B.E. Mechanical Engineering (Manufacturing)  
Choice Based Credit System  

HAND BOOK  
2018
DEPARTMENT OF
MANUFACTURING ENGINEERING

VISION

Provide high quality education to create technically competent manufacturing engineers to strive hard for the sustainable development of industry and society and to serve for the nation building.

MISSION

- Develop the student community with wider knowledge in the emerging fields of Mechanical Engineering with more emphasis on Manufacturing Engineering.

- Inculcate innovative skills, research aptitude, team work, ethical practices among students so as to meet the expectations of the industry as well as society.

- Motivate the students to pursue higher education and take competitive examinations and various career enhancing program.

- Create a conducive and supportive environment for all round growth of the students,
- faculty & staff with emphasis on life-long learning.

- Provide quality education by periodically updating curriculum, effective teaching-learning process, best laboratory facilities and collaborative ventures with the industries.

PROGRAMME EDUCATIONAL OBJECTIVES

1. The graduates acquire ability to create model, design, synthesize and analyze essential production operational skills, mechanism and automation system.

2. The graduates use their talent, self-confidence, knowledge and engineering practice which facilitate them to presume position of scientific and/or managerial leadership in their career paths.

3. The graduates will adopt ethical attitude and exhibit effective skills in communication management team work and leader qualities.

4. The graduates apply their consciousness of moral, professional responsibilities and motivation to practice life-long learning in a team work environment.
B.E. MECHANICAL ENGINEERING (MANUFACTURING)

PROGRAM OUTCOMES

After the successful completion of the B.E. Mechanical Engineering (Manufacturing) degree programme, the students will be able to:

PO1: INTEGRATION OF KNOWLEDGE
Demonstrate strong basics in mathematics, science, engineering and technology which serve as the foundation for the Programme.

PO2: PROBLEM ANALYSIS
Demonstrate the ability to design and conduct experiments, as well as to analyze and interpret data in the spheres of fundamental engineering.

PO3: DESIGN AND DEVELOPMENT OF SOLUTIONS
Demonstrate the 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.

PO4: USE OF MODERN TOOLS AND TECHNIQUES
Become familiar with modern engineering tools and analyse the problems within the domains of Manufacturing Technology as the members of multidisciplinary teams.

PO5: COLLABORATIVE AND MULTIDISCIPLINARY APPROACH
Acquire the capability to identify, formulate and solve engineering problems related to manufacturing engineering in interdisciplinary and multidisciplinary sciences.

PO6: ETHICAL PRACTICES AND SOCIAL RESPONSIBILITIES
Demonstrate an understanding of professional and ethical responsibility with reference to their career in the field of manufacturing engineering.

PO7: COMMUNICATION SKILLS
Interact with engineering community and with society at large, regarding intricate engineering activities on technical perspectives and emerge as an efficient motivator. He will be able to communicate effectively both in verbal and non verbal forms.

PO8: PROJECT MANAGEMENT
Design and develop innovative / manufacturable / marketable/ environmental friendly products useful to the society and nation at large. Graduate will be able to manage any organization well and will be able to emerge as a successful entrepreneur.

PO9: LIFE LONG LEARNING
Understand the value for life long-long learning, in the context of technological challenges.
PO10: ENVIRONMENT AND SUSTAINABILITY
Acquire ample knowledge essential for sustainable development in consideration of environmental impacts and contemporary issues.

PO11: SOCIAL RESPONSIBILITY
Understand the nature of profession and be vigilant in order to maximize the chances of a positive contribution to society.

PO12: INVESTIGATION OF COMPLEX PROBLEM
Perform investigations, design and conduct experiments, analyze and interpret the results to provide valid conclusion.

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### DETAILS OF COURSE CODE

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# COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2018)

## SEMESTER I

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Students must undergo Internship for 4 weeks during summer vacation which will be assessed in the forthcoming III Semester.

## SEMESTER II

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### FACULTY OF ENGINEERING AND TECHNOLOGY
#### DEPARTMENT OF MANUFACTURING ENGINEERING

**COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2018)**

#### SEMESTER III

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*For the Lateral entry students total credit for III Semester is 23.5 as they are exempted from internship during summer vacation of II semester.

#### SEMESTER IV

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Total Credits 21.5

Students must undergo Internship for 4 weeks during summer vacation which will be assessed in the forthcoming V Semester.
### FACULTY OF ENGINEERING AND TECHNOLOGY
#### DEPARTMENT OF MANUFACTURING ENGINEERING

#### COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2018)

#### SEMESTER V

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**ETIT510**  IT-II Industrial Training / Rural Internship/Innovation / Entrepreneurship *Four weeks during the summer vacation at the end of IV Semester* 100 100 4.0

**Total Credits** 26.5

#### SEMESTER VI

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**Total Credits** 21

Students must undergo Internship for 4 weeks during summer vacation which will be assessed in the forthcoming VII Semester.
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**DEPARTMENT OF MANUFACTURING ENGINEERING**

**COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2018)**

### SEMESTER VII

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### PE-PROFESSIONAL ELECTIVES

1. MMPESCN  Non-Traditional Manufacturing Processes
2. MMPESCN  Tool Engineering
3. MMPESCN  Computer Integrated Manufacturing Systems
4. MMPESCN  Computer Aided Product Design
5. MMPESCN  Production & Operation Management
6. MMPESCN  Total Quality Management
7. MMPESCN  Advanced Manufacturing processes
8. MMPESCN  Non-Destructive Testing

### OE-OPEN ELECTIVES

1. MMOESCN  Operations Research
2. MMOESCN  Machine Tool Design
3. MMOESCN  Neural Network and Fuzzy Logic
4. MMOESCN  Maintenance and Safety Engineering
5. MMOESCN  Engineering Economics
6. MMOESCN  Sensors and Control Systems in Manufacturing
7. MMOESCN  Surface Engineering
8. MMOESCN  Precision Engineering and Nano-Technology
9. MMOESCN  Composite Materials
10. MMOESCN  Supply Chain Management

### HONOURS ELECTIVES

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<td>MMHESCN</td>
<td>Modern Manufacturing Strategies</td>
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<td>MMHESCN</td>
<td>Robotics and Automations</td>
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<td>Plant Layout and Material Handling</td>
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### MINOR ENGINEERING ELECTIVES

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Category | Basic Science Course
Course title | PHYSICS

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Course Objectives

- To understand the ray of light to undergo the phenomenon of interference diffraction and polarization.
- To understand the principle and various application of laser.
- To develop knowledge in crystal structure and its properties.
- To understand the energy quantization of subatomic particles like electron.
- Rationalize the law of conservation of energy in solar water heater and solar cells.

Unit - I. Wave optics (9 Lectures)

Huygens’ Principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young’s double slit experiment, Newton’s rings, Michelson interferometer and Mach-Zehnder interferometer. Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; diffraction gratings and their resolving power.

Unit - II. Lasers (8 Lectures)

Introduction – Principles of Laser – Stimulated emission, Properties of laser beams: mono-chromaticity, coherence, directionality and brightness Einstein’s theory of, stimulated emission A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO₂), solid- state lasers (ruby, Neodymium), dye lasers, laser speckles, applications of lasers in science, engineering and medicine.

Unit - III. Crystal Physics (7 Lectures)

Introduction to solid Materials – crystal structure – Geometry of lattice unit cell – Bravais’ lattice – crystal systems, Crystal structures of Materials –(Coordination number, Atomic radius, packing factor and packing density) – Types of crystal Lattice (Simple Cubic, Body Centered Cubic, Face Centered Cubic and Hexagonal Closed Packed) Miller Indices and their calculations - Finding Miller indices of crystal planes.

Unit - IV. Quantum Mechanics (8 Lectures)

Heisenberg uncertainty Principle –Dual nature of Matter and radiation – De Broglie’s Wave length – wave Velocity and group velocity. The wave Equation, Schrödinger’s time dependent and independent wave equations - The Wave function and its physical significance - The particle in a box Problem (one dimensional box) - energy quantization – Eigen values and Eigen functions.
Unit - V. Energy Physics (8 Lectures)


Text Books

Reference Books

Course Outcomes
- To understand the ray of light to undergo the phenomenon of interference diffraction and polarization.
- To understand the principle and various application of laser.
- To develop knowledge in crystal structure and its properties.
- To explain the fundamental terms in crystallography.
- To discuss Miller indices in crystal plans and their applications.

<table>
<thead>
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<th>Mapping of Course Outcomes with Programme Outcomes</th>
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Unit 1: Calculus: (6 lectures)
Evaluation of definite integrals and their properties-Applications of definite integrals to evaluate surface areas and volumes of revolutions. Improper integral-Beta and Gamma functions and their properties.

Unit 2: Calculus: (6 lectures)
Rolle’s theorem-Mean value theorem. Indeterminate forms-L'Hospital's rule. Functions of two variables: Taylor’s and Maclaurin’s series expansions-Maxima and minima for functions of two variables.

Unit 3: Sequences and series: (10 lectures)
Convergence of sequence and series-tests for convergence: Comparison test(only for series with positive terms)-D’Alembert’s ratio test-Cauchy’s root test-Integral test-Leibnitz’s test(Alternating series).

Unit 4: Vector Calculus (Differentiation): (8 lectures)
Gradient, divergence and curl- directional derivative-unit normal vector-irrotational and solenoidal vectors-expansion formulae for operators involving $\nabla$.

Unit 5: Matrices (10 lectures)
Rank of a matrix- Symmetric, skew-symmetric and orthogonal matrices-Characteristic equation- Eigen values and Eigen vectors - Cayley-Hamilton Theorem-Diagonalization of symmetric matrices by Orthogonal transformation.

Suggested Text/Reference Books
Sons, 2006.


**Course Outcomes**

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

- To apply differential and integral calculus to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
- The fallouts of Rolle’s Theorem that is fundamental to application of analysis to Engineering problems.
- The tool of sequences and series for learning advanced Engineering Mathematics.
- To deal with vector calculus that are essential in most branches of engineering.
- The essential tool of matrices and linear algebra in a comprehensive manner.

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Course Code | ETES103  
Category | Engineering Science Course  
Course Title | Basic Electrical Engineering  
Scheme and Credits | L | T | P | Credits  
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**Course Objectives:**
- To understand the basic laws and theorems of electric circuits.
- To know the concept of AC and DC quantities.
- To understand the working of transformer.
- To know the operation and principles of electrical machines.
- To know the protective devices used in electrical installations.

**Unit 1: DC Circuits (8 Hours)**

**Unit 2: AC Circuits (8 Hours)**

**Unit 3: Transformers (6 Hours)**

**Unit 4: Electrical Machines (8 Hours)**

**Unit 5: Electrical Installations and Power Converters (12 Hours)**
Types of Wires and Cables – Introduction to protective devices: Switch Fuse Unit (SFU), MCB, ELCB, MCCB – Earthing: Pipe and Plate Earthing - PN Junction Diode – Silicon Controlled Rectifier (SCR) - Rectifiers.

**Suggested Text/ Reference Books**

**Course Outcomes**
- Able to understand and analyze the basic electric circuits.
- Acquire knowledge about the principles and operations of Transformers.
- Acquire knowledge about the principles and working of Electric generators and Motors.
- Able to understand the characteristics of SCR and process of rectification.
- Acquire knowledge about the components of low voltage electrical installations and safety practices.

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<th>Mapping of Course Outcomes with Programme Outcomes</th>
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**Course code** | ETBP104  
**Category** | Basic Science Course  
**Course title** | Physics Laboratory  
**Scheme and Credits** | L T P Credits  
| 0 | 0 | 3 | 1.5 |

**Objectives:**
- To access the Rigidity modulus of wire.
- To assess the various properties of light.
- To assess the characterization of Metals.
- To analyses the thickness of microsized objects.

**List of Experiments:**
1. Air Wedge
2. Newtons’s Rings
3. Simple Pendulum
4. Dispersive power of the Prism
5. Diffraction Grating
6. Acoustic diffraction Grating
7. Compound Pendulum
8. Kunt’s tube experiment
9. Young’s double slit experiment
10. Laser Grating
11. Torsional Pendulum
12. Young’s Modulus – Non-uniform Bending

Course outcomes:
- Understand the material characteristics of metals and insulators.
- Understand the usage of vernier caliper and screw gauge for the length measurement.
- To understand the torsional properties of metal wires.
- To understand the dispersion of light through prism.
- Make measurement of thickness of microsized object.
- To understand and measurement of wavelength of polychromatic source of light.

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Mapping with Programme Outcomes.

Course Code: ETSP105
Category: Engineering Science Course
Course Title: Electrical Engineering Laboratory
Scheme and Credits:  

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List of experiments/demonstrations:
- Measuring the steady – state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L and R-C circuits – impedance calculation and verification. Observation of phase difference between current and voltage. Resonance in R-L-C circuits.
- Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics. Loading of a transformer: measurement of primary and secondary voltages and currents and power.
- Three-phase transformers: Star and Delta connections, Voltage and Current relationships (line-line voltage, phase –to – neutral voltage, line and phase currents). Phase-shifts
between the primary and secondary sides. Cumulative three-phase power in balanced three-phase circuits.

- Demonstration of cut-out sections of machines: de machine (commutator -brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging – slip ring arrangement) and single–phase induction machine.
- Torque Speed Characteristic of separately excited de motor.
- Synchronous Machine operating as a generator: stand-alone operation with a load.
- Control of voltage through field excitation.
- Demonstration of (a) dc-dc convertors (b) dc-ac convertors – PWM waveform (c) the use of dc-ac convertor for speed control of an induction motor and (d) Components of LT switchgear

**Laboratory Outcomes**

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Get an exposure to the working of power electronic converters.

| Mapping of Course Outcomes with Programme Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
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| CO3 | ✓ | ✓ | ✓ | | | | | | | | | |
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**Course code** ETSP106

**Course title** Workshop / Manufacturing Practices

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(i) Lectures & Videos: (10 ours)
1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)
4. Electrical & Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic molding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

**Suggested Text/Reference Books:**

**Course Outcomes**
Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

(ii) **Workshop Practice: (60 hours)**
1. Machine shop (10 hours)
2. Fitting shop (8 hours)
3. Carpentry (6 hours)
4. Electrical & Electronics (8 hours)
5. Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs))
6. Casting (8 hours)
7. Smithy (6 hours)
8. Plastic moulding & Glass Cutting (6 hours)

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

**Laboratory Outcomes**
- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.
SECOND SEMESTER

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**Module 1: Vocabulary Building**

1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Count and uncount nouns.
1.4 Synonyms, antonyms, and standard abbreviations.
1.5 Language development - Wh questions asking and answering yes or no questions.

**Module 2: Basic Writing Skills**

2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence and Techniques for writing precisely
2.5 Organizing principles of paragraphs in writing

**Module 3: Nature and Style of sensible Writing**

3.1 Describing and Defining
3.2 Classifying and Providing examples or evidence
3.3 Writing introduction and conclusion
3.4 Comprehension
3.5 Precis Writing

**Module 4: Writing Practices & Oral Communication**

4.1 Listening to lectures and making notes
4.2 Mechanics of presentation, asking and giving instruction
4.3 Essay Writing – Writing analytical essays and issue based essays.
4.4 Dialogue writing and conversation
4.5 Letter writing – Formal and informal

**Module 5: Group Discussion and Job Application**
5.1 Characteristics and practices of group discussion
5.2 Job application
5.3 Resume preparation
5.4 Writing reports – minutes of a meeting, accident, survey
5.5 E-mail – etiquette

Suggested Readings:

(Vii) Raman, Meenakshi and Shama, Sangeetha – Technical Communication Principles
and Practice, Oxford University Press, New Delhi,2014.

Course Outcomes
The student will acquire basic proficiency in English including reading and listening
Comprehension, writing and speaking skills.

- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations

| Mapping of Course Outcomes with Programme Outcomes |
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Course Code ETBS202
Category Basic Science Course
Course title Chemistry
Scheme and Credits

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</table>
Unit – I : Water Chemistry and Surface Chemistry


Unit – II : Electrochemistry and Corrosion


Unit – III : Fuels and Storage Devices


Unit – IV : Polymers and Nano Materials


Unit – V : Engineering Materials and Spectroscopic Techniques

Refractories – Classification, characteristics (Refractoriness, RUL, Thermal spalling, porocity) and uses, Lubricants – Classification, properties (cloud and pour point, flash and fire point, viscosity index) and applications. Principles of spectroscopy – Beer – Lambert’s Law – UV – Visible and IR spectroscopy – Basic principles and instrumentation (block diagram) – Fluorescence and its applications in medicine.

Suggested Tex Books


**Course Outcomes**

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

- develop innovative methods to produce soft water for industrial uses, drinking purpose and understand concept of surface chemistry,
- study the concept of electrochemistry and its applications and corrosion control methods,
- understand the properties of fuels and applications of energy storage devices,
- synthesis and uses of various polymers and gain knowledge on refractories and lubricants,
- understand the concepts of certain analytical techniques and applications of nanochemistry.

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Course code: ETES203
Category: Engineering Science Course
Course title: Programming for Problem Solving
Scheme and Credits:

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**Unit 1:** Introduction to Programming, Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.), Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code. *(8 lectures)*

**Unit 2:** Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops. *(14 lectures)*

**Unit 3:** Arrays: Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required). *(12 lectures)*

**Unit 4:** Function: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort. *(10 lectures)*

**Unit 5:** Structure: Structures, Defining structures and Array of Structures, Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation). File handling (only if time is available, otherwise should be done as part of the lab). *(6 lectures)*

**Suggested Text Books**
(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill

**Suggested Reference Books**
(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

**Course Outcomes**

- The student will learn
- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
➢ To decompose a problem into functions and synthesize a complete Program using divide and conquer approach.

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**Module 1: Multivariable Calculus (Integration): (8 lectures)**

- Double integrals (Cartesian) - change of order of integration in double integrals
- Change of variables (Cartesian to polar) - Applications: Area as a double integral.
- Triple integrals (Cartesian) - Applications: Volume as a triple integral.

**Module 2: Vector Calculus (Integration): (8 lectures)**

- Line, Surface and Volume integrals - Gauss divergence theorem (without proof)
- Green’s theorem in the plane (without proof) – Stokes theorem (without proof).
- Verification of the above theorems and evaluation of integrals using them.

**Module 3: Ordinary differential equations: (8 lectures)**

- First order ordinary differential equations (Linear and Bernoulli’s differential equations, exact differential equations).
- Solution of Second order ordinary linear differential equations with constant co-efficient (method of variation of parameters only).
- Solution of Second order ordinary linear differential equations with variable co-efficient (Euler and Legendre’s linear equations).

**Module 4: Complex Variable (Differentiation): (8 lectures)**

- Analytic functions and their properties - Cauchy-Riemann equations - harmonic functions - harmonic conjugate of elementary analytic functions – Construction of an analytic function.
- Mobius transformations.

**Module 5: Complex Variable (Integration): (8 lectures)**

- Cauchy theorem (without proof) - Cauchy Integral formula (without proof) - Cauchy Integral formula for higher derivatives (without proof) – zeros and poles of an analytic functions

**Suggested Text/Reference Books**


**Course Outcomes**

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

- The mathematical tools needed in evaluating multiple integrals and their usage.
- The effective mathematical tools for the solutions of differential equations that model physical processes.
- The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.
- To deal with Complex Variable for Differentiation that are essential in most branches of engineering.
- To deal with Complex Variable for Integration that are essential in most branches of engineering.

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List of Topics

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

Suggested Software package: Globarena Package for communicative English

The Globarena Package consists of the following exercises

1. Reading comprehension
2. Listening comprehension
3. Vocabulary exercises
4. Phonetics
5. Role Play in dialogues
6. Auto Speak

Suggested Readings:

v. English Skills for Technical Students, WBSCTE with British Council, OL.

Course Outcomes:

- Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap At the end of the course learners will be able to:
- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialization successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.
### Course code | ETBP206
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### Category | Basic Science Course

### Course title | Chemistry Laboratory

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#### Objectives:
- To list the water quality standards
- To assess the composition of an alloy
- To appreciate the practical significance of acidimetry, alkalimetry, permananganometry, conductometry and potentiometry
- To analyse quantitatively the amount of a substance present in a given sample.

#### List of Experiments:
1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Determination of the rate constant of a reaction
6. Determination of cell constant and conductance of solutions
7. Potentiometry - determination of redox potentials and emfs
8. Saponification/acid value of an oil
9. Determination of the partition coefficient of a substance between two immiscible liquids
10. Adsorption of acetic acid by charcoal
11. Volumetric analysis

#### Course outcomes:
At the end of the course the students will be able to

- Gain knowledge in the quantitative chemical analysis of water quality related parameters.
- Assess the composition of an alloy
- Analyse the quantitatively the amount of substance present in a given sample by acid-base, permanganometry.
- Analyse quantitatively the amount of substance present in a given sample by conductometry and potentiometry
- Analyse the quantitatively the amount of substance present in a given sample by acid-base and iodometry titration

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Course code: ETSP207
Category: Engineering Science Course
Course title: Computer Programming Laboratory

Objectives:
To make the students conversant with
- Water treatment techniques, disinfection methods and adsorption techniques
- Working principal of electrochemical cell and knowledge about corrosion and control of corrosion.
- Sources, refining of petroleum various types of fuels, and knowledge about primary and secondary cells.
- Types of polymers, polymerization products, Uses of polymers and introduction to nono materials.
- Engineering materials such as refractories, lubricants and principles of spectroscopy – UV and IR

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given]

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations

Laboratory Outcomes
- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at runtime
- To be able to write iterative as well as recursive programs
Mapping of Course Outcomes with Programme Outcomes

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Course code: ETSP208  
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Course title: Engineering Graphics and Drafting
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**Traditional Engineering Graphics:**
Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Reading a Drawing; Sectional Views; Dimensioning, True Length, Angle.

**Computer Graphics:**
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

*(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)*

**COURSE OBJECTIVES:**
- To develop the ability to produce simple engineering drawing and sketches based on current practice
- To develop the means for communication of ideas, thoughts and design of objects, related to engineering applications, to others though drawing
- To develop the skills to read manufacturing and construction drawings used in industry
- To develop a working knowledge of the layout of plant and equipment
• To develop skills in abstracting information from calculation sheets and schematic diagrams to produce working drawings for manufacturers, installers and fabricators

_Unit 1: Introduction to Engineering Drawing_,

_Unit 2: Orthographic Projections_,
Orthographic projections: Introduction – Projections of points
Projections of Straight lines: Determination of true length and true angle of inclinations using half cone and trapezoidal methods – drawing the projections of straight lines using half cone method from true length and true angle of inclinations.

_Unit 3: Projections of Regular Solids_,
Projections of solids: Auxiliary projections – projections of prisms, pyramids, cylinder and cone when the axis is inclined to only one plane.

_Unit 4: Sections and Sectional Views of Right Angular Solids_,
Sections of solids: Sections of prisms, pyramids, cylinder and cones – true shape of section.
Developments of solids: Developments of lateral surfaces of solids using parallel and radial line methods.

_Unit 5: Isometric Projections_,
Isometric projections: Projections of simple solids.
Conversion of pictorial view of simple objects into orthographic projections (only elevation and plan)

_Overview of Computer Graphics_ covering,
Introduction to CAD software: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars). The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.
Customisation & CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines and other basic geometric entities.

Annotations, layering & other functions
applying dimensions to objects and annotations to drawings; Setting up and use of Layers, Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation;

Suggested Text/Reference Books:
(v) (Corresponding set of) CAD Software Theory and User Manuals

Course Outcomes
All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students are prepared for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to prepare the students:

- Communicate effectively through drawing
- Apply techniques, skills, and modern engineering tools necessary for engineering practice
- Exposure to the visual aspects of engineering graphics
- Exposure to engineering graphics standards
- Exposure to engineering communication

Mapping of Course Outcomes with Programme Outcomes

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COURSE OBJECTIVES

- The students will be trained on the basics of chosen topics of mathematics, namely, partial differential equations, Fourier series, Boundary value problems, Fourier transform and Z-transform.
- The above topics introduced in this course will serve as basic tools for specialized studies in engineering.

UNIT I

UNIT II
Dirichle's conditions - General Fourier series - Odd and Even functions - Half range sine series - Half range cosine series - Complex form of Fourier series – Parseval's identity.

UNIT III
Solutions of one dimensional wave equation – One dimensional heat equation (without derivation) – Fourier series solutions in Cartesian co-ordinates.

UNIT IV
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem - Parseval's identity

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
1. Students would acquire basic understanding of the most common partial differential equations and to learn some methods of solving them
2. Students would acquire basic understanding of the Fourier series, Fourier transform and Z-transform and to learn some methods of solving them.
3. The students should be able to solve some boundary value problems.

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**UNIT I**

Introduction - Multidisciplinary nature of environmental studies - Definition, scope and importance - Need for public awareness.

Natural resources - Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.- Role of an individual in conservation of natural resources.- Equitable use of resources for sustainable lifestyles.

**UNIT II**

Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological - pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT III**


**UNIT IV**

Definition - Cause, effects and control measures of Air pollution - Water pollution - Soil pollution - Marine pollution- Noise pollution - Thermal pollution - Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Disaster management: floods, earthquake, cyclone and landslides. Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, and watershed management - Resettlement and rehabilitation of people; its problems and concerns. - Environmental ethics:
Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.


UNIT V


Field work:

Visit to a local area to document environmental assets river / forest / grassland / hill / mountain - Visit to a local polluted site - Urban / Rural / Industrial / Agricultural - Study of common plants, insects, birds - Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

TEXT BOOKS

2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)

REFERENCES

2. Clark R.S., Marine Pollution, Claderson Press Oxford (TB)
5. Down to Earth, Centre for Science and Environment (R)
7. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
16. Survey of the Environment, The Hindu (M)
ETES303 ENGINEERING MECHANICS

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COURSE OBJECTIVES

- To introduce the fundamentals of forces and their effects with their governing laws.
- To understand the definitions of particle, body forces and their equilibrium conditions.
- To understand and predict the forces and its related motions.

UNIT I

Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminancy

UNIT II

Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

UNIT III

Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

UNIT IV

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained
motion; Newton’s 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT V
Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D’Alembert’s principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation
Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums;

TEXT BOOKS

REFERENCES
1. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press

COURSE OUTCOMES
Upon successful completion of the course, student should be able to:
1. Use scalar and vector analytical techniques for analysing forces in statically determinate structures
2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
3. Apply basic knowledge of maths and physics to solve real-world problems
4. Understand measurement error, and propagation of error in processed data
5. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts); 
6. Understand basic dynamics concepts – force, momentum, work and energy;
7. Understand and be able to apply Newton’s laws of motion;
Mapping with Programme Outcomes

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MMES304 | THERMAL ENGINEERING | L | T | P | C
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COURSE OBJECTIVES

- To give an idea regarding the basic concepts and laws of thermodynamics
- To introduce the fundamentals of thermal engineering such as internal combustion engines and steam turbines
- To introduce the fundamentals of air compressors, refrigeration and air conditioning
- To introduce the basic concepts of steam turbines
- To introduce the fundamentals of various modes of air heat transfer.

UNIT I

Thermodynamics - Definition - heat and work - open system and closed system - state, property and change of state of a system - properties of vapor - internal energy - entropy, dryness fraction - Calorimeter for determination of dryness fraction.

UNIT II


UNIT III

Reciprocating air compressor - single and multistage compression - inter cooling - calculation of main dimensions - Effect of clearance volume - Volumetric efficiency.

UNIT IV

Rankine cycle with reheating and regenerating, feed heating, steam turbines - details - compounding of turbine - velocity diagram - blade efficiency - reaction turbine - height of blade and diameter of drum.

UNIT V

Primary modes of heat transfer - basic laws of conduction, convection and radiation - simple problems - refrigeration and air-conditioning - General principles of refrigeration - C.O.P calculations of psychometric chart - air conditioning methods.

TEXT BOOKS


REFERENCES
2. Spalding and Cole, Engineering Thermodynamics, ELBS.

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the laws of thermodynamics
2. Know the different types combustion engines.
3. Differentiate Otto and diesel cycles
4. Obtain knowledge about air compressors, refrigeration and air conditioning, and modes of air heat transfer.
5. Obtain knowledge of steam turbines

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MMPC305 | MACHINE TOOL TECHNOLOGY | L | T | P | C |
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COURSE OBJECTIVES
- To understand the different types and functions of metal cutting machine tools.
- To provide in depth knowledge about various machine tools and operating procedures.
- To illustrate different mechanisms used in metal cutting machines.
- To understand the basic concepts of computer numerical control (CNC) machine tool and CNC programming.

UNIT I
Lathe: Specifications of centre lathe - operations performed - accessories and attachments - principle of capstan and turret lathes - layout of tools.
Shaper, Planner and slotter: General arrangement - principle of operation - drive mechanisms.

UNIT II
Milling machine: Types - specification - operations - types of cutters - attachments and accessories - examples of work.
Drilling and Boring: Types - specification of drilling machines - operations - accessories and attachments - types of boring machines - jig boring.
Sawing: Power saws - types and principle of operation.
UNIT III

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Know the different types of operations with necessary tools.
2. Understand the mechanisms and their settings involved in appropriate machine tool.
3. Differentiate single point and multi point cutting tools and machines.
4. Obtain knowledge about advanced machine tools.
5. Gain and apply the knowledge of CNC machines and programming.
COURSE OBJECTIVES

- To understand the basic principles of measurements
- To introduce the various methods of measuring mechanical parameters
- To learn about advancements in measurement and automation

UNIT I
General concept - Generalised measurement system - Units and standards - Measuring instruments: sensitivity, stability, range, accuracy and precision - static and dynamic response - repeatability - systematic and random errors - correction, calibration - Introduction to Dimensional and Geometric Tolerancing - interchangeability.

UNIT II

UNIT III
Measurement of screw threads: Thread gauges, floating carriage micrometer-
Measurement of gear tooth thickness: constant chord and base tangent method - Gleason gear testing machine - Radius measurements - surface finish: equipments and parameters, straightness, flatness and roundness measurements.

UNIT IV

UNIT V
TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the basics of measurements and know various linear, angular, form measuring equipments- their principle of operation and applications.
2. Select appropriate measuring instrument for a required mechanical parameter to a specific application.
3. Know about modern measuring equipments for a production industry.
4. To gain knowledge on alignment of machine tools
5. To understand the basics of advance inspection systems

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MMSP307 | THERMODYNAMICS LABORATORY | L | T | P | C
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COURSE OBJECTIVES
- To inculcate the knowledge about the working of I.C engines and different types of dynamometers.
- To study the valve timing and port timing of an IC engine
- To make the students understand the working principle of various flow and pressure measuring devices.

LIST OF EXPERIMENTS
1. Study and valve timing on four stroke diesel engine.
2. Study and port-timing on two stroke petrol engine.
3. Dismantling and assembling of four stroke diesel engine.
4. Study of Carburettor
5. Study of fuel injection pump
6. Study of cooling system
7. Study of lubrication system  
8. Study of air compressor  
9. Measurement of temperature using resistance temperature detector  
10. Determination of coefficient of discharge of orifice /Venturimeter  
11. Measurement of displacement using LVDT  
12. Experiments on DC Servo motor controller  
13. Experiment on DC motor position control system

**COURSE OUTCOMES**
Upon completion of course, the students will be able to:
1. Understand the various types of engines and working principles of dynamometers.  
2. Know the dismantling and assembling procedure of a four stroke CI engines.

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**COURSE OBJECTIVES**
- To provide hands-on experience on the use of metal working machines such as lathe shaper and slotter.
- To study the constructional features of automatic and turret lathe
- To study the constructional features of cylindrical and surface grinding machines.
- To provide hands-on experience in wood Turning of simple models.

**LIST OF EXPERIMENTS:**
1. Plain Turing  
2. Step Turing  
3. Taper Turing  
4. Thread Cutting (Internal & External)  
5. Knurling  
6. Key way machining on a slotter  
7. Convex profile machining on a slotter  
8. T-slot milling  
9. Keyway machining using a shaper  
10. External dovetail machining on a shaper  
11. Internal dovetail machining on a shaper  
12. Study of Single-spindle automatic lathe  
13. Study of capstan lathe and turret lathe  
14. Study of gear hobbing machine  
15. Study of cylindrical grinding machine  
16. Study of surface grinding machine
COURSE OUTCOMES
Upon the completion of this course, students would be able to
1. Handle metal working machines such as lathe and shaper milling and slotter
2. Carry out simple operations on lathe and shaper milling and slotter
3. Understand the constructional features of automatic and turret lathe
4. Understand the constructional features of cylindrical and surface grinding machines

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COURSE OBJECTIVES
- To educate the students on the handling and use of precision measuring instruments used during the manufacturing processes.

LIST OF EXPERIMENTS:
1. Checking the straightness of straight edge
2. Calibration of a dial gauge
3. Measurement of internal diameter (4 balls)
4. Calibration of micrometer
5. Measurement of internal taper
6. Measurement of external taper (Sine Bar and Roller)
7. Calibration of plain plug gauge
8. Measurement of external radius and internal radius
9. Inspection of screw thread
10. Gear inspection
11. Checking the flatness of surface plate
12. Process capability

COURSE OUTCOMES
Upon the completion of this course, students would be able to
1. Understand the usage of many precision instruments and their respective handling methods.
2. Learn to calibrate the precision instruments.

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COURSE OBJECTIVES

- To introduce the probability, random processes, and statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.
- To develop the skills of the students in numerical mathematics - using method of finite difference interpolation,
- Finding numerical solution of algebraic and transcendental equations.
- Finding numerical solution of ordinary and partial differential equations.

UNIT I
Definition – Types of random variables - probability distribution function - probability density function – expectation and moments – moment generating functions – joint probability distribution - marginal probability distribution function – joint probability density function – marginal probability density function – conditional probability density function.

UNIT II

UNIT III
Hypothesis, testing – Large sampling tests – small sampling test based on t, F and chi-square distributions – interval estimates of mean, standard deviation and proportion.

UNIT IV

UNIT V

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
At the end of the course, the students would.
1. Understand the concept of algebraic and transcendental equations
2. Acquire skills in handling situations involving random variables, random processes
3. Solve problems for engineers in using numerical methods.

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Mapping with Programme Outcomes

COURSE OBJECTIVES
To impart fundamental knowledge on the structure of Engineering Materials,
- To impart knowledge about characteristics of polymer, ceramic and metal matrix composite materials.
- To impart knowledge about magnetic characteristics of engineering materials

UNIT I
Unit cell, Crystal systems, BCC, FCC & HCP structures, Crystallographic planes & direction, Miller indices, Crystal imperfections - point, line & area defects. Constitution of alloys, compounds & solid solutions, Gibbs phase rule, lever rule.

UNIT II

UNIT III

UNIT IV
UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the basic structures of Engineering materials
2. Impart fundamental knowledge about Polymer composites;
3. Use Bio degradable materials for the future will keep the environment clean
4. Implement Fiber based composites results in high industrial productivity
5. Understand the properties of ferric and non-ferric materials

Mapping with Programme Outcomes

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COURSE OBJECTIVES
- To understand the different types of mechanism.
- To provide in depth knowledge about power loss in different types of bearings and clutches.
- To draw the turning moment diagram of reciprocating engines.
- To illustrate the different types of problem in balancing and vibration of rotating masses
- To introduce as a tool for static and dynamic analysis of mechanisms for use in design and engineering
UNIT I

UNIT II

UNIT III

UNIT IV
Balancing - static and dynamic balancing - Balancing of rotating masses, balancing of reciprocating masses – introduction to primary and secondary balancing.

UNIT V
Vibrations: Definitions for free Forced and damped oscillations of single degree freedom system with examples. Whirling of shafts. Torsional oscillations of two rotor systems

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Know the different types of links and pairs in the kinematic chain.
2. Understand the power loss in friction for different types of clutches and bearings.
3. Obtain knowledge about the turning moment diagram for reciprocating engines.
4. Know the different types of balancing of static and dynamic system.
5. To understand the different types of vibration systems

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COURSE OBJECTIVES

- Apply knowledge of materials to prescribe appropriate welding process for specific applications;
- Model and simulate welding processes to conduct experiments and analyze the performance using modern tools;
- Understand the environmental issues related to each welding methods and try to develop ‘green welding’ methods.

UNIT I

Basics of arc welding processes - Classification of welding and allied Processes - Welding arc: physics involved in arc, structure and characteristics, arc efficiency calculation, methods of arc initiation and maintenance, arc stability, arc blow - V-I characteristics, constant current and constant voltage characteristics, duty cycle, simple problems Arc Welding Power Sources: welding transformers, generators, rectifiers, inverters; Classification of electrodes - Metal Transfer: forces affecting metals transfer - modes of metal transfer.

UNIT II

Arc welding processes-Basic principles, Process variables, Chief characteristics and applications of the following processes: Shielded(Manual) Metal Arc Welding (SMAW/MMAW) - Submerged Arc Welding (SAW), Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), CO₂ welding, Flux cored Arc Welding (FCAW), Electro Slag and Electro Gas Welding - Atomic Hydrogen Welding.

UNIT III

Resistance welding processes Basic principle, Process variables, Welding Sequence, Process characteristics and applications of the following processes: Spot welding, simple problems - Seam welding - Projection welding - Percussion welding - Resistance Butt welding - Flash Butt welding - High Frequency Resistance Welding (HFRW) and High Frequency Induction Welding (HFIW).

UNIT IV


UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the physics behind welding arc and heat flow equations;
2. Distinguish between fusion welding processes and solid state welding processes;
3. Select appropriate welding process for joining specific materials;
4. Inspect welding defects using Non-destructive testing methods;
5. Understand the environmental issues and safety requirements for each processes.

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Mapping with Programme Outcomes

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COURSE OBJECTIVES
• To know the Metal Cutting Process.
• To know the basic concepts of temperature developed during machining.
• To understand Tool Materials, Tool Life and Tool Wear.

UNIT I
Tool Materials: HSS, Carbide and coated tools, CBN, Ceramic and PCD. Tool geometry - single point cutting tool and multi point cutting tool - Tool signature-Tool designation: ASM, DIN, British standards and their relationships.
UNIT II
Metal Cutting Process: Chip formation - Types of chips - chip breakers- Chip thickness ratio, radius of chip curvature, cutting speed, feed and depth of cut –Theories of formation of built-up edge and their effect - Chip formation in drilling and milling.

UNIT III
Introduction to Orthogonal and Oblique cutting processes- The force system- Velocity relationship- forces in turning and milling- Relationship between forces, speed, feed and depth of cut- - Forces and energy calculations (Merchant’s Analysis) Single Point Cutting Tool: Various systems of specifications, single point cutting tool geometry and their inter-relation.

UNIT IV
Tool Life and Tool Wear: Theories of tool wear – adhesion, abrasive and diffusion wear mechanisms, forms of wear, Tool life criteria and machinability index. Effect of machining parameter on tool life- measurement techniques for tool wear- Tool economics- basic concepts- simple problem

UNIT V
Thermal Aspects of Machining and Cutting Fluid: Regions of heat generation; Heat In the Primary Shear Zone, Heat at the Tool/work Interface, Heat Flow at the Tool Clearance Face, Average shear plane temperature; Average chip-tool interface temperature; method of tool temperature measurement, temperature distribution in tool, Cutting Fluid: Types and composition of cutting fluids, selection of cutting fluid.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Gain knowledge on various tool materials and tool signature
2. Analyze the Tool Life and Tool Wear.
3. Understand basic concept of tools and tool materials.
4. Distinguish between Orthogonal and Oblique cutting.
5. Understand the concepts of thermal aspects of machining.
COURSE OBJECTIVES

- To introduce students various Industrial Engineering and Management concepts.
- To provide an understanding of the systematic approaches of various management functions.
- To enhance the management skills through the application of appropriate techniques.

UNIT I


UNIT II


UNIT III

UNIT IV
Break-even analysis - concept and applications - Depreciation - straight line and declining balance method.
Plant Location: Influencing factors. Location models – Breakeven analysis – Qualitative factor rating Method.

UNIT V
Work Measurement: Objectives, Work measurement techniques – time study, work sampling -Determination of time standards- Observed time, basic time, normal time, rating factors, allowances, and standard time.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Recognise the factors such as demand and production for pricing criteria
2. Understand and learn the effective interpersonal, team building and leadership skills
3. Improved the organizational performance through the effective management of human resources
4. Practice the process of management's four functions: planning, organizing, leading, and controlling
5. Differentiate between the various types of organizational structures and patterns
COURSE OBJECTIVES

- To supplement the principles learnt in kinematics and Dynamics of Machinery.
- To make the students understand the working principle of various types of governors, balancing systems, Cam analyzer, Torsional vibration of single rotor system, whirling speed concept, action of forces in gyroscope.

LIST OF EXPERIMENTS

1. Experimental verification of natural frequency in undamped vibration of single rotor system.
2. Determine the characteristic curves of watt/Hartnell governors.
3. Determination of mass moment of inertia of connecting rod and flywheel.
4. Studies on cam analyser
5. Study of gyroscopic couple.
7. Study and experiments on static and dynamic balancing of rotating masses.

COURSE OUTCOMES

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

1. Determine the mass moment of inertia of connecting rod and flywheel either experimentally or theoretically or both.
2. Understand the working principle of governors.
3. Calculate the stiffness of springs.
COURSE OBJECTIVES

- To inculcate the knowledge of making different types of joints in welding
- To study effect of welding power sources on heat input and bead geometry
- To provide on hand experience in the non-destructive testing of weldments

LIST OF EXPERIMENT

1. Butt Joint
2. Lab Joint
3. Corner Joint
4. ‘T’ Joint
5. Comparative evaluation of welding performance of Arc Welding power source.
7. Effect of Electrode Polarity Arc Welding Performance
9. Temperature Measurement in Arc Welding Process
11. Distortion Measurement
12. Magnetic particle test
13. Dye penetrant test

COURSE OUTCOMES

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

1. Fabricate different types of joints
2. To understand effect of heat input on bead geometry
3. To understand effect of power sources in arc welding

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MAPMING WITH PROGRAMME OUTCOMES

COURSE OBJECTIVES

- To provide hands-on experience on spur and helical gear machining
- To provide hands-on experience on clutch milling and flute milling
- To carry out alignment test on lathe
- To learn to measure the forces in lathe and grinding
LIST OF EXPERIMENTS
1. Lathe tool dynamometer
2. Power measurement in a lathe
3. Estimation of cutting forces by Merchant’s theory
4. Alignment test on lathe
5. Grinding tool dynamometer
6. Plain milling
7. Spur gear milling
8. Helical gear milling
9. Flute milling
10. Pantograph milling
11. Straight tooth clutch milling (3/4 dogs)

COURSE OUTCOMES
Upon the completion of this course, students would be able to
1. Understand the usage of dynamometers in lathe and grinding
2. To make spur, helical and to flute milling
3. To check the alignment of lathe structure

Mapping with Programme Outcomes

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MMPC501 CASTING TECHNOLOGY

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COURSE OBJECTIVES
- To impart about the sand casting process and its importance.
- The basic phenomena involved in metal casting process, gating and risering system.
- To introduce Modern casting methods

UNIT I

Pattern: Types of Pattern - Pattern Materials - Pattern Allowances- Pattern Making Machinery. Core: Purpose of Cores- Preparation of Cores- Core Materials and Additions- Core Dressing, Effect on Castings- Location and Fixing.

UNIT II
Melting: Melting Furnaces- Ferrous and Non-Ferrous Metals- Charging Operation in Cupola- Dissolved Gases in Molten Metal, Degassing Methods- Analysis and Composition of the Metal Ladle- Fluxes, Effect of Inoculation.
UNIT III

UNIT IV
Foundry Mechanisation: Moulding- Core Making Sand Conditioning- Removal of Moulds- Pouring Methods- Shake out- Core Cleaning, Fettling, and Handling

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the basic features and terminologies in casting process, gating and reserving system
2. Gain knowledge on melting furnaces and degassing methods
3. To understand the design aspects and the basics in solidification or the casting formation.
4. Study the types of defects occurred in casting and provide remedial solutions.
5. To obtain knowledge in the advanced casting process

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MMPC502  METAL FORMING PROCESSES  

COURSE OBJECTIVES
- To familiarize the students with the types of stress, in two and three dimensional.
- To provide basic knowledge of secondary processes and conditions for manufacturing defect free end-product.
- To illustrate the concepts of various advanced metal forming processes.

UNIT I
State of stress in two dimensions – two and three dimensions - Principal stresses, Stress deviator, Vonmises criteria, yield criteria. Comparison of yield criteria, Forming load calculation - Fundamentals of Metal working: Flow curve, Relationship between true stress and true strain, Temperature in metal forming, hot cold and warm working – residual stresses.

UNIT II
Forging: Types of Process & hammers defects & remedies. Forging classification, open die forging, Closed die forging - calculations of forging loads, Defects - causes - remedies.

Rolling: Rolling of blooms billet, Slab & Sheet, types of rolling mills – hot and cold rolling - forces & geometrical relationship in rolling, Analysis of rolling load, torque & power, defects - causes and remedies.

UNIT III
Drawing of rods, wires & tubes : Simple analysis of wire tube drawing . residual stress in rod, wire & tubes .

Extrusion – classification – hot and cold extrusion – deformation, lubrication - simple analysis of extrusion process - hydrostatic extrusion - tube extrusion, production of seamless pipes and tubes - extrusion defects causes and remedies

UNIT IV

UNIT V
High Speed Forming: Basic principle, process variables, Characteristics and application of the following processes: Electro hydraulic forming, electromagnetic forming, explosive forming, fuel combustion process, water hammer forming. Comparison between conventional forming and high speed forming.

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the stresses and component of stresses
2. Expertise different forming process to manufacture near net- shape product
3. Expertise different types of drawing and extrusion process
4. Gain knowledge on various types of sheet metal forming methods
5. Impart basic knowledge on various high speed forming processes

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MMPC503 ENGINEERING METALLURGY

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COURSE OBJECTIVES
- To impart fundamental knowledge on the structure, properties, heat treatment, testing and applications of metals and alloys.
- To introduce the concept of powder metallurgy and different type of corrosion.

UNIT I
Constitution of alloys, compounds & solid solutions, Gibbs phase rule, lever rule - Diffusion in Solids, Fick’s laws – Solidification, Nucleation and grain growth - constitutional supercooling, formation of dendrites - Directional solidification, Micro segregation, Macro segregation, Porosity and inclusions - Metallography - metallurgical microscope - preparation of specimen, micro & macro examination. Grain size ASTM grain size number, grain size measurement.

UNIT II
Phase diagrams, isomorphous, eutectic, peritectic, eutectoid and peritectoid reactions, Iron - Carbon equilibrium diagram - Classification of steel - Plain carbon steels - effect of C, Mn, Si, P & S. Purpose of alloying, effect of important alloying elements. - Important low alloy steels, stainless steel, tool steels - types, compositions and applications; Cast iron - types, composition and applications.
UNIT III

Heat treatment of steel: Isothermal transformation diagram - Time Temperature Transformation Diagram, Continuous cooling transformation diagrams, full annealing, stress relief annealing, spheroidizing, normalizing, Hardenability and Jominy end quench test - Austempering and martempering - case hardening, carburising, nitridding, cyaniding, and carbon nitriding, flame hardening, induction hardening, vacuum hardening and cryogenic treatment- Precipitation and Age hardening

UNIT IV

Non ferrous metals: Physical, Mechanical, Metallurgical properties of Aluminum alloys, Magnesium alloys, Copper alloys, Nickel alloys and Titanium alloys – Classification of these alloys and applications.

Powder metallurgy: Process fundamentals, production of metal powders, characteristics, powder blending, compacting, Sintering, applications

Corrosion - Factors influencing corrosion, pitting corrosion, cavitation corrosion, cervice corrosion, fretting corrosion, inter – granular corrosion - corrosion prevention.

UNIT V


TEXT BOOKS


REFERENCES


COURSE OUTCOMES

Upon completing this course, students should be able to:

1. Understand the correlation between structure and properties of metals and alloys;
2. Select the appropriate alloys for specific applications;
3. Design heat treatment methods for specific applications;
4. Protect the metals and alloys from environmental degradation;
5. Evaluate the mechanical properties of materials by modern tools and equipments.

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**MMPC504**

**MECHANICS OF MATERIALS**

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**COURSE OBJECTIVES**

- To gain knowledge of simple stresses, strains and deformation in components due to external loads.
- To assess stresses and deformations through mathematical models of beams, twisting bars or combinations of both.
- To study the effect of component dimensions and shape on stresses and deformations are to be understood.
- The study would provide knowledge for use in the design courses

**UNIT I**


**UNIT II**


**UNIT III**

UNIT IV
Torsion - Theory of pure torsion in circular shafts - Variation of shear stress distribution across the solid (Circular), Hollow (Circular), and thin walled sections - Saint Venant’s torsion - Warping torsion - Torque transmitted in circular and hollows shaft - Spring-stiffness - Linear stiffness and rotary stiffness - Types: Helical (open coiled, close coiled) and leaf spring uses - spring in series and - spring in parallel - load versus deformation ship - spring deflections. Stiffness and shear stress - Automobile springs.

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completion of the course, the student should be able to:
1. Develop knowledge on identifying stress, strain and their effects
2. Understand the theory of various types of loading systems
3. Critically analyses components like beams and twisting bars
4. Understand theories on columns and springs
5. Employ all the knowledge gained in designing of machine components.

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COURSE OBJECTIVES
- To educate the importance of various process parameters during metal forming processing methods such as rolling water hammer forming.
To learn to plot the stress strain curve of compression and tension testing
To provide hands-on experience on preparing various types of green sand mould.

LIST OF EXPERIMENTS
1. Formability of sheet metals by water hammer technique
2. Rolling of metal strips
3. Disc compression test
4. Estimation of creep rate of a given specimen
5. Uniaxial tensile test
6. Charpy impact test
7. Izod impact test

Foundry Shop – Green sand mould preparation using the following patterns
8. Face Plate (Solid Pattern)
9. Hexagonal Nut (Self Core solid Pattern)
10. Lathe Saddle (Loose Piece Pattern)
11. Oil Cup (Self Core solid Pattern)
12. Ball Handle (Split Pattern)
13. Pipe Flange (Split Pattern)
14. Pulley (Split Pattern)
15. Gear wheel (Solid Pattern)

COURSE OUTCOMES
Upon completion of the course, the student should be able to:
1. Determine tensile parameters
2. Understand the parameters that influencing various material processing methods.
3. Prepare green sand moulds of given pattern.

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MMCP508 METALLURGY LABORATORY
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COURSE OBJECTIVES
- To study the Microstructure of ferrous non-ferrous and heat treated specimens etc.
- To learn to construct phase diagram
- To study effect of section size and quenching media on hardness

LIST OF EXPERIMENTS:
1. Effect of section size on hardness
2. Effect of quenching media on hardness
3. Jominy hardenability test
4. Microscopic examination of a metallic specimen and determination of grain size
5. Micro-structural study of ferrous material
6. Micro-structural study of non-ferrous material
7. Micro-structural changes of a heat treated specimen
8. Micro-structural changes at the heat effected zone of a welded specimen
9. Identification of materials by spark test
10. Phase diagram
11. Estimation of creep rate
12. Characteristics of moulding sand
13. Corrosion test

COURSE OUTCOMES:
Upon completion of the course, the student should be able to:
1. Differentiate the Microstructure of ferrous non-ferrous and heat treated specimens etc.
2. Construct phase diagram
3. Understand the effect of section size and quenching media on hardness

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COURSE OBJECTIVES
- To impart practical training on simple machines like screw jack, worm wheel, etc.,
- To understand the theoretical and practical aspects of elasticity and plasticity of the materials through a variety of experiments

LIST OF EXPERIMENTS
1. Simple Machines - screw jack, worm and wheel, differential wheel and Axle, Handlowinch
2. Material Testing - Tension, compression and shear tests on different materials
3. Bending and deflection test on beams
4. Hardness, impact and ductility tests on metals
5. Torsion tests on rods, springs and fatigue tests (Demonstration only)

COURSE OUTCOMES
Upon completion of the course the students will be able to
1. Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.
2. Utilize appropriate materials in design considering engineering properties, sustainability, cost and weight.
3. Perform engineering work in accordance with ethical and economic constraints related to the design of structures and machine parts.
Mapping with Programme Outcomes

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COURSE OBJECTIVES

- To provide basic knowledge about functioning of different control systems, the mechanical and electrical actuation systems.
- To familiarize the students the performance of different types of sensors and transducers, the principle of signal conditioning.
- To illustrate the concepts real time interfacing and advanced application and data acquisition and control systems of mechatronics in manufacturing.

UNIT I


UNIT II


UNIT III


UNIT IV


UNIT V

Real time interfacing and advanced application: Real time interfacing with computer - elements of data acquisition and control system - overview of I/O process. Application - Sensors for conditioning monitoring – mechatronics control in automated manufacturing.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the elements of mechatronic system
2. Understand the construction and working principles mechatronic control systems, Electrical and Mechanical actuation systems.
3. Distinguish between sensors and Transducers.
4. Identify suitable mechatronics control system for manufacturing processes.
5. Develop new mechatronics control system for different manufacturing processes

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MMPC602 | FLUID MECHANICS & MACHINERY | L | T | P | C |
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COURSE OBJECTIVES
- To study the applications of the conservation laws to flow through pipes and hydraulic machines.
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines

UNIT I
Introduction to fluid mechanics - Real and ideal fluids – Properties of fluid – Pressure in a fluid – Manometers — compressible and incompressible fluids – Pressure measurements — Hydrostatic forces on surfaces - Total pressure and Centre of pressure on different surfaces – Buoyancy and static stability – Metacentre.

UNIT II
Types of flows and flow pattern (stream lines, stream tube, Path lines and streak line) – one dimensional flow analysis – General continuity equation – steady flow equation of continuity – Euler’s equation- Bernoulli’s equation and its applications. (Orifice meter, Venturimeter and pitot tube).
UNIT III
Boundary layer – laminar and turbulent flow separation – Transition- types of Boundary layer thickness – Flow through pipes- Weisbach equation and chezy’s for friction loss in pipe- Major and minor losses – Buckingham [] theorem – non – dimensional numbers – Reynolds number – Froude numbers, Weber number, Euler’s number and Mach number.

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completion of this course, the students will be able to:
1. Apply mathematical knowledge to predict the properties and characteristics of a fluid.
2. Critically analyse the performance of pumps and turbines.
3. Identify hydraulic component
4. Ability to design hydraulic circuits
5. Visualize how the hydraulic circuit will work to accomplish the function.

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COURSE OBJECTIVES
- To impart hands on experience to students in Geometric Modeling, Assembly and Engineering Drafting.
- To introduce the concepts of CNC programming and simulation on CNC turning, CNC Milling machines.
- To provide hands on experience in the use of hydraulic & pneumatic components.
- To formulate simple circuits which enable the students to understand the concept of mechatronics.

LIST OF EXPERIMENTS
Creo:
1. Sketcher
2. Solid modeling
3. Surface modeling
4. Feature manipulation
5. Assembly
6. Drafting

Mechatronics:
7. Study of various pneumatic and electro-pneumatic components.
8. Study of pneumatic and electro-pneumatic symbols, circuits.
10. Study of characteristics of sensors.
11. Study of image processing technique.
12. Modelling and analysis of pneumatic and electrical circuits using FluidSim/P Software.
13. Application on Pneumatics
14. Application on Electro Pneumatics
15. Application on Programming Logic Control (PLC)

COURSE OUTCOMES
Upon successful completion of the course, the students are able to
1. Gain practical experience in handling 2D drafting and 3D modeling using modeling software systems.
2. Understand and apply the concepts G and M codes and manual part programming of turning and milling processes.
3. Understand the functional aspects of different pneumatic and hydraulic components and its use in circuits.
4. Construct and demonstrate pneumatic, electro pneumatic and PLC circuits for various applications.
COURSE OBJECTIVES
- To understand the properties of fluids and fluid statics, methods for determination of co-efficient of discharge.
- To study of the characteristic features of pumps and turbines.
- To understand the significance and role of such utilities in their further course of study.

LIST OF EXPERIMENTS
1. Determination of Co-efficient of discharge of Mouth Piece
2. Determination of Co-efficient of discharge of Venturimeter
3. Determination of Co-efficient of Head loss due to Sudden Change in Section
4. Determination of Co-efficient of Head loss due to Friction in Pipe
5. Determination of Co-efficient of discharge of Rectangular Notch
6. Study of Performance characteristics of Elmo Pump (Centrifugal Pump)
7. Study of Performance characteristics of Sump Pump (Centrifugal Pump)
8. Study of Performance characteristics of Submersible Pump (Centrifugal Pump)
9. Study of Performance characteristics of Gould’s Pump (Reciprocating Pump)
10. Study of Performance characteristics of Pelton Turbine (Constant Speed method)
11. Study of Performance characteristics of Francis Turbine (Constant Head method)
12. Determination of Metacentric Height of a floating vessel (Demo Only)

COURSE OUTCOMES
After completion of this course, student will be able to:
1. Determine the properties of fluids, pressure and their measurements
2. Measure flow in pipes and determine frictional losses
3. Compute forces on immersed plane and curved plates applying continuity equation and energy equation in solving problems on flow through conduits
4. Develop Characteristics of pumps and turbines

Mapping with Programme Outcomes

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COURSE OBJECTIVES

- To understand the moral and ethical dimensions in engineering.
- To take balanced decisions.

UNIT I


UNIT II


UNIT III


UNIT IV


UNIT V


TEXT BOOKS


REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, the students are able to
1. Understand the relationship between the engineer and the society.
2. Learn the importance of codes in engineering practice.
3. Acquire knowledge on the legal aspects in engineering.
4. Acquire knowledge on the moral and ethical aspects in engineering.

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MMPC702  DESIGN OF MACHINE ELEMENTS  L  T  P  C
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COURSE OBJECTIVES
- To familiarize the various steps involved in the Design Process
- To understand the principals involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components

UNIT I
Introduction: Types of Design factors. Factor of safety, Theories of failure - Curved beam, crane hook and C frames.
Design for fatigue strength: S-N diagram - Endurance limit modifying factors - Stress concentration - Fluctuation stress – Soderberg & Good Man equations

UNIT II
Thin cylinders – Stresses in thin cylindrical shell due to internal pressure – circumferential and longitudinal stresses and deformation in thin cylinders Design of mechanical elements: Shafts – Design for static load – bending and torsion – Equivalent twisting moment. Coupling - Types - Design and selection of coupling - Flange coupling, Bushed pin type, flexible coupling design and selection

UNIT III
Theory of columns: Design of push rod, piston rod and I.C. Engine connecting rods sections.
Wire ropes - Stresses - selection Design procedure–leaf springs - construction equalized stresses in leaves - material and design. Open and closed coiled helical springs stress - Wahl's factor

UNIT IV
Power screws - Thread forms Design consideration and materials - wear and shear - design procedure. Threaded fasteners – Bolted joints – simple and eccentrically loaded bolted joints
UNIT V
Welded joints: Introduction - Strength of transverse and parallel fillet welded joints - Axially loaded unsymmetrical welded sections - Eccentrically loaded welded joints

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to
1. To understand the basics of engineering design of machine elements
2. To understand the functions of various machine elements and assemblies
3. To design various machine components according to the requirement as per the prescribed standards
4. To apply the knowledge of materials and their properties
5. To use standard design data book

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COURSE OBJECTIVES
- To provide basic understanding of machine drawing.
- To study the provide assembly and disassembly drawings of bearings, screw jack ect.

UNIT I
Fasteners: Different form of rivet heads – Single, double riveted lap and butt joints - Foundation bolts - Locking arrangements for nuts - lock nut, split pin, locking plate and spring washer - Stud Set screws – Different forms of machine screws - pan, countersunk, slotted and philip headed screws - Keys - sunk taper key, gib headed taper key, feather key, woodruff key, saddle key.
UNIT II
To draw orthographic views from the given isometric views of simple objects. Detailed assembly drawing and additional views from the given drawing.
(a) Shaft coupling - Protected type and Pin type flexible coupling
(b) Bearings and Supports - Bushed bearing, Foot step bearing and Plummer Block
(c) Eccentric
(d) Steam engine stuffing box
(e) Screw jack.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. An Ability to understand and apply the knowledge of machine drawing as a system of communication in which ideas are expressed clearly and all information fully conveyed.
2. An ability to understand the design a system, component or process to meet desired needs within, realistic constraints such as manufacturability, economic, environmental, safety & sustainability etc., to represent a part drawing and assembly drawings.
3. Recognition of the need for and an ability to engage in self education and life-long learning.

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COURSE OBJECTIVES
- To expose students to the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions.
• To have hands-on experience in the students’ related field so that they can relate and reinforce what has been taught at the university.
• To promote cooperation and to develop synergetic collaboration between industry and the university in promoting a knowledgeable society.
• To set the stage for future recruitment by potential employers.

The student has to present a seminar on the chosen topic. However, the student can select a topic duly approved by the Seminar Coordinator and the Head of the Department concerned. The student who has presented the seminar has to submit a report and appear for viva-voce examination at the end of the semester conducted by faculty members nominated by head of the department.

For Industrial training, the student has to undergo training in a reputed industry for 15 days and has to submit a report on completion of the training. The report will be evaluated by a team of faculty members nominated by the head of the department.

COURSE OUTCOME
Upon completion of the Training, students will have the
1. Ability to work in a team
2. Ability to take initiatives.
3. Ability to effectively communicate solution to problems (oral, visual, written).
4. Ability to manage a project within a given time frame.
5. Ability to apply prior acquired knowledge in problem solving.
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COURSE OBJECTIVES
• To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
• To train the students in preparing project reports and to face reviews and viva voce examination.

This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project or internship in the industry or even a minor practical project in the college. Participation in any technical event/competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course.
COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Take up any challenging practical problems and find solution by formulating proper methodology.
2. Students will acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
3. Students will acquire collaborative skills through working in a team to achieve common goals.
4. Students will be able to learn on their own, reflect on their learning and take appropriate actions to improve it.
5. Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.

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PROFESSIONAL ELECTIVE COURSES

MMPESCN | NON-TRADITIONAL MANUFACTURING PROCESSES | L | T | P | C
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COURSE OBJECTIVES
- To introduce the fundamentals of Non-Traditional Manufacturing Processes and their methods, applications advantages and disadvantages
- To introduce the concept of nano technology and rapid prototyping

UNIT I
Overview of non-traditional manufacturing – classification of processes under source of energy, transfer media and mechanism
Electric Discharge Machining (EDM): Principles – equipment – power supply, dielectric system, electrodes – process parameters – applications
Wire Electric Discharge Machining (WEDM): Principles – equipment – power supply, dielectric system, electrodes – process parameters – applications

UNIT II

UNIT III
Chemical machining (CHM): Principles – equipment – masks, etchants – process parameters – applications

UNIT IV
Electron Beam Machining (EBM): Principles – equipment – EB gun – power supply – process parameters – applications
Laser Beam Machining (LBM): Principles – equipment – power supply – process parameters – applications
Plasma Arc Machining (PAM): Principles – equipment – plasma torches – process parameters – applications
Hot machining – Neutral particle technique – High speed machining.

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. To understand the need for non-traditional manufacturing processes.
2. To gain knowledge on principle of various non-traditional manufacturing processes
3. Provide better knowledge on the concepts non-traditional manufacturing processes
4. Understand the basic principles of nano technology.
5. Understand the basic principles of rapid prototyping.
COURSE OBJECTIVES

- To introduce different production tools, including press tools, their design.
- To provide an understanding of design and use of jigs and fixtures.

UNIT I
Design principles of cutting tools – problems in cutting tool design – factors in tool design -. Single point cutting tool – chip breakers – determination of tool shank dimensions.
Milling cutters – determination of number of teeth, teeth size and other features. Design features – drills – reamers - broaching tools

UNIT II

UNIT III

UNIT IV
Elements of Jigs and Fixure – Locating and clamping principles. Locating method and devices – Clamping devices. Types of Jigs: Plate, Template, Latch, Channel Leaf, Box and Indexing.

UNIT V
Modular work holding systems – POKA YOKE - quick change toolings - single minute exchange of dies – Computer aided fixture design – phases.

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to
1. Develop an understanding of the cutting tool nomenclatures
2. Develop and design of progressive and compound dies for simple sheet metal operations
3. Calculate bending force, number of draw for the required cup shape, blank size for forged components.
4. Understand the modern techniques of tool engineering and the various phases in computer aided fixture design
5. Acquire knowledge about the plastic tool materials and development methods

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COURSE OBJECTIVES
- To familiarize the basic concepts of CAD / CAM / CIM
- To introduce the various aspects of automated manufacturing
- To introduce the fundamentals of materials handling and storage system and robotics
- To introduce the concepts of automated assembly and control system

UNIT I

UNIT II
UNIT III

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Provide engineering knowledge on the importance of CAD / CAM / CIM
2. Understand the various aspects of automated assembly and control system
3. To understand the basics of Industrial robots in modern manufacturing
4. Provide knowledge on the concepts of group technology and flexible manufacturing
5. Understand the usage of modern materials handling and storage system and industrial robots
### COURSE OBJECTIVES

- To introduce the concepts and applications of CAD
- To introduce the various concepts and techniques used for Product design.
- To develop product design skills.

### UNIT I

Introduction to Engineering Design – Various phases of systematic design – sequential engineering and concurrent engineering – Computer hardware & Peripherals – software packages for design and drafting.

### UNIT II


### UNIT III


### UNIT IV


### UNIT V


### TEXT BOOKS

REFERENCES
   McGraw Hill.

COURSE OUTCOMES
1. Upon completing this course, students should be able to:
2. Understand fundamentals of 2D and 3D drawing.
3. Able to apply Geometric modeling principles of design.
4. Able to manage the product data and apply product life cycle management to
   Industrial Components.
5. Understand and apply the product modeling.

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COURSE OBJECTIVES
- To provide an understanding of the modern approaches to manage the operations,
- To present a broad conceptual framework for the management of the operations
  function in an organization

UNIT I
Production and operation management – Evolution and objectives - Concept of
Production system - Types of Production systems – Continuous, Intermittent -Elements of
Production planning and control, concept of Productivity - Production versus Services.
Aggregate planning: Costs, Strategies – Application of chase and level strategies and
Transportation model - Simple problems.

UNIT II
Capacity planning: Defining and measuring capacity – determinants of effective
capacity – Developing capacity alternatives.
Forecasting - components of demand - Quantitative methods - Single moving average method
- Single exponential smoothing method - Simple linear regression model – Measures of
accuracy - Illustrative examples - Qualitative Methods.

UNIT III
Inventory planning and control: Need, inventory costs, Determination of EOQ,
EPQ/ELS (without shortages) - Effect of quantity discounts. Determination of ROL, Safety
Stocks - Methods of calculating safety stock using Normal - single period inventory model, Inventory control systems - P, Q, and S-s System.

UNIT IV
Materials Requirements Planning (MRP) - Master Production Schedule (MPS), Bill of Materials (BOM), MRP concept, Lot sizing: Lot-for-lot technique, EOQ approach, Periodic order quantity approach – Illustrative Examples.

UNIT V
Operations scheduling and sequencing: Notations and definitions - Job shop scheduling: sequencing of n jobs through one machine - Priority decision rules – Measures of Performance - n jobs through 2 machines - Jackson’s rule. Flow shop scheduling: sequencing of n jobs through 2, 3 machines, Johnson’s rule. n jobs through m machines - CDS algorithm.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Develop an understanding of various types of production systems
2. Differentiate Production and services
3. Gain an understanding and appreciation of the principles and applications relevant to the planning, design, and operations of manufacturing/service firms
4. Develop the ability to identify operational methodologies to assess and improve an organizations performance
5. Gain ability to recognize situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making in the areas such as Aggregate planning, Inventory control, forecasting MRP and scheduling

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COURSE OBJECTIVES

- To provide an understanding of modern techniques and tools of quality management
- To impart the knowledge and on the application of the statistical quality control techniques which are used in manufacturing and service industries.
- To provide knowledge and understanding of the modern manufacturing strategies and to present a broad conceptual framework for the management of the operations function across the supply chain.

UNIT I


UNIT II

Objectives of statistical quality control - inspection and its importance – Introduction to Single sampling plan – OC Curve - differences between inspection and quality control - Causes and types of variations - Theory of control charts, Control charts for attributes - p, np, c and u charts.

UNIT III

Control charts for variables, X - R charts, standard deviation charts - Moving range chart. Relationship between statistical control limits and specification limits - modified control chart, process capability studies (Cp and Cpk) – concept of six sigma.

UNIT IV


UNIT V


TEXT BOOKS

REFERENCES
COURSE OUTCOMES

Upon completing this course, students should be able to:

1. Understand the core features of the Total quality management in terms of various dimensions of quality.
2. Measure the cost of poor quality and process effectiveness and efficiency to track performance quality and to identify areas for improvement.
3. Develop an understanding on quality management philosophies and frameworks.
4. Develop the ability to apply the tools of quality control and quality management.
5. Understand proven methodologies to enhance management processes, such as benchmarking and business process reengineering, lean manufacturing.

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MMPESCN | ADVANCED MANUFACTURING PROCESSES | L | T | P | C | 3 | 0 | 0 | 3 |

COURSE OBJECTIVES

- To acquaint the students with recent developments in modern casting and welding processes.
- To introduce students to the scientific principles underlying material behaviour during manufacturing processes.
- To make students aware of the necessity to manage manufacturing processes and systems for the best use of material.

UNIT I

Advanced casting processes - plaster mold and ceramic mold casting – vacuum casting – Evaporative pattern casting, ceramic shell investment casting, slush casting, squeeze casting and semisolid metal forming-Rapid solidification for Amorphous alloys.

UNIT II

Advanced welding processes: Basic principle, Process variables, Chief characteristics and applications of the following processes: Laser beam welding, Electron beam welding, Plasma arc welding, Friction stir welding, Explosive welding, Ultrasonic welding and diffusion welding.

UNIT III

UNIT IV


UNIT V


TEXT BOOKS


REFERENCES


COURSE OUTCOMES

Upon completing this course, students should be able to:
1. The student will be able to understand the latest processes in the field of Manufacturing Technology.
2. An understanding of Powder metallurgy processes and Welding processes
3. To gain knowledge on processing of plastic
4. Realize the need and place for rapid prototyping approach.
5. Ability to develop a project on design and product development, considering advanced production technologies.

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COURSE OBJECTIVES

- To introduce the various aspects of destructive testing and Non-destructive testing
• To introduce the fundamentals of advanced materials testing methods

UNIT I

UNIT II

UNIT III

UNIT IV
Production of ultrasonic waves – Different types of waves - Normal beam inspection – Angle beam inspection - Thickness measurements – Applications.

UNIT V
Principle of acoustic emission - Instrumentation for Non destructive testing - Principles of holography - Applications of holographic techniques - Non destructive inspection - Advantages and limitations - Other techniques.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. To provide better understanding of the principles of various Non destructive testing methods
2. To impart knowledge on the advantages and disadvantages of the processes
3. To understand the application of acoustic emission testing methods
4. Able to select appropriate NDT method for testing of defects
Mapping with Programme Outcomes

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COURSE OBJECTIVES

- To introduce students the use of quantitative methods and techniques for effective decisions-making.
- To provide an understanding of the systematic approach to solve decision making problems.
- To enhance the decision-making skills through the application of appropriate models.

UNIT I

Linear programming - graphical method - Simplex method - Big M method-Applications – Problems.

UNIT II


UNIT III


UNIT IV

PERT and CPM - basic steps - rules for constructing the network - Fulkerson's rule - time estimates - PERT calculations - probability of meeting the time schedule - time - cost trade off (crashing) - difference between PERT and CPM – applications.

UNIT V

Decision Theory - Decision making under risk condition - expected monetary value criteria - Decision trees - Decision making under uncertain conditions - Minimax, maximin, maximax, Hurwitz and Regret criteria.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, the students are able to
1. Formulate and solve linear programming models and solutions
2. Apply the concept of waiting line to analyze waiting cost and level of service
3. Develop solutions for various assignment problems
4. Apply project management techniques
5. Select appropriate decision making models for the real life problems.

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COURSE OBJECTIVES
- To introduce the various drive systems used in machine tools
- To understand the basic design aspects of various of machine tool components and structures

UNIT I & II
Various driving systems for machine tools - Stepper motors - Use of preferred numbers in machine tools - Stepped drives - Graphical representation of speed - structural and ray diagrams - Optimum ray diagram - Ruppert drive - Feed gear boxes - Norton ssdrive - Meander drive. Various stepless regulation systems - principles of self aligning - methods of increasing the range of regulation in modern machine tools

UNIT III

UNIT IV
Machine tool beds - types - constructional and design features - Design of column of drilling and milling Machine - Stiffeners and ribs arrangement.
UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Apply the concept of preferred numbers in machine tools
2. Differentiate the types of drives for machine tools
3. Develop an understanding of the constructional and design features of machine beds, columns
4. Develop an understanding of the constructional and design features of machine guideways
5. Design and develop power screws

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COURSE OBJECTIVES
- To learn the concepts to increase machine IQ by overlapping the dynamic system, adaptive control, Statistics with probability and mathematical logic.

UNIT I
Introduction to Fuzzy Logic Principles: Basic concepts of Fuzzy Set theory - Operations of Fuzzy sets - Properties of Fuzzy sets - Crisp relations - Fuzzy relational equations - operations on Fuzzy Relations Fuzzy systems - Propositional Logic - Inference - Predicate Logic - Inference in Predicate Logic - Fuzzy Logic Principles - Fuzzy Quantifiers -
Fuzzy Inference – Fuzzy rule based systems – Fuzzification and Defuzzification – types.

UNIT II

UNIT III

UNIT IV
Other JANN Architectures: Associative Memory - Exponential BAM - Associative Memory for Real Coded Pattern Pairs - Applications Adaptive Resonance Theory - Introduction - ART 1 - ART2 - Applications - Neural Networks based on Competition - Kohonen Self Organizing Maps - Learning vector Quantization - Counter Propagation Networks Industrial Applications.

UNIT V

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon completing this course, students should be able to:

1. Inculcate the knowledge of principles of fuzzy logic
2. Inculcate the knowledge of principles of neural network concepts
3. Have an understanding in the Recent Advances of Non Traditional Optimization Techniques

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COURSE OBJECTIVES

- To impart a better understanding of the fundamental philosophies of Maintenance Management, and the different techniques that enable the selection of the optimum maintenance strategy. It also discuss the concepts of reliability engineering and spare parts management.

UNIT I

UNIT II
Maintenance facilities planning: Planning of Maintenance Function – Long range planning – Short range planning – Man power allocation - Planning techniques – Planning steps - Optimal number of machines / crew size - Use of waiting line and Simulation model.

UNIT III
Replacement strategies and Policies: Basic concepts of replacement analysis, economic service life, opportunity costs - Replacement analysis using specified time period - probabilistic replacement models – simple problems

UNIT IV
Reliability Engineering: Bath tub curve - Failure data analysis and life testing – Reliability parameters – System reliability with components in series, parallel and mixed configuration – Active, partial and standby redundancy – Availability and Maintainability concepts - Reliability centered maintenance – FTA, FMECA.

UNIT V
REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Develop a maintenance plan for a technical system
2. Have a working knowledge of the techniques of reliability engineering
3. Apply learned concepts to improve the maintenance, the maintainability, hazard risk and the safety of the plant
4. Apply problem solving models to maintenance
5. Analyze different failure of a component/equipment

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COURSE OBJECTIVES
- To introduce the student to the cost implications of the various decisions that may have to be made in a manufacturing environment.

UNIT I
Basic concepts, terms, demand – supply relationship. Role of engineering economics in decision making, Interest calculation (simple & compound), cash (IN/OUT) flows.

UNIT II
Principle of money – Factors and their uses – single payment factors, uniform series present worth factor - capital recovery factor, sinking fund factor present worth, future worth and equivalent uniform annual worth calculation.

UNIT III
Application of money – time relationships: present worth, capitalized cost evaluation, equivalent uniform annual worth calculation, rate of return components for single projects, rate of return evaluation for multiple alternatives. Minimum attractive rate of return.
UNIT IV
Replacement strategies and Policies: Basic concepts of replacement analysis, economic service life, opportunity costs - cash flow approaches to replacement analysis - Replacement analysis using specified study period - probabilistic replacement models.

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the basic terms of economics
2. Understand the principle of money and depreciation
3. Apply present worth criterion of money
4. Develop and compare different replacement policies
5. Recognize the cost volume profit relationship

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COURSE OBJECTIVES
- To equip the students with concepts of sensor performance, product monitoring and control applications in robotics.
- To acquaint the student with the elements of CIM, FMS and the integration of manufacturing functions.
To provide students with a sound understanding of the use of advance instrumentation and sensing methods.
Understand the various components of sensor network architecture, networks in manufacturing and PLC.
To provide an exposure to current trends in areas related to fiber optics in sensor and biomedical technology.

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Fiber Optics in Sensor and Control System.- Fibre Optics Parameters, Configurations, Photo Electric Sensor for Long Distance, Sensor Alignment Techniques, Sensors for Biomedical Technology.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Learn the basics of sensor requirement in product monitoring.
2. Provide an introduction to condition monitoring procedures and system integration
3. Know about Identification of manufactured Components and applications in Robotics.
4. Provide understanding of the use of advanced instrumentation and sensing methods.
COURSE OBJECTIVES
This course will enable the student
- To familiarize the basic concepts of Surface Engineering and Tribology
- To introduce the various aspects of wear, its mechanism and control.
- To introduce the fundamentals of various surface modification processes.
- To introduce the concepts of thick film and thin film coatings.

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Provide engineering knowledge on the importance of methods of Surface Engineering
2. Understand the various aspects of thick film coatings and thin film coatings for manufacturing products
3. Provide better knowledge on the concepts on surface characterization.
4. Understand the usage of implementation on testing of coatings and inspection of surface on surface engineering.

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Mapping with Programme Outcomes

COURSE OBJECTIVES
- To introduce the concept of precision engineering and manufacturing methods
- To introduce the concept of nano technology and scanning instrumentation
- To make an understanding of MEMS

UNIT I

UNIT II

UNIT III
Precision Manufacturing: Manufacturing Methods in Precision Engineering - Joining Technologies - Finishing processes - Special Casting techniques - Etching techniques -
Coatings with metals & Inorganic Materials - Optical Production Methods - Vacuum Deposition MEMS & Micro Machining.

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Learn the concept of precision engineering and manufacturing methods
2. Learn the concept of nano technology and scanning instrumentation
3. Expose to the principle of MEMS

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COURSE OBJECTIVES

- To impart an in-depth knowledge on composite materials and types
- To make an understanding of the production processing and the structural development in composite materials.

UNIT I


UNIT II

Classification of Polymers - properties and applications of selective engineering polymers - Polymer Matrix Composites: Polymer matrix resins - Thermosetting resins, thermoplastic resins - Reinforcement fibres - Rovings - Woven fabrics - Non Woven random mats - various types of fibres. PMC processes - Hand layup processes - Spray layup processes - Compression moulding - Reinforced reaction injection moulding - Resin transfer moulding - Pultrusion - Filament winding - Injection moulding. Fibre reinforced plastics (FRP), (Glass fibre reinforced plastics (GRP)).

UNIT III


UNIT IV


UNIT V


REFERENCES

5. Fundamentals of Composite Manufacturing, B. Strong, SME, 1989
7. “Short Term Course on Advances in Composite Materials”, Composite Technology Centre, Department of Metallurgy, IIT - Madras, December 2001
8. Hand Book of Plastic processing, Brydson,

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Obtain knowledge on classification of composite materials used in the modern world
2. Obtain knowledge on different types of production technique of composite materials
3. To understand the basics of polymer matrix composites
4. Gain knowledge on the processing methods of metal matrix composites and ceramic matrix composites
5. Acquire knowledge on production of light weight composites that are used in aerospace industries

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COURSE OBJECTIVES
- Discuss the fundamental concepts of supply chain management;
- impart the knowledge on how to align the management of a supply chain with corporate goals and strategies.
- Expose the issues in international supply chain management

UNIT I
Introduction to Supply Chain Management- Definition- Decision phases in supply chain, Process Vs Push pull view of supply chain-The development chain - Design the right sc-functional Vs innovative products- product life cycle and SC design – clock speed.

UNIT II
UNIT III
Value of Information- Bullwhip effect- information and supply chain technology-
Supply chain integration- Concepts of MTO, MTS, ETO and ATO -demand driven strategies-
impact of internet on SCM-

UNIT IV
Supply network – factors influencing supply chain network design - distribution
strategies VAT material flow analysis. Strategic alliances – Make or buy decision –
Framework for strategic alliance – outsourcing - Krajalic matrix - core competency – 3PL-
4PL – Effect of Demand and supply uncertainty- cross docking- - risk pooling- Square root
law -centralized vs decentralized system

UNIT V
Global SC - International Issues in SCM- Introduction- risks and advantages- design
for logistics- supplies integration into to new product-development- mass customization-
Issues in customer value – Information technology for SCM- Goals - standardization-
infrastructure- DSS for supply chain management.

REFERENCES
1. Designing and managing the Supply Chain, Simchi - Levi Davi, Kaminsky Philip and
2. Supply chain management, 2nd edition, Sunil Chopra and Peter Meindl, Pearson
3. Supply Chain Management: Text and Cases, Janat Shah, Pearson Education India,
2009.
4. Supply Chain Management, Robert B Hand Field and Ernest Nichols, Prentice Hall,
5. Supply chain management: concepts, techniques and practices, Ling Li, world
scientific press, 2011
6. Supply chain management (Theories & practices), R Mohanty and S G Deshmukh, 1st
edition, Biztantra innovation in management, 2005

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the roles of supply chain among various business functions and their roles
in the organizations’ strategic planning and gaining competitive advantage
2. Able to actively employ supply chain management methodologies
3. Able to apply supply chain techniques in both manufacturing and service industries
4. Analyze the principles, concepts and challenges for developing sourcing,
manufacturing and distribution strategies in a global market.
5. Describe the role of information technology to improve the performance of the supply
chain

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**COURSE OBJECTIVES**

- To impart a sound understanding of the tensile, hardness and toughness behaviour of materials.
- To understand the factors affecting the fatigue and fracture behaviour of materials.
- To study the time dependant mechanical behaviour of materials.

**UNIT I**

Tensile behaviour: Engineering stress-strain curve: Derivation of tensile strength, yield strength, ductility, modulus of elasticity, resilience and toughness from stress strain curves, comparison of stress-strain curves for different materials - True Stress - Strain Curve: true stress at maximum load, true fracture strain, true uniform strain, Necking strain - necking Criteria - Effect of strain rate, temperature and testing machine on flow properties - Notch tensile test - Tensile properties of steel

**UNIT II**


**UNIT III**


**UNIT IV**


**UNIT V**

Time dependant mechanical behaviour: Creep curve - Stress rupture Test - Structural changes during creep - Mechanisms of creep deformation - Deformation mechanisms maps - Activation energy for steady state creep - Fracture at elevated temperature - Introduction to high temperature alloys - Predication of long time properties - Creep under combined stresses - Creep- Fatigue Interaction.
REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the mechanical behaviour of metals;
2. Protect the metals from fatigue damage.
3. Understand the environmental factors affecting the mechanical behaviour of materials
4. Evaluate the high temperature properties of metals.
5. Design the metals for specific applications;

Mapping with Programme Outcomes

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MMHESCN | MODERN MANUFACTURING STRATEGIES | L | T | P | C
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COURSE OBJECTIVES
- To provide knowledge and understanding of the modern manufacturing strategies
- Present a broad conceptual framework for the management of the operations function across the supply chain.

UNIT I
Total Productive Maintenance (TPM) - Six big losses – TPM implementation – TPM and TQC.

UNIT II
UNIT III

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Recognize and apply the concept of Total Productive Maintenance
2. Understand the roles of supply chain among various business functions and their roles in the organizations’ strategic planning and gaining competitive advantage
3. Appreciate the effect of waste reduction
4. Know and apply Business Process Re-engineering techniques
5. Know Technology Management and Strategic Management concepts

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Mapping with Programme Outcomes
COURSE OBJECTIVES

- To know about the basic concepts in industrial automation
- Be exposed to pneumatic, electric, hydraulic and electronic systems in automation of mechanical operations
- Describe in detail how industrial robot systems are used, structured and operate,
- Identify fundamental issues within sustainable industrial development from an automation perspective and be able to exemplify the consequences of these,
- Implement and present a basic automation task with an industrial robot, including pilot study, online and offline programming and evaluation of the results, based on a given specification.

UNIT I

Fundamental concepts in manufacturing and automation, definition of automation, reasons for automating. Types of production and types of automation, automation strategies, levels of automation

Transfer Lines And Automated Assembly: General terminology and analysis, analysis of transfer lines without storage, partial automation. Automated flow lines with storage buffers. Automated assembly - design for automated assembly, types of automated assembly systems, part feeding devices, analysis of multi-station assembly machines. AS/RS, RFID system, AGVs, modular fixturing, Flow line balancing

UNIT II

Design of Mechatronic Systems: Stages in design, traditional and mechatronic design, possible design solutions. Case studies-pick and place robot

UNIT III

Programmable Automation: Special design features of CNC systems and features for lathes and machining centers. Drive system for CNC machine tools. Introduction to CIM; condition monitoring of manufacturing systems


UNIT IV

UNIT V
Types of Robots: Application of robots in various fields: Non-conventional industrial robots, Service industry, Robots for agriculture, mining, exploration, underwater, civilian and military applications, nuclear applications, Space applications. Humanoid robots: Wheeled and legged

TEXT BOOKS

COURSE OUTCOMES
1. Gain fundamental concepts in automation
2. Knowledge of industrial automation by transfer lines and automated assembly lines
3. Understand advancement in hydraulics and pneumatics systems
4. To understand the importance of robots in automation
5. Use Robots for different applications

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COURSE OBJECTIVES
- Introduce the concepts of layout planning and the various algorithms used
- Introduce the design of material handling systems, mechanized assembly, hoppers and feeders and transfer systems.

UNIT I
UNIT I

Apples plant layout procedure – Reed’s plant layout procedure - Computer Aided Plant Layout Planning: CORELAP, PLANET, MAT, ALDAP, CRAFT - Plant Layout Algorithms: Modified spanning tree algorithm – Graph based method – BLOCPLAN Algorithm

UNIT III


UNIT IV


UNIT V

Mechanized Assembly: Principles and Operating characteristics of Part Feeders such as Vibratory Bowl Feeder, Reciprocating Tube Hopper, Centrifugal Hopper Feeder and Center Board hopper feeder – Orientation of Parts – In-bowl and Out-of-bowl tooling – Different Types of Escapements Transfer Systems and Indexing Mechanisms.

REFERENCES

9. Mechanised Assembly, Boothroyd & Redford

COURSE OUTCOMES

Upon completing this course, students should be able to:

1. Understand the different layout planning techniques
2. Apply layout planning techniques for solving layout problems
3. Carryout economics analysis of material handling equipments
4. To understand the concepts of mechanized assembly

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MINOR ENGINEERING COURSES

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COURSE OBJECTIVES

- To impart an understanding of the principle of metal cutting
- To provide knowledge of various cutting tool materials
- To provide an overview of various machine tools and operations performed
- To focus on the principle of Numerical control of machine tools

UNIT I

Fundamentals of Metal Cutting: Mechanics of chip formation – Types of chips – Shear Zone – Orthogonal Cutting – Shear angles and its relevance – Cutting forces and Power – Merchant’s Circle – Numerical examples

UNIT II


UNIT III


UNIT IV


UNIT V


TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the principle of metal cutting
2. Gain knowledge of various cutting tool materials
3. Gain knowledge above the various machine tools and operations performed
4. Differentiate single point and multi point cutting tools and machines.
5. Gain and apply the knowledge of NC machines and programming

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COURSE OBJECTIVES
- To introduce the principle of metal casting process and various process elements
- To provide an understanding of various metal forming processes
- To give a focus on the various sheet metal forming operations
- To give broad idea on the various metal joining processes

UNIT I
UNIT II

UNIT III

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Recognize different forming process to manufacture near net- shape product
2. Understand the basic features and terminologies in casting process, gating, reserving system and their design aspects, the basics in solidification or the casting formation.
3. Study the types of defects occurred in casting and provide remedial solutions.
4. Distinguish between fusion welding processes and solid state welding processes;
5. Inspect welding defects using Non-destructive testing methods;

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