technological environment. | **10** |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes : |
|---|
| Upon successful completion of this course, the student will be able to:<br>    1. Apply the concept, tools and techniques for managing large projects.<br>    2. Construct project plans for different types of organizations.<br>    3. Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities;<br>    4. Will be able to explain on resource and time planning, controls, communication mechanisms, reviews and other project management tools.<br>    5. Analyze and evaluate risks in large and complex project environments |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO3,PO4,PO5,PO7,PO8,PO9,PO11 |
| CO2 | PO3,PO4,PO5,PO7,PO8,PO9,PO11,PO12 |
| CO3 | PO3,PO4,PO5,PO6,PO11 |
| CO4 | PO4,PO5,PO11 |
| CO5 | PO4,PO10,PO11,PO12 |

| **TEXT BOOKS:** |
|---|
|     1. Project management Dr. Lalitha Balakrishnaan, Dr Gowri Ramachandran – Himalaya Publishing House, 2019 edition<br>    2. **Project Management a System approach to Planning Scheduling & Controlling** - Harold Kerzner, CBS Publishers and Distributors. 2016.<br>    3. **Project Execution Plan: Plan for project Execution interaction  -** Chaudhry S.2016 |

4. **Project Management Institute, "A guide to the project management body of knowledge (PMBOK Guide)".**5th edition, 2013, ISBN: 978-1-935589-67-9. 2015

**REFERENCES BOOKS:**

1. **Project Planning Analysis selection financing Implementation and Review-** Tata Mc Graw Hill Publication, 7th edition 2010, Prasana Chandra.
2. **Project Management** – Beningston Lawrence McGraw Hill 1970.
3. **A Management Guide to PERT and CPM**, WEIST & LeVY Eastern Economy of PH 2002.
4. **PERT & CPM**.-L.S.Srinnath, Affiliated East West Press Pvt. Ltd. 2002.
5. **Project planning analysis selection implementation & review** Prasanna Chandra, ISBNO-07-462049-5   2002.
6. **Performing and Controlling Project,-**Angus, Planning, 3rd End, Person Education, ISBN:812970020.2001
7. **Project planning scheduling & control**, James P.Lawis, Meo Publishing Company 2001.
8. **Project Management -**Bhavesh M.Patel, Vikas Publishing House, ISBN 81-259-0777-7 2002

| Sub Title : SIMULATION LAB | | |
|---|---|---|
| Sub Code : 18IML67 | No. of Credits: =0 : 0 : 1 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 36 |

**Objectives:**
1. To Explain and apply the basic fundamental concepts of Statistics to manufacturing operations.
2. Application of probability distributions to various manufacturing problems.
3. Application of random number generations for different experiments of simulation models.
4. To test the input and output analysis using statistical analysis.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction to Simulation Package.** <br> Features of Simulation Package and Input Modeling <br> Identifying probability distributions for given data <br> Building simulation models for manufacturing operations ( With Common templates) <br> Building simulation models for manufacturing operations ( With Basic templates) <br> Building simulation models for manufacturing operations with transport System <br> Building simulation models for manufacturing operations with layout. <br> Simulation of Multi Product Assembly line System. | 18 |
| 2 | **Building simulation models for service operations and analysis of data.** <br> Building simulation Models for Banking service (Bank teller problem) <br> Building simulation Models for Mortgage application problem <br> Building simulation Models for food processing problem <br> Building simulation Models for Post office animation <br> Statistical Analysis of Simulation models (input analysis) <br> Statistical Analysis of Simulation models (output analysis) <br> Modelling a Live Problem | 18 |

**Outcomes:**
1. Able to identify type of probability distribution and analyze nature of input data
2. Able to apply various simulation models using common and basic process templates
3. Will be able to solve the various manufacturing related problems and analyze output data

| Cos | Mapping with POs |
|---|---|
| CO1 | PO2,PO5, PO11 |
| CO2 | PO2,PO4,PO5,PO11 |
| CO3 | PO2,PO5,PO11 |

| **Scheme of Examination:** | | |
|---|---|---|
| ONE question from Unit -1: | 20 marks | |
| ONE question from Unit -2: | 20 marks | |
| Viva-Voce: | 10 marks. | |

**Suggested software:**
**1. Suggested Software Packages:  Arena / Quest / Witness / Extend.**
**Note: A minimum of 12 exercises are to be conducted.**

| Sub Title : Mini Project | | |
|---|---|---|
| Sub Code : 18IMP68 | No. of Credits:2 =0 : 0 : 2 (L-T-P) | No. of lecture hours/week : |
| Exam Duration : | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : |

| Objective: |
|---|
| 1. To equip students for making a subject presentation based on a thorough research review on any contemporary area of engineering and management fields. |
| 2. Offering the student an opportunity to interact with faculty and peer group and to build the ability to making independent presentation. |

| Sl. No. | Syllabus | |
|---|---|---|
| 1 | **Procedure:**<br><br>1. A list of contemporary topics will be offered by the faculty of the department in the in the interlude period between 7th and 8th Semester.<br><br>2. Student can opt for topic of their own choice and indicate their option to the department at the beginning of the 8th semester.<br><br><br>This component is also evaluated twice in the semester like Mini Project-CIE-1 and CIE-II. The final, marks shall be submitted to the exam section at the end of the semester. | |

# Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY
# BANGALORE - 56
**AIDED BY GOVERNMENT OF KARNATAKA**
**&**
**AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,**



# PROPOSED SYLLABUS

## For

## VII & VIII Semester
**(FOR THE ACADEMIC YEAR 2021-2022)**
**(Batch 2018)**

# Department of Industrial Engineering & Management

Website: www.drait.edu.in                    e-mail id: principal@drait.edu.in
# Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY
# BANGALORE - 56
**AIDED BY GOVERNMENT OF KARNATAKA**
**&**
**AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,**

## *Vision*

- To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

## *Mission*

- To offer state-of-the-art undergraduate, postgraduate and doctoral programs in the fields of Engineering, Technology And Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industry requirements.
- To install moral and ethical values with social and professional commitment.

# Department of Industrial Engineering & Management

## *Objective*

➢ To maintain a Comprehensive curriculum that enables students to become leading engineers and creative researchers in the global marketplace.

➢ To collaborate with private and public sectors in the search of methodologies and creative solutions to problems that contributes to the advancement of education, technology and professional development.

➢ To contribute to the profitable growth of industrial economic sectors by using IE analytical tools, effective computational approaches, and systems thinking methodologies.

➢ To maintain high standards of professional and ethical responsibility.

➢ To provide a broad education necessary to determine the impact of engineering solutions in a global economic, environmental, a societal context.

## *Vision:*

✚ To be globally recognized as a leader in industrial engineering education, research and enhance the application of technical knowledge to benefit the society.

## *Mission:*

✚ To offer globally recognized programs that equip graduates with strong problem   solving ability in the design, analysis and implementation of integrated systems in manufacturing and service sectors.

✚ Create state-of-the-art infrastructure for research and training in Industrial Engineering

✚ Promoting collaboration with academia, industries and Research organizations at national and international levels for socioeconomic development

# Program Outcomes (POs)

1. Ability to apply knowledge of mathematics, science and engineering.

2. Ability to design and conduct experiments related to deterministic or stochastic systems, as well as to analyze and interpret data.

3. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

4. Ability to identify, formulate and solve Industrial and Management Systems Engineering problems.

5. Student will be able to use modern industrial Engineering and management tools necessary for engineering practice.

6. Ability to determine the impact of engineering solutions in a global, economic, environmental, and societal context.

7. Determine the major environmental, social and economic drivers pertaining to the necessity of developing sustainable operations.

8. Student will exhibit professionalism and ethical responsibility.

9. Effectively collaborate and function on multidisciplinary teams.

10. Student will be able to communicate orally and verbally with different sections of society.

11. Manage Project and Finance to satisfy customer expectations.

12. Engage in life-long learning and appreciate the need for continual self-development.

# Program Educational Objectives

**PEO 1**: Have a strong foundation in Mathematics, Science and Engineering fundamentals that prepare them for a successful career in Industrial Engineering, Management and allied fields.

**PEO 2**: Function at a technically competent level in designing a system within realistic constraints such as economic, environmental, social, political, ethical, manufacturability, health and safety and sustainability.

**PEO 3**: To effectively and economically utilize the resources of the Enterprise using various optimization techniques.

**PEO 4**: Exhibit professionalism, good oral & written communication skills, team work and develop an attitude for lifelong learning.

# Department of Industrial Engineering & Management

**Faculty List:**

| | | |
|---|---|---|
| 1 | Dr.N.Mohan | Professor and Head |
| 2 | Dr. S. K. Rajendra | Associate Professor |
| 3 | Dr. Rajeshwari P | Associate Professor |
| 4 | Dr. C R Mahesha | Assistant Professor |
| 5 | Mrs. Suprabha R | Assistant Professor |
| 6 | Mr. Chetan N | Assistant Professor |
| 7 | Mr. Rajesh K | Assistant Professor |
| 8 | Mrs. Sarvamangala S P | Assistant Professor |

## VII SEMESTER

| Sl. No | Course and Course code | | Course Title | Teaching Department | Teaching Hours /Week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | | | | | |
| 1 | MC | 18HS71/ 72 | CMEP / OSHA | IM/ CV | 2 | -- | -- | 03 | 50 | 50 | 100 | 2 |
| 2 | PC | 18IM71 | Operations Management | | 2 | 2 | -- | 03 | 50 | 50 | 100 | 4 |
| 3 | PE | 18IM72 | Supply Chain Management | | 2 | 2 | -- | 03 | 50 | 50 | 100 | 4 |
| 4 | PE | 18IM73 X | Professional Elective -3 | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 5 | PE | 18IM74 X | Professional Elective -4 | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 6 | OE | 18IM75 X | Open Elective - C | | 3 | -- | -- | 03 | 50 | 50 | 100 | 3 |
| 7 | PC | 18IML76 | Statistics Laboratory | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| 8 | PC | 18IML77 | ERP & OR Laboratory | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| 9 | Project | 18IMP78 | Project Work Phase - 1 | | -- | -- | 2 | 03 | 50 | 50 | 100 | 2 |
| 10 | INT | | Internship | (If not completed after VI semester examinations, it has to be carried out during the intervening vacations of VII and VIII semesters ) | | | | -- | -- | -- | -- | -- |
| | | | **TOTAL** | | **15** | 4 | **6** | **27** | **450** | **450** | **900** | **23** |

**Note: PC: Professional Core, PE: Professional Elective, OE: Open Elective, INT: Internship, MC: Mandatory Course**

**Internship:** All the students admitted to III year of BE have to undergo mandatory internship of 4 weeks during the vacations of VI and VII semesters and /or VII and VIII semesters. A SEE examination will be conducted during VIII semester and prescribed credits shall be added to VIII semester. Internship is considered as a head of passing and is considered for the award of degree. Those, who do not take-up/complete the internship will be declared as failed and have to complete during subsequent SEE examination after satisfy the internship requirements.

| Electives | | | |
|---|---|---|---|
| Course code | Professional Electives - 3 | Course code | Professional Electives - 4 |
| 18IM731 | Project Management | 18IM741 | Design of Experiments |
| 18IM732 | Nanotechnology | 18IM742 | Strategic Management |
| 18IM733 | Human Resource Management | 18IM743 | Product Design and Manufacturing |
| 18IM734 | Database Management System | 18IM744 | Total Quality Management |
| 18IM735 | Technology Management | 18IM745 | Industrial Relations and Labour Welfare |
| **CMEP: Cost Management of Engineering Projects, OSHA: Occupational Safety and Health Administration** | | | |

| Course code | Open Elective -C |
|---|---|
| 18IM751 | Human Resource Management |
| | |

**VIII SEMESTER**

| Sl. No | Course and Course code | | Course Title | Teaching Department | Teaching Hours /Week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | | | | | |
| 1 | MC | 18HS81/82 | CMEP / OSHA | IM/CV | 2 | -- | -- | 03 | 50 | 50 | 100 | 2 |
| 2 | Project | 18IMP82 | Project Work Phase - 2 | | -- | -- | 2 | 03 | 50 | 50 | 100 | 10 |
| 3 | Seminar | 18IMS83 | Technical Seminar | | -- | -- | 2 | 03 | 50 | 50 | 100 | 1 |
| 4 | INT | 18IMI84 | Internship | (Completed during the intervening vacations of VI and VII semesters and /or VII and VIII semesters.) | | | | 03 | 50 | 50 | 100 | 2 |
| | | | | **TOTAL** | **2** | **--** | **4** | **12** | **350** | **350** | **700** | **15** |

**Note: PC: Professional Core, PE: Professional Elective, OE: Open Elective, INT: Internship, MC: Mandatory Course**

**Internship:** Those, who have not pursued /completed the internship, will be declared as failed and have to complete during subsequent SEE examination after they satisfy the internship requirements.

**CMEP: Cost Management of Engineering Projects OSHA: Occupational Safety and Health Administration**

# VII SEMESTER

| Sub Title : COST MANAGEMENT OF ENGINEEREINGT PROJECTS | | |
|---|---|---|
| Sub Code : 18HS71 | No. of Credits: 2 | No. of lecture hours/week : 2 |
| Exam Duration : 2 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 26 |

| Objectives: |
|---|
| 1. The objective of this course is to familiarize the student with the basic concepts, standards and practices of financial accounting. <br> 2. The course is devoted to the basic financial statements, the analysis and recording of transactions, and the underlying concepts and procedures, <br> 3. To carry out financial statement analysis and studying and preparation of cost sheet and budget. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **COST CONCEPTS:** Cost- meaning, Cost v/s Expense, meaning of loss, classification of cost, cost driver & cost unit. <br> Overheads- Meaning and Classification of Overheads. | 05 |
| 2 | **COMPONENTS OF COSTING:** objectives of costing, elements of Costing. <br> Preparation of Cost Sheet, Job Costing-Batch Costing, Process Costing and Activity Based Costing( Simple Problems on Activity Based Costing) | 05 |
| 3 | **INTRODUCTION TO ECONOMICS**: Meaning, Scope, Engineering Decision Makers, Nature and Significance of Economies, Laws of Demand - Concepts, Exceptions. Elasticity of Demand, Demand Forecasting - meaning, methods. <br> Law of Supply - Concepts, Exception. Law of Diminishing Marginal Utility. <br> . | 05 |
| 4 | **INDIAN AND GLOBAL BUSINESS ECONOMICS / MACRO ECONOMICS:** National Income Concept, Per Capita Income (PCI), Gross Domestic Product (GDP) – Concept, Components. <br> Business Cycles – Meaning, Phases. Inflation-Types, Causes and Measurements- Consumer Price Index (CPI) and Whole Sale Price Index (WSI). SWOT Analysis of Indian Economy. | 05 |
| 5 | **FINANCIAL PLANNING:** Income Statement and Balance Sheet (Proforma), Indian Financial System Components. <br> Capital Budgetiing – Phases, Techniques- Pay Back Period (PBP), Net present Value (NPV), Internal Rate of Returns (IRR). <br> Projecting the Cash Flows – Components. | 06 |

| Outcomes: |
|---|
| Upon completion of the course, you will be able to: |

1. Understand and apply fundamental accounting concepts, principles and conventions and to carry out journal entries and adjustments.
2. Prepare financial statements in accordance with generally accepted accounting principles.
3. Prepare and analyze a trial balance, cash flow statement, cost sheet variance analysis.
4. To prepare and analyze different types of budget
5. To explain the concepts of financial management, working capital and their applications to industries.

**Mapping with POs:**

| Cos | Mapping with POs |
|---|---|
| **CO1** | **PO1, PO4, PO5, PO7, PO8, PO11, PO12** |
| **CO2** | **PO1, PO3, PO5, PO6, PO11, PO12** |
| **CO3** | **PO1,PO3, PO5, PO11, PO12** |
| **CO4** | **PO1,PO3,PO5,PO10,PO11,PO12** |
| **CO5** | **PO3,PO5,PO8,PO11,PO12** |

**TEXT BOOKS:**

   **1Cost Accouting- Principles and Practices,** S P Jain K L Narang, Kalyani Publishers.
   **2 Enineering Economy,** Riggs J.L., 5th Edition, Tata McGraw Hill, ISBN 0-07-058670-5.
   **3. Financial Management-Theory and practices,** Shashi.K.Gupta, R K Sharma, Kalyani Publishers, ISBN 13, 978 9327235975.

**REFERENCE BOOKS:**

   **1 Cost Accounting,** Khan M Y, 2nd Edition, 2000, Tata McGraw Hill, ISBN 007042248.
   **2 Engineering Economics,** R.Paneerselvam, Eastern Economy Edition 2001, PHI, ISBN-81-203-1743-2Khan & Jain.
   **3. Financial Management,** Khan & Jain, McGrawHill, India.

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

**Scheme of semester End Examination (SEE):**

| Units | Unit-1 | | | | Unit-2 | | | | Unit-3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Qno.** | 1.a | 1.b | O | 2.a | 3.a | 3.b | O | 4.a | 5.a | 5.b | O | 6.a | 6.b |
| **Marks** | 05 | 05 | R | 10 | 05 | 05 | R | 10 | 05 | 05 | R | 05 | 05 |

| Units | Unit-4 | | | | | Unit- 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Qno.** | 7.a | 7.b | O | 8.a | 8.b | 9.a | 9.b | O | 10.a | 10.b |
| **Marks** | 05 | 05 | R | 05 | 05 | 05 | 05 | R | 05 | 05 |

| Semester: VII / VIII | |
|---|---|
| **Course Title: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)** | |
| Course Code: **18HS72** | Evaluation Procedure: |
| Credits: **02** | CIE + Assignment + Group Activity + SEE Marks = 40 + 5 + 5 + 50 = 100 |
| Teaching Hours: 26 Hrs. (L:T:P:S) - 2:0:0:0 | SEE Duration: 3 Hrs |

| **Course Learning Objectives:** | |
|---|---|
| 1 | To gain an historical, economic, and organizational perspective of occupational safety and health. |
| 2 | To investigate current occupational safety and health problems and solutions. |
| 3 | To identify the forces that influence occupational safety and health. |
| 4 | To demonstrate the knowledge and skills needed to identify work place problems and safe work practice. |

| **UNIT - I** | |
|---|---|
| **OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES:**<br>Safety, History and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation. | **6 Hrs** |
| **UNIT - II** | |
| **ERGONOMICS AT WORK PLACE:**<br>Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Emergency Response - Decision for action – purpose and considerations. | **5 Hrs** |
| **UNIT - III** | |
| **FIRE PREVENTION AND PROTECTION:**<br>Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers. Electrical Safety. | **5 Hrs** |
| **UNIT – IV (Blended Learning)** | |
| **HEALTH CONSIDERATIONS AT WORK PLACE:**<br>Types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) – types and advantages, effects of exposure and treatment for engineering industries, municipal solid waste. Environment management plans (EMP) for safety and sustainability. | **5 Hrs** |
| **UNIT - V** | |
| **OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS:**<br>Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, supervisors and managers. | **5 Hrs** |

| **Course Outcomes:** The students will be able to | |
|---|---|
| 1 | Acquire knowledge on OSHA policies, Laws and regulations. |

| 2 | Identify hazards in the workplace that pose a danger or threat to the safety or health, or that of others. |
|---|---|
| 3 | Control unsafe or unhealthy hazards and propose methods to eliminate the hazards. |
| 4 | Discuss the role of health and safety in the workplace and effects of industries on environment. |
| 5 | Identify workplace hazards, safety considerations and roles and responsibilities of workers, supervisors and managers. |

| **Question paper pattern:** |
|---|
| The question paper will have ten full questions carrying equal marks. |
| Each full question will be for 20 marks. |
| There will be two full questions (with a maximum of four sub - questions) from each unit. |
| Each full question will have sub - question covering all the topics under a unit. |
| The students will have to answer five full questions, selecting one full question from each unit. |

| **Text Books:** | |
|---|---|
| 1 | Goetsch D. L., (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall. |
| 2 | Heinrich H.W., (2007), "Industrial Accident Prevention- A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991). |
| 3 | Industrial Safety and Pollution Control Handbook. |

| **Reference Books:** | |
|---|---|
| 1 | Colling D.A., (1990), "Industrial Safety Management and Technology", Prentice Hall, New Delhi. |
| 2 | Della D.E., and Giustina, (1996), "Safety and Environmental Management", Van Nostr and Reinhold International Thomson Publishing Inc. |

| **Additional Books:** | |
|---|---|
| 1 | Industrial safety, health and environmental management. R K Jain, Sunil S Rao, Khanna Publications. |
| 2 | Safety, occupational health and environmental management in construction. S E Sharma, Vineeth Kumar, Khanna Publications. |
| 3 | Labour laws, Commercial law publishers India Pvt Ltd. |
| 4 | The occupational Safety, health & working conditions code. Commercial law publishers 2020. |
| 5 | Occupational health and safety management - A practical approach by Charles-De-Reese. |
| 6 | Occupational ergonomics, theory and applications by Amith Battacharya & James D Mc Glotthin. |
| 7 | Occupational Safety and health law handbook. Mc Dermott will & Enercy LLP. |
| 8 | Occupational health and safety management. Lambert Academic Publishing. |
| 9 | Fundamentals of Industrial Ergonomics - Babur Musthaffa (Google books). |
| 10 | Global occupational safety health and management handbook. Thomas Fuller, CAC press. |
| 11 | Introduction to Industrial Ergonomics. |
| 12 | Ergonomics and practical manual for beginners. Manjith Kaur Chauhan. |

| Sub Title : | OPERATIONS MANAGEMENT | |
|---|---|---|
| Sub Code : 18IM71 | No. of Credits: 4= 3: 2 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

| Course Objectives : |
|---|
| 1. Introduction of operations management and its importance in production operations and decision making.<br>2. To apply the knowledge of forecasting of production demand.<br>3. To study and apply the knowledge of Aggregate planning, MPS and MRP<br>4. To study and apply different scheduling methods to determine the idle times of the machines. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **OPERATIONS MANAGEMENT CONCEPTS**: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations. Manufacturing and service systems.<br>**OPERATIONS DECISION MAKING:** Introduction, Management as a science, Characteristics of decisions, and Framework for decision making, Decision methodology. | 07 |
| 2 | **FORECASTING DEMAND:** Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts. | 07 |
| 3 | **AGGREGATE PLANNING:** Introduction- planning and scheduling, Objectives of aggregate plan, Aggregate planning methods.<br>**MASTER PRODUCTION SCHEDULING**: Master scheduling objectives, Master scheduling methods. Developing a master production schedule, Reconciling the MPS with sales operation.<br>**RESOURCE PLANNING FOR SERVICE PROVIDERS**: Dependent demand for srvices, Bill of resources. Case study-ERP implementation by SAP | 08 |
| 4 | **MATERIAL AND CAPACITY REQUIREMENTS PLANNING:** Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities. | 08 |
| 5 | **SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES:** Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control.<br>**SINGLE MACHINE SCHEDULING**: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, minimizing the number of tardy jobs.<br>**FLOW -SHOP SCHEDULING**: Introduction, Johnson's rule for V jobs on 2 and 3 machines, CDS heuristic.<br>**JOB-SHOP SHEDULING**: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines. | 09 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**

**Note 2: Two assignments are evaluated for 5 marks.**

Course Outcomes:
1. Able to memorize history and describe importance of OM to take decision based on different models.
2. Able to calculate forecasted values using different forecasting methods
3. Will be able to operate the production activities on Aggregate planning, MPS and MRP
4. Will be able to operate the production activities based on priorities and capacity.
5. Will be able to select the best course of action for better production quality and quantity based on new methods of production.

| Cos | Mapping with POs |
|-----|-------------------|
| CO1 | PO2,PO4,PO5,PO6,PO9,PO10,PO12 |
| CO2 | PO1,PO2,PO3,PO4,PO5,PO8,PO9,PO12 |
| CO3 | PO2,PO3,PO4,PO5,PO7,PO8,PO9,PO11,PO12 |
| CO4 | PO1,PO2,PO3,PO4,PO6,PO9,PO10,PO11,PO12 |
| CO5 | PO2,PO3,PO4,PO5,PO8,PO9,PO12 |

**TEXT BOOKS:**
1. Operations Management- Monks, J.G., McGraw Hill; Second edition (8 January 2020)
2. Production and Operations Management- Pannerselvam. R, Prentice Hall India Learning Private Limited; 3rd edition (1 January 2012).
3. Production and Operations Management- Chary S.N, McGraw-Hill; Sixth edition (10 April 2019)

**REFERENCE BOOKS:**
4. Modern Production/ Operations Management- John Wiley & Sons Inc; 7th edition (1 January 1983)
5. Operations Management for Competitive Advantage by Chase and Jacobs, McGraw-Hill Education; 11th edition (16 May 2005)
6. B. Mahadevan    Operations Management: Theory and Practice, Pearson (1 January 2018)

| Sub Title : | SUPPLY CHAIN MANAGEMENT | |
|---|---|---|
| **Sub Code : 18IM72** | **No. of Credits: 4= 3 : 2 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 39** |

| Objectives: |
|---|
| 1. To describe the basic strategic frame work to analyze supply chain |
| 2. To outline the concept of facility location and network design |
| 3. To define about planning and managing inventories, sourcing, transportation. |
| 4. To explain about the role of Information & Technology in Supply chain |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **BUILDING A STRATEGIC FRAMEWORK TO ANALYSE SUPPLY CHAINS:** Supply chain stages and decision phases process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance | **08** |
| 2 | **FACILITY LOCATION AND NETWORK DESIGN:** Models for facility location and capacity allocation. Impact of uncertainty on SCN –. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit. Case discussions. Distribution Networking – Role, Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions. | **08** |
| 3 | **PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN:** Review of inventory concepts. Trade promotions, Managing multi-echelon cycle inventory, safety inventory determination. Impact of supply uncertainty aggregation, Optimum level of product availability; importance factors. Managerial levers to improve supply chain profitability. | **08** |
| 4 | **SOURCING, TRANSPORTATION AND PRICING PRODUCTS:** Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration. Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Tailored transportation, International transportation. | **08** |
| 5 | **COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN:** Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships. The role of IT supply Chain, The role of E-business in a supply chain. | **07** |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes : |
|---|
| 1. Will be able to indicate the utilization of supply chain management systems and resources being effectively used in an organization |
| 2. Will be able to identify capacity allocation facility location models, apply Managerial levers to improve supply chain profitability |
| 3. Will be able to plan and manage inventories to improve supply chain profitability |
| 4. Will be able to identify factors affecting transportation decisions and design transportation network to improve supply chain operations |
| 5. Will be able to relate Bullwhip effect, role of information technology in supply Chain, |

apply concepts of Reverse Logistics and recommend Implementation of Six Sigma in Supply Chains

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO3,PO5,PO8,PO10 |
| CO2 | PO3,PO5,PO,PO11 |
| CO3 | PO3,PO5,PO11 |
| CO4 | PO3,PO5,PO10,PO11 |
| CO5 | PO3,PO5,PO8,PO10,PO11 |

**TEXT BOOK**:
1. **Supply Chain Management** – 2001, Strategy, Planning & Operation. Sunil Chopra & Peter Meindl; Pearson Education Asia, ISBN: 81-7808-272-1.
2. **Supply Chain Management** – N Chandrashekaran , Oxford Higher education , 2013
3. **Supply Chain Engineering: Models and Applications,** A. Ravi Ravindran, Donald Warsing Jr., CRC Press; First edition (1 January 2019)

**REFERENCE BOOKS**:
1. **Supply Chain Redesign** – Transforming Supply Chains into Integrated Value Systems –Robert B Handfield, Ernest L Nichols, Jr., 2002, Pearson Education Inc, ISBN: 81-297-0113-8
2. **Modelling the Supply Chain** –Jeremy F Shapiro, Duxbury;, 2002, Thomson Defineing, ISBN 0-534-37363
3. **Designing & Managing the Supply Chain** –David Simchi Levi, Philip Kaminsky & Edith Simchi Levi;; Mc Graw Hill

| Sub Title :  PROJECT MANAGEMENT | | |
|---|---|---|
| Sub Code : 18IM731 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50  +  50 =100 | Total  No. of Contact Hours : 39 |

| Objectives: |
|---|
| 1. To introduce concepts of project management with a strong emphasis on issues and problems associated with delivering successful projects.<br>2. To Define and study the project planning and estimating its cost.<br>3. To determine the elapsed time and idle time through project scheduling<br>4. To determine the critical path for the projects through project management tools and techniques. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **CONCEPTS OF PROJECT MANAGEMENT:** Concepts of a Project, Categories of projects, Phases of project life cycle, Roles and responsibility of project leader, tools and techniques for project management. | 06 |
| 2 | **PROJECT PLANNING AND INTEGRATION**: Feasibility report phased planning, Project planning steps, Preparation of cost estimation.<br>**Project Integration Management:** Develop project charter, develop project management plan, direct & manage project work, monitor & control project work, perform integrated change control, close project or phase. | 07 |
| 3 | **ORGANIZING AND STAFFING THE PROJECT TEAM:** Authorities and responsibilities of project manager, Project organization and types of accountability in project execution, controls. Tendering and selection of contractors. | 06 |
| 4 | **PROJECT SCOPE MANAGEMENT**: Project scope management, collect requirements, define scope, create WBS, validate scope, and control scope.<br>**Project Risk Management** : Plan risk management, identify risk, Perform qualitative risk analysis, perform quantitative risk analysis, plan risk resources, control risk | 10 |
| 5 | **PROJECT TIME MANGEMENT**: Plan schedule management, define activities, sequence activities, estimate activity resources, estimate activity durations, develop schedule, control schedule. Exercises on PERT/CPM. Case studies on project management. | 10 |

| Outcomes : |
|---|

Upon successful completion of this course, the student will be able to:
1. Apply the concept, tools and techniques for managing large projects.
2. Construct project plans for different types of organizations.
3. Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities;
4. Will be able to explain on resource and time planning, controls, communication mechanisms, reviews and other project management tools.
5. Analyze and evaluate risks in large and complex project environments

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO3,PO4,PO5,PO7,PO8,PO9,PO11 |
| CO2 | PO3,PO4,PO5,PO7,PO8,PO9,PO11,PO12 |
| CO3 | PO3,PO4,PO5,PO6,PO11 |
| CO4 | PO4,PO5,PO11 |
| CO5 | PO4,PO10,PO11,PO12 |

## TEXT BOOKS:
1. **Project Management a System approach to Planning Scheduling & Controlling** - Harold Kerzner, CBS Publishers and Distributors. 2016.
2. **Project Execution Plan: Plan for project Execution interaction -** Chaudhry S.2016
3. **Project Management Institute, "A guide to the project management body of knowledge (PMBOK Guide)".**5th edition, 2013, ISBN: 978-1-935589-67-9. 2015

## REFERENCES BOOKS:
1. **Project Planning Analysis selection financing Implementation and Review-** Tata Mc Graw Hill Publication, 7th edition 2010, Prasana Chandra.
2. **Project Management** – Beningston Lawrence McGraw Hill 1970.
3. **A Management Guide to PERT and CPM**, WEIST & LeVY Eastern Economy of PH 2002.
4. **PERT & CPM**.-L.S.Srinnath, Affiliated East West Press Pvt. Ltd. 2002.
5. **Project planning analysis selection implementation & review** Prasanna Chandra, ISBNO-07-462049-5  2002.
6. **Performing and Controlling Project,-**Angus, Planning, 3rd End, Person Education, ISBN:812970020.2001
7. **Project planning scheduling & control**, James P.Lawis, Meo Publishing Company 2001.
8. **Project Management -**Bhavesh M.Patel, Vikas Publishing House, ISBN 81-259-0777-7 2002

**Note 1:** Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
**Note 2:** Two assignments are evaluated for 5 marks.

| Sub Title : NANOTECHNOLOGY | | |
|---|---|---|
| Sub Code : 18IM732 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

**Objectives :**
1. To have the basic knowledge of nanomaterials and the process.
2. Descrive methods ogf nanoscale manufacturing and the characterization can be enabled.
3. To learn about Nano sensors and their applications in mechanical , electrical , electronic.Magnetic, Chemical field
4. To understand the concept for a nanoscale product based on sensing, transducing and actuating mechanism.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1. | **Introduction to Nanomaterials :** History of Nanotechnology ,structure and properties of carbon based: Fullerenes(Bucky Ball,Nanotubes) ,metal based:Nano shells,Quantum Dots , Dendrimers , Diamond like carbon (DLC) Nanocarriers ,bionanomaterials:protein & DNA based nanostructures,Hybrids:hybrid biological/inorganic ,Nanosafety Issues : Toxicology health effects caused by nanoparticals. | 09 Hrs |
| 2. | **Characterization of Nanostructures**: Spectroscopy: UV-Visible spectroscopy, Fourier Transform infrared spectroscopy (FTIR), Raman Spectroscopy, X-rat spectroscopy. **Electron microscopy**: Scanning electron microscopy (HRSEM). Transmission electron microscopy (TEM). **Scanning probe microscopy**: Atomic Force microscopy (AFM), Scanning tunnel microscopy (STM). | 08 Hrs |
| 3. | **Nano Synthesis and Fabrication:** Introduction & overview of Nanofabrication: Bottom up and Top-down approaches-Nano Grinding, Sol-gel Process, Chemical Vapour deposition (CVD). Plasma arching and various lithography techniques Hard & Soft lithography. **Nanosensors**: Introduction, classification of Nanosensors and their applications. | 09 Hrs |
| 4. | **Micro & Nano – Electromechanical Systems and Microfluidics**:MEMS/NEMS :Magnetic ,Chemical and Mechanical Transducers Sensing and Actuators ,Microfluidics:Laminar flow ,Hagen-Poiuselle equation ,basic fluid ideas ,Special comsideration of flow in small channels,mixing ,microvalves &micropumps. | 06 Hrs |
| 5. | **Applications of Nanotechnology**: Molecular electronics ,molecular switches ,mechanical cutting tools , machine components ,DLC coated grinding wheels ,solar cells ,Batteries ,fuel cells,Nanofilters Medical nanotechnology in Diagnosyic,Therapeutics,Drug delivery and Nanosurgery. Electromagnetic nanosensors, Biosensors: Biosensors in modern medicine. | 07 Hrs |

**Course Outcomes :**After completing the course ,the students will be able to
CO1: Remember, understand and apply knowledge about of nanomaterials and their uses.
CO2: Interpret and apply the techniques of manufacturing and characterization processes
CO3: Apply the knowledge of Nanosensors, related to nanosensors in electronics, mechanical, chemical and

biological systems.
CO4:Create and evaluate nano Design and System in various disciplines

**TEXT Books:**
1. B S Murthy, P Shankar, B Raj and J Murday, Text book of nanoscience and nanotechnology, Springer, Copublication with university press (India) Pvt Ltd. VCH, XII, 1st edition
2. V K Khanna, Nanocensors, Physical, Chemical and Biological    CRC Press, 1st edition, 2013
3. C C Kock, Nanostructured materials, William Andrew publishing, 2nd edition
4. M Wilson, K Kannangara, G Smith, M Simmons, B Raguse, Nano Technology, Overseas Press (India) Pvt Ltd. 1st edition 2005

**REFERENCES BOOKS:**

1. Charles P. Poole Introduction to Nanotechnology 1st Edition,
   Frank J. Owens
2. Manasi Karkare, Nanotechnology 0th Edition, Publisher, I K International Publishing House
   ISBN-13978-8189866990
3. Thomas Varghese,   K.M. Balakrishna , an Introduction to Synthesis, Properties and Applications of Nanomaterials 1st Edition, by Thomas Varghese (Author),

4. Rakesh Rathi , Nanotechnology, S.Chand And Publishing Limited, First edition, 2009

| Sub Title : HUMAN RESOURCE MANAGEMENT | | |
|---|---|---|
| Sub Code : 18IM733 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

| Objectives : |
|---|
| 1. An ability to evaluate and apply theories of social science disciplines to workplace issues<br>2. Use of HRM functional capabilities to select, develop, and motivate workers<br>**3.** To develop strong analytical, communication, and decision making skills. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION:** Introduction, meaning, nature, scope of HRM. Importance and Evolution of the concept of HRM. Major functions of HRM, Principles of HRM, Organization of Personnel department, Role of HR Manager.<br>**JOB ANALYSIS:**Meaning, process of job analysis, methods of collecting job analysis data, Job Description and Specification, Role Analysis | **08** |
| 2 | **HUMAN RESOURCE PLANNING**: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting..<br>**RECRUITMENT:** Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process. | **08** |
| 3 | **SELECTION:** Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion exit interview, (Tutorial on written test, Group Discussion, Interviews) | **08** |
| 4 | **TRAINING AND DEVELOPMENT:** Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods.<br>**PERFORMANCE APPRAISAL:** Components (all round performance appraisal), Methods, Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports. | **08** |
| 5 | **INDUSTRIAL RELATIONS:** Meaning Characteristics of Industrial Relations, Factors of Industrial, Relations, the Three Actors of Industrial Relations, Importance of Harmonious Industrial Relations, Objectives of Industrial Relations, Functions of Industrial Relations, Code of Industrial Relations, Conditions for Congenial Industrial Relations. | **07** |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes: |
|---|
| 1. Apply the knowledge and skills needed to effectively manage human resources |
| 2. Examine current issues, trends, practices, and processes in HRM |
| 3. Compare the common methods for recruiting and selecting human resource |

4. Contribute to employee performance management and organizational effectiveness
5. Evaluate employee orientation, training, and development programs.

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO2,PO8,PO12 |
| CO2 | PO3,PO5,PO11 |
| CO3 | PO2,PO8,PO12 |
| CO4 | PO3,PO5,PO11 |
| CO5 | PO2,PO8,PO11,PO12 |

**TEXT BOOKS**
1. **Human Resources Management** – Dr. K Ashwathappa, Tata McGraw Hill, Edition 2016
2. **Essentials of HRM and industrial relations** – Subbarao,P , Himalaya publishing house 2016


**REFERENCES BOOKS**

**1   Management of Human Resources** – CB Mamoria – Himalaya   Publication House, 2003

**2   Personnel / Human resource Management** – Decenoz and robbins PHI, 2002
**3   Industrial Acts** by Jain, 2004
**4   Industrial Relations** – Arun Monappa – TMH, ISBN – 0-07-451710-8

| Sub Title : DATA BASE MANAGEMENT SYSTEM | | |
|---|---|---|
| **Sub Code : 18IM734** | **No. of Credits:3=3: 0 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE +Assignment + SEE =** <br> **45 + 5 + 50 =100** | **Total  No. of Contact Hours : 39** |

| Objectives: |
|---|
| 1. Explain the fundamental concepts of database management such as database design, database languages, and database-system implementation |
| 2. Analyze database models & entity relationship models. |
| 3. Determine the physical and logical database designs, data modeling, relational, hierarchical and network models. |
| 4. Define the Structured Query Language for easy accessibility of the Database. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **DATABASES AND DATABASE USERS:** Introduction, characteristics of data base approach, intended uses of a DBMS, advantages and implication of database approach. <br><br> **DATABASE SYSTEMS CONCEPTS AND ARCHITECTURE:** Data models, Schemas and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of data base management systems. | 10 |
| 2 | **DATA MODELING:** High level conceptual data models for database design. Entity types, entity sets, attributes, and keys. Relationships, relationship types, roles, and structural constraints. Weak entity types. ER diagrams. <br><br> **RECORD STORAGE AND PRIMARY FILE ORGANIZATIONS:** Secondary storage devices, buffering of blocks, placing file records on disk, operations on files, heap files and sorted files, hashing techniques. Single-level and multilevel ordered indexes, dynamic multi level indexes using B-trees and B+trees. | 10 |
| 3 | **RELATIONAL DATA MODEL AND RELATIONAL ALGEBRA:** Brief discussion on **Codd** rules, relational model concepts, constraints, and schemas. Update operation on relations, basic and additional relational algebra operations, and queries in relational algebra. | 06 |
| 4 | **Structured Query Language (SQL):** Data definition etc. in SQL2. Basic and complex queries in SQL. Insert, delete, update statements, and views in SQL, embedded SQL. | 07 |

| 5 | **DATABASE DESIGN:** Design guidelines for relational schemes, functional Dependencies, normalization -$1^{st}$, $2^{nd}$, $3^{rd}$, $4^{th}$, and $5^{th}$ normal forms. Database design process, factors influencing physical database design guidelines, and guidelines for relational systems. | **06** |
|---|---|---|

**Note 1:** Unit 1 and Unit 2 will have internal choice.
**Note 2:** Two assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2.
   Assignment - 2 from units 3, 4 and 5.

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**Outcomes:**

By the end of the course students will be able to
1. Distinguish Data Base systems, Data models and DBMS architecture.
2. Model the data models for database design and experiment storage devices.
3. Write relational algebra operations, and queries in relational algebra.
4. Demonstrate the Structured Query Language (SQL) to query, update and  manage a database
5. Define and relate the database design guidelines, and guidelines for relational systems.

| Cos | Mapping with POs |
|---|---|
| CO1 | PO3,PO4,PO5,PO6,PO9,PO10,PO11 |
| CO2 | PO3,PO4,PO5,PO6,PO9,PO10,PO11 |
| CO3 | PO3,PO5,PO8 |
| CO4 | PO3,PO5,PO8 |
| CO5 | PO5,PO6,PO8,PO9,PO10 |

**TEXT BOOKS:**
1. **"Fundamentals of database systems"-**Ramez Elmasri and Shamkanth B. Navathe, , $6^{th}$  Edition, Addison Wesley Publishing Company.
2. **"Database Management System", -**Raghu Ramakrishnan and Johannes Gehrke, $3^{rd}$ Edition, TATA McGraw Hill, ISBN 0-07-1231511

**REFERENCE BOOKS:**
1. **Modern Data base management** - Mc Lfadden, hoffer, Prescott
2. **Database Management Design -** Gary W. Hansen and James V. Hanesn, "and" $2^{nd}$ Edition, PHI Pvt. Ltd.

| Sub Title :TECHNOLOGY MANAGEMENT | | |
|---|---|---|
| **Sub Code : 18IM735** | **No. of Credits: 3= 3: 0 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE +Assignment + SEE =** <br> **45 + 5 + 50 =100** | **Total  No. of Contact Hours : 39** |

| **Objectives:** |
|---|
| 1.  Integrate framework that will allow students to synthesize knowledge from other courses into a comprehensive understanding of competitive advantage. <br> 2.  Explain the nature of technology and its types, application in development of new technologies. <br> 3.  Discuss how to think critically in the research and development |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **THE CONCEPT OF TECHNOLOGY:** Introduction, The nature of knowledge, Aspects of classification, Concept and Meaning of technology, The character of a specific technology, Scope of technology, Examples of classification of technology, Scale of technology information, Levels of technology, Technology portfolios, Technology as an environment. | 8 |
| 2 | **THE NATURE OF TECHNOLOGICAL CHANGE:** Introduction, Meaning of technological change, Concept of invention, Nature of innovation, Emergence of new technologies, Life cycle of a technology, Motivation for technological change, Nature of technological progress, Nature of mature technology, Nature of diffusion, Technological convergence. | 8 |
| 3 | **THE ECONOMICS OF TECHNOLOGY:** Introduction, Meaning of technological economics, Examples of technological economics, Scope of technological economics, Engineering economics, Production economics, Concept of economy of scale, Concept of optimum size, Technology as a commodity, Technology at the macro-economic level. | 8 |
| 4 | **CORPORATE TECHNOLOGY STRATEGY:** Introduction, The Business Mission, Where Is The Business? Concept Of Business Strategy, Capability For Strategic Planning, Corporate Technology Strategy, Competitive Technology, Focus Of Strategy, Technological Alliances, Realization Of Strategy, Technology Crisis | 8 |
| 5 | **TECHNOLOGY- AN INSTRUMENT OF COMPETITION:** Introduction, securing competitive advantage, Technological competition analysis, Technological leadership, Adoption of new technology, marketing a new technology product, Retention of competitive advantages. | 7 |

<u>Note 1:</u> **SEE Question paper contains total 10 Questions, student should answer any one question from each Unit  shall answer total five question.**
<u>Note 2:</u> **Two assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2.**
   **Assignment - 2 from units 3, 4 and 5.**

**Outcomes:**

**After completing the course students are able to**
1. Describe and assess tool, techniques and strategies of the management of technology and innovation.
2. Examine the management of techno logy and innovation from the perspective of research and development, new product development, production, operations, finance, commercialization and strategy.
3. Analyze the high levels of complexity and risk associated with the management of technology and innovation and develop company strategies.

| COs | Mapping with POs |
|-----|------------------|
| CO1 | PO2,PO8,PO12 |
| CO2 | PO3,PO5,PO11 |
| CO3 | PO2,PO8,PO12 |
| CO4 | PO3,PO5,PO11 |
| CO5 | PO2,PO8,PO11,PO12 |

**TEXT BOOKS:**
1. Paul Lowe – The management of technology, Perception and opportunities, Chapman and Hall, London 1995. NEW TEXT BOOK

**REFERENCE BOOKS:**
1. Frederick Betz – Strategic Management of technology, Mc Graw hill inc. 1993.
2. Rastogi P.N. – Management of Technology & Innovation: Competing through Technology Excellence, Sage Publications, 1995.

| Sub Title : DESIGN OF EXPERIMENTS | | |
|---|---|---|
| Sub Code : 18IM741 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

**Objectives:**
1. To describe how to design experiments, carry them out, and analyze the data they yield.
2. To introduce Taguchi methods, and compare and contrast them with more traditional techniques.
3. To examine how a factorial design allows cost reduction, increases efficiency of experimentation
4. Design and conduct orthogonal array experiments for process improvement.

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction:** Strategy of Experimentation, Design of Experiments: Definition, Objectives, Principles of DOE, Applications, Guidelines.<br>Principles of Quality Engineering- Definition of quality, Taguchi's Quality philosophy, Off-line and on-line quality control, Quality loss function, Quadratic loss function, Noise Factors, P- diagram, Optimization of Product and Process design | 07 |
| 2 | **Factorial Experimentation** – Single Factor Experiments, The $2^2$ Design, The $2^3$ Design, The General $2^k$ Design, A Single Replicate of the $2^k$ Design, Problems. | 10 |
| 3 | **Blocking and Confounding in the $2^k$ Design:** Blocking a Replicated $2^k$ Factorial Design, Confounding in the $2^k$ factorial design, Confounding the $2^k$ factorial design in two Blocks and Four Blocks | 08 |
| 4 | **Designing of experiments through Orthogonal Arrays:** Counting degrees or freedom, selecting a standard orthogonal array, dummy level technique, and compound factor method. Linear graphs and interaction assignment. Modification of linear graphs, column merging method, branching design. Strategy for constructing an orthogonal array. Comparison with the classical statistical experiment design. | 07 |
| 5 | **Robust Design:** Case study discussion, Noise factors and testing conditions. Quality characteristics and objective functions. Control factors and their levels. Matrix experiment and data analysis plan. Conducting the matrix experiment, Data analysis, Verification experiment and future plan.<br>**Signal-To-Noise Ratio:** Evaluation of sensitivity to noise. S/N ratios for Static problems: Smaller-the-better, Larger-the-better, Nominal-the-best and Asymmetric Cases. Signal-to-noise ratio for dynamic problems: S/N ratios for Continuous-continuous, continuous-digital, digital-continuous, digital-digital cases. Introduction to Response Surface Methodology. | 07 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Course Outcomes: |
|---|
| CO1: Determine the importance of statistical design of experiments and benefits in R&D |
| CO2: Investigate the logic of hypothesis testing, including analysis of variance and the detailed |

analysis of experimental data.
CO3: Design and conduct orthogonal array experiments for process improvement.
CO4:Choose an appropriate experimental design based on the study objectives
CO5:Interpret the results of the experiment and report the conclusions based on S/N ratio analysis

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO1,PO3,PO4 |
| CO2 | PO2,PO4,PO5 |
| CO3 | PO3,PO4 |
| CO4 | PO2,PO3 |
| CO5 | PO2,PO4 |

**TEXT BOOKS:**
1. **Quality Engineering Using Robust Design –** Madhav S. Phadke, Prentice Hall PTR, Englewood Cliffs, 2012
2. **Applied Design of Experiments and Taguchi Methods** - K. Krishnaiah, P. Shahabudeen, PHI, 2013

**REFERENCE BOOKS:**
1. **Design and Analysis of Experiments –** D.C. Montgomery, John Wiley and Sons, 10th Edition, 2019.
2. **Designing for Quality** – Robert H. Lochner and Joseph E. Matar, - an Introduction Best of Taghuchi and Western Methods or Statistical Experimental Design", Chapman and Hall Madras, 2nd edition, 1990
3. **Taguchi techniques for quality engineering**, Phillip J. Ross, McGraw Hill, 1996.

| Sub Title : STRATEGIC MANAGEMENT | | |
|---|---|---|
| Sub Code : 18IM742 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

| Objectives: |
|---|
| 1. To provide an integrative framework that will allow students to blend knowledge from other courses into a comprehensive determining of competitive advantage. |
| 2. To provide a basic determining of the nature and dynamics of the strategy formulation and implementation processes. |
| 3. To encourage students to think critically and strategically. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **STRATEGIC MANAGEMENT INTRODUCTION:** Definition- Levels of strategy- Roles of Strategist- Strategic Management Process benefits and limitations. Mission -Objectives -Social responsibilities. | **07** |
| 2 | **STRATEGY FORMULATION:** Strategic Thinking, SWOT analysis- Techniques for environmental analysis- TOWS matrix, Balanced Score Card, Steps in strategy implementation -formulation of SBU strategy. Leadership implementation, communicating the strategy:- Annual and Functional objectives- Development of policies- Organizational Implementation- Evaluation and control. Reward system. | **10** |
| 3 | **STRATEGY AND STRUCTURE:** Strategy- Structure relationship. Organizational restructuring and Transformation, Principles of Organization. Strategic control- Premise and Implementation control strategic Surveillance special alert control- Operational control - Steps in Operational Control, Types of Operational control. | **06** |
| 4 | **PORTFOLIO STRATEGY:** Business portfolio analysis- BCG matrix, GE multi matrix, an evaluation of Portfolio models - factors influencing portfolio strategy. | **06** |
| 5 | **COMPETITIVE ANALYSIS AND STRATEGIES:** Structural analysis of industries threat of entry rivalry among existing competitors, threat of substitutes; Bargaining power of suppliers; structural analysis and competitive strategy - competitor analysis value chain.<br>**BUSINESS GROWTH:** Reasons, Risks and indicators of Business growth, Growth Strategies- Intensive, Growth Strategies, Integrative Growth Strategies, Diversification, External Growth Strategies. | **10** |

**Note 1:** **Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2:** **Two assignments are evaluated for 5 marks.**

| Outcomes: |
|---|
| 1. Articulate a vision that gives meaning to all the firm's stakeholders of the firm's objectives |
| 2. Formulate a strategic plan that operationalizes the goals and objectives of the firm |
| 3. Implement a strategic plan that takes into account the functional areas of business |

4. Evaluate and revise programs and procedures in order to achieve organizational goals
5. Analyse dynamics in competitive rivalry including competitive action and response, for acting both proactively and defensively.

| Cos | Mapping with POs |
| --- | --- |
| CO1 | PO4,PO7,PO8 |
| CO2 | PO6,PO7,PO9 |
| CO3 | PO6,PO7,PO9,PO11 |
| CO4 | PO7,PO10,PO11 |
| CO5 | PO7,PO11,PO12 |

**TEXT BOOKS:**
1. **Strategic Management** - Francis Cherunilam, Himalya Publishers, 4$^{th}$ Edition, 2016
2. **Strategic Management**, Azhar Kazmi, Adela Kazmi, McGraw Hill, Fifth Edition, 2020

**REFERENCE BOOKS:**
1. **Business Policy and Strategic Management** -P Subba Rao, Himalya Publishers 1$^{st}$ Edition, 2011
2. **The Competitive Strategy: Techniques for Analyzing Industries and Competitors,** Michael Porter, Simon & Schuster, 2004
3. **Strategic Management** – Robert A Pitts and David Lei, South Western Publishing, 4$^{th}$ Edition, 2006

| Sub Title : PRODUCT DESIGN AND MANUFACTURING | | |
|---|---|---|
| **Sub Code : 18IM743** | **No. of Credits: 3= 3 : 0 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 39** |

| Objectives: |
|---|
| 1. To know the principles, contemporary theories and practices of effective product design. |
| 2. To Determine and apply concept of adaptive on consumer products. |
| 3. To develop skills and concepts on economic product manufacturing |
| 4. To translate ideas in to sketches |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introduction to Product design**: Asimow's Model : definition of product design ,Design by evolution, design by innovation, Essential factors of product design, production-consumption cycle, Flow and value addition I the production – consumption cycle, The morphology of design (The seven phases),primary design phases and flow charting, Roll of allowances, process capability and tolerance in detailed design and assembly. | 10 |
| 2 | **Product design practice and Industry**: Introduction, product strategies, Time to market, Analyses of the product, The three S's standardization , Renard series(preferred numbers), simplification, The designer and his role, the designer myth and reality, The industrial design organization, Basic design consideration, Problems faced by industrial designer, procedure adopted by industrial designer, Types of model designed by industrial designers, what the designer contributes, Role of aesthetics in product design, functional design practice. | 7 |
| 3 | **Strength consideration in product design:** Principal stress trajectories force , floe lines, balanced design, Criteria and objectives of design, material toughness, Resilience, Designing for uniform strength, Tension via-a via compression. <br> **Design for production- Metal parts**: Producibility requirement in the design of machine components, forging design, pressed component design, casting design, design for machining ease, The role of process engineer, Ease of location & clamping, Some additional aspect of production design, Die casting and special castings, Design for powder metallurgical parts, expanded metals & wire forms. | 10 |
| 4 | **Optimization in design**: Introduction, siddal's, classification of design approaches, optimization by differential calculus, langrage multipliers, geometric programming Lohnson's methods of optimum design. | 6 |
| 5 | **Economic factors influencing design**: Product value, Design for safely, reliability and environmental consideration, Manufacturing operation in relations to design, Economic analysis, and Profit and competitiveness breakeven analyses, Economics of a news product design (Samual Eilon model). <br> **Value engineering & product design**: Introduction, Historical perfective, what is value? Nature and management of value, maximum value, normal degree of value, Importance of value. The value analyses job plan, creativity, creative techniques. <br> **Modern approaches to product design**: Concurrent design, Quality functions development(QFD) | 6 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes: |
| --- |
| 1. Determine principles and concepts of effective product design |
| 2. Apply creative thinking skills for idea generation |
| 3. Illustrate conceptual ideas through clear drawing. |
| 4. Construct ideas using software and to develop the drawings |

| Cos | Mapping with POs |
| --- | --- |
| CO1 | PO3,PO8 |
| CO2 | PO3,PO8,PO10 |
| CO3 | PO3,PO8 |
| CO4 | PO3,PO8,PO11 |

| **Text Books:** |
| --- |
| 1. Product Design & Manufacturing, A C Chitale and R C Gupta, Prentice Hall India Learning Private Limited; 5th edition (1 January 2011) |
| **Reference Book:** |
| 1. Tim Jihns, Butterworth Heinmana – New product development Oxford,UIC 1997 |
| 2. Ronald engine Kinetivicz - New product development design & Analyses, John Wiley & Sons |
| 3. Geoffery Boothroyod, Peter Dew Hurst and Winston knight- Product design for manufacture and assembly |

| Sub Title : TOTAL QUALITY MANAGEMENT | | |
|---|---|---|
| Sub Code: 18IM744 | No. of Credits:3 =3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hours | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

| Course objectives: |
|---|
| **1.** Develop and determining the necessary information and skills needed to manage, control and improve quality practices in the organization through TQM Philosophy. <br> 2. Apply the improvement methodologies for problem solving in organizations. <br> 3. Demonstrate the importance of TQM tools required for problem solving processes. <br> 4. Demonstrate the quality Management standards for the present industrial scenario. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Introdction:** TQM introduction- Historical review- Obstacles- Benefits of TQM, Elements of TQM- Principles of TQM- Concepts of TQM- Fundamental Characteristics of TQM- TQM routine duties and awareness- Quality in Manufacturing and Service Systems. | 6 |
| 2 | **Principles and Philosophies of Total Quality Management -**Gurus of TQM and their Contribution-Deming's Management Philosophy- 14 points for management and PDCA cycle – Juran's Philosophy, Juran-quality trilogy, Imai,s Kaizen and innovation, The Crosby Philosophy- quality treatment and and 14 points. Taguchi Loss Function. <br> Leadership: Definition, characteristics of quality leaders, leadership concept. | 8 |
| 3 | **Quality Evolution,Customer Satisfaction and Employee Involvement** <br> Evolution of Quality Concepts **-**Four Fitness of quality and Weakness**-**Evolution of Quality Methodology- Evolution of Company Integration- Quality of Conformance versus Quality of Design-From Deviations to Weakness to Opportunities- Aware of Four Finesses-Future Finesses- Four Revolutions of Management Thinking and Four Levels of Practice of TQM. <br> A Customer Focus – Fact-Based Management– Continuous Improvement – Teamwork and Participation. Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement, | 10 |
| 4 | **TQM Tools and Techniques** <br> 7 Basic tools of TQM –Nominal Group Technique – Quality Circles – Flow Charts – Pareto Analysis– Poka Yoke (Mistake Proofing), Process, Quality Function Deployment (QFD), House of Quality, QFD Process, Benefits, Total Productive Maintenance (TPM) Concept, Improvement Needs, FMEA, Stages of FMEA, cybernetic Analysis, Six Sigma Concepts and Methodology (Introducion ascpets only) | 10 |
| 5 | **Quality Management Systems (Introductory Aspects Only**) <br> a. The ISO 9001:2000 Quality Management System Standard <br> b. The ISO 14001:2004 Environmental Management System Standard <br> c. ISO 27001:2005 Information Security Management System <br> d. ISO / TS16949:2002 for Automobile Industry <br> e. CMMI Fundamentals and Concepts and f. Certification process. | 05 |

**Note 1:** Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
**Note 2:** Two assignments are evaluated for 5 marks.

| Outcomes: |
|---|
| 1. Ability to Determine the TQM philosophies in organization and concepts of leadership. |
| 2. To Define and Determine the evolution of quality concepts, methods and customer satisfaction. |
| 3. To gain the knowledge of quality control tools in TQM. |
| 4. To determine the concepts of reliability and quality failure. |
| 5. To Determine the fundamental concepts of quality management systems |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO6,PO7,PO11 |
| CO2 | PO5,PO8,PO10,PO12 |
| CO3 | PO4,PO5,PO6,PO7 |
| CO4 | PO4,PO5,PO6,PO7 |
| CO5 | PO4,PO5,PO6,PO7 |

**TEXT BOOKS:**
**1.** A New American TQM Four Practical Revolutions in Management‖ –Shoji Shiba, Alan Graham and David Walden,– Productivity Press, Portlans (USA) , 1993
**2.** Management for Total Quality" –N Logothetis- Prentice Hall of India, New Delhi, 1994.
3.Dale H. Besterfield "Total Quality Management ''(3rd Edition) 3rd Edition Prentice Hall Publications

**REFERENCE BOOK:**
 1. The Quality Improvement Hand Book, -Roger C Swanson, Publisher Vanity Books International, New Delhi, 1995.
2. Total Quality Management – Kesavan R – I K International Publishing house Pvt. Ltd, 2008

**E BOOKS:**
1. http://psbm.org/Ebooks/Total%20Quality.pdf
2. http://www.mescenter.ru/images/abook_file/Total_Quality_Management_and_Six_Sigma.pdf
MOOCs:
3. https://www.mooc-list.com/course/fundamentals-six-sigma-quality-engineering-andmanagement-edx?static=true

| Sub Title : INDUSTRIAL RELATIONS AND LABOUR WELFARE | | |
|---|---|---|
| **Sub Code : IM745** | **No. of Credits: 3= 3 : 0 : 0 (L-T-P)** | **No. of lecture hours/week : 3** |
| **Exam Duration : 3 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 39** |

| **Course Objectives:** | |
|---|---|
| 1 | To gain an historical and industrial perspective of Industrial Relations. |
| 2 | To investigate industrial conflicts to solve labour problems and find solutions. |
| 3 | To demonstrate the knowledge and skills needed to identify labour welfare measures, funds at work place for better work practice. |
| 4 | To identify the forces that influence occupational safety and health. |
| 5. | To identify the welfare of special categories of labour form social assistance and security. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INDUSTRIAL RELATIONS**<br>Concepts – Importance – Industrial Relations problems in the Public Sector – Growth of Trade Unions – Codes of conduct. | 08 |
| 2 | **INDUSTRIAL CONFLICTS**<br>Disputes – Impact – Causes – Strikes – Prevention – Industrial Peace – Government Machinery –Conciliation – Arbitration – Adjudication. | 08 |
| 3 | **LABOUR WELFARE**<br>Concept – Objectives – Scope – Need – Voluntary Welfare Measures – Statutory Welfare Measures – Labour – Welfare Funds – Education and Training Schemes. | 06 |
| 4 | **INDUSTRIAL SAFETY**<br>Causes of Accidents – Prevention – Safety Provisions – Industrial Health and Hygiene –Importance – Problems – Occupational Hazards – Diseases – Psychological problems –Counseling – Statutory Provisions | 08 |
| 5 | **WELFARE OF SPECIAL CATEGORIES OF LABOUR**<br>Child Labour – Female Labour – Contract Labour – Construction Labour – Agricultural Labour –Differently abled Labour –BPO & KPO Labour - Social Assistance – Social Security – Implications. | 09 |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**

**Note 2: Two assignments are evaluated for 5 marks.**

| Course Outcomes: |
|---|
| Students will know how to resolve industrial relations and human relations problems and promote welfare of industrial labour. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO3, PO7, PO9, PO12 |
| CO2 | PO3, PO8, PO9 |
| CO3 | PO7, PO12 |
| CO4 | PO3, PO7 |
| CO5 | PO3, PO7 |

**TEXT BOOKS:**
1. Mamoria C.B. and Sathish Mamoria, Dynamics of Industrial Relations, Himalaya Publishing House, New Delhi, 2007.
2. Arun Monappa, Ranjeet Nambudiri, Patturaja Selvaraj. Industrial relations & Labour Laws. Tata McGraw Hill. 2012
**REFERENCE BOOKS:**
1. Ratna Sen, Industrial Relations in India, Shifting Paradigms, Macmillan India Ltd., New Delhi, 2007.
2. C.S.Venkata Ratnam, Globalisation and Labour Management Relations, Response Books, 2007.
3. Srivastava, Industrial Relations and Labour laws, Vikas, 2007.
4. P.N.Singh, Neeraj Kumar. Employee relations Management. Pearson. 2011.
5. P.R.N Sinha, Indu Bala Sinha, Seema Priyardarshini Shekhar. Industrial Relations, Trade Unions and Labour Legislation. Pearson. 2004

| Sub Title : HUMAN RESOURCE MANAGEMENT | | |
|---|---|---|
| Sub Code : 18IM751 | No. of Credits: 3= 3 : 0 : 0 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 39 |

| Objectives : | |
|---|---|
| 1 | An ability to evaluate and apply theories of social science disciplines to workplace issues |
| 2 | Use of HRM functional capabilities to select, develop, and motivate workers |
| **3** | To develop strong analytical, communication, and decision making skills. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **INTRODUCTION:** Introduction, meaning, nature, scope of HRM. Importance and Evolution of the concept of HRM. Major functions of HRM, Principles of HRM, Organization of Personnel department, Role of HR Manager. <br> **JOB ANALYSIS:** Meaning, process of job analysis, methods of collecting job analysis data, Job Description and Specification, Role Analysis | **08** |
| 2 | **HUMAN RESOURCE PLANNING**: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting.. <br> **RECRUITMENT:** Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process. | **08** |
| 3 | **SELECTION:** Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion exit interview, (Tutorial on written test, Group Discussion, Interviews) | **08** |
| 4 | **TRAINING AND DEVELOPMENT:** Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods. <br> **PERFORMANCE APPRAISAL:** Components (all round performance appraisal), Methods, Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports. | **08** |
| 5 | **INDUSTRIAL RELATIONS:** Meaning Characteristics of Industrial Relations, Factors of Industrial, Relations, the Three Actors of Industrial Relations, Importance of Harmonious Industrial Relations, Objectives of Industrial Relations, Functions of Industrial Relations, Code of Industrial Relations, Conditions for Congenial Industrial Relations. | **07** |

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

| Outcomes: |
|---|

6. Apply the knowledge and skills needed to effectively manage human resources
7. Examine current issues, trends, practices, and processes in HRM
8. Compare the common methods for recruiting and selecting human resource
9. Contribute to employee performance management and organizational effectiveness
10.    Evaluate employee orientation, training, and development programs.

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO2,PO8,PO12 |
| CO2 | PO3,PO5,PO11 |
| CO3 | PO2,PO8,PO12 |
| CO4 | PO3,PO5,PO11 |
| CO5 | PO2,PO8,PO11,PO12 |

**TEXT BOOKS**
   1 **Human Resources Management** – Dr. K Ashwathappa, Tata McGraw Hill, Edition   2016
   2 **Essentials of HRM and industrial relations** – Subbarao,P ,  Himalaya publishing house 2016


**REFERENCES BOOKS**
   1 **Management of Human Resources** – CB Mamoria – Himalaya   Publication House, 2003

   2 **Personnel / Human resource Management** – Decenoz and robbins PHI, 2002
   3 **Industrial Acts** by Jain, 2004
   4 **Industrial Relations** – Arun Monappa – TMH, ISBN – 0-07-451710-8

| Sub Title : STATISTICS LAB | | |
|---|---|---|
| Sub Code : 18IML76 | No. of Credits: 1= 0 : 0 : 1 (L-T-P) | No. of lecture hours/week : 3 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 36 |

| Objective: |
|---|
| 1. Explain and apply the basic fundamental concepts of Statistics to engineering problems and the importance of Data summary and Display. <br> 2. Application of probability distributions to various manufacturing problems. <br> 3. Application of hypothesis to random experiments of manufacturing processes. <br> 4. Test the statistical parameters by regression and correlation. <br> 5. Design an engineering problem as random experiment to solve and test for variance. |

| Unit No. | Syllabus content | Hrs |
|---|---|---|
| 1 | 1. Determining basic statistics (Mean, Median, Mode, and Standard deviation, Range, Harmonic Mean, Geometric Mean, Variance and Coefficient of variation) for the given quality characteristic and interpreting it. <br> 2. Representing the data in graphical forms: <br> Line graph, Bar graph, Pie Chart, Stem and leaf plot, Histogram, Pareto Chart. <br> 3. Construction of Scatter diagram for the given variables and interpretation of different forms of scatter diagrams. <br> 4. Conduction of regression analysis for two variables using least squares method and fitting a straight line. <br> 5. Conduction of multiple regression analysis for the given variables. | 15 |
| 2 | 1. Interval estimation and hypothesis testing on mean of a normal distribution. <br> 2. Interval estimation and hypothesis testing on difference in means of two normal distributions. <br> 3. Hypothesis testing on variance of a normal population. <br> 4. Hypothesis testing on variances of two normal populations. <br> 5. Hypothesis testing on a single population proportion. <br> 6. Fitting an appropriate distribution (normal distribution) for the given variable quality characteristic <br> 7.Conduct One way and two way ANOVA Analysis for the given problem <br> 8.Design of experiments using CATAPULT | 21 |

| Outcome: |
|---|
| By the end of the course students will be able to <br>     1. Apply the statistical data in the form of Tabular and Graphical display. <br>     2. Identify discrete type of probability and solve the various engineering problems. <br>     3. Solve Continuous type of probability and solve the various engineering problems <br>     4. Estimate the hypothesis and give inference to random experiments. <br>     5. Evaluate the statistical parameters by estimation. |

| Cos | Mapping with POs |
|-----|------------------|
| CO1 | PO1,PO2,PO3,PO6,PO7,PO11,PO12 |
| CO2 | PO1,PO2,PO3,PO6,PO7,PO11,PO12 |
| CO3 | PO1,PO2,PO3,PO6,PO7,PO11,PO12 |
| CO4 | PO1,PO2,PO3,PO6,PO7,PO11,PO12 |

**Scheme of Examination:**

ONE question from Unit -1:  15 marks
ONE question from Unit -1:  25 marks
Viva-Voce            : 10 marks

**Suggested software:**
1. Statistical Packages : SYSTAT / MINITAB / SPSS/ R- studio and such others

| Sub Title : ENTERPRISE RESOURCE PLANNING and OR LAB | | |
|---|---|---|
| Sub Code : 18IML77 | No. of Credits: 1= 0 : 0 : 1 (L-T-P) | No. of lecture hours/week : 2 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 13 |

| Objective: |
|---|
| 1. To provide an determining of the managerial issues involved in the design and implementation of Enterprise Resource Planning Systems<br>2. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry;<br>3. Use of statistical tools for data analysis. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | Creating Item Master for various Engineering Designs<br>Creating Supplier Master for Items<br>Creating customer Master for Items<br>Generating Bill of Materials for Various Engineering Designs<br>Creating Purchase order for Items<br>Creating Work order / job card for Items and Dispatch Instruction for Items | 24 |
| 2 | Optimization problems using OR packages<br>Linear programming<br>Transportation problem<br>Assignment problem<br>PERT/CPM | 12 |

| Course Outcomes: |
|---|
| CO1: Develop the skills and knowledge to support the implementation and maintenance of Enterprise Resource Planning (ERP) systems.<br>CO2: Formulate and solve Linear programming problems, transportation and assignment Problems |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO3,PO5,PO6,PO11 |
| CO2 | PO2,PO4,PO5 |

| Scheme of Examination: |
|---|
| ONE question from Unit -1        : 30 marks<br>ONE question from Unit -2        : 10 marks<br>               Viva-Voce: 10 marks. |
| **Suggested Software Packages** |
| 1. Statistical Packages : SYSTAT / MINITAB / SPSS and such others<br>2. ERP Packages : SIXTH SENSE / RAMCO / MAARSMAN / CIMAS / UNISOFT<br>3. OR Packages : Lindo / Lingo / Storm |

# VIII SEMESTER

| Sub Title :   COST MANAGEMENT OF ENGINEEREINGT PROJECTS | | |
|---|---|---|
| Sub Code : 18HS81 | No. of Credits: 2 | No. of lecture hours/week : 2 |
| Exam Duration : 2 hrs | CIE + SEE = 50  +  50 =100 | Total  No. of Contact Hours : 26 |

| Objectives: |
|---|
| 1. The objective of this course is to familiarize the student with the basic concepts, standards and practices of financial accounting.<br>2. The course is devoted to the basic financial statements, the analysis and recording of transactions, and the underlying concepts and procedures,<br>3. To carry out financial statement analysis and studying and preparation of cost sheet and budget. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **COST CONCEPTS:** Cost- meaning, Cost v/s Expense, meaning of loss, classification of cost, cost driver & cost unit.<br>Overheads- Meaning and Classification of Overheads. | 05 |
| 2 | **COMPONENTS OF COSTING:** objectives of costing, elements of Costing. Preparation of Cost Sheet, Job Costing-Batch Costing, Process Costing and Activity Based Costing( Simple Problems on Activity Based Costing) | 05 |
| 3 | **INTRODUCTION TO ECONOMICS**: Meaning, Scope, Engineering Decision Makers, Nature and Significance of Economies, Laws of Demand - Concepts, Exceptions. Elasticity of Demand, Demand Forecasting - meaning, methods.<br>Law of Supply - Concepts, Exception. Law of Diminishing Marginal Utility.<br>. | 05 |
| 4 | **INDIAN AND GLOBAL BUSINESS ECONOMICS / MACRO ECONOMICS:** National Income Concept, Per Capita Income (PCI), Gross Domestic Product (GDP) – Concept, Components.<br>Business Cycles – Meaning, Phases. Inflation-Types, Causes and Measurements-Consumer Price Index (CPI) and Whole Sale Price Index (WSI). SWOT Analysis of Indian Economy. | 05 |
| 5 | **FINANCIAL PLANNING:** Income Statement and Balance Sheet (Proforma), Indian Financial System Components.<br>Capital Budgetiing – Phases, Techniques- Pay Back Period (PBP), Net present Value (NPV), Internal Rate of Returns (IRR).<br>Projecting the Cash Flows – Components. | 06 |

| Outcomes: |
|---|

Upon completion of the course, you will be able to:
6. Understand and apply fundamental accounting concepts, principles and conventions and to carry out journal entries and adjustments.
7. Prepare financial statements in accordance with generally accepted accounting principles.
8. Prepare and analyze a trial balance, cash flow statement, cost sheet variance analysis.
9. To prepare and  analyze different types of budget
10. To explain the concepts of financial management, working capital and their applications to industries.

**Mapping with POs:**

| Cos | Mapping with POs |
|---|---|
| CO1 | PO1, PO4, PO5, PO7, PO8, PO11, PO12 |
| CO2 | PO1, PO3, PO5, PO6, PO11,  PO12 |
| CO3 | PO1,PO3,  PO5, PO11,  PO12 |
| CO4 | PO1,PO3,PO5,PO10,PO11,PO12 |
| CO5 | PO3,PO5,PO8,PO11,PO12 |

**TEXT BOOKS:**
   **1Cost Accouting- Principles and Practices,**  S P Jain K L Narang, Kalyani Publishers.
   **2  Enineering Economy,** Riggs J.L., 5th Edition, Tata McGraw Hill, ISBN 0-07-058670-5.
   **3. Financial Management-Theory and practices,** Shashi.K.Gupta, R K Sharma, Kalyani Publishers, ISBN 13, 978 9327235975.
**REFERENCE BOOKS:**
   **1 Cost Accounting,** Khan M Y, 2nd Edition, 2000, Tata McGraw Hill, ISBN 007042248.
   **3  Engineering Economics,** R.Paneerselvam, Eastern Economy Edition 2001, PHI, ISBN-81-203-1743-2Khan & Jain.
   **3.  Financial Management,** Khan & Jain, McGrawHill, India.

**Note 1:** **Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2:** **Two assignments are evaluated for 5 marks.**

**Scheme of semester End Examination (SEE):**

| Units | Unit-1 | | | | Unit-2 | | | | Unit-3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Qno. | 1.a | 1.b | O | 2.a | 3.a | 3.b | O | 4.a | 5.a | 5.b | O | 6.a | 6.b |
| Marks | 05 | 05 | R | 10 | 05 | 05 | R | 10 | 05 | 05 | R | 05 | 05 |

| Units | Unit-4 | | | | | Unit- 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Qno. | 7.a | 7.b | O | 8.a | 8.b | 9.a | 9.b | O | 10.a | 10.b |
| Marks | 05 | 05 | R | 05 | 05 | 05 | 05 | R | 05 | 05 |

| Sub Title : Project Work Phase II | | |
|---|---|---|
| Sub Code : 18IMP82 | No. of Credits: 10= 0: 0: 2 (L-T-P) | No. of lecture hours/week : 2 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 32 |

| Sl. No. | Syllabus |
|---|---|
| 1 | Phase– 02: 10 Credits in VII Semester. |
| 2 | Student shall complete the project work well in time and shall be assessed by the guide and the departmental Project Review Committee for 50 marks (CIE). Later project viva-voce shall be conducted by the exam section and both internal and external examiners for 50 marks do evaluation. |

| Sub Title : Technical Seminar | | |
|---|---|---|
| Sub Code : 18IMS83 | No. of Credits: 2= 0 : 0 : 2(L-T-P) | No. of lecture hours/week : 2 |
| Exam Duration: 3 hr. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 32 |

| Objective: |
|---|
| 1. To equip students for making a subject presentation based on a thorough research review on any contemporary area of engineering and management fields. |
| 2. Offering the student an opportunity to interact with faculty and peer group and to build the ability to making independent presentation. |

| Sl. No. | Syllabus |
|---|---|
| 1 | **Procedure:** <br><br> 1. A list of contemporary topics will be offered by the faculty of the department in the interlude period between 7th and 8th Semester. <br><br> 2. Students can opt for topic of their own choice and indicate their option to the department at the beginning of the 8th semester. <br><br> This component is also evaluated twice in the semester. The final marks shall be submitted to the exam section at the end of the semester. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO2,PO8,PO12 |
| CO2 | PO3,PO5,PO11 |
| CO3 | PO2,PO8,PO12 |
| CO4 | PO3,PO5,PO11 |
| CO5 | PO2,PO8,PO11,PO12 |

| Sub Title : Internship | | |
|---|---|---|
| Sub Code : 18IMI84 | No. of Credits: 2= 0 : 0 : 2(L-T-P) | No. of lecture hours/week : 2 |
| Exam Duration: 3 hr. | CIE + SEE = 50 + 50 =100 | Total  No. of Contact Hours : 32 |

| Sl. No. | Syllabus |
|---|---|
| 1 | **Internship:**<br>All the students admitted to III year of BE  shall  undergo  mandatory  internship program for a duration for 4 weeks either during the vacation period of IV& V semester   or during VI and VII. A SEE examination will be conducted during VIII semester and prescribed credits shall be added to VIII semester.<br>Students who do not take-up/complete the internship will be declared as failed and have to complete during subsequent SEE examination after satisfying the internship requirements. |

| Sub Title : COST MANAGEMENT OF ENGINEEREINGT PROJECTS | | |
|---|---|---|
| **Sub Code : 18HS81** | **No. of Credits: 2** | **No. of lecture hours/week : 2** |
| **Exam Duration : 2 hrs** | **CIE + SEE = 50 + 50 =100** | **Total No. of Contact Hours : 26** |

| Objectives: |
|---|
| 1. The objective of this course is to familiarize the student with the basic concepts, standards and practices of financial accounting.<br>2. The course is devoted to the basic financial statements, the analysis and recording of transactions, and the underlying concepts and procedures,<br>3. To carry out financial statement analysis and studying and preparation of cost sheet and budget. |

| Unit No. | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **COST CONCEPTS:** Cost- meaning, Cost v/s Expense, meaning of loss, classification of cost, cost driver & cost unit.<br>Overheads- Meaning and Classification of Overheads. | 05 |
| 2 | **COMPONENTS OF COSTING:** objectives of costing, elements of Costing. Preparation of Cost Sheet, Job Costing-Batch Costing, Process Costing and Activity Based Costing( Simple Problems on Activity Based Costing) | 05 |
| 3 | **INTRODUCTION TO ECONOMICS**: Meaning, Scope, Engineering Decision Makers, Nature and Significance of Economies, Laws of Demand - Concepts, Exceptions. Elasticity of Demand, Demand Forecasting - meaning, methods.<br>Law of Supply - Concepts, Exception. Law of Diminishing Marginal Utility.<br>. | 05 |
| 4 | **INDIAN AND GLOBAL BUSINESS ECONOMICS / MACRO ECONOMICS:** National Income Concept, Per Capita Income (PCI), Gross Domestic Product (GDP) – Concept, Components.<br>Business Cycles – Meaning, Phases. Inflation-Types, Causes and Measurements-Consumer Price Index (CPI) and Whole Sale Price Index (WSI). SWOT Analysis of Indian Economy. | 05 |
| 5 | **FINANCIAL PLANNING:** Income Statement and Balance Sheet (Proforma), Indian Financial System Components.<br>Capital Budgetiing – Phases, Techniques- Pay Back Period (PBP), Net present Value (NPV), Internal Rate of Returns (IRR).<br>Projecting the Cash Flows – Components. | 06 |

| Outcomes: |
|---|

Upon completion of the course, you will be able to:

11. Understand and apply fundamental accounting concepts, principles and conventions and to carry out journal entries and adjustments.
12. Prepare financial statements in accordance with generally accepted accounting principles.
13. Prepare and analyze a trial balance, cash flow statement, cost sheet variance analysis.
14. To prepare and analyze different types of budget
15. To explain the concepts of financial management, working capital and their applications to industries.

**Mapping with POs:**

| Cos | Mapping with POs |
|---|---|
| **CO1** | **PO1, PO4, PO5, PO7, PO8, PO11, PO12** |
| **CO2** | **PO1, PO3, PO5, PO6, PO11, PO12** |
| **CO3** | **PO1,PO3, PO5, PO11, PO12** |
| **CO4** | **PO1,PO3,PO5,PO10,PO11,PO12** |
| **CO5** | **PO3,PO5,PO8,PO11,PO12** |

**TEXT BOOKS:**

1 **Cost Accouting- Principles and Practices,** S P Jain K L Narang, Kalyani Publishers.
2 **Enineering Economy,** Riggs J.L., 5th Edition, Tata McGraw Hill, ISBN 0-07-058670-5.
3. **Financial Management-Theory and practices,** Shashi.K.Gupta, R K Sharma, Kalyani Publishers, ISBN 13, 978 9327235975.

**REFERENCE BOOKS:**

1 **Cost Accounting,** Khan M Y, 2nd Edition, 2000, Tata McGraw Hill, ISBN 007042248.
4 **Engineering Economics,** R.Paneerselvam, Eastern Economy Edition 2001, PHI, ISBN-81-203-1743-2Khan & Jain.
3. **Financial Management,** Khan & Jain, McGrawHill, India.

**Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.**
**Note 2: Two assignments are evaluated for 5 marks.**

**Scheme of semester End Examination (SEE):**

| Units | Unit-1 | | | | Unit-2 | | | | Unit-3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Qno.** | 1.a | 1.b | O | 2.a | 3.a | 3.b | O | 4.a | 5.a | 5.b | O | 6.a | 6.b |
| **Marks** | 05 | 05 | R | 10 | 05 | 05 | R | 10 | 05 | 05 | R | 05 | 05 |

| Units | Unit-4 | | | | Unit- 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Qno.** | 7.a | 7.b | O | 8.a | 8.b | 9.a | 9.b | O | 10.a | 10.b |
| **Marks** | 05 | 05 | R | 05 | 05 | 05 | 05 | R | 05 | 05 |

| Semester: VII / VIII |
|---|
| **Course Title: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)** |

| Course Code: **18HS82** | Evaluation Procedure: |
|---|---|
| Credits: **02** | CIE + Assignment + Group Activity + SEE Marks = 40 + 5 + 5 + 50 = 100 |
| Teaching Hours: 26 Hrs. (L:T:P:S) - 2:0:0:0 | SEE Duration: 3 Hrs |

| **Course Learning Objectives:** | |
|---|---|
| 1 | To gain an historical, economic, and organizational perspective of occupational safety and health. |
| 2 | To investigate current occupational safety and health problems and solutions. |
| 3 | To identify the forces that influence occupational safety and health. |
| 4 | To demonstrate the knowledge and skills needed to identify work place problems and safe work practice. |

| UNIT - I | |
|---|---|
| **OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES:** <br> Safety, History and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation. | **6 Hrs** |
| **UNIT - II** | |
| **ERGONOMICS AT WORK PLACE:** <br> Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Emergency Response - Decision for action – purpose and considerations. | **5 Hrs** |
| **UNIT - III** | |
| **FIRE PREVENTION AND PROTECTION:** <br> Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers. Electrical Safety. | **5 Hrs** |
| **UNIT – IV (Blended Learning)** | |
| **HEALTH CONSIDERATIONS AT WORK PLACE:** <br> Types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) – types and advantages, effects of exposure and treatment for engineering industries, municipal solid waste. Environment management plans (EMP) for safety and sustainability. | **5 Hrs** |
| **UNIT - V** | |
| **OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS:** <br> Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, supervisors and managers. | **5 Hrs** |

| **Course Outcomes:** The students will be able to | |
|---|---|
| 1 | Acquire knowledge on OSHA policies, Laws and regulations. |
| 2 | Identify hazards in the workplace that pose a danger or threat to the safety or health, or that of others. |

| 3 | Control unsafe or unhealthy hazards and propose methods to eliminate the hazards. |
|---|---|
| 4 | Discuss the role of health and safety in the workplace and effects of industries on environment. |
| 5 | Identify workplace hazards, safety considerations and roles and responsibilities of workers, supervisors and managers. |

**Question paper pattern:**

The question paper will have ten full questions carrying equal marks.

Each full question will be for 20 marks.

There will be two full questions (with a maximum of four sub - questions) from each unit.

Each full question will have sub - question covering all the topics under a unit.

The students will have to answer five full questions, selecting one full question from each unit.

**Text Books:**

| 1 | Goetsch D. L., (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall. |
|---|---|
| 2 | Heinrich H.W., (2007), "Industrial Accident Prevention- A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991). |
| 3 | Industrial Safety and Pollution Control Handbook. |

**Reference Books:**

| 1 | Colling D.A., (1990), "Industrial Safety Management and Technology", Prentice Hall, New Delhi. |
|---|---|
| 2 | Della D.E., and Giustina, (1996), "Safety and Environmental Management", Van Nostr and Reinhold International Thomson Publishing Inc. |

**Additional Books:**

| 1 | Industrial safety, health and environmental management. R K Jain, Sunil S Rao, Khanna Publications. |
|---|---|
| 2 | Safety, occupational health and environmental management in construction. S E Sharma, Vineeth Kumar, Khanna Publications. |
| 3 | Labour laws, Commercial law publishers India Pvt Ltd. |
| 4 | The occupational Safety, health & working conditions code. Commercial law publishers 2020. |
| 5 | Occupational health and safety management - A practical approach by Charles-De-Reese. |
| 6 | Occupational ergonomics, theory and applications by Amith Battacharya & James D Mc Glotthin. |
| 7 | Occupational Safety and health law handbook. Mc Dermott will & Enercy LLP. |
| 8 | Occupational health and safety management. Lambert Academic Publishing. |
| 9 | Fundamentals of Industrial Ergonomics - Babur Musthaffa (Google books). |
| 10 | Global occupational safety health and management handbook. Thomas Fuller, CAC press. |
| 11 | Introduction to Industrial Ergonomics. |
| 12 | Ergonomics and practical manual for beginners. Manjith Kaur Chauhan. |

| Sub Title : Project Work Phase II | | |
|---|---|---|
| Sub Code : 18IMP82 | No. of Credits: 10= 0: 0: 2 (L-T-P) | No. of lecture hours/week : 2 |
| Exam Duration : 3 hrs | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 32 |

| Sl. No. | Syllabus |
|---|---|
| 1 | Phase– 02: 10 Credits in VII Semester. |
| 2 | Student shall complete the project work well in time and shall be assessed by the guide and the departmental Project Review Committee for 50 marks (CIE). Later project viva-voce shall be conducted by the exam section and both internal and external examiners for 50 marks do evaluation. |

| Sub Title : Technical Seminar | | |
|---|---|---|
| Sub Code : 18IMS83 | No. of Credits: 2= 0 : 0 : 2(L-T-P) | No. of lecture hours/week : 2 |
| Exam Duration: 3 hr. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 32 |

**Objective:**
3. To equip students for making a subject presentation based on a thorough research review on any contemporary area of engineering and management fields.
4. Offering the student an opportunity to interact with faculty and peer group and to build the ability to making independent presentation.

| Sl. No. | Syllabus |
|---|---|
| 1 | **Procedure:**<br><br>3. A list of contemporary topics will be offered by the faculty of the department in the interlude period between 7th and 8th Semester.<br><br>4. Students can opt for topic of their own choice and indicate their option to the department at the beginning of the 8th semester.<br><br>This component is also evaluated twice in the semester. The final marks shall be submitted to the exam section at the end of the semester. |

| Cos | Mapping with POs |
|---|---|
| CO1 | PO2,PO8,PO12 |
| CO2 | PO3,PO5,PO11 |
| CO3 | PO2,PO8,PO12 |
| CO4 | PO3,PO5,PO11 |
| CO5 | PO2,PO8,PO11,PO12 |

| Sub Title : Internship | | |
|---|---|---|
| Sub Code : 18IMI84 | No. of Credits: 2= 0 : 0 : 2(L-T-P) | No. of lecture hours/week : 2 |
| Exam Duration: 3 hr. | CIE + SEE = 50 + 50 =100 | Total No. of Contact Hours : 32 |

| Sl. No. | Syllabus |
|---|---|
| 1 | **Internship:**<br>All the students admitted to III year of BE shall undergo mandatory internship program for a duration for 4 weeks either during the vacation period of IV& V semester or during VI and VII. A SEE examination will be conducted during VIII semester and prescribed credits shall be added to VIII semester.<br>Students who do not take-up/complete the internship will be declared as failed and have to complete during subsequent SEE examination after satisfying the internship requirements. |

# DR. AMBEDKAR INSTITUTE OF TECHNOLOGY

## SCHEME AND SYLLABUS
**Outcome Based Education (CBCS)**
## (As per NEP 2020)

## Scheme of Teaching and Examinations
## (Common to all B.E. Programmes)
## For I Year B.E. (I & II Semester)

## Academic Year 2021-2022

### Dr. Ambedkar Institute of Technology
Approved by AICTE, New Delhi, Aided by Government of Karnataka,
Accreditated by NAAC, Accreditated by NBA, New Delhi
(An Autonomous Institution, Affiliated to VTU, Belagavi)
Outer Ring Road, Near Jnanabharathi Campus
Mallathahalli, Bengaluru - 560 056

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**Dr. Ambedkar Institute of Technology, Bengaluru-560056**
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (As per NEP 2020)**
**Scheme of Teaching and Examination for I Semester B.E., (Common to all B.E. Programmes) Academic Year:2021-22**

Physics Cycle : I Semester

| Sl. No. | Course Category | Course Code | Course Title | Teaching Department | Teaching Hours/Week L | T | P | S | Total | Duration (Hrs) | CIE Marks | SEE Marks | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BS | 21MAT101 | Calculus and Differential Equations | Mathematics | 3 | 2 | 0 | 0 | 5 | 3 | 50 | 50 | 100 | 4 |
| 2 | BS | 21PHT102 | Engineering Physics | Physics | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 | 3 |
| 3 | ES | 21EET103 | Basic Electrical Engineering | Electrical | 2 | 2 | 0 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 4 | ES | 21CVT104 | Civil Engineering & Mechanics | Civil | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 | 3 |
| 5 | ES | 21MEL105 | Engineering Graphics | Mechanical | 2 | 0 | 2 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 6 | BS | 21PHL106 | Engineering Physics Lab | Physics | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 7 | ES | 21EEL107 | Basic Electrical Engineering Laboratory | Electrical | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 8 | HS | 21HST108 | Communicative English | Humanities | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 9 | AE | 21HST109 | Health and Wellness | Humanities | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 10 | MC | 21HSN110 | Career Development skill-I | Humanities | 1 | 0 | 1* | 0 | 2 | -- | 50 | - | PP/NP | 0 |
| | | | | | | | | Total | 29 | | 500 | 450 | 900 | 20 |

Note: BS: Basic Science Course, ES: Engineering Science Course,HS: Humanities & Social Science Course,
AE: Ability Enhancement Course, MC: Mandatory Course,      * No practical evaluation,
L: Lecture, T:Titorial, P:Practical/drawing, S:Self study, CIE: Continuous Internal Evaluation, SEE: Semester End Examination

**Dr. Ambedkar Institute of Technology, Bengaluru-560056**

Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (As per NEP 2020)

Scheme of Teaching and Examination for I Semester B.E., (Common to all B.E. Programmes) Academic Year:2021-22

**Chemistry Cycle: I Semester**

| Sl. No. | Course Category | Course Code | Course Title | Teaching Department | Teaching Hrs/Week | | | | | Duration (Hrs) | Examination | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | S | Total | | CIE Marks | SEE Marks | Total Marks | |
| 1 | BS | 21MAT101 | Calculus and Differential Equations | Mathematics | 3 | 2 | 0 | 0 | 5 | 3 | 50 | 50 | 100 | 4 |
| 2 | BS | 21CHT102 | Engineering Chemistry | Chemistry | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 | 3 |
| 3 | ES | 21CST103 | Problem solving through Programming | Computer Science | 2 | 2 | 0 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 4 | ES | 21ECT104 | Basic Electronics and Communication Engineering | Electronics | 2 | 2 | 0 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 5 | ES | 21MET105 | Elements of Mechanical Engineering | Mechanical | 2 | 0 | 2 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 6 | BS | 21CHL106 | Engineering Chemistry Laboratory | Chemistry | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 7 | ES | 21CSL107 | Computer Programming Laboratory | Computer Science | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 8 | HS | 21HST108 | Communicative English | Humanities | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 9 | AE | 21CVT109 | Rural Development Engineering | Civil | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 10 | MC | 21HSN110 | Career Development skill-I | Humanities | 1 | 0 | 1* | 0 | 2 | ---- | 50 | -- | PP/NP | 0 |
| | | | | Total | | | | | 30 | | 500 | 450 | 900 | 20 |

Note: BS: Basic Science Course, ES: Engineering Science Course,HS: Humanities & Social Science Course,

AE: Ability Enhancement Course, MC: Mandatory Course, * No practical evaluation,

L: Lecture, T:Titorial, P:Practical/drawing, S:Self study, CIE: Continuous Internal Evaluation, SEE: Semester End Examination

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**Dr. Ambedkar Institute of Technology, Bengaluru-560056**

**Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (As per NEP 2020)**

**Scheme of Teaching and Examination for II Semester B.E., (Common to all B.E. Programmes) Academic Year:2021-22**

**Physics Cycle: II Semester**

| Sl. No. | Course Category | Course Code | Course Title | Teaching Department | Teaching Hrs/Week | | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | S | Total | Duration (Hrs) | CIE Marks | SEE Marks | Total Marks | |
| 1 | BS | 21MAT201 | Advanced Calculus and Numerical Methods | Mathematics | 3 | 2 | 0 | 0 | 5 | 3 | 50 | 50 | 100 | 4 |
| 2 | BS | 21CHT202 | Engineering Chemistry | Chemistry | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 | 3 |
| 3 | ES | 21CST203 | Problem solving through Programming | Computer Science | 2 | 2 | 0 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 4 | ES | 21ECT204 | Basic Electronics and Communication Engineering | Electronics | 2 | 2 | 0 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 5 | ES | 21MET205 | Elements of Mechanical Engineering | Mechanical | 2 | 0 | 2 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 6 | BS | 21CHL206 | Engineering Chemistry Laboratory | Chemistry | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 7 | ES | 21CSL207 | Computer Programming Laboratory | Computer Science | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 8 | HS | 21HST208 | Professional writing skills in English | | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 9 | AE | 21CVT209 | Rural Development Engineering | Civil | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 10 | MC | 21HSN210 | Career Development skill-II | Humanities | 1 | 0 | 1* | 0 | 2 | ---- | 50 | -- | PP/NP | 0 |
| | | | | | | | | Total | 30 | | 500 | 450 | 900 | 20 |

**Note: BS: Basic Science Course, ES: Engineering Science Course,HS: Humanities & Social Science Course,**

**AE: Ability Enhancement Course, MC: Mandatory Course, * No practical evaluation,**

**L: Lecture, T:Titorial, P:Practical/drawing, S:Self study, CIE: Continuous Internal Evaluation, SEE: Semester End Examination**

## Dr. Ambedkar Institute of Technology, Bengaluru-560056
### Outcome Based Education(OBE) and Choice Based Credit System (CBCS) (As per NEP2020)
### Scheme of Teaching and Examination for II Semester B.E., (Common to all B.E. Programmes) Academic Year:2021-22

**Chemistry Cycle : II Semester**

| Sl. No. | Course Category | Course Code | Course Title | Teaching Department | Teaching Hours/ Week | | | | | Duration (Hrs) | Examination | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | S | Total | | CIE Marks | SEE Marks | Total Marks | |
| 1 | BS | 21MAT201 | Advanced Calculus and Numerical Methods | Mathematics | 3 | 2 | 0 | 0 | 5 | 3 | 50 | 50 | 100 | 4 |
| 2 | BS | 21PHT202 | Engineering Physics | Physics | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 | 3 |
| 3 | ES | 21EET203 | Basic Electrical Engineering | Electrical | 2 | 2 | 0 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 4 | ES | 21CVT204 | Civil Engineering & Mechanics | Civil | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 | 3 |
| 5 | ES | 21MEL205 | Engineering Graphics | Mechanical | 2 | 0 | 2 | 0 | 4 | 3 | 50 | 50 | 100 | 3 |
| 6 | BS | 21PHL206 | Engineering Physics Laboratory | Physics | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 7 | ES | 21EEL207 | Basic Electrical Laboratory | Electrical | 0 | 0 | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 1 |
| 8 | HS | 21HST208 | Professional writing skills in English | Humanities | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 9 | AE | 21HST209 | Health and Wellness | Humanities | 1 | 0 | 1* | 0 | 2 | 2 | 50 | 50 | 100 | 1 |
| 10 | MC | 21HSN210 | Career Development skill-II | Humanities | 1 | 0 | 1* | 0 | 2 | -- | 50 | - | PP/NP | 0 |
| | | | | | | | Total | | 29 | | 500 | 450 | 900 | 20 |

Note: BS: Basic Science Course, ES: Engineering Science Course,HS: Humanities & Social Science Course,
AE: Ability Enhancement Course, MC: Mandatory Course,   * No practical evaluation,
L: Lecture, T:Titorial, P:Practical/drawing, S:Self study, CIE: Continuous Internal Evaluation, SEE: Semester End Examination

**Dr Ambedkar Institute of Technology, Bengaluru-56**
**Department of Mathematics**
**Scheme and Syllabus - CBCS – 2021 -2022**

| Course Title | **CALCULUS & DIFFERENTIAL EQUATIONS** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21MAT101** | | | | | | |
| Category | Basic Science Course (BS) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 03 | 02 | 00 | 00 | 05 | 65 | 04 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | | |

**COURSE OBJECTIVE:** This course is intended to impart to the students the skills of employing the basic tools of differential and for solving basic and difficult engineering problems.

| **UNIT I** | **8+5 hours** |
|---|---|

**Differential Calculus-1:** Recapitulation of differentiation, Taylor's and Maclaurin's series for single variable (no proof). Introduction to polar curves, expression for angle between radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature-Cartesian, parametric, polar and pedal forms.
*Self-study: Indeterminate forms, center and circle of curvature.*

| **UNIT II** | **8+5 hours** |
|---|---|

**Differential Calculus-2:** Partial derivative of first and second order, total derivative, derivative of composite function. Euler's theorem for function of two variables. Jacobians and property $JJ' = 1$. Taylor's series for functions of two variables (no proof). Maxima and minima for function of two variables.
*Self-Study: Errors and approximations, Extended Euler's theorem, Lagrange's undetermined multiplier method.*

| **UNIT III** | **8+5 hours** |
|---|---|

**Ordinary differential equations (ODE's) of first order:** Linear differential equations. Reducible to linear differential equation, Bernoulli's equations. Exact and reducible to exact differential equations. Orthogonal trajectories in Cartesian and polar form. Introduction to general and singular solutions; solvable for *p* only and Clairaut's equations.
*Self-study: Reducible to Clairaut's equations. Application to Newton's law of cooling.*

| UNIT IV | 8+5 hours |
|---|---|

**Ordinary differential equations (ODE's) of higher order:** Higher order linear ODE's with constant coefficients, Inverse differential operator method (no product of functions). Method of variation of parameter. Cauchy's and Legendre's homogenous linear differential equations. Applications: L-C-R circuits.

***Self-study: Method of Undetermined co-efficents.***

| UNIT V | 8+5 hours |
|---|---|

**Linear Algebra:** Elementary row and column operations of a matrix, echelon form, Rank of matrix. Consistency of homogeneous and non-homogeneous equations. Gauss elimination, Gauss Jordan and Gauss-Seidel methods.

***Self-study: Solution of system of linear equations by Jacobi method, eigenvalues and eigenvectors.***

**TEACHING LEARNING PROCESS:** Chalk and Talk, power point presentation, animations, videos

**COURSE OUTCOMES:** On completion of the course, student should be able to:

**CO1: Determine** the rate of changes, extreme values, Taylor's series for the function of two variables and rank of a matrix.

**CO2: Solve** ordinary differential equations and system of linear equations.

**CO3: Test** for angle of polar curves, consistency of linear equations, the independency of two functions of two identical independent variables and orthogonally of two polar curves.

**CO4: Describe** Mathematical procedures to find integrating factors, orthogonal trajectories, complementary functions, particular integrals and consistency of system of equations.

**CO5: Apply** the terminologies of calculus and linear algebra for approximations.

**TEXT BOOKS**

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreysizig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint)2016.

**REFERENCE BOOKS**

1. V. Ramana : Higher Engineering Mathematics, McGraw –Hill Education,11th Ed..
2. H. C. Taneja, Advanced Engineering Mathematics, Volume I& II, I.K. International Publishing House Pvt. Ltd., New Delhi.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

**ONLINE RESOURCES**

1. http://www.nptel.ac.in
2. https://en.wikipedia.org

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 1 | | 2 | | 3 | | 4 | | 5 |

1. Two full questions (each of 20 Marks) are to be set from each unit.

2. Student shall answer five full questions selecting one full question from each unit.

**MAPPING of COs with POs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | | | | | | | |
| CO2 | 3 | 3 | | | | | | | | | | |
| CO3 | 3 | 3 | | | | | | | | | | |
| CO4 | 3 | 3 | | | | | | | | | | |
| CO5 | 3 | 3 | 3 | | | | | | | | | |
| **Strength of correlation:** Low-1, Medium- 2, High-3 | | | | | | | | | | | | |

## Dr Ambedkar Institute of Technology, Bengaluru-56
## Department of Physics
## Scheme and Syllabus - CBCS – 2021 -2022

| Course Title | **ENGINEERING PHYSICS** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21PHT102/202** | | | | | |
| Category | Basic Science Course (BS) | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 03 | 00 | 00 | 00 | 03 | 40 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | |

**COURSE OBJECTIVE:** To introduce the Engineering students to the basics of elasticity, vibrations, quantum mechanics, electrical and dielectric properties of materials,laser and fiber optics, crystal structure and nanomaterials with an emphasis on inculcating strong analytical skills among them so that they can understand and analyze complex engineering problems with relative ease.

| UNIT I | 8 hours |
|---|---|

**Elasticity**: Torsion: Expression for couple per unit twist of a solid cylinder (derivation). Torsional Pendulum: Expression for period of oscillation and Rigidity modulus (derivation). Bending of Beams: Definition of beam, neutral surface and neutral axis. Expression for bending moment of a beam (derivation). Expression for Young's modulus of the material of a single cantilever (derivation). Numerical problems.

**Vibrations:** Theory of free vibrations, theory of damped vibrations and discussion of three cases of damping. Theory of Forced vibrations. Resonance: Condition for resonance, sharpness of resonance. Numerical problems.

***Self-study component: Types of beams and its engineering applications, application of damping in automobiles, LCR resonance.***

**UNIT II**                                                            **8 hours**

**Modern Physics:** de- Broglie hypothesis: de Broglie wavelength for free and accelerated electron. Concept of wave packet. Phase velocity, group velocity (no derivation), relation between phase velocity and group velocity, relation between group velocity and particle velocity, relation between phase velocity, group velocity and velocity of light. Numerical problems.

**Quantum Mechanics:** Heisenberg's uncertainty principle and its physical significance. Application of uncertainty principle: Non-confinement of electron in the nucleus. Wave function. Properties and Physical significance of a wave function. Probability density and Normalization of wave function. Setting up of one dimensional time independent Schrödinger's wave equation. Eigen values and Eigen functions. Application of Schrödinger wave equation to a particle in a box: Expression for energy Eigen values and Eigen functions for a particle in one-dimensional potential well of infinite height and finite width, discussion of wave functions and probability density for a particle in a box for ground and first excited state. Numerical problems.

*Self-study component: Davisson and Germer experiment, Matter waves and their properties. Discussion of wave functions and probability density for a particle in a box for n=3, Quantum tunneling.*

**UNITIII**                                                            **8 hours**

**Electrical properties:** Assumptions of quantum free electron theory, Fermi level, Fermi energy, Fermi velocity and Fermi temperature. Fermi factor f(E) and its dependence on temperature. Expression for density of states (qualitative), expression for Fermi energy at absolute temperature (derivation). Electrical conductivity using effective mass and Fermi velocity (derivation). Merits of quantum free electron theory. Numerical problems.

**Dielectric properties:** Introduction to dielectrics: types of dielectrics, polarization, polarizability, dielectric constant, relation between dielectric constant and polarizability. Polarization mechanism and types of polarization. Derivation of equation for internal field in liquids and solids (1-Dimensional). Expression for Classius-Mossotti equation (Derivation). Numerical problems.

*Self-study component:Distinguish between CFET and QFET, applications of dielectric materials in engineering (Mica, glass, rubber, and porcelain), Piezo-electricity.*

| UNIT IV | 8 hours |
| --- | --- |

**Lasers:** Interaction of radiation with matter: Induced absorption, spontaneous emission and stimulated emission of radiation. Expression for energy density in terms of Einstein's coefficients (derivation). Requisites of a laser system. Condition for laser action. Principle, construction and working of He-Ne laser. Application of laser: Holography, principle, recording (wave front division technique) and reconstruction of 3-D images. Mention of applications of holography. Numerical problems.

**Optical fibers:** Propagation mechanism in optical fibers. Expression for angle of acceptance and numerical
aperture (derivation). Fractional index change, V- number and modes of propagation (N). Types of optical fibers. Attenuation: expression for attenuation coefficient (derivation). Application of optical fibers: Point
to point communication with block diagram. Advantages and limitations of fiber optic communication over conventional communication system. Numerical problems.

***Self-study component: Applications of laser in medical and industry. Discuss the causes for attenuation in optical fibers.***

| UNIT V | 8 hours |
| --- | --- |

**Crystal Structure:** Seven crystal systems, Miller indices, Interplanar spacing in terms of miller indices. X-ray diffraction, Bragg's law (derivation), Bragg's X-ray spectrometer (construction and working) and determination of crystal structure by Bragg's X-ray spectrometer, Numerical Problems.

**Nanomaterials:** Nano Scale, Surface to Volume Ratio, Quantum Confinement, types of nanomaterials, Synthesis of nanomaterials: Top-down approach: High energy Ball-milling method and Bottom-Up approach: Sol-Gel method. Characterization Technique: Scanning Electron Microscope (SEM), Properties of nanomaterials: Mechanical, electrical, magnetic and optical.

***Self-study component: Co-ordination number, Atomic packing factor (APF) for simple cubic, body centered and face centered cubic structure. Applications of nanomaterials: Medical and Electronics.***

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**TEACHING and LEARNING PROCESS:** Chalk and Talk, power point presentation, animations, videos

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**COURSE OUTCOMES:** On completion of the course, student should be able to:

**CO1:Apply** the knowledge of elasticity and vibrations to engineering.

**CO2:Apply** the knowledge of basic quantum mechanics, to set up one-dimensional Schrodinger's wave equation and its application to a matter wave system.

**CO3:Summarize** the importance of free electrons in determining the properties of metals; understand the concept of Fermi energy. Gain the knowledge of the electrical and dielectric properties of a materials.

**CO4:Describe** the basics of laser Physics, working of lasers, holography and principle of propagation of light in optical fibers.

**CO5:Recognize** various planes in a crystal and describe the structure determination using X-rays.

## TEXT BOOKS

1. P. S. Aithal, H. J. Ravindra, Textbook of Engineering Physics, Acme Learning Pvt. Limited, New Delhi, 1st edition, (2017).
2. Dr. Amit Sarin, Anil Rewal, Engineering Physics Books, Wiley India Private Ltd., New Delhi 9th Edition (2014).
3. Avadhanulu M. N. and P.G. Kshirsagar, A text Book of Engineering Physics, 10th Edition (2014).
4. Engineering Physics by Gaur and Gupta, DhanpatRai Publications (P) Ltd.
5. Dr. K. Vijayakumar, Dr. S. Chandralingum, Modern Engineering Physics, S. Chand and Company Limited, 1st edition 2010
6. K. K. Chattopadhyay, Introduction to Nanoscience and Nanotechnology, PHI India, (2009).
7. Sulabha Kulkarni, Introduction to Nanoscience and Nanotechnology 2nd Edition (2012)

## REFERENCE BOOKS

1. S. O. Pillai, Solid State Physics, New Age International. Sixth Edition.
2. A Marikani, Engineering Physics, PHI Learning Private Limited, Delhi - 2013
3. Prof. S. P. Basavaraju, Engineering Physics, Subhas Stores, Bangalore.
4. V. Rajendran , Engineering Physics, Tata McGraw Hill Company Ltd., New Delhi -2012
5. S. Mani Naidu, Engineering Physics, Pearson India Limited – 2014
6. AjoyGhatak, Optics, Tata McGraw Hill, 2005.
7. Arthur Beiser, Concepts of Modern Physics, McGraw Hill,7th edition 2017.

**ONLINE RESOURCES**

1. http://www.nptel.ac.in
2. https://en.wikipedia.org
3. https://physicsworld.com/

*Note: Questions from Self-study component will not be asked for CIE and SEE.*

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 1 | | 2 | | 3 | | 4 | | 5 |
| 1. Two full questions (each of 20 Marks) are to be set from each unit. | | | | | | | | | |
| 2. Student shall answer five full questions selecting one full question from each unit. | | | | | | | | | |

**MAPPING of COs with POs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | √ | √ | | | | | | | | | | |
| CO2 | √ | √ | | | | | | | | | | |
| CO3 | √ | √ | | | | | | | | | | |
| CO4 | √ | √ | | | | | | | | | | |
| CO5 | √ | √ | | | | | | | | | | |
| **Strength of correlation:** Low-1,   Medium- 2, High-3 | | | | | | | | | | | | |

**Dr Ambedkar Institute of Technology, Bengaluru-56**
**Department of Chemistry**
**Scheme and Syllabus - CBCS – 2021 -2022**

| Course Title | **ENGINEERING CHEMISTRY** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21CHT102/202** | | | | | |
| Category | Basic Science Course (BS) | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 03 | 00 | 00 | 00 | 03 | 40 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | |

**COURSE OBJECTIVE:** To expose first year engineering students to various physicochemical aspects of engineering materials such as metals, alloys, plastics, conducting polymers etc. with a view to highlight their significance and importance in application oriented systems.

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**UNIT I**                                                   **8 hours**
**Electrochemical energy sources:**
**Electrochemical cells**
Introduction to electro chemical cells, origin of single electrode potential, sign convention and cell notation, standard electrode potential, derivation of Nernst equation for single electrode potential, numerical problems.
Types of electrodes- Classification of reference electrodes, calomel electrode – construction, working and applications, Measurement of single electrode potential using calomel electrode, Electrochemical series,Concentration cells-Derivation of Emf of a concentration cell - numerical Problems. Ion selective electrodes – Glass electrode – construction and working, Determination of pH of a solution using glass electrode.
**Batteries and fuel cells**
Basic concepts – principal components of a battery, operation of a battery during charging and discharging, Battery characteristics – voltage, capacity, energy efficiency, cycle life and shelf life. Classifications of batteries, Construction, working and applications of Lead acid, Ni-metal hydride and Li-ion battery, significance of Lithium.
**Fuel cells** – Construction, working and applications of CH3OH-$O_2$ fuel cell using H2SO4 electrolyte.
**Self-study : Introduction to Refrence electrode, Ag-AgCl electrode, Introduction to fuel cells & battery, H2-O2 Fuel cell.**

**UNIT II**                                              **8 hours**
**Corrosion and Metal finishing**
**Corrosion science**
Corrosion – Introduction, electrochemical theory of corrosion, galvanic series: Types of corrosion – Differential metal corrosion –Differential aeration corrosion, Stress corrosion. Factors– Related to nature of metal: electrode potential, relative sizes of anode and cathode, nature of the corrosion product. Related to environment: pH of the medium, temperature, humidity and presence of impurities in the atmosphere.
Corrosion control: Inorganic coatings; Anodizing – anodized coating of aluminium. Phosphating. Metallic coatings – Anodic metallic coating ex : Galvanizing, Cathodic metallic coating ex : Tinning .Organic coatings – examples, Corrosion inhibitors – definition, anodic and cathodic inhibitors, Cathodic protection – definition, sacrificialanode method.
**Metal finishing**
Technological importance, Electroplating – pre-treatment, process.
Significance of Polarization, Decomposition potential and Overvoltage in electroplating and their applications. Effect of plating variables on the nature of electrodeposit – metal ion concentration, organic additives (Complexing agents, brighteners, levelers, structure modifiers and wetting agents), current density, pH, temperature and throwing power of the plating bath, Electroplating of chromium.
Electroless plating: difference between electroplating and electroless plating. Pre-treatment and activation of the surface, electroless plating of copper in the manufacture of PCBs.
**Self-study : Metallic coating : Anodic metallic coating- Galvanization, Cathodic metallic coating- Tinning, Organic coating**

**UNIT III**                                             **8 hours**
**Energy: Sources & Conversion**
**Chemical fuels:** Hydrocarbon fuels, classification. Calorific value –GCV and NCV. Bomb calorimeter, numerical problems.
Petroleum cracking – Fluidized catalytic cracking process, Knocking – mechanism and harmful effects, Octane and Cetane numbers, Reforming of petrol. Unleaded petrol, power alcohol, Biodiesel, Catalytic converters – construction and working.
**Solar energy:** Photovoltaic cells – Introduction, definition, production of solar grade silicon, purification of silicon by zone refining process,construction and working of silicon-photovoltaic cell, advantages and disadvantages.
**Self-study :Determination of GCV &  NCV of gaseous fuel by Buoys calorimeter and numerical problems.**

| UNIT IV | 8 hours |
|---|---|

**Polymer science and Environmental Pollution**

**Polymer science**

Polymerization – Classification- addition and condensation polymerization with examples: Techniques of polymerization- bulk, solution, emulsion and suspension polymerization. Free radical mechanism taking ethylene as an example, Glass transition temperature (Tg) –significance and factors affecting Tg, compounding of resins into plastics. Synthesis and applications- PMMA, Polyurethane, phenol-formaldehyde resin. Elastomers: Introduction, vulcanization of rubber. Synthesis and applications of neoprene and butyl rubber; adhesives: synthesis of epoxy resins. Conducting polymers: mechanism of conduction in polyacetylene and its applications.

**Environmental Pollution:** Introduction, Air pollutants: Sources and effects of primary& Secondary air Pollutants, Ozone depletion, greenhouse effect - global warming. Sources of water pollution, Determination of BOD and COD

**Self-study :Characterization of nanomaterials- FT-IR, XRD, SEM, TGA, BET-surface area analysis.**

| UNIT V | 8 hours |
|---|---|

**Instrumental methods of chemical analysis:** theory, instrumentation and applications- Colorimetric estimation of Cu, Potentiometric estimation of FAS, Conductometric estimation of acid mixture.

**Water technology**

Impurities in water –water analysis: Hardness – types, determination by EDTA method, dissolved oxygen by Winkler's method.

Potable water- desalination of water by electrodialysis method.

**Green chemistry:** Introduction, Principles, green synthesis – Aspirin and ibuprofen

Green catalyst – Zeolite and Silica. Microwave assisted reaction in water – Methyl benzoate to Benzoic acid, oxidation of toluene, Ultrasound assisted reaction – Sonochemicalsimmons-smith reaction

**Self –study: Importance of green chemistry in industry, environment related issues.**

| **TEACHING AND LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos** |
|---|

**Course Outcomes:**

1.  CO1: At the end of the first unit the student will be able to understand the basic concepts electrochemistry and its applications, in the construction of electrochemical energy sources.

2.  CO2: At the end of the second unit the student will be able to understand concepts of corrosion and its control in the fabrication and design of structural materials and importance of metal finishing in

enhancing physicochemical properties.

3. CO3: At the end of the third unit the student will be able to understand concepts of renewable and non-renewable energy sources.

4. CO4: At the end of the fourth unit the student will be able to understand the application of polymeric materials for different applications.

5. CO5: At the end of the fifth unit the student will be able to understand the instrumental techniques and water quality parameters.

**REFERENCE:**

1. Principles of Physical Chemistry B.R.Puri, L.R.Sharma&M.S.Pathania, S.Nagin Chand &Co.
2. Text Book of Polymer Science by F.W.Billmeyer, John Wiley & Sons
3. Corrosion Engineering – by M.G.Fontana, Mc Graw Hill Publications.
4. Environmental Chemistry by Stanley E. Manahan, 7th Edition, lewis Publishers, 2000
5. Engineering Chemistry by DrRenubapna, Macmilan publisher India limited
6. Engineering Chemistry by Jayaprakash and VenugopalSubhash Publications.
7. Nano Metal Oxides For Environmental Remediation. United Publications Dr. Jahagirdar A.A and Dr. Nagaswarupa H P

*Note: Questions from Self-study component will not be asked for CIE and SEE.*

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT 1 | | 2 | | 3 | | 4 | | 5 | |
| 1. Two full questions (each of 20 Marks) are to be set from each unit. | | | | | | | | | |
| 2. Student shall answer five full questions selecting one full question from each unit. | | | | | | | | | |

**MAPPING of COs with POs**

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | √ | √ |  |  |  |  |  |  |  |  |  |  |
| CO2 | √ | √ |  |  |  |  |  |  |  |  |  |  |
| CO3 | √ | √ |  |  |  |  |  |  |  |  |  |  |
| CO4 | √ | √ |  |  |  |  |  |  |  |  |  |  |
| CO5 | √ | √ |  |  |  |  |  |  |  |  |  |  |
| Strength of correlation: Low-1, Medium- 2, High-3 | | | | | | | | | | | | |

| Course Title | **BASIC ELECTRICAL ENGINEERING** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21EET103/21EET203** | | | | | | |
| Category | Engineering Science  (ES) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 02 | 02 | 00 | 00 | 04 | 52 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | | **Duration of SEE: 03 Hours** | | | |

**COURSE OBJECTIVE:**

1. Understand the basic laws of electrical engineering and energy billing.
2. Explain the working of basic electrical parameters under sinusoidal excitation.
3. Analyze the series and parallel electrical circuits for voltage, current, power, and energy.
4. Describe the construction and working principles of electrical machines.
5. Explain electric power generation, transmission and distribution, wiring schemes and equipment and  personal safety measures.

| UNIT I | 6+6 hours |
|---|---|

**DC circuits:** Ohm's law and Kirchhoff's laws, analysis of series, parallel, and series-parallel circuitsexcited by independent voltage sources. Power and energy, maximum power transfer theorem appliedto the series circuit and its applications.

**Electromagnetism and AC Fundamentals:** Faraday's laws, Lenz's law. Fleming's rules & dynamically induced e.m.f. Statically induced e.m.f.s., the concept of self and mutual inductance & coefficient of coupling, force on the current-carrying conductor. Generation of sinusoidal voltage, average and RMS value, form factor, and peak factor.

**Self-Study:** Basics of lead acid batteries, nickel - iron batteries, lithium – ion batteries, advantages and disadvantages of batteries, rating of batteries in ampere - hour.

**UNIT II**                                                           **5+5 hours**

**Single-phase circuits:** Voltage, current, and power waveforms with phasor diagram, in R, L, and C circuits. Analysis of R-L, R-C, R-L-C Series and Parallel circuits, Real, reactive and apparent powers, power triangle, and Power factor.

**Three-phase circuits:** advantages of three-phase systems, generation of three-phase power, representation of the balanced star (3 wire and 4 wire system) and delta connected loads, phase and line relations of voltages and currents from phasor diagrams. Measurement of three-phase power by the two-wattmeter method.

**Self-Study:** Electric Wiring : Casing and cap wiring, Open conduit and closed conduit systems. Advantages  and disadvantages. Types of wires used for lighting and heating (power) circuits.

**UNIT III**                                                           **5+5 hours**

**DC Machines:** (**a**) Principle of operation, constructional details, induced emf equation, types of generators, and the relation between induced emf and terminal voltage.

(**b**) Principle of operation, back emf and torque equations, types of motors, characteristics (shunt and series only), and applications.

**Transformers**: Necessity of transformer, the principle of operation, Types, and construction of single-phase transformers, emf equation, losses, efficiency, and condition for maximum efficiency.

**Self-Study:** DC compound generators, compound motors, three phase transformers – types and constructions.

**UNIT IV**                                                           **5+5 hours**

**Three-phase induction Motors**: Concept of rotating magnetic field, the principle of operation, constructional features of motor, types – squirrel cage and wound rotor and their applications., slip, the significance of slip, and problems on slip calculations.

**Three-phase synchronous generators:** Principle of operation, constructional features of salient and non-salient pole generators, synchronous speed, frequency of generated voltage, emf equation, with the concept of winding factor (excluding the derivation and calculation of winding factors)

**Self-Study:** Single phase induction motors: Double field revolving theory. Types, Working principle and constructions.

| UNIT V | 5+5 hours |
|---|---|

**Power transmission and distribution-** Concept of electric power transmission and distribution. Low voltage distribution system (400 V and 230 V) for domestic, commercial, and small scale industry through block diagram/single line diagrams only

**Electricity bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two- part electricity tariff, calculation of electricity bill.

**Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB)merits and demerits.

**Personal safety measures:** Electric Shock, Safety Precautions, Earthing, and its types.

**Self-Study: E**lectrical Power Generation: Sources of energy – renewable and non-renewable, working principle of hydel, thermal, nuclear, wind and solar power plants through block diagrams, environmental effects and advantages and disadvantages.

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**TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos**

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**COURSE OUTCOMES:** On completion of the course, student should be able to:

**CO1:** Describe the basic concepts in electrical engineering.

**CO2:** Analyze-dc circuits, single-phase, and three-phase ac circuits.

**CO3:** Explain the construction and operation principle of electrical machines.

**CO4:** Solve basic problems on electrical machines.

**CO5:** Explain the concept of electric power transmission, distribution, electricity billing, equipment, and personal safety measures.

**TEXT BOOKS**

1. Basic Electrical Engineering, D. C. Kulshreshtha, McGraw-Hill Education, Revised first edition, 2019
2. Electrical and Electronic Technology, Edward Hughes, Pearson, 12th edition, 2016
3. Lecture Notes (for module 5), Dr. AIT.

**REFERENCE BOOKS**

1. Basic Electrical Engineering, D.P. Kothari I.J.Nagrath, McGraw-Hill Education, 4th Edition,2019.
2. Fundamentals of Electrical Engineering and Electronics, B.L. Theraja, S Chand and Company, Reprint Edition 2013.
3. Principles Electrical Engineering and Electronics, V.K Mehata, Rohit Mehta, S Chand and Company, 2nd edition, 2015.

**ONLINE RESOURCES**

1. http://www.nptel.ac.in
2. https://www.youtube.com/watch?v=IZA_bJiGiJc&list=PL_ mruqjnuVd8LP2z0c4yBwKAGEiEW_Si9&index=1
3. https://www.youtube.com/watch?v=3TR_ DS_7z2w&list=PLbRMhDVUMngfdEXVcdf_ijj2Eub-UHs_y

*Note: Questions from Self-study component will not be asked for CIE and SEE.*

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 1 | | 2 | | 3 | | 4 | | 5 |
| 1. Two full questions (each of 20 Marks) are to be set from each unit. | | | | | | | | | |
| 2. Student shall answer five full questions selecting one full question from each unit. | | | | | | | | | |

**MAPPING of COs with POs and PSOs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO11 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | | | 1 | | 1 | | 1 | 3 | 1 | 1 |
| CO2 | 3 | 3 | | | | | | 1 | | 1 | | 1 | 3 | 1 | 1 |
| CO3 | 3 | 3 | | | | | | 1 | | 1 | | 1 | 3 | 1 | 1 |
| CO4 | 3 | 3 | | | | | | 1 | | 1 | | 1 | 2 | 1 | 1 |
| CO5 | 3 | 3 | | | | 3 | 1 | 1 | | 1 | | 1 | 3 | 1 | 1 |
| Strength of correlation:  Low-1,    Medium- 2,    High-3 | | | | | | | | | | | | | | | |

22

| Course Title | **PROBLEM SOLVING THROUGH PROGRAMMING** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21CST103/203** | | | | | | |
| Category | Engineering Science Course(ES) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 02 | 02 | 00 | 00 | 03 | 52 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | |

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

| | |
|---|---|
| **UNIT I** | **8+3 hours** |

**Fundamentals of Problem Solving:**
Art of programming through Algorithm and Flowchart, Designing solutions to various problems.
**Overview of C:** Basic structure of C program, executing a C program. Constant, variable and data types, Operators and expressions
*Self Study Component:Introduction to Computer: Computer generations, computer types, CPU, Primary memory, Secondary memory, input devices, output devices.*

| | |
|---|---|
| **UNIT II** | **8+3 hours** |

**Managing Input and output operations:Conditional Branching and Loops:** Example programs, finding roots of a quadratic equation, computation of binomial coefficients, plotting of Pascal's triangle.
*Self Study Component: Hardware and Software: Computers in a network, Network hardware, Software basics, software types.*

| | |
|---|---|
| **UNIT III** | **8+2 hours** |

**Arrays:** Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching and Sorting Algorithms(Linear search, Binary search, Bubble sort and Selection sort).
*Self Study Component:Programming Examples*

| | |
|---|---|
| **UNIT IV** | **8+2 hours** |

**User Defined Functions and Recursion.**
Example programs: Finding Factorial of a positive integer, GCD of two numbers and Fibonacci sequence.
***Self Study Component:*** Storage classes: auto, extern, static, register.

| | |
|---|---|
| **UNIT V** | **8+2 hours** |

**Structures, Unions and Pointers,** Programs like Addition of two complex numbers using structures, compute the sum, mean and standard deviation of all elements stored in an array of N real numbers using pointers.

***Self Study Component: Case Study related to Functions and Structures :***
  ***Example: Implement structures to read, write and compute average***
  ***marks and the students scoring above and below average marks for a***
  ***class of 'N' students with the structure definition as***
  ***struct student***
  ***{***
          ***char name[20];***
          ***introllno;***
          ***int m1, m2, m3;***
          ***intavg;***
***}***

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**TEACHING LEARNING PROCESS:    Chalk and Talk, power point presentation, animations, videos**

**COURSE OUTCOMES:** On completion of the course, student should be able to: At the end of the course the student will be able to:

**CO1:Elucidate** the basic architecture and functionalities of a computer and also recognize the hardwareparts.

**CO2:Apply** programming constructs of C language to solve the real worldproblem

**CO3:Explore** user-defined data structures like arrays in implementing solutions to problems like searching andsorting

**CO4:Explore** user-defined data structures like structures, unions and pointers in implementingsolutions

**CO5: Design and Develop** Solutions to problems using modular programmingconstruct Using functions

**TEXT BOOKS**
1. E. Balaguruswamy, "Programming in ANSI C", 7th Edition, TataMcGraw-Hill
2. Brian W. Kernighan and Dennis M. Ritchie, "The 'C' Programming Language", Prentice Hall ofIndia.

**REFERENCE BOOKS**
1. "Programming in C"by ReemaThereja, , Cengage publication.
2. "C- Programming Techniques" by A.M. Padma Reddy, Sri Nandi Publications

**ONLINE RESOURCES**
1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. https://nptel.ac.in/courses/106/105/106105171/

   MOOC courses can be adopted for more clarity in understanding the topics and varieties ofproblem solving methods.

*Note: Questions from Self-study component will not be asked for CIE and SEE.*

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 1 | | 2 | | 3 | | 4 | | 5 |
| 1. Two full questions (each of 20 Marks) are to be set from each unit. | | | | | | | | | |
| 2. Student shall answer five full questions selecting one full question from each unit. | | | | | | | | | |

**MAPPING of COs with POs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 2 | | 2 | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - |
| CO3 | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | - |
| CO4 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | - |
| CO5 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - |
| **Strength of correlation:** Low-1, Medium- 2, High-3 | | | | | | | | | | | | |

## Dr Ambedkar Institute of Technology, Bengaluru-56
## Department of Civil Engineering
## Scheme and Syllabus – OBE - CBCS – 2021 -2022

| Course Title | **Civil Engineering and Mechanics** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21CVT104 / 204** | | | | | | |
| Category | **Engineering Science Course (ESC)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **3** | **0** | **0** | **0** | **3** | **40** | **3** |
| **CIE Marks:50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course Objectives:** Students will be revealed to
1. Apply the various lawsand principles of mechanics in various fields of engineering curricula and develop analytical ability and powers of reasoning.
2. Become conversant with basics of force systems to analyze various conditions developed in supports, static, relative motions and surfaces of the bodies in various planes.
3. To understand the significance of the area concentrated at one point in the planes and bodies, determine itscoordinate'sfor simple and composite sections and its higher properties like Moment of Inertia.
4. To familiarize with laws of rectilinear motion, kinematics of motion and their inter relationships.

| UNIT I: 7 Hours |
|---|
| **Basics of Civil Engineering:** Introduction to Civil engineering: Scope of different fields of civil engineering – Surveying, Building materials, Construction technology, Geotechnical engineering, Structural engineering, Hydraulics, Water resource engineering and Irrigation engineering, Transportation engineering, Environmental engineering. Infrastructure: Types of infrastructure, role of civil engineer in the infrastructure development, Effect of the infrastructure facilities on socio-economic development of a country. **Self-study: -**Roads, Bridgesand Dams; Types of roads, bridges and Dams, components and their function with simple sketches. |

| | |
|---|---|
| **UNIT II:** | **10 Hours** |

**Fundamental principles of mechanics:** Introduction**,** basic principles and concepts of mechanics, Laws of mechanics, Idealization of mechanics.
**Basic principles of statics:**Introduction to Force and its characteristics, equivalent system of forces, principles of transmissibility of a force, systems of forces, resultant of coplanar concurrent forces, component of a force, moment of a force with respect to a point, principles of moments (Varignon's theorem), Couples, effects of a force at another point, equations of static equilibrium, free body diagram.
**Co-planar forces (forces in a plane):**Resultant of co-planar concurrent forces, equilibrium of co-planar concurrent forces and Numerical problems.
**Co-planar non concurrent force system:**Resultant of co-planar non-concurrent forces, equilibrium of coplanar non concurrent forces and Numerical problems.

| | |
|---|---|
| **UNIT III:** | **8 Hours** |

**Support Reactions:**Introduction, Beam, Classification of beams, types of loads and supports, support reactions in statically determinate beams - Numerical problems.
**Friction:**Introduction, laws of dry friction, limiting friction, co-efficient of friction, angle of friction, angle of repose and cone of friction. Numerical problems on Blocks (horizontal and inclined plane), Ladder friction and Wedge friction.

| | |
|---|---|
| **UNIT IV:** | **8 Hours** |

**Centroid:**Introduction, centroid and center of gravity. Derivations of simple geometrical sections – rectangle, triangle, semicircle and quarter circle. Numerical problems on composite sections.
**Moment of Inertia:**Introduction, Moment of Inertia of an area, Parallel axis theorem, Perpendicular axis theorem, Radius of gyration, Polar moments of inertia. Derivations of simple geometrical sections – Rectangle, Triangle, Circle, Semicircle and Quarter circle. Numerical problems on composite sections.

| | |
|---|---|
| **UNIT V:** | **7 Hours** |

**Basic Principles of Dynamics**: Introduction, kinematics and kinetics, Definitions of Displacement, Speed, Velocity and Acceleration. D'Alembert's principlewith numerical problems.Newton's Laws of motion,Concept of Rectilinear motion: withsimple-numerical problems.Differential relationship between displacement, velocity and accelerations. Principles of projectile with numerical problems.

**COURSE OUTCOMES:** The students will be able to

**CO1:** Discuss the basics of Civil Engineering, Concept of Engineering Mechanics, Forces and ForceSystems to      determine the resultant

**CO2:** Define the effect of forces on the bodies in respect of its contact surfaces and the reactions developed in the           system

**CO3:** Identify the geometrical properties like, centroid and Moment of Inertia of regular, composite and built-up    sections.

**CO4:** Illustrate the concept of rectilinear motion,kinetics and kinematics of bodies with numerical approach.

**TEXT BOOKS:**

1. Irving H Shames, Engineering Mechanics, Prentice Hall.
2. F P Beer and E R Johnson, Vector Mechanics for Engineers, Vol-II-Dynamics, Tata McGraw Hill.
3. Engineering Mechanics by Timoshenko-Young and J V Rao, Mc Graw-Hills Book Company, New, Delhi
4. Elements of Civil Engineering (IV Edition) by S S Bhavikatti, Vikas Publishing House Pvt. Ltd. New, Delhi.
5. Elements of Civil Engineering and Engineering Mechanics, by M N Shesha Prakash and G VMogaveer, PHI Learning 2009.

  1 R C Hibler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
  2 Endy Ruina and Rudraprathap, Introduction to Statics and Dynamics, Oxford University Press.
  3 Shanes and Rao, Engineering Mechanics, Pearson Education.
  4  Bansal R J, Text Book of Engineering Mechanics, Likshmi Publications.
  5  Engineering Mechanics by M V S Rao and D R Durgaiah, University Press 2005.

**REFERENCE BOOKS:**

**ONLINE RESOURCES**

1. http://www.nptel.ac.in
2. https://en.wikipedia.org

## SCHEME FOR EXAMINATION

| QUESTION PAPER PATTERN FOR SEE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 01 | | 02 | | 03 | | 04 | | 05 | |

1. Two full questions (each of 20 Marks) are to be set from each unit.
2. Student shall answer five full questions selecting one full question from each unit.

## MAPPING OF Cos WITH POs

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

| Course Title | **BASIC ELECTRONICS AND COMMUNICATION ENGINEERING** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21ECT104/204** | | | | | | |
| Category | Engineering Science Course (ES) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 02 | 02 | 00 | 00 | 03 | 52 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | | |

**COURSE OBJECTIVES:**

1. Preparation:To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.

2. Core Competence: To equip students with a basic foundation in electronic engineering fundamentals required for comprehending the operation and application of electronic circuits, logic design, embedded systems and communication systems.

3. Professionalism & Learning Environment: To inculcate in first year engineering students an ethical and a professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context and life- long learning needed for a successful professional career.

| UNIT I | 8+3 hours |
|---|---|

**Electronic Circuits:** Rectifiers, Reservoir and smoothing circuits, Full-wave rectifiers, Bi-phase rectifier circuits, Bridge rectifier circuits, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers, Power Supplies–Block diagram, (No Derivations, Numericals on Rectifiers included).

**Amplifiers:** Types of amplifiers, Class of operation, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback.

**Operational amplifiers:** Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits, Multi-stage amplifiers.

**Oscillators:** Positive feedback, Conditions for oscillation, Ladder network oscillator, Wein bridge oscillator. (No Derivations, Numericals on Op-amp included). **Text 1**

***Self-study component: BJT types, comparison of BJT, FET &FinFET.***

| UNIT II | 8+3 hours |
|---|---|

**Logic Circuits:** Boolean Algebra, Logic gates, Realization of Boolean Expressions using basic gates and their truth table.

Half Adder and Full Adder, Multiplexer and decoder. Shift registers and its types – operation and truth table, Counters and asynchronous counters. Bistables, R-S Bistables, D-type Bistables, J-K Bistables. **Text 4**

Data representation, Data types, Data storage, A microcontroller system.

**Sensors and Interfacing**: Instrumentation and control systems, Transducers, Sensors. **Text 1**

Actuators, LED, 7-Segment LED Display, Optocoupler, Stepper Motor, Relay, Piezo Buzzer, PushButton Switch, Keyboard. **Text 2**

***Self-study component: Actuator types, LCD, Touch screen displays***

| UNIT III | 8+2 hours |
|---|---|

**Embedded Systems**: Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC, Harvardvs Von-Neumann, Big-EndianvsLittle-Endian,Memory,Program storage memory (ROM),RAM, Embedded firm ware, other system components. **Text 2**

**Communication Interface:** UART, Parallel Interface, USB, Bluetooth, Wi-Fi, GPRS. **Text 2**

***Self-study component: Block diagrams of the architectures of RISC, CISC, Harvard and Von-Neumann.***

| UNITIV | 8+2 hours |
|---|---|

**Analog and Digital Communication**: Modern communication system scheme, Information source and input transducer, Transmitter, Channel – Hardware and Software, Noise, Receiver, Multiplexing, Types of communication systems. **Text 3**

Types of modulation (only concepts)– AM,FM,PhaseModulation,PulseModulation,PAM,PWM,PPM,PCM. Concept of Radio wave propagation. Concepts of Sampling theorem, Nyquist rate, Digital Modulation Schemes– ASK, FSK,PSK

*Self-study component: Evolution of Wireless Network Communication Technologies (1G, 2G, 3G and4G, 5G).*

| UNITV | 8+2 hours |
|---|---|

**Data Transmission:** Asynchronous Transmission, Synchronous Communication, Data Compression, Encryption.

Radio Waves, Antennas, Satellite Communication, Microwave Communication, Optical Fiber Communication (OFC): Block diagram of OFC, Advantages of OFC, Applications of OFC. **Text 4**

**Cellular Wireless Networks** - Introduction, cellular telephone system, cellular concept and frequency reuse.

**Text 3**

*Self-study component:* **Co-ordination number, Atomic packing factor (APF) for simple cubic, body centered and face centered cubic structure. Applications of nanomaterials: Medical and Electronics.**

**TEACHING LEARNING PROCESS:** Chalk and Talk, power point presentation, animations, videos

**COURSE OUTCOMES:** On completion of the course, student should be able to:

**CO1:** Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators.

**CO2:** Explain the concepts of digital logic circuits, sensors, actuators and I/O subsystems.

**CO3:** Discuss the characteristics of embedded systems and types of communication interface.

**CO4:** Describe the fundamental concepts of analog communication, digital communication and radio wave propagation.

**CO5:** discuss the techniques of data transmission, different modes of communication, wired and wireless communication systems.

## TEXT BOOKS

1. MikeTooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015. DO Ihttps://doi.org/10.4324/9781315737980. eBook ISBN9781315737980

2. KVShibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016.

3. SLKakaniand Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017. https://elib4u.ipublishcentral.com/pdfreader/communication-systems

4. DPKothari, IJNagrath, 'BasicElectronics', 2ndedition, McGraw Hill Education (India), Private Limited, 2018.

## REFERENCE BOOK

1. Mitchel E. Schultz, 'Grob's Basic Electronics', 11th Edition, McGraw-Hill, 2011.

## ONLINE RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_ee55/preview

## MODERN TOOLS:

1. PSPICE

***Note: Questions from Self-study component will not be asked for CIE and SEE.***

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 1 | | 2 | | 3 | | 4 | | 5 |

1. Two full questions (each of 20 Marks) are to be set from each unit.

2. Student shall answer five full questions selecting one full question from each unit.

## MAPPING of COs with POs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | | 1 | | | 2 | 1 | 1 | | 3 |
| CO2 | 3 | 2 | 1 | | | | | 2 | 1 | 1 | | 3 |
| CO3 | 3 | | | | | | | 2 | 1 | 1 | | 3 |
| CO4 | 3 | | | | | | | 2 | 1 | 1 | | 3 |
| CO5 | 3 | | | | | | | 2 | 1 | 1 | | 3 |
| **Strength ofcorrelation:**Low-1, Medium-2, High-3 | | | | | | | | | | | | |

| Course Title | **ELEMENTS OF MECHANICAL ENGINEERING** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21MET105/205** | | | | | | |
| Category | Engineering Science Course (EC) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 02 | 00 | 02 | 00 | 04 | 52 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | | **Duration of SEE: 03 Hours** | | | |

**COURSE OBJECTIVE:**

1. Acquire a basic understanding role of Mechanical Engineering in the industry and society, formation of steam and its industrial application, renewable energy resources and basic concepts of Hydraulic turbines.

2. Acquire knowledge on automobile technology in transport application and basics of Refrigeration and Air-Conditioning.

3. Acquire knowledge of various engineering materials, and metal joining techniques.

4. Acquire essential experience on basic Power transmission systems and Robotics.

5. Acquire knowledge of basic concepts on manufacturing principles and machine tools and their advancement.

| UNIT 1 | 8+3 hours |
|---|---|

**Introduction to Mechanical Engineering (Overview only):**
Role of Mechanical Engineering in Industries and Society
**Sources of energy:** Classification, renewable and non- renewable sources of energy and comparison.
**Steam:** Steam formation at a constant pressure: properties of steam, simple numerical problems to understand the use of steam tables. Applications of steam in industries.
**Power generating systems:** Introduction, construction and working of: Steam turbines – Impulse and reaction turbine, Gas turbines – Open and closed cycle, Hydraulic turbines – Pelton wheel, Francis and Kaplan turbine.
**Power absorbing systems:** Introduction, classification of pumps and compressors.
***Self-study:***
***Harnessing of renewable energy sources: Wind energy, Solar energy, Bio-mass and their applications***
***Boilers- Introduction, classification of boilers, difference between fire tube and water tube boilers.***
***Laboratory Components:***
*1. Study/Visit any one Conventional or Renewable Energy Power Plant and prepare a comprehensive report.*
***2.*** *Demonstration of Components of any one Turbo-machine.*
***3.*** *Study/Visit to an Industry using steam for their process and prepare a comprehensive report.*

| UNIT 2 | 8+3 hours |
|---|---|

**Internal combustion engines:** Introduction, classification, parts and terminology of I C engines, working of 4-stroke petrol & diesel engines, simple numerical problems on four stroke engines. Applications of IC engines.
**Hybrid and Electrical vehicles:** Introduction, basic working principle ofelectrical and hybrid vehicles.
**Refrigeration and Air conditioning-** Introduction, definition and unit of refrigeration. Refrigerants and their properties. Types of refrigeration systems- Vapour absorption and Vapour compression refrigeration systems and their comparison. Principle & working of room air conditioner. Applications of Refrigerators and Air conditioning system.
***Self-study:***
***Engines: Two stroke petrol and diesel engines, emission norms.***
***Laboratory Components:***
*1. Study of Engine Components through Cut Sections*
*2. Demonstrate Components and Working principles of Domestic Refrigerator and prepare a comprehensive report* ***OR*** *Study/visit any commercial centralized Air-Conditioning unit, understand various components and operations, and prepare a comprehensive report.*

| **UNITIII** | **8+2 hours** |
|---|---|

**Engineering Materials:** Types and applications of ferrous, nonferrous metals and alloys. Composite Materials: Introduction, classification and applications.

**Heat treatment:** Introduction to heat treatment, Types of Heat Treatment: Annealing, quenching, carburizing, and hardening.

**Metal Joining Processes:**

**Soldering and brazing:** Definition, types, advantages, limitations and applications of soldering and brazing. Working principle of soldering iron and torch brazing methods.

**Welding:** Introduction, classification and applications of welding. Working principle of electric arc welding and oxy-acetylene gas welding. Introduction to TIG and MIG welding.

*Self-study:*

*Engineering materials: Polymers, Ceramics, Bio materials, Smart materials and its engineering applications.*

*Laboratory Components*

*1. One exercise each involving Welding, Soldering, and Brazing.*

*2. Study oxy-acetylene gas flame structure and its application to gas welding*

*3. Demonstration of **anyone** Heat transfer application device and prepare a comprehensive report*

| **UNIT IV** | **8+2 hours** |
|---|---|

**Power transmission:**

**Belt drives** – Introduction, types of belts and belt drive. Terminology - velocity ratio, creep and slip.

**Gear drives** - Introduction, classification; Gear trains – types of gear train. Simple numerical problems on gear drives.

**Robotics**: Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics in Material Handling, Processing, Assembly, and Inspection.

*Self-study:*

*Power transmission: Rope drives, Chain drives and Pulleys.*

*Laboratory Components:*

*1.   Demonstration of the machine consists of Gear Trains*

*2.   Demonstration of various elementary mechanisms and their motion.*

*3.   Demonstration of any one model of Robot*

| UNIT V | 8+2 hours |
|---|---|

**Manufacturing process:** Introduction and classification of manufacturing process.

**Machine tools: Lathe -**Working principle and specification of center lathe.Sketch and description of operations performed – turning, facing, knurling, thread cutting, drilling, taper turning. Construction and Working of Milling Machines and applications.

**Introduction to Mechatronics**: Concept of open-loop and closed-loop systems, Examples of Mechatronic systems and their working principle.

**Rapid prototyping (3D printing)** - Definition, Classifications, Advantages, Disadvantages, Applications, Brief introduction of 3D Printers-SLA, SLS, FDM.

*Self-study:*

*Introduction to Modern Manufacturing Tools and Techniques:*

*CNC: Introduction, components of CNC, advantages and applications of CNC, CNC Machining centres and Turning Centers.*

*Laboratory Components:*

*1. Demonstration of developing one model involving Lathe, Milling and Drilling*

*2. Study/Visit an Industry using CNC/ modern techniques and submit a report*

| TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos |
|---|

**COURSE OUTCOMES:** On completion of the course, student should be able to:

**CO1:Demonstrate** the working of various power generation devices such as steam, gas, hydraulic turbines and power absorbing devices like air compressors.

**CO2**: **Analyze** about the various IC engines, and power absorbing devices such as refrigerators and air conditioning.

**CO3**:**Describe** the engineering materials, heat treatment, joining processes for various applications.

**CO4**:**Describe** power transmission methods for various applications.

**CO5:Demonstrate** the principle, application of various basic and advanced manufacturing processes.

**TEXT BOOKS**

1. Elements of Mechanical Engineering - K.R. Gopalkrishna, Subhash publishers, Bangalore.
2. A Text Book of Elements of Mechanical Engineering – S. Trymbaka Murthy I. K. International Pvt Ltd, 2010 - Mechanical engineering
3. Elements of Mechanical Engineering – Dr. A.S. Ravindra, Best Publications, 7th edition, 2009.
4. Robotics, AppuKuttan KK K. International Pvt Ltd, volume 1.
5. Material Science, by Raghavan, Fifth Edition,PHI(P)LTD.

**REFERENCE BOOKS**

1. Elements of Workshop Technology. Vol 1 & 2, S.K.H. Chowdhary, A.K.H. Chowdhary and Nirjhar Roy, 11th edition 2001, Media Promoters and Publishers, Mumbai.
2. Hand books of Mechanical Engineering.
3. Material science, by Callister, Reprint 2008,Wiley India(P) LTD

**ONLINE RESOURCES**

1. http://www.nptel.ac.in
2. https://en.wikipedia.org
3. https://mechanicalengineeringworld.com/

| Assessment Details both (CIE and SEE) |
| --- |
| The weightage of Continuous Internal Evaluation (CIE) and Semester End Exam (SEE) is 50% each. The students have to obtain a minimum of 40% marks individually both in CIE and SEE to pass. |
| Student has to score a minimum of 40% marks individual in thoery and laboratory test components to quality to take up SEE. |
| Student has to score a minimum of 40% marks in SEE to pass. |

| CONTINUOUS INTERNAL EVALUATION (CIE) | | Max Marks | | Minimum Marks to be scored in CIE, to qualify to take SEE (40% individually) |
|---|---|---|---|---|
| Theory | Weightage of Tests (Test1, Test2) | 30 | | 12 |
| Laboratory components | Lab demonstration components: Rubrics for each lab component are added, then taken average (more emphasized on demonstrationtopics) | 10 | 20 | 08 |
| | Lab Test | 10 | | |
| TOTAL | | 50 | | 20 |

Note: Questions from Self-study component will not be asked for CIE and SEE.

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 1 | | 2 | | 3 | | 4 | | 5 | |
| 1. Two full questions (each of 20 Marks) are to be set from each unit. | | | | | | | | | | |
| 2. Student shall answer five full questions selecting one full question from each unit. | | | | | | | | | | |

MAPPING of COs with POs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 3 |
| CO2 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 3 |
| CO4 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 3 |
| CO5 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 3 |
| Strength of correlation: Low-1,    Medium- 2, High-3 | | | | | | | | | | | | |

| Course Title | **ENGINEERING GRAPHICS** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21MEL105/205** | | | | | |
| Category | Engineering Science Course (EC) | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 02 | 00 | 02 | 00 | 04 | 52 | 03 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | |

**Course Objectives:**

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

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

- Students should be made to aware of powerful communication tool – Drawing.
- Simple Case studies can be suitably selected by the teacher for hands on practice to induce the feel of fruitfulness of learning.
- Appropriate Models, Power Point Presentation, Charts, Videos, shall be used to enhance visualization before hands on practice.
- For application problems use very generally available actual objects. (Example: For rectangular prism / object; matchbox, carton boxes, book, etc can be used. Similarly for other shapes).
- Use any CAD software for generating orthographic and pictorial views.
- Make use of sketch book with graph sheets for manual / preparatory sketching.

| UNIT I | 12 hours |
|---|---|

**Introduction:** *(Not for SEE)*

Significance of Engineering drawing, Lettering, BIS Conventions of Engineering Drawing, Freehand sketching of engineering drawing, Introduction to Scales and its types.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet andcurves.

**Orthographic Projections of Points, Lines and Planes:**

Introduction to Orthographic projections, Orthographic projections of points in all the quadrants. Orthographic projections of lines placed in first quadrant only; Inclined to HP,toVP and to both the planes.

Orthographic projections of planes placed in first quadrant only; resting on HP and on VP, inclined to HP,to VP and toboth the planes viz. triangle, square, rectangle, pentagon, hexagon and circular laminae.

***Application on projections of Lines & Planes (Not for SEE)***

| UNIT II | 12 hours |
|---|---|

**Orthographic Projection of Solids:**

Orthographic projection of right regular solids resting on HP, inclined to HP and to VP only.

Prisms and Pyramids (triangle, square, rectangle, pentagon, hexagon), Cylinders, Cones, Cubes, Tetrahedron. Applications problems on projections of Solids (Not for SEE)

***Projections of Frustum of cone, pyramid & truncated sphere (Not for SEE)***

| UNIT III | 10 hours |
|---|---|

**Isometric Projections:**

Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simplesolids.

**Conversion of simple isometric drawings into orthographic views**.

Problems on applications of Isometric projections of simple objects / engineering components***(Not for SEE)***

***Introduction to drawing views using 3D environment (Not for SEE)***

| UNIT IV | 10 hours |
|---|---|

**Development of Lateral Surfaces of Solids:**

Development of lateral surfaces of right regular prisms, cylinders, pyramids, and cones resting with baseonHPonly.

Development of their frustums and truncations.

Problems on applications of development of lateral surfaces like funnels, trays *(Not for SEE)*

*Problems on applications of development of lateral surfaces of transition pieces connecting circular duct and rectangular duct (Not for SEE)*

| UNIT V | 08 hours |
|---|---|

**Multidisciplinary Applications & Practice *(Not for SEE):***

**Free hand Sketching;** True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc.

**Drawing Simple Mechanisms;** Gear trains, Ratchets, two wheeler cart & Four wheeler carts to dimensions etc.

**Electric Wiring and lighting diagrams;** Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software

**Basic Building Drawing;** Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or suitable software,

**Electronics Engineering Drawings**- Like, Simple Electronics Circuit Drawings.

**Graphs & Charts**: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.

**COURSE OUTCOMES: On completion of the course, student should be able to:**

**CO1. Understand** and visualize the objects with definite shape and dimensions

**CO2. Analyse** the shape and size of objects through different views

**CO3.Develop** the lateral surfaces of the object

**CO4.Create** a 3D view using CAD software

**CO5. Identify** the interdisciplinary engineering components or systems through its graphical representation

**TEXT BOOKS:**

1. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53$^{rd}$ edition, Charotar Publishing House Pvt. Limited,2019.

2. K.R Gopalakrishna & Sudhir GopalakrishnaTextbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017.

3. S. N. Lal: Engineering Drawing with an Introduction to Auto CAD: First-angle Projection 1st Edition, Cengage, Publication, 2018.

4. S.N. Lal, & T Madhusudhan:, Engineering Visulisation, 1st Edition, Cengage, Publication.

5. LuzadderWarrenJ.,DuffJohnM., Fundamentals of Engineering Drawing: with an Introduction to Interactive Computer Graphics for Design and Production, Prentice-Hall of India Pvt. Ltd., New Delhi, Eastern Economy Edition,2005.

**REFERENCE BOOKS:**

1. Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press,2015.

2. Dhawan R. K., A Textbook of Engineering Drawing, 3/e, S. Chand Publishing,2019.

3. Venugopal K., Engineering Drawing and Graphics, New Age International publishers,2014.

4. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint2005.

5. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newnes,1997.

6. K S Sai Ram Design of steel structures, Third Edition by Pearson.

7. Nainan p kurianDesign of foundation systems, Narosa publications.

8. A S Pabla, Electrical power distribution, 6th edition, Tata Mcgraw hill.

| SCHEME FOR CIE | | |
|---|---|---|
| | **DETAILS** | **MAX. MARKS** |
| **Manual Sketching (25)** | Classwork | **15** |
| | Assignment | **10** |
| **Computer Printout (15)** | Classwork | **15** |
| **Test Marks\*** | | **10** |
| **TOTAL CIE MARKS** | | **50** |

43

| * Test marks is based on the average of two tests conducted in the mid-semester and end-semester. | |
|---|---|

## QUESTION PAPER PATTERN FOR SEMESTER END EXAMINAITON (SEE)

| UNIT | 1 | | 2 | | 3 | | 4 | |
|---|---|---|---|---|---|---|---|---|
| Max. Marks | 15 | | 15 | | 10 | | 10 | |
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 |

NOTE:
1. Two Full Questions to be set from each Unit with internal choice.
2. Each Full question shall cover all the topics of the Unit.
3. Model question paper may be referred for distribution of topics in each Full Question.

## SCHEME OF EVALUATION FOR SEE

| Unit | Maximum Marks | Manual Sketching | Computer display and print out |
|---|---|---|---|
| 1 | 15 | 08 | 07 |
| 2 | 15 | 07 | 08 |
| 3 | 10 | 05 | 05 |
| 4 | 10 | 05 | 05 |
| Total | 50 | 25 | 25 |

NOTE: Evaluation shall be carried out jointly by both the examiners.

## MAPPING OF COs WITH POs

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

**Strength of correlation:** Strongly related-3, Moderately related-2, Weakly related-1, Not related-0

## Dr Ambedkar Institute of Technology, Bengaluru-56
## Department of Physics
## Scheme and Syllabus - CBCS – 2021 -2022

| Course Title | **ENGINEERING PHYSICS LABORATORY** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21PHL106/206** | | | | | | |
| Category | Basic Science Course (BS) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 00 | 00 | 02 | 00 | 02 | 26 | 01 |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks=100** | | **Duration of SEE: 03 Hours** | | |

**Course objective:** To make Engineering students to understand basic concepts and principles of Physics. Gain the practical knowledge of elasticity, vibrations, Laser and optical fibers.

| Sl. No. | Title of the Experiment | Compatibility with the theory course |
|---|---|---|
| 1. | Determination of Young's Modulus of a material by single cantilever. | Unit I |
| 2. | Determination of Rigidity modulus of a material by torsional pendulum. | Unit I |
| 3. | Determination of acceleration due to gravity by using bar pendulum. | Unit I |
| 4. | Determination of resonant frequency & quality factor in Series & Parallel LCR Circuits | Unit I |
| 5. | Determination of Planck's constant using LED's | Unit II |
| 6. | Determination of knee voltage and resistance from I-V characteristics of Zener Diode. | Unit III |
| 7. | Measurement of dielectric constant. | Unit III |
| 8. | Determination of Fermi energy of copper. | Unit III |
| 9. | Determination of wavelength of Semiconductor Laser by diffraction method. | Unit IV |
| 10. | Determination of Acceptance angle and numerical aperture of an optical fiber. | Unit IV |
| 11. | Radius of curvature of Plano convex lens using Newton's rings | Unit IV |
| 12. | Energy gap of a given semiconductor | Unit III |

**COURSE OUTCOMES:** At the end of the course the students will be able to:

CO1: Apply the Physics concepts relevantly and appropriately where ever required.

CO2: The mechanical properties of solids will be understood by carrying out experiments of Young's Modulus, rigidity modulus and bar pendulum.

CO3: The optics experiments such as wavelength of laser by diffraction and numerical aperture of an Opticalfiber will help the students to understand the significance of Physics in various fields of Science and Technology.

CO4: Understand the importance of Physics in electronics.

**REFERENCE BOOKS:**
1.  Laboratory Manual in Applied Physics    -- H. Sathyaseelan. – New Age International.
2.  An Advanced Course in Practical Physics --  D. Chattopadhyay and P.C. Rakshit, New Central Book Agency (p) Ltd, Kolkata .

**Web link for Physics virtual lab: https://www.vlab.co.in/broad-area-physical-sciences**

•   The maximum Marks prescribed for SEE is 50.
•   Students shall perform one or two experiments (50 Marks) for the duration of 3 hours.

**MAPPING of COs with POs**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1  | √   | √   |     |     |     |     |     |     |     |      |      |      |
| CO2  | √   | √   |     |     |     |     |     |     |     |      |      |      |
| CO3  | √   | √   |     |     |     |     |     |     |     |      |      |      |
| CO4  | √   | √   |     |     |     |     |     |     |     |      |      |      |
| **Strength of correlation:** Low-1,   Medium- 2, High-3 |||||||||||||

| Course Title | **ENGINEERING CHEMISTRY LABORATORY** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21CHL106/206** | | | | | |
| Category | Basic Science Course (BS) | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 00 | 00 | 02 | 00 | 02 | 12 | 01 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | |

**COURSE OBJECTIVE:** To expose first year engineering students to various experimental technique related to potentiometric, conductometric, colourimetric and PKa with a view to highlight their significance and importance in application oriented systems. Students will be able to analyze hardness of water, COD of waste water.

| Sl. No. | Syllabus content |
|---|---|
| | **PART-A** |
| 1 | Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution. |
| 2 | Colorimetric determination of Copper. |
| 3 | Conductometric estimation of acid mixture using standard NaOH solution. |
| 4 | Determination of pKa of a weak acid using pH meter. |
| 5 | Determination of viscosity coefficient of a given liquid using Ostwald's viscometer. |
| 6 | Flame photometric estimation of Sodium and Potassium in the given sample of water. (Demonstration) |
| | **PART-B** |
| 7 | Determination of Total Hardness of water using disodium salt of EDTA. |
| 8 | Determination of Calcium Oxide in the given cement by Rapid EDTA method. |
| 9 | Determination of percentage of Copper in the given brass solution using standard Sodium thiosulphate solution. |
| 10 | Determination of Iron in Hematite ore solution using Potassium dichromate crystals by external indicator method. |

| 11 | Determination of Chemical Oxygen Demand of the given industrial waste water sample. |
|---|---|
| 12 | Determination of Total Alkalinity of given water sample using standard Hydrochloric acid.(Demonstration) |

## Course Outcomes:

1. Students will be able to apply the basic concepts electrochemistry in experiments such as potentiometry and determination of PKa of weak acid, conductometry experimentsetc

2. Students will be able to understand concepts of electromagnetic radiation and perform coulorimetric experiments.

3. Students will be able to analyze the total hardness of water sample and COD of the wastewater

4. Students will be able to analyze the hematite ore in the given sample.

## References Books:

1. Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.

2. Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J.Bassett, J.Mendham and R.C Denney.

## VIRTUAL LAB LINK DETAILS:

- https://www.labster.com/chemistry-virtual-labs/
- https://youtu.be/OwZbw6Mhrqc
- https://youtu.be/UOLOsKZxi6Y

- The maximum Marks prescribed for SEE is 50.
- Students shall perform one or two experiments (50 Marks) for the duration of 3 hours.

## MAPPING of COs with POs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | √ | √ | | | | | | | | | | |
| CO2 | √ | √ | | | | | | | | | | |
| CO3 | √ | √ | | | | | | | | | | |
| CO4 | √ | √ | | | | | | | | | | |
| Strength of correlation: Low-1, Medium- 2, High-3 | | | | | | | | | | | | |

| Course Title | **BASIC ELECTRICAL ENGINEERING LABORATORY** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21EEL107/207** | | | | | |
| Category | Engineering Science  (ES) | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 00 | 00 | 02 | 00 | 02 | 26 | 01 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | |

**COURSE OBJECTIVE:**

1. To understand and measure electrical quantities and parameters.
2. To verify the relation between line and phase quantities, measure power and power factor in three-phase circuits.
3. To demonstrate fundamental laws of electrical engineering.
4. To determine the efficiency of single-phase transformers
5. To understand the significance of power, power factor, and control electrical Lamps from different places.

| Expt No | Syllabus Contents | No.of Hours | Blooms Taxonomy level. |
|---|---|---|---|
| 1 | Measurement of Resistance using Voltmeter-Ammeter method and verification using Wheatstone bridge. | 2 | L1 |
| 2 | Measurement of Inductance in single-phase circuit by the three-voltmeter method. | 2 | L2 |
| 3 | Measurement of voltage, current, power, and power factor and verify line and phase relationship in the three-phase star-connected circuit. | 2 | L3 |
| 4 | Verification of Kirchhoff's Laws in DC circuits | 2 | L2 |
| 5 | Verification of maximum power theorem in DC circuits. | 2 | L2 |
| 6 | Comparison of domestic lamps against their power consumption. | 2 | L3 |
| 7 | Improvement of power factor in inductive circuits. | 2 | L3 |
| 8 | Control of electrical Lamp from one, two and three points. | 2 | L2 |
| 9 | Load test on a single-phase transformer. | 2 | L3 |

| 10 | Demonstration of FUSE and MCB by creating overload and fault. | 2 | L1 |
|---|---|---|---|
| | **EXPERIMENTS BEYOND SYLLABUS** | | |
| 1 | Speed load characteristics of a three-phase induction motor. | 2 | L2 |
| 2 | Voltage regulators to control electrical output. | 2 | L3 |

## Course Outcomes:

**CO1:** Verify basic laws and theorem of electrical circuits.

**CO2:** Understand the power consumption of different types of lamps and control of lamps

from different points.

**CO3:** Determine the impedance of an electrical circuit and power consumption by a 3-phase

load.

**CO4:** Evaluate the performance of single-phase transformers.

**CO5:** Demonstrate the effects of fault and protection of electrical circuits.

## References.

1.  Dr. Eranna Dr. S. Vasudevamurthy, "Department manual.

## Web Links.

1.  http://vlab.amrita.edu/?sub=1&brch=75&sim=217&cnt=1/
2.  http://vlab.amrita.edu/?sub=1&brch=75&sim=322&cnt=1

- The maximum Marks prescribed for SEE is 50.
- Students shall perform one or two experiments (50 Marks) for the duration of 3 hours.

## MAPPING of COs with POs and PSOs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | 1 | | 1 | 1 | 1 | | 1 | 3 | | 1 |
| CO2 | 3 | 3 | | | | 1 | | 1 | 1 | 1 | | 1 | 3 | | 1 |
| CO3 | 3 | 3 | | | | 1 | | 1 | 1 | 1 | | 1 | 3 | | 1 |
| CO4 | 3 | 3 | | | | 1 | | 1 | 1 | 1 | | 1 | 3 | | 1 |
| CO5 | 3 | 3 | | | | 1 | | 1 | 1 | 1 | | 1 | 3 | | 1 |
| **Strength of correlation:** Low-1, Medium- 2, High-3 | | | | | | | | | | | | | | | |

| | COMPUTER PROGRAMMING LABORATORY | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21CSL107/207** | | | | | | |
| Category | Engineering Science Course (ES) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Hrs./ semester | Credits |
| | L | T | P | SS | Total | | |
| | 0 | 0 | 2 | 0 | 2 | 26 | 1 |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 03 Hours** | | |

**Course objectives to:**

• Explain problem statements and identify appropriate solutions
• Demonstrate the use of IDE, C Compiler, and identify and rectify the syntax and syntactic errors during programming.
• Development of algorithms and programs using constructs of C programming language
• Reporting the observations

| Practice Programs | |
|---|---|
| 1. | To calculate simple interest (SI) for a given principal (P), time (T), and rate of interest (R) (SI = P*T*R/100). |
| 2. | To print the ASCII value of the given input. |
| 3. | To findlargest of three numbers. |
| 4. | To perform simple calculator using switch case statement. |
| 5. | To find factorial of a number. |
| 6. | To print even and odd numbers using looping Construct. |
| 7. | To find sum of N natural Numbers |
| 8. | Write a C Program to search for the given key element with the help of Linear search technique. |
| 9. | Develop a c program to implement selection sort technique. |
| 10. | Develop a C program to swap two numbers using pointers (Call by Reference). |

| Lab Programs |
|---|
| 1 | a | Write a C program to find the roots of a quadratic equation. |
| | b | Write a C program to print the numbers in triangular form<br>　　1<br>　　1 2<br>　　1 2 3<br>　1 2 3 4 |
| 2 | a | Write a C program to check whether the given four digit number is palindrome or not. |
| | b | Write a C program using function to sort the given array elements using bubble sort technique. |
| 3 | a | Develop a C program  to Store age of n students and perform the following operations<br>　i.　　　Find minimum age of student in the list<br>　ii.　　　Find maximum age of a student in the list |
| | b | Develop a C Program to compute Sin(x) using Taylor series approximation.Compare your resultWith the built- in Library function. Print both the results with appropriate messages. |
| 4 | a | If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss and determine how much profit or loss incurred in percentage. |
| | b. | Write a C program to implement Recursive functions for Binary to Decimal Conversion. |
| 5 | a | Write a C program to generate N Fibonacci series. |
| | b | Develop a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers. |
| 6 | a | Write a C program to check whether the given number is prime or not. |
| | b | Write a C program to<br>　i.　　　read N Bank Employees name<br>　ii.　　　Search for an employee in the list using Binary Search Technique.<br>Note: Use 2-D character array to store Bank employees names |

| 7 | a | Develop a C program to calculate tax based on given yearly salary and tax percentages. Read monthly salary of an employee as an input from the user.<br>Conditions to calculate tax, if yearly salary is:<br><br>| Income Range | Tax Charges |<br>|---|---|<br>| <=1,50,000 | No tax |<br>| 1,50,001 to 3,00,000 | 10% |<br>| 3,00,001 to 5,00,000 | 20% |<br>| 5,00,001 and above | 30% | |
|---|---|---|
| | b | Write a menu driven C Program to compute Trace and Norm of a matrix Using Functions. |
| 8 | | Write C functions to implement string operations such as Compare, Concatenate and String length. Convince the parameter passing techniques. |
| 9 | | Three people denoted by P1, P2, P3 intend to buy some rolls, buns, cakes and bread. Each of them needs these commodities in differing amounts and can buy them in two shops S1, S2. Which shop is the best for every person P1, P2, P3 to pay as little as possible? The individual prices and desired quantities of the commodities are given in the following tables:<br><br>Demanded quantity of foodstuff:<br><br>| | roll | bun | cake | bread |<br>|---|---|---|---|---|<br>| $P_1$ | 6 | 5 | 3 | 1 |<br>| $P_2$ | 3 | 6 | 2 | 2 |<br>| $P_3$ | 3 | 4 | 3 | 1 |<br><br>Prices in shops $S_1$ and $S_2$:<br><br>| | $S_1$ | $S_2$ |<br>|---|---|---|<br>| roll | 1.50 | 1.00 |<br>| bun | 2.00 | 2.50 |<br>| cake | 5.00 | 4.50 |<br>| bread | 16.00 | 17.00 |<br><br>**MATRIX MULTIPLICATION**<br><br>Write a C program by considering 2 matrices A (M x N) and B (P x Q) that uses functions to perform the following: i. Reading data to p1, p2, p3 (Matrix A) ii. Reading data to s1, s2 (Matrix B) iii. Multiplication of Two Matrices(C=AXB) |
| 10 | | Write a C Program To maintain a record of bank customer's with four fields (Customer ID, Customer Name, Address and ACC-Num). Read and display the bank customer details.<br>Note: Using array of structures. |

**Note:** In the practical examination the student need to select one question and both a, b (if present) should be executed. All the questions listed in the syllabus have to be included in        the lots. The change of question has to be considered by deducting marks(20% of     execution),    provided the request is made for the same, within half an hour from the start of the examination.

**Course Outcomes:**

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

**CO1:**Define the problem statement and identify the need for computer programming

**CO2:**Make use of C compiler, IDE for programming, identify and correct the  syntax and  syntactic errors in programming

**CO3:**Develop algorithm, flowchart and write programs to solve the given problem

**CO4:**Demonstrate use of functions, recursive functions, arrays, strings, structures and pointers in problem solving.

**Suggested Learning Resources:**

1.  Yashavanth Kanetkar, Let us C, Authentic Guide to C Programming Langauge, bpb publisher, 17th Edition, 2020.

2.  Herbert Schildt, C: The complete reference, Mc Graw Hill, 4th Edition, 2017 Programming in C, Reema Theraja, Cengage publication.

**Weblinks and Video Lectures (e-Resources):**

1.  http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
2.  https://nptel.ac.in/courses/106/105/106105171/

*   The maximum Marks prescribed for SEE is 50.
*   Students shall perform one or two experiments (50 Marks) for the duration of 3 hours.

**MAPPING of COs with POs**

| CO-PO Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | 2 | | 3 | - | - | - | - | - | - | - |
| CO3 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - |
| CO | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - |

| Course Title | **COMMUNICATIVE ENGLISH** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21HST108** | | | | | |
| Category | **Humanities & Social Sciences (HS)** | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total Hrs./ semester | Credits |
| | L | T | P | SS | Total | | |
| | 1 | 0 | 1* | - | 02 | 26 | 01 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks: 100** | **Duration of SEE: 02 Hours** | | | |

**COURSE OBJECTIVE:** To enable the students to assimilate the correct patterns of the language, & to develop students insight into the structure of English language. To enrich vocabulary bank, to communicate more effectively in English, to express opinions including facts & ideas & maintain conversation in everyday situations. To use digital literacy tools their LSRW skills can be enhanced and to master good speaking skills with different strategies.

| UNIT I | 4 hours |
|---|---|
| Introduction to Communicative English, Fundamentals of Communicative English, Barriers to Effective Communicative English, Different styles in Communicative English, Interpersonal Communication Skills, How to improve Interpersonal Communication Skills, Developing Interpersonal Skills. Grammar: Basic English Grammar and Parts of Speech - Nouns, Pronouns, Adjectives, Verbs, Adverbs, Preposition, Articles, Conjunctions. | |

| UNIT II | 6 hours |
|---|---|
| Grammar: Preposition, kinds of Preposition and Prepositions often confused / used in different situations. Word Accent – Rules for Word Accent, Stress Shift, Question Tags, Question Tags for Assertive Sentences (Statements) – Some Exceptions in Question Tags and Exercises, Vocabulary: One Word Substitutes and Exercises, Synonyms and Antonyms, Exercises on it. Idioms & Phrases, Words often confused, Homophones, homonyms | |

| | |
|---|---|
| **UNIT III** | **6 hours** |

Grammar: Articles – Definite & Indefinite articles, Spelling Rules and Words often Misspelt, Word Pairs (Minimal Pairs), Sequence of Tenses (Rules in use of Tenses), Situational dialogues: Self-introduction, greeting, thanking, accepting thanks, apologizing, invitations, making complaints, Wh-questions/ yes-no questions, Vocabulary: Contractions/Abbreviations, strong and Weak forms of verbs, Words Formation-Prefixes and Suffixes.

| | |
|---|---|
| **UNIT IV** | **5 hours** |

Communication Skills: LSRW Skills

| | |
|---|---|
| **UNIT V** | **5 hours** |

Speaking Skills**:** Extempore / Public Speaking, Difference between Extempore / Public Speaking, and Guidelines for Practice. Listening Comprehension. Oral Presentation, Role Plays Just a minute (JAM), Group Discussion, Persuasion Speech, Description.

**TEACHING LEARNING PROCESS:  Chalk and Talk, power point presentation, videos**

**COURSE OUTCOMES:** On completion of the course, student will be able to:

**CO1:** Learn basic grammar rules, developed the mastery of language.

**CO2:** Enhance vocabulary and fluency will be increased.

**CO3:** Gain the ability to communicate confidently in various situations.

**CO4:** improve listening, speaking, reading and writing skills.

**CO5:** Overcome their stage freight and express their views freely without hesitation.

**TEXT BOOKS**
1. Workbook
2. English Grammar and composition by WREN AND MARTIN
3. Contemporary English Grammar by JAYANTHI DAKSHINAMURTHY
4. English for Technical Communication by LAKSHMINARAYANA K.R
5. Effective English for Technical Communication by FARATULLAH T.M

**REFERENCE BOOKS**
1. Objective English ( Multiple choice questions with answers for competitive examinations) by Dr.B.James
2. The English Errors of Indian Students by T.L.H Smith Pearse.

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3. Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press - 2018.
4. A Textbook of English Language Communication Skills, Infinite Learning Solutions – (Revised Edition) 2020.
5. English for Engineers by N.P.Sudharshana and C.Savitha, Cambridge University Press 2018.
6. Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
7. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – 2019.
8. Practical English Usage by Michael Swan, Oxford University Press – 2016.
9. Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
10. Effective Technical Communication – Second Edition by M. Ashraf Rizvi, McGraw Hill Education (India) Private Limited – 2018.

## SCHEME FOR EXAMINATIONS

**Theory Question Paper Pattern:**
**CIE- Objective type (Max. marks: 30 marks)**

- The Pattern of question paper is MCQ (1 mark each).
- Theory SEE paper will be set for 50 questions.
- The time allotted for SEE is 02 hour.

## MAPPING of COs with POs

| Ss | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | | | | | | | | | 3 | | |
| CO2 | | | | | | | | | | 3 | | |
| CO3 | | | | | | | | | | 3 | | |
| CO4 | | | | | | | | | | 3 | | |
| CO5 | | | | | | | | | | 3 | | |
| **Strength of correlation:** Low-1, Medium- 2, High-3 | | | | | | | | | | | | |

| Course Title | **HEALTH & WELLNESS** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21HST109** | | | | | |
| Category | **Ability Enhancement Course (AE)** | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total Hrs./ semester | Credits |
| | L | T | P | SS | Total | |
| | 1 | 0 | 1* | 0 | 02 | 26 | 01 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks: 100** | **Duration of SEE: 02 Hours** | | | |

**Course objective**:

The definition of Health and quality of life will teach the learner the necessity for a balanced strength and well-being. The Determinants of Health and Wellness topics like Diet, Food & Nutrition, life style, bring the points of understanding. Physical health, mental health, Social Health, Spiritual health, etc is a point to learn. The adolescent chooses the food as per the taste rather than the usefulness. Warming up exercises, physical exercises, yogasanas, pranayama and certain aspects of personality development may help in going a long way to improve the health and personality of the youth.

| **UNIT I** | **5 hours** |
|---|---|
| Fundamentals of Balanced Health: Health and quality of life, Definition of Health (WHO), Five Pillars of Balanced Health, Body and Mind concepts, Disease and Healing, Genetics & Environment. | |
| **UNIT II** | **4 hours** |
| Determinants of Health and Wellness: Lifestyle and Health, Sleep and health, Relaxation and Meditation, Physical Fitness and Stamina, Reproductive health and hygiene. | |
| **UNIT III** | **7 hours** |
| Seven dimensions of Health & Wellness: Physical health, Mental health, Social Health, Spiritual health, Cultural health, Moral health, Economical health. | |
| **UNIT IV** | **5 hours** |
| Healthy Eating- Diet and Nutrition: Food and Diet – Difference, Concept of DIET, Nutrition. | |

| UNIT V | 5 hours |
| --- | --- |
| Physical activity and personality Development: Warming up exercise, Physical exercise, Yogasanas, Pranayama etc. Special training for the challenged students  A few words on personality development (personal quality). | |
| **TEACHING LEARNING PROCESS:  Chalk and Talk, power point presentation,  videos** | |

**COURSE OUTCOMES:** On completion of the course, student will be able to:

**CO1:** Understand the necessity for a balanced health and well-being.

**CO2:**  Know one's life style, physical fitness and stamina.

**CO3:** Differentiate types of health.

**CO4:** understand 'Food is medicine' or 'Medicine is food' concept.

**CO5:** Have the knowledge of yogasanas & pranayama for an overall personality.

**TEXT BOOKS**

1.    Dixit Suresh (2006) Swasthya Shiksha Sports Publications, Delhi.
2.    Pinto John and Ramachandra K (2021) Kannada version " Daihika Shikshanada Parichaya", Louis Publications, Mangalore.

**REFERENCE BOOKS**

1.    Simplified Physical Exercises, Thathvagnani, The World Community Service Center, Vethathiri  Maharshi, Vethathiri Publications, Erode, SKY Yoga.
2.    Puri K. & Chandra S.S (2005) "Health & Physical Education', Surjeet Publication, New Delhi.
3.    Shanti K.Y (1987) "The Science of Yogic Breathier" Pranayama D B Bombay.S.

**SCHEME FOR EXAMINATIONS**
Theory Question Paper Pattern:
CIE- Objective type   (Max. marks: 30 marks)

•    The Pattern of question paper is MCQ (1 mark each).
•    Theory SEE paper will be set for 50 questions.
•    The time allotted for SEE is 02 hour.

## MAPPING of COs with POs

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1  |     |     |     |     |     | 3   |     |     |     |      |      |      |
| CO2  |     |     |     |     |     | 3   |     |     |     |      |      |      |
| CO3  |     |     |     |     |     | 3   |     |     |     |      |      |      |
| CO4  |     |     |     |     |     | 3   |     |     |     |      |      |      |
| CO5  |     |     |     |     |     | 3   |     |     |     |      |      |      |
| Strength of correlation: Low-1,   Medium- 2,   High-3 | | | | | | | | | | | | |

| Course Title | **RURAL DEVELOPMENT ENGINEERING** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21CVT109/209** | | | | | | |
| Category | **Ability Enhancement Course  (AE)** | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total Teaching Hours | Credits |
| | L | T | P | SS | Total | | |
| | **1** | **0** | **1\*** | **0** | **2** | **26** | **1** |
| **CIE Marks: 50** | **SEE Marks: 50** | | **Total Max. Marks: 100** | | **Duration of SEE: 02 Hours** | | |

**Course Objectives:**

1. Describe the scope of Rural Development Planning and Concept of Appropriate Technology and implementation of various national policies.
2. Understand the need and concept of low-cost construction materials for individual and group housing;
3. Illustrate the concept of Water Supply and Rural Sanitation.
4. Interpret the concept of rural transport system and issues related to it.
5. Summarize the need of effective Watershed and catchments area development methods and problems relating to watershed management, watershed structures.

| UNIT I | 3 Hours |
|---|---|

**Rural Development Planning and Concept of Appropriate Technology**:

Scope; development plans; various approaches to rural development planning; concept of appropriate technology. Rural development program / projects.

| UNIT II | 3 Hours |
|---|---|

**Rural Housing:**

Low-cost construction materials for housing; Composite material - ferro-cement & fly ash, soil-stabilized un-burnt brick; Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry; rat-trap bond for walls; Panels for roof, ferro-cement flooring / roofing units.

| UNIT III | 3 Hours |
|---|---|

**Rural Water Supply and Sanitation:**
Sources of water. BIS & WHO water standards. Quality, Storage and distribution for rural water supply works; low-cost water treatment technologies; conservation of water; rainwater harvesting; drainage in rural areas, septic tank; low-cost community & individual Garbage disposal systems

| UNIT IV | 3 Hours |
|---|---|

**Rural Transportation System:**
Categories of Pavement Layers, Types of roads, Surface Treatments for roads in rural areas. Soil Stabilization, Lime, Lime Fly ash and Cement Treated Course.

| UNIT V | 3 Hours |
|---|---|

**Irrigation Techniques:** Consideration of low-cost irrigation techniques, drip & sprinkler irrigation systems. Watershed and catchments area development - problems and features of watershed management, watershed structures

**COURSE OUTCOMES:** The students will be able to,

**CO1:** Understand the concepts and relative Technology for implementation of various National Policies relating to Rural Development in the Country

**CO2:** Apply the knowledge for Designing and selection of the Construction Materials for Rural Housing

**CO3:** Analyze and Conceptualize Rural Water Supply and Rural Sanitation.

**CO4:** Evaluate and interpret the aspects of Rural Transport System

**CO5:** Appraise and Evaluate the effectiveness of Watershed and Catchment Management for Modern Irrigation System

**TEXT BOOKS:**

1. Rural Development by Katar Singh, SAGE Publication
2. A.G.Madhov Rao, D.S.Ramachandra Murthy, Appropriate Technologies for low cost Housing Oxfordand IBH Publishing Co. Pvt .Ltd.

**REFERENCE BOOK(S):**

1 Rural Infrastructure by P.Nair, SBS Publication
2 Rural Infrastructure by Samalia Bihari Verma, Gyaneshwar Prasad & Sahib Kumari Singh, Sarup & Sons.

3    C. Satyanarayana Murthy, Design of Minor Irrigation and Canal Structures. Wiley Eastern Ltd.,

4    Document on Rural Road Development in India Volume1& 2; Central Road Research Institute,  New Delhi.

**ONLINE RESOURCE:**

1.   http://www.nptel.ac.in
2.   https://en.wikipedia.org

•    The Pattern of question paper is MCQ (1 mark each).
•    Theory SEE paper will be set for 50 questions.
•    The time allotted for SEE is 02 hour.

**MAPPING of COs with POs**

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

| Course Title | **Career Development Skills - I** | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Code | **21HSN110** | | | | | | |
| Category | HSS (Humanities) | | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 01 | 00 | 01* | 00 | 02 | 26 | 00 |
| **CIE Marks: 50** | **SEE Marks: -** | **Total Max. Marks=50** | **Duration of SEE: NIL** | | | | |

**COURSE OBJECTIVE:**

1. The lessons under this unit are designed to enable the students to plan their career on correct measures and motivate them to set their goals on prior basis.

2. This unit aims to develop the personality skills of the students and teach them to lead a corporate discipline nurture. It also helps them to get groomed with professional ethics.

3. This unit is designed to give the awareness to the students about the job market to prepare themselves at their own pace and potential. It also teaches them about the self-developing attitude through their emotions and intelligence.

4. This unit complies with the overcoming ability of students dealt in stress and it also teaches the punctuality and time managing.

5. This lesson will help students make inferences and predictions about spoken, writing & listening discourse. And by utilizing digital literacy tools, their LCRW skills can be enhanced.

| Unit no | Syllabus content | Hours/COs |
|---|---|---|
| 1 | 1. Career Planning | 5 |
| | 2. Goal Settings | CO1 |
| 2 | 1. Personality Effectiveness | 6 |
| | 2. Building Personality and Discipline | CO2 |
| | 3. Grooming, hygiene and Cleanliness | |

| 3 | 1. Self- Awareness & Self Confidence<br>2. Attitudes<br>3. Emotional & Intelligent Quotient | 6<br>CO3 |
|---|---|---|
| 4 | 1. Time Management<br>2. Stress Management | 4<br>CO4 |
| 5 | 1. LICRW Skills (Listening, Interpersonal, Conversation, Reading & Writing skills) | 5<br><br>CO5 |

**COURSE OUTCOME:**

1. The students will be able to learn about the overview of their goals and also gets to know diversities in the field of their career planning.

2. The student will develop and improve their personal and professional effectiveness. At the end of this unit, students will have deploy themselves about the corporate culture.

3. At the completion of this unit, students will develop the self-confidence and emerge as the confident person.

4. After the completion of this unit students will understand the stress, time and emotional management. Also they will learn about the overcoming the fear and uncomfortable situations such as Public speaking.

5. After the completion of this unit, students will gain knowledge about the assertiveness of Listening, Reading, Writing& Interpersonal segments.

**REFERENCE:**

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education
3. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.
4. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
5. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA
6. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

• The Pattern of question paper for test is MCQ (1 mark each).

**Dr Ambedkar Institute of Technology, Bengaluru-56**
**Department of Mathematics**
**Scheme and Syllabus - CBCS – 2021 -2022**

| Course Title | **ADVANCED CALCULUS AND NUMERICAL METHODS** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21MAT201** | | | | | |
| Category | Basic Science Course (BS) | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 03 | 02 | 00 | 00 | 05 | 65 | 04 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks=100** | **Duration of SEE: 03 Hours** | | | |

**COURSE OBJECTIVE:** This course is intended to impart to the students the skills of employing the basic tools of Calculus and Numerical methods for solving basic and difficult engineering problems.

| |
|---|
| **UNIT I**                                           **8+5 hours** <br> **Multiple Integrals:** Evaluation of double and triple Integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find area as double integral and volume as triple integral. <br> **Beta and Gamma functions:** Definitions, properties, relation between Beta and Gamma functions. <br> ***Self- Study: Centre of gravity, Moment of inertia.*** |
| **UNIT II**                                        **8+5 hours** <br> **Vector Differentiation:** Scalar and vector point functions, gradient, directional derivative, divergence, curl and Laplacian of a vector field. Solenoidal and irrotational vector fields. Vector identities (without proof). <br> **Vector Integration**: Line integrals, Applications to work done by a force. Green's theorem in a plane and Gauss Divergence theorem (without proof) involving cubes and rectangular parallelepiped. <br> ***Self- Study: Surface integrals and Stoke's theorem.*** |
| **UNIT III**                                     **8+5 hours** <br> **Partial Differential Equations (PDE's):** Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDE's involving derivative with respect to the one independent variable only. Solution of one- dimensional heat equation and wave equation by the method of separation of variables. <br> ***Self- Study: Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation.*** |

| UNIT IV | 8+5 hours |
|---|---|

**Numerical Methods-1:** Solution of polynomials and transcendental equations: Regula–Falsi and Newton–Raphson method (without proof). Interpolation-Newton's forward and backward difference formulae, Newton's divided difference formula, Lagrange's interpolation formula and its inverse interpolation formula(without proof).

**Numerical differentiation and Integration**: Approximation of derivatives using Newton's forward and backward interpolation polynomials. Numerical integration using Simpson's $(1/3)^{rd}$ and Simpson's $(3/8)^{th}$ rules (without proof).

***Self- Study: Newton–Raphson method for repeated roots, Weddle's rule.***

| UNIT V | 8+5 hours |
|---|---|

**Numerical Methods-2:** Numerical solutions of Ordinary Differential Equations of first order and first degree: Taylor's series method, Modified Euler's method, Fourth order Rungekutta method (without proof). Multi steps methods-Milne's predictor- corrector formula (No derivation).

***Self- Study: Euler's method, Picard's method, Adam- Bashforth method.***

**TEACHING LEARNING PROCESS:** Chalk and Talk, power point presentation, animations, videos

**COURSE OUTCOMES:** At the end of the course the students are able to:

**CO1: Show** the equivalences of mathematical expressions involving differentiation and integration.

**CO2: Find** divergence, directional derivatives, area bounded, flux and work done.

**CO3: Illustrate** mathematical procedures to change the order of integration, method of separation, predictor and corrector.

**CO4: Identify** the mathematical tool for solving flow models, improper integrals, interpolation and quadrature.

**CO5: Apply** the integral operator and vector differential operator for mensuration and measurements in complex engineering field.

**TEXT BOOKS**

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.

2. E. Kreysizig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint) 2016.

**REFERENCE BOOKS**

1. V. Ramana : Higher Engineering Mathematics, McGraw –Hill Education,11th Ed..

2. H. C. Taneja, Advanced Engineering Mathematics, Volume I& II, I.K. International Publishing House Pvt. Ltd., New Delhi.

3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

**ONLINE RESOURCES**

1. http://www.nptel.ac.in
2. https://en.wikipedia.org

*Note: Questions from Self-study component will not be asked for CIE and SEE.*

| QUESTION PAPER PATTERN (SEE) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| UNIT | 1 | | 2 | | 3 | | 4 | | 5 |
| 1. Two full questions (each of 20 Marks) are to be set from each unit. | | | | | | | | | |
| 2. Student shall answer five full questions selecting one full question from each unit. | | | | | | | | | |

**MAPPING of COs with POs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | | | | | | | |
| CO2 | 3 | 3 | | | | | | | | | | |
| CO3 | 3 | 3 | | | | | | | | | | |
| CO4 | 3 | 3 | | | | | | | | | | |
| CO5 | 3 | 3 | 3 | | | | | | | | | |
| **Strength of correlation:** Low-1, Medium- 2, High-3 | | | | | | | | | | | | |

**Dr Ambedkar Institute of Technology, Bengaluru-56**
**Department of Humanities & Social Sciences**
**Scheme and Syllabus – OBE - CBCS – 2021 -2022**

| Course Title | **PROFESSIONAL WRITING SKILLS IN ENGLISH** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21HST208** | | | | | |
| Category | **Humanities & Social Sciences (HS)** | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total Hrs./ semester | Credits |
| | L | T | P | SS | Total | | |
| | 1 | 0 | 1 | - | 02 | 26 | 01 |
| **CIE Marks: 50** | **SEE Marks: 50** | **Total Max. Marks: 100** | **Duration of SEE: 02 Hours** | | | |

**Course objective**:

To implement English vocabulary at command and ensure language proficiency, to achieve better Technical writing and Presentation skills, identify the common errors in speaking and writing English. Learn better sentence structures, acquire Employment and Workplace communication skills, to learn about Techniques of Information Transfer through presentation in different levels.

| UNIT I | 4 hours |
|---|---|
| Identifying Common Errors in Writing and Speaking  English, Subject Verb Agreement (Concord Rules with Exercises), Common errors in Subject-verb agreement, Noun-pronoun agreement, Adjective, Adverb, Verb, Sequence of Tenses, Misplaced modifiers, Common errors in Conjunctions,  Common errors in the use of Idioms and phrases. | |
| **UNIT II** | **6 hours** |
| Nature and Style of sensible writing, organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, The Art of Condensation (Precise writing) and Techniques in Essay writing, Redundancies & Clichés. | |
| **UNIT III** | **6 hours** |
| Technical Reading and Writing Practices, Effective Technical Reading and Writing Practices, technical Reports writing and Technical Proposals Writing, Grammar – Voice (Active and Passive Voices), Reported Speech, Vocabulary – Analogies, Words Confused/Misused, Collocations | |

| **UNIT IV** | **5 hours** |
|---|---|

Communication for Employment, Components of a formal letter, Formats and types of business letters, Model Letter of Application (Cover Letter) with Resume, Emails, Blog Writing and other recent communication types, Reading Skills and Reading Comprehension.

| **UNIT V** | **5 hours** |
|---|---|

Communication at Workplace, Interpersonal Communication Skills, Non-Verbal Communication Skills (Body Language), Group Discussion and Employment Interviews, Presentation skills and Formal Presentations by Students, Dialogues in Various Situations (Practical Sessions by Students).

**TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos**

**COURSE OUTCOMES:** On completion of the course, student will be able to:

**CO1:** Identify common errors in spoken and written communication.

**CO2:** Get familiarized with English vocabulary and language proficiency.

**CO3:** Improve nature and style of sensible writing & acquire employment and workplace skills.

**CO4:** Improve their Technical Communication Skills through Technical Reading and Writing practices.

**CO5:** Perform well in campus recruitment, engineering and all other general competitive examinations.

**TEXT BOOKS:**

1.  Workbook

2.  Functional English, Cengage learning India Pvt Limited [Latest Revised Edition] - 2020.

3.  Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press - 2018. Refer it's workbook for activities and exercises – "Communication Skills – I (A Workbook)" published by Oxford University Press – 2018.

4.  A Course in Technical English, Cambridge University Press – 2020.

## REFERENCE BOOKS

1.  Professional Writing Skills in English, Infinite Learning Solutions – (Revised Edition) 2021.
2.  Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
3.  High School English Grammar & Composition by Wren and Martin, S Chandh & Company Ltd – 2015.
4.  Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private Limited – 2018.
5.  Intermediate Grammar, Usage and Composition by M.L.Tichoo, A.L.Subramanian, P.R.Subramanian, Orient Black Swan – 2016.

## SCHEME FOR EXAMINATIONS

Theory Question Paper Pattern:
CIE- Objective type (Max. marks: 30 marks)

• The Pattern of question paper is MCQ (1 mark each).
• Theory SEE paper will be set for 50 questions.
• The time allotted for SEE is 02 hour.

## MAPPING of COs with POs

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1  |     |     |     |     |     |     |     |     |     |      |      |      |
| CO2  |     |     |     |     |     |     |     |     |     |      |      |      |
| CO3  |     |     |     |     |     |     |     |     |     |      |      |      |
| CO4  |     |     |     |     |     |     |     |     |     |      |      |      |
| CO5  |     |     |     |     |     |     |     |     |     |      |      |      |
| **Strength of correlation:** Low-1, Medium- 2, High-3 |

| Course Title | **Career Development Skills - II** | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **21HSN210** | | | | | |
| Category | HSS (Humanities) | | | | | |
| Scheme and Credits | No. of Hours/Week | | | | Total teaching hours | Credits |
| | L | T | P | SS | Total | | |
| | 01 | 00 | 01* | 00 | 02 | 26 | 00 |
| **CIE Marks: 50** | **SEE Marks: -** | | **Total Max. Marks=50** | **Duration of SEE: NIL** | | |

**COURSE OBJECTIVE:**

1. The main goal of this unit is to help students to overcome the fear of speaking in both personal and professional culture and it also focuses on the presenting the topics with confidence. This unit also teaches the students about the team building activities

2. This unit depicts the easier decision making and problem solving techniques for overcoming the hardships of interview process. It also teaches on behavior & mannerism that should be maintained during the interview.

3. The lessons under this unit help students' to learn to business communication activities which sought to help them to become an entrepreneur.

4. This unit deals with the preparation of Interview skill and also teaches the students about the various interview structures like Resume Building, GD etc..

5. This unit is completely an activity session, constructed to overcome the stage presence or fear.

| Unit no | Syllabus content | Hours/COs |
|---|---|---|
| **1** | 1. Presentation Speaking skills<br>2. Public Speaking skills<br>3. Team Building | **5**<br>**CO1** |

| 2 | 1. Decision Making & Problem Solving | 5 |
|---|---|---|
| | 2. Mannerism & Behavior | **CO2** |
| | 3. Reaching your potential | |
| **3** | 1. Business Communication | 5 |
| | 2. Sales & Negotiations | **CO3** |
| | 3. Customer Service | |
| **4** | 1. Interview Skills | 6 |
| | 2. Resume Building | **CO4** |
| | 3. Group Discussion (Each student will be assessed based on their body language, voice modulation, content & Creativity | |
| **5** | 1. Activity Sessions | 5 |
| |    > Debate | **CO5** |
| |    > Picture Connector | |
| | 2. Mock Interview | |

**COURSE OUTCOME:**

1.  The students will have learnt about the way of quality communication with the co-workers and it will also help to build a strong social relationship with outside society. And students will also learn to deliver the presentation in a more powerful and persuasive way.

2.  At the end of this unit, students will have deploy themselves in the active thinking and also learns about the effective usage of words. And students will learn about the synchronization with the workmate and also gives them an opportunity to unlock their individual potentials.

3.  After the completion of this unit, student will have learnt how to undergo business etiquettes with proper negotiations and customization.

4.  After the completion of this unit student have learnt about the interview standards that being asked during the recruitment process. It also improves the clarity and confidence of the students.

5.  At the end of this sessions, students will be confident on their speech and will be exposed to interview standards that being asked during the recruitment process.

**REFERENCE:**

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education
3. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.
4. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
5. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA
6. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing
7. Enhancing English and Employability Skills by State Board of Technical.
8. Soft skills an integrated approach to maximize personality by SANGEETHA SHARMA, GAJENDRA SINGH CHAUHAN, and Wiley Publishing.

- The Pattern of question paper for test is MCQ (1 mark each).