### B.Tech 5th Semester

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B.Tech. 8th semester

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*List of the available and selected mocks courses will be intimated before the commencement of the semester
COURSE STRUCTURE (AR-13)
For 2013 Admitted Batch
FSI Model – For students going FSI in 7th Semester

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**Elective-1**

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Available and Selected MOOCs Courses

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GMR30204/GMR30206/ Mini Project /Term paper

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**Elective – IV & Elective – V**

*(Students shall opt two courses from the below list)*

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**Available and Selected MOOCs Courses**

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<td>CAM &amp; Mechatronics lab</td>
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**Total**

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*List of the available and selected mocks courses will be intimated before the commencement of the semester*
## COURSE STRUCTURE (AR-13)

For 2013 Admitted Batch

FSI Model – For students going FSI in 8th Semester

### B.Tech 5th Semester

<table>
<thead>
<tr>
<th>Code</th>
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<td>ME 3418</td>
<td>Basic elements of Machine design</td>
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<td>ME 3420</td>
<td>Metal Cutting &amp; Metrology</td>
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<td>ME 3421</td>
<td>Steam and Gas turbines</td>
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<td>ME 3422</td>
<td>Instrumentation and control systems</td>
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<td>ME 3423</td>
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<td>Unconventional Machining Processes</td>
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<td>ME 3225</td>
<td>Machine ols &amp; Metrology Lab</td>
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### B.Tech 6th Semester

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<td>HS 3405</td>
<td>Engineering Economics and Project Management</td>
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<td>Design of Machine Members</td>
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<td>Heat Transfer</td>
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<td>ME 3429</td>
<td>Industrial Robotics</td>
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<td>ME 3431</td>
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<td>IT 3418</td>
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<td>CHEM 3427</td>
<td>Industrial Safety and Hazard Management</td>
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<td>EEE 3427</td>
<td>Renewable energy sources</td>
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### B.Tech. 7th Semester

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<td>ME 4435</td>
<td>Geometric Modeling and Computer Aided Manufacturing</td>
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<td>Finite Element Methods</td>
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<td>ME 4436</td>
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<td>ii) Design for Manufacturing</td>
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<td>ME 4438</td>
<td>iii) Fracture mechanics &amp; Fatigue</td>
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<td>ME 4439</td>
<td>iv) Non-conventional Source of Energy</td>
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<td>ME 4441</td>
<td>i) Jet propulsion and Rocket Engineering</td>
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<td>ME 4442</td>
<td>ii) Nano Technology</td>
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<td>ME 4443</td>
<td>iii) Production Planning and Control</td>
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*List of the available and selected mocks courses will be intimated before the commencement of the semester

### B.Tech. 8th Semester

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<th>Code</th>
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Department of Mechanical Engineering

B.Tech- 5th Semester
Course Title: Basic Elements of Machine Design

Course Objectives
The course content enables students:

1. Understand the design procedure and selection of material for a specific application.
2. Apply failure theories in evaluating strength of machine elements.
3. Analyze machine components subjected to static and variable loads.
4. Design machine elements like Riveted and welded joints, Bolted joints, Keys, cotters and knuckle joints, shafts and their couplings and springs.

Course Outcomes
At the end of the course students are able:

1. Understand the design procedure and selection of material for a specific application.
2. Design a component subjected to static loads based on strength and stiffness criterion.
3. Design a component when it is subjected to variable loads.
4. Provide alternate design solutions based on requirement.

UNIT – I


UNIT – II
Riveted and welded joints – Design of joints with initial stresses – eccentric loading

UNIT – III

UNIT – IV
Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code


Flange coupling

TEXT BOOKS:

3. Design Data hand Book, S MD Jalaludin, AnuRadha Publishers

REFERENCES:

1. Design of Machine Elements / V.M. Faires
B.Tech- 5th Semester

SYLLABUS
(Applicable for the batches admitted from 2013-14, 5th & 6th semester, Non-FSI & FSI Model)

Course Title: Dynamics of Machinery
Course Code: ME 3419

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Course Objectives
The course content enables students:

1. Understand Synthesis and analysis by providing significant skills and experience in creating and modeling mechanisms.
2. Apply analytical skills in the mechanism synthesis process that will result in aumation of the design process.
3. Apply the ols necessary for kinematic and dynamic analysis of mechanisms and machines, and the skills necessary consider the role of dynamics in the design of machines.
4. Understand Static and dynamic balancing of mechanisms.

Course Outcomes
At the end of the course students are able:

1. Interpret the principle of gyroscope and calculate gyroscopic effect for aeroplanes, ships, two wheelers and four wheelers.
2. Perform static and dynamic force analysis of planar mechanisms.
3. Summarize the working of important machine elements like clutches, brakes, flywheels and governors.
4. Examine balancing of rotating and reciprocating masses.
5. Analyze mechanical systems subjected to longitudinal, transverse and torsional vibrations.

UNIT – I
Precession: Gyroscopes, effect of precession motion on the stability of moving vehicles such as mor car, mor cycle, aero planes and ships.

Clutches: Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal clutch
Brakes and dynamometers: Simple block brakes, , band brake of Vehicle, internal expanding brake. Dynamometers – absorption and transmission types. General description and methods of operations

UNIT – II
Turning moment diagram and fly wheels: Turning moment – Inertia rque connecting rod angular velocity and acceleration, crank effort and rque diagrams – Fluctuation of energy – Fly wheels
Governers: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and hartung with auxiliary springs. Sensitiveness, isochronism and hunting

UNIT – III
Balancing: Balancing of rotating masses Single and multiple – single and different planes.
Balancing of Reciprocating Masses: Primary, Secondary and higher balancing of reciprocating masses, analytical and graphical methods. Locomotive balancing – Hammer blow, Swaying couple, variation of tractive efforts. Unbalanced forces and couples – examination of “V” multi cylinder in line and radial engines for primary and secondary balancing,

UNIT – IV
Vibration: Free Vibration of mass attached vertical spring – oscillation of pendulums, centers of oscillation and suspension. Transverse loads, vibrations of beams with concentrated and distributed loads.
Whirling of shafts, critical speeds Dunkerly’s methods, Raleigh’s method,. Simple problems on forced damped vibration Vibration Isolation & Transmissibility, rsional vibrations, two and three ror systems

TEXT BOOKS:

REFERENCES:
1. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
2. Theory of Machines / Shiegly / MGH
3. Theory of Machines / Thomas Bevan / CBS Publishers
Department of Mechanical Engineering

B.Tech- 5th Semester

SYLLABUS
(Applicable for the batches admitted from 2013-14, 5th & 6th semester, Non-FSI & FSI Model)

Course Title: Metal Cutting & Metrology

Course Code: ME 3420

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Course Objectives

The course content enables students:
1. Acquire the knowledge of engg. metrology and its practice which is having increasing importance in industry.
2. Specifically makes the student improve applications aspect in the measurements and control of process of manufacture
3. Impart the fundamental aspects of the metal cutting principles and their application in studying the behavior of various machining processes.
4. Train in knowing the fundamental parts of various machine ols and their kinematic schemes.
5. Discuss various principles of jigs and fixtures which will be used hold the workpieces in various machine ols

Course Outcomes
At the end of the course students are able:
1. Understand the cutting ol geometry, mechanism of chip formation and mechanics of orthogonal cutting.
2. Identify basic parts and operations of machine ols including lathe, shaper, planer, drilling, boring, milling and grinding machine.
3. Design locating and clamping devices produce a component.
4. Select a machining operation and corresponding machine ol for a specific application in real time.
5. Select a measuring instrument inspect the dimensional and geometric features of a given component.

UNIT – I
Elementary treatment of metal cutting theory, ol geometry, chip formation and types of chips, Mechanics of orthogonal cutting, ol life, ol materials

UNIT – II
Shaping slotting and planing machines – Principal parts – specification, machining time calculations
Drilling and Boring Machines – Principle parts, ol- holding devices, Jig Boring machine Milling machine –Principal features, methods of indexing.

UNIT –III
Grinding machine – Principle parts, selection of a grinding wheel, Kinematic scheme of grinding machines.
Super finishing- Lapping, honing and broaching machines–Kinematics scheme of Lapping, Honing and Broaching machines. machining time calculations
Principles of design of Jigs and fixtures. Principles of location - and clamping –Typical examples of jigs and fixtures

UNIT – IV
Measurement of angles and tapers: Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers and spheres used determine the tapers.
Optical measuring instruments: ol maker’s microscope and its uses – collimars, optical projector – optical flats and their uses, interferometer.
Flat surface measurement: Measurement of flat surfaces – instruments used – straight edges – surface plates – optical flat and au collimar.
Measurement through comparars: Comparars – Mechanical, Electrical and Electronic Comparars, pneumatic comparars and their uses in mass production.
Screw thread measurement: Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.
Gear measurement: Gear measuring instruments, Gear oth profile measurement, Measurement of diameter, pitch pressure angle and oth thickness.
Coordinate Measuring Machines: Types of CMM, Role of CMM, and Applications of CMM.

TEXT BOOKS:
2. Production Technology by H.M.T. (Hindustan Machine ols).
4. Engineering Metrology- R K Jain and S C Gupta

REFERENCES:
2. Manufacturing engineering and Technology-Kalpakjian-Addison Wsley
Course Title: Steam and Gas Turbines
Course Code: ME 3421

Course Objectives
The course content enables students:
1. Develop the concept on Rankine’s cycle and its thermal refinement
2. Understand the various boilers and their performance
3. Develop the concept on flow steam in nozzles and related problems.

Course Outcomes
At the end of the course students are able:
1. Understand the concept of Rankine cycle.
2. Understand working of boilers including water tube, fire tube and high pressure boilers and determine efficiencies.
3. Analyze the flow of steam through nozzles
4. Evaluate the performance of condensers and steam turbines
5. Evaluate the performance of gas turbines

UNIT I
Vapour power cycles: Thermodynamic analysis of simple Rankine cycle- performance improvement of simple Rankine cycle by Reheating and Regeneration.


UNIT II
Steam nozzles: Function of nozzle – applications - types, Flow through nozzles, thermodynamic analysis – assumptions -velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.
Steam Condensers: Classification of condensers – working principle of different types – vacuum efficiency and condenser

UNIT III
Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blade efficiency – condition for maximum efficiency. Velocity compounding, pressure compounding, Pressure velocity compounding. Velocity and Pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.


UNIT IV

Jet Propulsion: principle of Operation-Classification of jet engines-working principles.

Rockets: Application-working principle-classification-propellant type- solid and liquid propellant Rocket engines

TEXT BOOKS:
1. Power Plant Engineering-P.K.Nag-TMH
2. Gas Turbines – V.Ganesan /TMH

REFERENCES:
1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
3. Gas Turbines / Cohen, Rogers and Saravana Muto / Addison Wesley – Longman
Course Title: Instrumentation &Control System (Elective-I)  
Course Code: ME 3422

Course Objectives
The course content enables students:

1. Educate the operating principles and function of measuring instruments used in Engineering and process industries
2. Be conversant with various working principles of instruments
3. Understand and analyze the behavioral characteristics of instruments
4. Learn about calibration procedure the instrument
5. Get educated about the fundamental aspects of control systems and their use in the context of industry applications.

Course Outcomes
At the end of the course students are able:

1. Understand working principles of basic measuring instruments
2. Select a transducer for measurement of primary and derived variables.
3. Analyze the response of a measuring instrument.
4. Analyze and design an instrumentation system.
5. Understand temperature, speed and position control systems.

UNIT-I
Definition - Basic principles of measurement - measurement systems, generalized configuration and functional descriptions of measuring instruments - examples, dynamic performance characteristics - sources of error, classification and elimination of error.

Measurement of displacement: Theory and construction of various transducers measure displacement - piezo electric, inductive, capacitance, resistance, calibration.


UNIT-II
Measurement of pressure: Units -classification -different principles used, manometers, pisn, bourdon pressure gauges, bellows – diaphragm gauges. low pressure measurement - thermal conductivity gauges – McLeod pressure gauge.
Measurement of level: Direct method - indirect methods - capacitive, ultrasonic, magnetic, cryogenic fuel level indicars – bubbler level indicars.

Flow measurement: Rotameter, magnetic, ultrasonic, turbine flow meter, hot-wire anemometer.

UNIT-III

Stress strain measurements: Various types of stress and strain measurements - electrical strain gauge - gauge facr - method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring rque, strain gauge rosettes.

UNIT-IV
Measurement of humidity - Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter

Measurement of force, rque and power- Elastic force meters, load cells, rsion meters, dynamometers.

Elements of control systems: Introduction, importance - classification - open and closed systems, servomechanisms-examples with block diagrams-temperature, speed & position control systems.

TEXTBOOKS:
I. Measurement Systems: Applications & design by D.S Kumar.
2. Mechanical Measurements/BeckWith, Marangoni,Linehard, PHI/PE

REFERENCE BOOKS:
I. Measurement systems: Application and design, Doeblin Earnest. O.Adaptation by Manik and Dhanesh/TMH
2. Experimental Methods for Engineers / Holman.
4. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH
Course Title: Operations Research (Elective-I)  
Course Code: ME 3423  

Course objectives:

The course content enables students:

1. Develop systematic approach to handle problems such as design of electrical circuit etc; with a goal of maximizing the profit and minimizing cost.
2. Understand the various optimization techniques such as classified optimization, linear programming. One dimensional minimization methods, unconstrained optimization techniques, constrained optimization techniques and dynamic programming.
3. Understand the necessary sufficient conditions for finding the solution of the problems in classical optimization.
5. Apply methods like North West corner rule, least count method etc. to solve the transportation problem.

Course Outcomes:

At the end of the course students are able:

1. Formulate a real time situation in a mathematical model.
2. Assign a right job to a right person using job sequencing.
3. Make right decisions in operations management using game theory, queuing theory and replacement analysis.
5. Perform optimum problem solving using dynamic programming and simulation techniques.

UNIT-I

Development – definition – characteristics and phases – types of models operation research models – applications.


UNIT-II:


UNIT –III

**Sequencing** – Introduction – flow – shop sequencing – n jobs through two machines – n jobs through three machines – job shop sequencing – two jobs through ‘m’ machines

**Replacement** - Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement

UNIT –IV


**Waiting lines:** Introduction – single channel – poison arrivals – exponential service times – with infinite population and finite population models – multichannel – poison arrivals – exponential service times with infinite population single channel poison arrivals.

**TEXT BOOKS:**

2. Introduction O.R/Hiller & Libermann (TMH)

**REFERENCE BOOKS:**

2. Operations Research Methods & Problems/Maurice Saseini, Arhur Yaspan & Lawrence Friedman
Course Title: Unconventional Machining Processes (Elective-I)  
Course Code: ME 3424  

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Course objectives:
The course content enables students:
1. Identify the classification of modern machine processes.
2. Understand the mechanism of Abrasive jet machining, Water jet machining and abrasive water jet machine
3. Compare thermal and non-thermal processes
4. Understand the applications of plasma process for machine processes.
5. Complete understanding on modern machine processes

Course Outcomes
At the end of the course students are able:
1. Understand the need and applications of modern machining processes.
2. Understand the working principle of modern machining process.
3. Select a suitable modern machining process for given applications.
4. Understand the working principle of advanced forming processes.

UNIT – I
Introduction – Need for modern machining methods-Classification of modern machining processes – considerations in process selection, Materials and Applications
Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations.

UNIT – II
Abrasive jet machining, Water jet machining and abrasive water jet machine : Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations. Magnetic abrasive finishing, Abrasive flow finishing,

Electro chemical processes
Fundamentals of chemical, machining, advantages and applications- Chemical machining-principle-maskants –etchants- Phochemical machining Thermo chemical machining

UNIT - III

**Thermal metal removal processes:** General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of ol electrode and dielectric fluids, methods surface finish and machining accuracy. Wire EDM, principle, applications.

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT-IV

Plasma s – transferred and non-transferred types of PAM- Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

HERFs- explosive forming, Electro hydraulic forming, magnetic pulse forming, hydrostatic extrusions

**TEXT BOOK:**
1. Advanced machining processes/ VK Jain/ Allied publishers.
2. Modern Production/Operations Management/Baffa &Rakesh Sarin

**REFERENCES:**
1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH.
Department of Mechanical Engineering
B.Tech- 5th Semester

SYLLABUS
(Applicable for the batches admitted from 2013-14, 5th & 6th semester, Non-FSI & FSI Model)

Course Title: Machine Tools and Metrology Lab
Course Code: ME 3225

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Course Objectives

The course content enables students:

1. Learn the measurement of bores by internal micrometers and dial bore indicars.
2. Learn the measurement of the angle and tapers by Bevel protractor, Sine bars, etc.
3. Learn the step turning and taper turning and thread cutting Drilling and Tapping on lathe machine.
4. Learn the operations of Shaping and Planing and milling.

Course Outcomes

At the end of the course students are able:

1. Measure the bores by internal micrometers and dial bore indicars.
2. Measure the angle and taper using Bevel protractor and Sine bar.
3. Measure screw thread parameters.
4. Perform step turning, taper turning, thread cutting, drilling and tapping operations on lathe.
5. Perform operations on shaper, planer and milling machines.
6. Perform alignment tests for the evaluation of machine tool accuracy.

List of experiments

Section A:

1. Measurements of length, height, diameters by vernier calipers micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicars.
3. Use of gear teeth, Vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Machine ol “Alignment of test on the lathe”.
6. ol makers microscope and its application.
7. Angle and taper measurements by Bevel Protractor, Sine bars etc.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by Two wire/three wire method or ol makers microscope.
Section B:

2. Step turning and taper turning on lathe machine.
3. Thread cutting and knurling on lather machine.
5. Shaping and planning.
7. Milling.
Course Title: Thermal Engineering Lab
Course Code: ME 3226

Course Objectives
The course content enables students:
1. Understand the importance and working of the heat engines
2. Find the performance of the heat engines
3. Aware of the Refrigeration and air conditioning
4. Prepare heat balance sheet

Course Outcomes
At the end of the course students are able:
1. Evaluate the performance of IC engines.
2. Perform heat balance analysis of IC engines.
3. Evaluate the performance of a reciprocating air compressor.
4. Evaluate the performance of refrigeration and air conditioning systems.
5. Plot Valve and Port timing diagrams of 4-stroke and 2-stroke engines
6. Compile and present specifications of two and four wheelers.

List of experiments
1. I.C. Engines valve / port timing diagrams
2. I.C. Engines performance test (4 - Stroke diesel engines)
3. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine
5. Economical speed test of an IC engine
6. measure quality of steam by using throttling and separating calorimeter.
7. Performance test on reciprocating air compressor unit
8. COP of Refrigeration Unit
9. Performance of A/C System
10. Study of boiler
11. Team work on survey of commercial Two and Four wheelers including compilation of technical specification and presentation
Department of Mechanical Engineering
B.Tech- 6th Semester

SYLLABUS
(Applicable for the batches admitted from 2013-14, 5th & 6th semester, Non-FSI & FSI Model)

Course Title : Engineering Economics and Project Management  Course Code : HS 3405

Course objectives:

The course content enables students :

1. Acquaint the basic concepts of Engineering Economics and its application
2. Know various methods available for evaluating the investment proposals
3. Make the optimal decisions acquiring the knowledge on financial accounting
4. Gain the relevant knowledge in the field of management theory and practice
5. Understand the project management lifecycle and be knowledgeable on the various phases from project initiation through closure

Course outcomes:

At the end of the course students are able :

1. Understand basic principles of engineering economics
2. Evaluate investment proposals through various capital budgeting methods
3. Apply the knowledge prepare the simple financial statements of a company for measuring performance of business firm
4. Analyze key issues of organization, management and administration
5. Evaluate project for accurate cost estimates and plan future activities

SYLLABUS:

UNIT-I: Introduction Engineering Economics:

Demand Forecasting & Cost Estimation:
Meaning – Facrs governing Demand Forecasting – Methods – Cost Concepts – Elements of Cost – Break Even Analysis
UNIT-II:
Investment Decisions & Market Structures:
Time Value of Money – Capital Budgeting Techniques - Types of Markets – Features – Price Out-put determination under Perfect Competition, Monopoly, Monopolistic and Oligopoly

Financial Statements & Ratio Analysis:

UNIT-III:
Introduction Management:

Marketing Management: Functions of Marketing and strategies, Channels of distribution.

UNIT-IV:

Text Books:

Reference Books:
Course Title: Design of Machine Members  
Course Code: ME 3427

Course Objectives

The course content enables students:

1. Learn about the design procedures for complex machine members like Gears, Bearings, and Engine Parts etc.
2. Use standard design hand books and codes rather than simple strength of materials approach.
3. Be exposed to the System Design concept in place of element design approach.

Course Outcomes

At the end of the course students are able:

1. Design journal bearings, ball and roller bearings subjected to static and dynamic loads.
2. Analyze curved beams subjected to static loads.
3. Design engine parts including connecting rod, crank shaft, pisns and cylinders.
4. Design power transmission systems including power screws, belts, pulleys, spur and helical gears.
5. Design machine tool elements including beds guide ways.

UNIT – I


Design of curved beams: introduction, stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C-clamps.

UNIT – II

Engine parts: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts, strength and proportions of over hung and center cranks– Crank pins, Crank shafts.

Pisns, Forces acting on pisn – Construction Design and proportions of pisn., Cylinder, Cylinder liners,

UNIT – III

Power transmissions systems, pulleys: Transmission of power by Belt and Rope drives, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives, Materials,Chain drives
Surface compressive strength – Bending strength – Design analysis of spur gears – Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations.

UNIT –IV

Design of power screws: Design of screw, Square ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

Machine ol Elements: Design of beds, slide ways, spindles- material selection, design of strength and rigidity of parts.

TEXT BOOK:

REFERENCES:
1. Design Data hand Book, S MD Jalaludin, Anuradha Publishers
3. Data Books : (I) P.S.G. College of Technology (ii) Mahadevan
Department of Mechanical Engineering
B.Tech- 6th Semester

SYLLABUS
(Applicable for the batches admitted from 2013-14, 5th & 6th semester, Non-FSI & FSI Model)

Course Title: Heat Transfer  
Course Code: ME 3428  
L T P C 3 1 0 4

Course Objectives
The course content enables students:
1. Identify the important and/or possible Heat Transfer modes in any physical system.
2. Provide students with an opportunity of direct experience of doing Heat Transfer calculation so that they can understand the base of the principles and able to make a critical assessment of industrial environment.
3. Experience with practical applications of Heat Transfer.
4. Apply the energy balance equation to Heat Transfer problems and calculate the rate for Heat Transfer for all physical devices in all modes of Heat Transfer.

Course Outcomes
At the end of the course students are able:
1. Understand basic modes of heat transfer and compute temperature distribution in steady state and unsteady state heat conduction.
2. Analyze heat transfer through extended surfaces.
3. Interpret and analyze free & forced convection heat transfer.
4. Comprehend the phenomena and flow regimes of boiling and condensation.
5. Understand the principles of radiation heat transfer.
6. Apply LMTD and NTU methods to design heat exchangers.

UNIT – I
Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer.
Conduction Heat Transfer: General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.
Systems with variable Thermal conductivity – systems with heat sources or Heat generation, Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin. (16)

UNIT II
One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers - Chart solutions of transient conduction systems.

UNIT-III
Forced convection:
External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer - Flat plates and Cylinders.

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for Vertical plates and pipes.

Heat Transfer with Phase Change:
Condensation: Film wise and drop wise condensation - Film condensation on vertical and horizontal cylinders using empirical correlations.

UNIT IV:
Heat Exchangers:
Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

Radiation Heat Transfer:

TEXT BOOKS:
1. Heat Transfer / HOLMAN/TMH

REFERENCE BOOKS:
5. Essential Heat Transfer - Chrisper A Long / Pearson Education
7. Heat and Mass Transfer – Kondandaraman
Course Title: Industrial Robotics (Elective-II)

Course Objectives

The course content enables students:

The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, choose, and incorporate robotic technology in engineering systems.

1. Make the students acquainted with the theoretical aspects of Robotics
2. Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
3. Make the students understand the importance of robots in various fields of engineering.
4. Expose the students to various robots and their operational details.

Course Outcomes (Expected)

At the end of the course students are able:

1. Understand basic parts and configurations of robotic systems.
2. Analyze robotic systems using forward and inverse kinematics.
4. Develop a trajectory plan for a given application.
5. Understand actuators and feedback devices used in robotic systems.

UNIT – I


Components of the Industrial Robotics: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors.
UNIT – II

**Motion Analysis:** Homogeneous transformations as applicable rotation and translation – problems.

**Manipular Kinematics:** Specifications of matrices, D-H notation joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT – III


Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion..

UNIT IV


**Robot Application in Manufacturing:** Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

**TEXT BOOKS:**

1. Industrial Robotics / Groover M P /Pearson Edu.
3. Robotics and Control / Mittal R K & Nagrath I J / TMH.

**REFERENCES:**

3. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.
Course Title: Mechatronics (Elective-II)  
Course Code: ME 3430  
L T P C  
3 1 0 4

Course objectives:

The course content enables students:

1. Understand of different sensors, transducers, signal conditioning techniques
2. Understand a system models like Mechanical, Electrical, Fluid & Thermal systems
3. Learn Transfer function for different Systems.
4. Learn the working principle of different controllers like Proportional, Derivative, Integral, PI, PD, PID. and PLC programming techniques with Microprocessor, ladder diagram for different logic Gates

Course Outcomes:

At the end of the course students are able:

1. Recognize of different sensors, transducers, signal conditioning techniques
2. Develop a system models like Mechanical, Electrical, Fluid & Thermal systems
3. Formulate Transfer function for different Systems.
4. Understand the working principle of different controllers like Proportional, Derivative, Integral, PI, PD, PID.
5. Develop a PLC programming techniques with Microprocessor, ladder diagram for different logic Gates

UNIT – I


UNIT – II

**Basic System Models:** Modeling of one and two degrees of freedom Mechanical, Electrical, Fluid and thermal systems. Block diagram representations for these systems.

**Dynamic Responses of System:** Transfer function, Modeling Dynamic systems, first order systems, second order systems

UNIT – III

**Closed loop controllers:** Continuous and discrete processes, control modes, Two step, Proportional, Derivative, Integral, PID controllers.

**Digital logic:** Logic gates, Boolean algebra, Karnaugh maps

UNIT – IV

**PLC:** Introduction, basic structure, I/P, O/P, processing, programming, ladder diagrams, timers, internal relays and counters, data handling, analogue input and output selection of PLC.

**Design:** Designing Mechatronics systems, possible design solutions, case studies of Mechatronics systems – i) Pick and place robot ii) Timed switch iii) Bar code reader

**Text books:**


**Reference Books:**

Department of Mechanical Engineering
B.Tech- 6th Semester
SYLLABUS
(Applicable for the batches admitted from 2013-14, 5th & 6th semester, Non-FSI & FSI Model)

Course Title: Refrigeration and Air Conditioning (Elective-II)  
Course Code: ME 3431

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Course Objectives
The course content enables students:

1. Impart various principles of entrepreneurship in enhancing the entrepreneur skills
2. Impart Management concepts along with the design of organizational structures
3. Emphasis the importance of work study, materials management, HRM and quality control aspects
4. Impart the knowledge about Project Management techniques
5. Enhance a relationship between market demands and production capability for maximum effectiveness in an economic manner of all the production activities
6. Manage work flow, inventories backlogs and changes in the level of production rate

Course Outcomes
At the end of the course students are able:

1. Understand the principles and applications of refrigeration systems
2. Understand vapor compression refrigeration system and identify methods for performance improvement
3. Study the working principles of steam jet, vapor absorption, thermoelectric and vortex tube systems
4. Analyze air conditioning processes using principles of psychometry.
5. Evaluate cooling and heating load in an air conditioning system
6. Identify ecofriendly refrigerants and use P-H charts evaluate the performance of refrigeration systems

UNIT – I


Air Refrigeration: Bell Coleman cycle and Brayn Cycle, Open and Dense air systems – Actual air refrigeration system problems – Refrigeration needs of Air crafts.

UNIT II

**System Components:** Compressors – General classification – comparison – Advantages and Disadvantages.
Condensers – classification – Working Principles
Evaporars – classification – Working Principles
Expansion devices – Types – Working Principles


UNIT III

**Steam Jet Refrigeration System:** Working Principle and Basic Components.
Principle and operation of (i) Thermoelectric refrigerar (ii) Vortex tube or Hilsch tube.

**Introduction Air Conditioning:** Psychometric Properties & Processes – Characterization of Sensible and latent heat loads — Load concepts of RSHF and ADP.- Problems

UNIT IV

Requirements of human comfort and concept of effective temperature- Comfort chart –Comfort Air conditioning – Requirements of Industrial air conditioning, Air conditioning Load Calculations.
Air Conditioning systems - Classification of equipment, cooling, heating humidification and dehumidification, filters, fans and blowers

TEXT BOOKS:
1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai

REFERENCES:
1. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
2. Principles of Refrigeration - Dossat / Pearson Education.
3. Refrigeration and Air Conditioning-P.L.Bellaney
4. Basic Refrigeration and Air-Conditioning – Ananthanarayanan / TMH
Department of Mechanical Engineering

B.Tech- 6th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 5th & 6th semester, Non-FSI & FSI Model)

Course Title: Principles of Entrepreneurship (Elective-III)  
Course Code: ME 3432  
L T P C  
3 1 0 4

Course Objective(S):

The course content enables students:

1. impart various principles of entrepreneurship in enhancing the entrepreneur skills
2. impart Management concepts along with the design of organizational structures
3. emphasis the importance of work study, materials management, HRM and quality control aspects
4. impart the knowledge about Project Management techniques
5. enhance a relationship between market demands and production capability for maximum effectiveness in an economic manner of all the production activities
6. manage work flow, inventories backlogs and changes in the level of production rate

Course Outcomes:

At the end of the course students are able:

1. Explain the role of entrepreneur in economic development.
2. Demonstrate methods of generating ideas
3. Develop the business plan start their own enterprises
4. Manage various production aspects such as manufacturing costs control, marketing management and waste reduction
5. Make financial plan for enterprise
6. Find the institutional support entrepreneurship

UNIT I: Introduction entrepreneurship:
Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur Vs. Manager, Entrepreneur Vs Entrepreneur. The Entrepreneurial decision process- Role of Entrepreneurship in Economic Developments, Ethics and Social responsibility of entrepreneurs, Opportunities for entrepreneurs in India and abroad. Woman as entrepreneur

UNIT II: Creating and starting the venture:
Sources of new Ideas, Methods of generating ideas, creating problems solving- Product planning and development process
The business plan:


UNIT III: Financing and managing the new venture:
Source of Capital, record keeping, recruitment, motivating and leading teams, financial controls, Marketing and sales controls. E-Commerce and Entrepreneurship, Internet advertising.

New venture expansion strategies and issues:
Features evaluation of joint ventures, acquisitions, merges, franchising, Public issues, rights issues, bonus issues and sck splits

UNIT IV: Institutional support entrepreneurship:
Role of Directorate of Industries, District Industries, Centers (DICS), Industrial development Corporation (IDC), state Financial corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), Technical Consultancy Organization (TCO), small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).
Labour legislation, salient provision under Indian Factories Act, Employees State Insurance Act, Workmen’s Compensation Act and payment of Bonus Act. This course replaces the course offered in earlier years as “Entrepreneurship & Management”.

TEXT BOOKS:

REFERENCES:
1. Vasant Desal: Dynamics of Entrepreneurial Development and management Himalaya publishing House, 2004
6. Agarwal: Indian Economy, Wishwa Prakashan 2005
8. Srivastava: Industrial Relations & Labour Laws Vikas, 2005
11. Mary Coulter: Entrepreneurship in Action, PHI 2/e 2005
Course Title: Heat Transfer Lab

Course Objectives:

The course content enables students:

1. Impart experimental experience in Heat Transfer Lab those support Mechanical Engineering.
2. Provide students with an opportunity of direct experience of doing Heat Transfer Lab calculation so that they can understand the base of the principles and able to make a critical assessment of industrial environment.
3. Teach the students fundamentals in element of Heat Transfer & its applications. So as to identify, formulate and solve the problems of Heat Transfer device designs.
4. Develop an idea about how to measure heat transfer coefficients/constant like h, emissivity, Stefan Boltzmann constants for devices like metal rod, lagged pipe, etc.,
5. Encourage the students understand importance energy conversation and make them experience with practical applications in Heat Transfer Lab.

Course Outcomes:

At the end of the course students are able:

1. Apply the knowledge of heat transfer perform experiments related conduction heat transfer
2. Evaluate heat transfer coefficient in free and forced convection heat transfer situation
3. Determine fin efficiency and emissivity in respective experiments
4. Observe the phenomena of drop and film wise condensation
5. Evaluate the performance of heat exchangers in parallel & counter flow types

List of Experiments

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
Course Title: Instrumentation and Dynamics Lab

Course Code: ME 3234

Course Objectives:
The course content enables students:

1. Students are able to understand principles involved in the measurement and control of industrial processes. In particular, students will be able to learn
2. Understand principles involved in Calibration
3. Learn about the Temperature sensors (Thermocouples, RTD's, Thermisrs, etc.)
4. Aware of Pneumatic and hydraulic pressure concepts
5. Balance the reciprocating masses

Course Outcomes:
At the end of the course students are able:

1. Perform calibration on Pressure gauges, temperature detectors and LVDT.
2. Study the working and calibrate pho and magnetic pickups and seismic pickups.
3. Determine the critical speed using whirling of shaft.
4. Perform balancing of rotating masses.
5. Determine gyroscopic couple.
6. Analyze cam profile.

List of Experiments:

1. Calibration of Pressure Gauges
2. Study and calibration of LVDT transducer for displacement measurement.
3. Calibration of thermocouple for temperature measurement.
5. Study and calibration of pho and magnetic speed pickups for the measurement of speed.
6. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
7. Study and calibration of McLeod gauge for low pressure.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a Rota meter for flow measurement.
10. Determination of critical Speed by using Whirling of Shaft
11. Balancing of Rotating Masses
12. Determination of Gyroscopic Couple
13. Cam profile Analysis
Course Title: Geometric Modeling and Computer Aided Manufacturing
Course Code: ME 4435

L T P C
3 1 0 4

Course Objectives:
The course content enables students to:

1. Understand the use of computers in product design and manufacturing and their life cycle.
2. Perform basic 2D and 3D geometric Transformations
3. Interpret and develop models of simple curves, surfaces and solids.
4. Understand NC, DNC, CNC, GT, CAPP and FMS
5. Develop CNC part programs for Milling and Turning operations.
6. Explain CAQC, CIM systems

Course Outcomes:
At the end of the course students are able:

1. Understand the use of computers in product design and manufacturing and their life cycle.
2. Perform basic 2D and 3D geometric Transformations
3. Interpret and develop models of simple curves, surfaces and solids.
4. Understand NC, DNC, CNC, GT, CAPP and FMS
5. Develop CNC part programs for Milling and Turning operations.
6. Explain CAQC, CIM systems

Unit – I
2D and 3D Transformations: Rotation, scaling, translation – homogeneous transformations – concatenation.
Wireframe modeling: Geometric Model wireframe model, wireframe entitles, parametric representation method, parametric representation of synthesis curves, Genetic cubic splines, Bezier curves, B-Splines.

Unit – II
Surface Modeling: Surface model surface entitles, surface representations, parametric representations of surfaces, plane surface, ruled surfaces, surface of revolution, tabulated cylinder, Hermite Bicubic surface. Bezier surface, B- Spline surfaces

Solid modeling: Solid representation Boundary representation (B-Rep), constructive Solid Geometry, examples.

Unit – III


Unit –IV
Group technology: Part families, Part classification and coding, Production flow analysis, Machine cell design, Advantages of GT.


Flexible manufacturing systems: Introduction, FMS components, types of FMS, FMS layouts, planning for FMS, Advantages and applications.

Text Books:

Reference Books:
Course Title: Advanced IC Engines

Course Objectives:

The course content enables students to:

1. Understand the engine
2. Learn the influence of thermodynamics, fluid mechanics, and heat transfer on the engine’s performance
3. Understand the delay period and fuel injection system
4. Understanding the environmental and social issues related to IC engines

Course Outcomes:

At the end of the course the learners will be able

1. Analyze engine cycles and the factors responsible for making the cycle different from the Ideal cycle
2. Apply principles of thermodynamics, fluid mechanics, and heat transfer influence the engine’s performance
3. Comprehend the delay period and fuel injection system
4. Understanding of the relationships between the design of the IC engine and environmental and social issues

UNIT – I


UNIT – II

Charge Motion: Mean velocity and Turbulent characteristics – Swirl, Squish – Prechamber Engine flows.

UNIT – III
Combustion in CI engines: Essential Features – Fuel Spray Behavior – Ignition Delay – Mixing Formation and control, Common rail fuel injection system

Fuel supply systems for S.I. and C.I engines use gaseous fuels like LPG, CNG and Hydrogen

UNIT – IV

Modern Trends in IC Engines
- Lean Burning and Adiabatic concepts
- Rotary Engines.
- Modification in I.C engines suit Bio-fuels.
- HCCI and GDI concepts

REFERENCES BOOKS:
1. I.C. Engines Fundamentals/Heywood/Mc Graw Hill
2. The I.C. Engine in theory and Practice Vol.I / Teylor / IT Prof. And Vol.II
4. I.C. Engines: Maleev
5. Combustion Engine Processes: Lichty
6. I.C. Engines: Ferguson
7. Scavenging of Two – stroke Cycle
Course Title: Design for Manufacturing
Course Code: ME 4437

Course Objectives:
The course content enables students to:

1. Know the modern manufacturing operations
2. Design a criterion based on material and process
3. Understand the manufacturability improvement methods at lower costs.
4. Know the method of examine a product

Course Outcomes:
At the end of the course students are able:

1. Understand modern manufacturing operations, including their capabilities, limitations, and how design various components for lowest cost.
2. Gain insight in how design a criterion for material selection interrelationship with process selection and process selection charts.
3. Acquire how analyze products and be able improve their manufacturability and lower costs.
5. Examine a product and determine how it was manufactured and why.
6. Comprehend how and why value stream analysis is used lower manufacturing costs.

UNIT - I
Introduction: Design philosophy-steps in design process-general design rules for manufacturability basic principles of designing for economical production-creativity in design.
Materials: Selection of materials for design-developments in material technology-criteria for material selection-material selection-material selection interrelationship with process selection-process selection charts.
UNIT - II

Machining processes: Overview of various machining processes-general design rules for machining dimensional tolerance and surface roughness-Design for machining – ease –redesigning of components for machining ease with suitable examples. General design recommendations for machined parts

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design product design rules for sand casting.

UNIT - III

Metal joining: Appraisal of various welding processes, facrs in design of weldments – general design guidelines-pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints.

Forging: Design facrs for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations

UNIT – IV

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components design considerations for injection moulding – design guidelines for machining and joining of plastics.

Text Books:
1. Design for manufacture, John cobert, Adisson Wesley. 1995
2. Product Design for Manufacture and Assembly by by Geoffrey Boothroyd , Peter Dewhurst and Winsn A. Knight - CRC Press; 3 edition

Reference Books:
1. ASM Hand book Vol.20
Department of Mechanical Engineering

B.Tech- 7th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 8th semester & FSI Model)

Course Title: Fracture Mechanics & Fatigue

Course Code: ME 4438

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Course Outcomes:

1. Understand the mechanism of fracture
2. Understand the critical stress intensity factor.
3. Learn plastic zone shape and size near the crack tip.
4. Understand the crack tip opening displacement (CD) & J-integral.
5. Understand micro mechanisms of fatigue & estimate life of a component

Course Outcomes:

At the end of the course students are able:

1. Understand the mechanism of fracture in ductile and brittle materials
2. Evaluate critical stress intensity facr.
3. Analyze plastic zone shape and size near the crack tip.
4. Estimate crack tip opening displacement (CD) & J-integral.
5. Understand micro mechanisms of fatigue & estimate life of a component

UNIT-I


Griffiths analysis: Concept of energy release rate, G, and fracture energy, R. Modification for ductile materials, loading conditions. Concept of R curves.

UNIT-II

Linear Elastic Fracture Mechanics, (LEFM). Three loading modes and the state of stress ahead of the crack tip, stress concentration facr, stress intensity facr and the material parameter the critical stress intensity facr.
The effect of Constraint, definition of plane stress and plane strain and the effect of component thickness, The plasticity at the crack tip and the principles behind the approximate derivation of plastic zone shape and size. Limits on the applicability of LEFM

UNIT-III

Elastic-Plastic Fracture Mechanics; (EPFM): The definition of alternative failure prediction parameters, Crack Tip Opening Displacement, and the J integral

UNIT-IV

Fatigue: definition of terms used describe fatigue cycles, High Cycle Fatigue, Low Cycle Fatigue, mean stress R ratio, strain and load control. S-N curves. Goodmans rule and Miners rule. Micromechanisms of fatigue damage, fatigue limits and initiation and propagation control, leading a consideration of factors enhancing fatigue resistance. Fatigue life and damage tolerant approaches life prediction

Text Books


REFERENCE BOOKS:

Course Title: Non-Conventional Sources of Energy

Course Code: ME 4439

Course Objectives:
The course content enables students to:
1. Give an idea about the energy demand in future as well as the government policies on energy
2. Familiarize with the solar, wind, tidal, Geothermal and bio-mass energies
3. Familiarize with the different energy storage techniques
4. Familiarize with the direct energy conversion system
5. Familiarize with Power Plant Economics and Environmental issues

Course Outcomes:
At the end of the course students are able:
1. Understand the concept of different forms of alternative sources of renewable energy
2. Explain the solar energy storage methods
3. Evaluate the design parameters of wind energy and solar energy
4. Understand the principles of Biomass energy conversion.
5. Explain the techniques and methods of Tidal, Geothermal and OTEC.
6. Illustrate the principles of direct energy conversion methods

UNIT- I
Introduction: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power.
Principles of solar radiation: Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on tilted surface, Instruments for measuring solar radiation and sun shine, solar radiation data.
Solar energy collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advances collectors.
Solar energy storage: Different methods, sensible, latent heat and stratified storage, solar ponds.
Solar application, solar heating/cooling techniques, solar distillation and drying, photovoltaic energy conversion

UNIT – II

Wind energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics.

Bi-mass – Principles of Bio conversion, Anaerobic/aerobic digestion, types of Bio gas digesters, gas yield, combustion characteristics of bio gas utilization for cooking

UNIT – III

Geothermal energy: Resources, types of wells, methods of harnessing the energy, potential in India.

O T E C: Principles, utilization, setting of OTEC plants, thermodynamics cycles.

Tidal and wave energy: Potential and conversion techniques.

UNIT – IV

Direct energy conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo electric generators, seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerar, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects.

Fuel cells, principle. Faraday’s laws, thermodynamics aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Non-conventional Energy Sources /G.D. Rai
2. Non-Conventional Energy / Ashok V Desai / Wiley Eastern
3. Non-conventional energy Systems / Km Mittal / Wheeler
4. Renewable Energy Technologies / Ramesh & Kumar /Narosa

REFERENCE BOOKS:

1. Renewable Energy Sources /Twidell & Weir
2. Solar Energy /Sukhame
Department of Mechanical Engineering

B.Tech- 7th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 8th semester & FSI Model)

Course Title: Finite Element Methods
Course Code: ME 4440

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Course Objectives:

The course content enables students:

1. Gain a fundamental understanding of the finite element method for solving boundary value problems and finite difference techniques for solving initial value problems.
2. Learn important concepts of strong form, weak form, variational form, minimum principles, and method of weighted residuals.
3. Study one dimensional problems such as truss, beam, and frame members, two-dimensional problems such as plain stress and plain strain elasticity problems, torsion problem.
4. Learn finite element and finite difference analysis of static and dynamic problems.
5. Gain knowledge and analysis skills in applying basic laws in mechanics and integration by parts develop element equation for a spring element and steps used in solving the problem by finite element method.
6. Develop the student’s skills in applying the basic matrix operation form a global matrix equation and enforce the concept of steps in obtaining solutions for a truss structures

Course Outcomes:

At the end of the course students are able:

1. Apply the concepts of minimum potential energy principles solve structural mechanics problems.
2. Demonstrate various concepts like total potential energy principles, weighted residual methods.
3. Apply the finite element procedure for stress analysis and design of load carrying structures.
4. Estimate Eigen values and eigenvectors find natural frequency and mode shapes for simple dynamic systems.
**Unit-I**


**Unit-II**

**Analysis of Trusses:** Finite Element modeling – Coordinates and shape functions – assembly of global stiffness matrix and load vector – Finite Element equations – treatment of boundary conditions – stress, strain and support reaction calculations.

**Analysis of Beams:** Hermite shape functions – Element stiffness matrix – Load vector – simple problems on beams.

**Unit-III**

Constant Strain Triangular Elements: Finite Element modeling of two dimensional stress analysis with Constant strain triangles – treatment of boundary conditions simple problems.

**Isoperimetric Elements:** Two – dimensional four node isoparametric elements and numerical integration.

**Unit-IV**

**Steady State heat transfer analysis:** One dimensional heat conduction – one dimensional fin element – two dimensional analysis of plate- simple problems.


**TEXT BOOKS:**


**REFERENCES:**

5. Finite Elements for Undergraduates – Akin.
Course Title: Jet Propulsion and Rocket Engineering                      Course Code: ME 4441

Course ObjectiveS:

The course content enables students to:

1. Understand the basic principles of gas turbine and jet propulsion.
2. Understand turboprop, turbojet and ramjet engines.
3. Understand and evaluate the performance of rocket engines.
4. Understand recent advances such as cryogenics, plasma arc propulsion etc.

Course Outcomes:

At the end of the course students are able:

1. Understand the basic principles of gas turbine and jet propulsion.
2. Illustrate and analyze turboprop, turbojet and ramjet engines.
3. Understand and evaluate the performance of rocket engines.
4. Apply the rocket technology recent advances such as cryogenics, plasma arc propulsion etc.

UNIT-I:


UNIT-II


UNIT III

Rocket Engines: Need - applications – Basic principle of operation and parameters of performance –
Classification, solid and liquid propellant rocket engines, advantages, domains of application –
Propellants – Comparison of propulsion systems.

UNIT –IV

Rocket technology: Flight mechanics, application Thrust Profiles, Acceleration – stating of Rockets,
need for – Feed systems, injectors and expansion nozzles – Rocket heat transfer and ablative cooling-
Testing & Instrumentation – Need for Cryogenics – Advances Propulsion Systems, Elementary treatment
of Electrical Nuclear and Plasma Arc Propulsion.

TEXT BOOKS:
1. Fundamentals of I.C Engineers/Gill, Smith and Zierys
2. Rocket Propulsion/Sutn

REFERENCE BOOK:
1. Gas Turbines / Cohen, Rogers & Saravana Muto/ Addison Wesley & Longman
2. Thermodynamics of Propulsion /Hill & Paterson
Department of Mechanical Engineering

B.Tech- 7th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 8th semester & FSI Model)

Course Title: Nano Technology  
Course Code: ME 4442

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Course Objectives:

The course content enables students to:

1. Learn history, applications and impact of nanotechnology.
2. Understand different p-down and both approaches for the synthesis of nanomaterials.
3. Learn the principles of different structural and microstructural characterization techniques.
4. Understand the mechanical, electrical and optical properties of the nano materials.
5. Understand the interaction between bio-molecules and nano-particle surface and the concepts of Nano-medicine development.

Course Outcomes:

At the end of the course the learners will be able

1. Outline the evolution, hisry, applications and impact of nanotechnology.
2. Compare and discuss different p-down and botm approaches for the synthesis of nanomaterials.
3. Explain the principles of different structural and microstructural characterization techniques.
4. Summarize the mechanical, electrical and optical properties of the nano materials.
5. Understand the interaction between bio-molecules and nano-particle surface and the concepts of nano-medicine development.

UNIT-I

Fundamentals and Overview of Nano science:


UNIT-II

Synthesis and Characterization of Nano materials:

p-down (Nanolithography, CVD), Botm-up (Sol-get processing, chemical synthesis). Wet Deposition techniques, Self-assembly (Supramolecular approach), Molecular design and modeling. Process of synthesis of Nano powders, Electro deposition, important Nano materials.
Electron macroscopic, scanning probe macroscopic, optical macroscopic for Nano science and technology, X-ray diffraction.

Silicon Carbide: Application of Silicon carbide, Nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of Nano particles,

UNIT-III
Properties of Nano materials:
Mechanical properties: Strength of Nano crystalline SiC, Preparation for strength measurements,
Mechanical properties, Magnetic properties,
Electrical properties: Switching glasses with Nano particles, Electronic conduction with Nano particles
Optical properties: Optical properties, special properties and the coloured glasses

UNIT-IV
Nano biology and Nano Medicines: Interaction between biomolecules and Nano particle surface,
Different types of inorganic materials used for the synthesis of hybrid Nano-bio assemblies.
Developing of Nano medicines Nano systems in use, Protocols for Nano drug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications.

TEXT BOOKS:
2. Nano Essentials- T.Pradeep/TMH

REFERENCE BOOKS:
2. Medical Nanotechnology and Nanomedicine by Harry F. Tibbals, CRC Press.
Department of Mechanical Engineering

B.Tech- 7th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 8th semester & FSI Model)

Course Title: Production Planning and Control (Elective-V)  Course Code: ME 4443

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Course Objectives:

The course content enables students :

1. Understand the hierarchy of production planning and control decisions from long term planning real-time batch control
2. Understand the interaction between marketing, purchasing, engineering design, manufacturing, and production control
3. Understand the aggregate planning models including ability formulate objective functions, resource constraints, and inventory balances

Course Outcomes:

At the end of the course students are able :

1. Define and relate the tasks of strategic planning, materials requirements planning, aggregate production planning and scheduling.
2. Develop forecasting models for demand forecasting
3. Solve various inventory management problems
4. Specify optimal global manufacturing process and logistics network based on world market options
5. Implement various scheduling techniques schedule shop floor activities of the industry.
6. Develop aggregate production plans weekly assembly quantities for end items

UNIT – I

Introduction: Definition – Objectives of production Planning and Control – Functions of production planning and control – Elements of production planning and control – Types of production – Organization of production planning and control department – Internal organization of department.

Forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods.
UNIT – II
Overview of reorder point techniques, MRP-I- Bill of Materials, Lead time, Procurement, Master Production Schedule and Receiving Dock  MRP-II-Demand Forecasting, Shipping Dock, Capacity Requirement Planning  Introduction ERP, JIT manufacturing..

UNIT – III
Facry physics: Basic facry dynamics, Little’s law, Variability, Corrupting influence of variability, Push and pull production systems.

UNIT – IV
Routing – Definition – Routing procedure – Route sheets – Bill of material – Facrs affecting routing procedure. Schedule –definition – Difference with loading
Scheduling Policies – Techniques, Standard scheduling methods, Expediting, controlling aspects
Introduction  aggregate planning, capacity planning

TEXT BOOKS:
1. Elements of Production Planning and Control / Samuel Eilon.
2. Modern Production/ operation managements / Baffa & Rakesh Sarin
3. Facry Physics, Hopp and spearman

REFERENCES:
2. Invenry Control Theory and Practice / Martin K. Starr and David W. Miller.
Department of Mechanical Engineering
B.Tech- 7th Semester
SYLLABUS
(Applicable for 2013-14 admitted batch)

Course Title: CAD LAB
Course Code: ME 4244
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Course Objectives:
The course content enables students to

1. Enable them in orthographic and isometric views of simple mechanical components using any drafting software as per the BIS standard.
2. Understand them in modeling and assembling 3D objects in Solid modeling software.
3. Learn a systematic approach for solving FEM problems.
4. Enable them to solve, analyze and validate the results using ANSYS.

Course Outcomes:
At the end of the course students are able:

1. Draw orthographic and isometric views of simple mechanical components using any drafting software as per the BIS standard.
2. Model and assemble 3D objects in Solid modeling software.
3. Prepare a systematic approach for solving FEM problems.
4. Solve, analyze and validate the results using ANSYS.

1. DRAFTING: Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting, Study of script, DXE and IGES files.

2. PART MODELING: Generation of various 3D Models through Protrusion, revolve, shell sweep. Creation of various features, Study of parent child relation, Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translars, Design simple components

3. ANALYSIS:
   a) Determination of deflection and stresses in 2D and 3D trusses.
   b) Determination of deflection and stresses in 2D and 3D Beams.
c) Determination of deflections component and principal and Vonmises stresses in plane stress, plane strain and axisymmetric components.

d) Determination of stresses in 3D and shell structures (at least one example in each case).

e) Estimation of natural frequencies and mode shapes Harmonic response of 2D beam.

f) Steady state heat transfer Analysis of plane and axisymmetric components.
Department of Mechanical Engineering
B.Tech- 7th Semester

SYLLABUS
(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & FSI Model)

Course Title: CAM & Mechatronics Lab
Course Code: ME 4245
L T P C
0 0 3 2

Course Objectives:
The course content enables students to:
1. Understand the Manual Part programs using G and M codes
2. Learn machining on CNC machines
3. Learn develop simple ladder logic programs and run them on PLCs.
4. Understand the basic components of pneumatic circuit and operate those using PLCs.
5. Learn operating various sensors and transducers using PLCs and to Write simple programs.

Course Outcomes:
At the end of the course students are able:
2. Perform machining on CNC machines and fabricate simple machine components on Lathe and milling Machines.
3. Develop simple ladder logic programs and run them on PLCs.
4. Understand the basic components of pneumatic circuit and operate those using PLCs.
5. Learn operating various sensors and transducers using PLCs.
   Write simple programs for controlling basic elements in aumatic systems by using microcontroller.

LIST OF EXPERIMENTS

1. Machine a given job using MTAB XL Turn
   i) Simple Facing and Turning Operation
   ii) Taper Turning Operation
   iii) Multiple Turning Operations
   iv) Programme for Threading Operation
2. Machine a given job using MTAB XL Mill
   i) Programming Using Linear and Circular Interpolation
   ii) Mirroring and Drilling
   iii) Pocketing
MECHATRONICS:
1. Basics of Ladder logic programming
2. PLC Programming with CX-Programming
3. AC Servo motor with drive and applications (Closed Loop)
4. Pneumatic trainer kit
5. Micro controller
6. Sensor and transducer kit
Packages be provided to cater NC/CNC Programming: Denford Offline lathe, Denford offline Mill, Master CAM, Gibbs CAM, Master CAM etc.
Department of Mechanical Engineering

B.Tech - 8th Semester

SYLLABUS
(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 7th semester & FSI Model)

Course Code: Aumobile Engineering

Course Code: ME 4446
L T P C
4 0 0 3

Course Objectives:

The course content enables students to:

1. develop an idea about different types of aumobile vehicles and their classification
2. give an idea about aumobile engines and associated systems such as lubricating system, cooling system, fuel feed system, ignition system etc., their necessity, requirements, construction details, different types and their working.
3. impart an idea about, How the power is transferred from the engine to the road wheels?, in power transmission system which deals with components such as clutch, gear box, propeller shaft, universal joint, differential etc.
4. impart an idea about, How the power is transferred from the engine to the road wheels?, in power transmission system which deals with components such as clutch, gear box, propeller shaft, universal joint, differential etc.
5. give an idea about, Different vehicle control systems such as steering system, Suspension system and braking system, their construction and working.
6. develop an idea about troubleshooting and servicing and maintenance of aumobile vehicles. Also create an idea on future challenges in the field of aumobile

Course Outcomes:

At the end of the course students are able:

1. Identify different types of aumobile vehicles and their category, engine construction, turbo charging and supercharging.
2. Choose the different components necessity and their working related transmission system.
3. Explain the necessity and working of controlling system like steering, suspension, braking and electrical system,
4. Identify different causes for troubles faced during the operation and their remedies.
5. Illustrate the engine safety systems and emission control methods

UNIT-I

Introduction: Components of four wheeler automobile - chassis and body - power unit - power transmission - rear wheel drive, front wheel drive, 4 wheel drive - types of automobile engines, engine construction, turbo charging and super charging - oil filters, oil pumps - crank case ventilation – reboring, de carbonization, Nitriding of crank shaft.

Transmission system: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, - gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive queue converter. Propeller shaft - universal joint- differential rear axles- types - wheels and tyres

UNIT-II

Steering system: Steering geometry - camber, casr, king pin rake, combined angle ein, center point steering. types of steering mechanism - Ackerman steering mechanism, Davis steering mechanism, steering gears - types.

Suspension system: Objects of suspension systems - rigid axle suspension system, rsion bar, shock absorber, Independent suspension system.

Braking system: Mechanical brake system, hydraulic brake system, master cylinder, wheel cylinder tandem master cylinder requirement of brake fluid, pneumatic and vacuum brakes.

UNIT-III

Electrical system: Charging circuit, generar, current – voltage regular - starting system, bendix drive mechanism solenoid switch, lighting systems, horn, wiper, fuel gauge - oil pressure gauge, engine temperature indicar etc.

Engine specification and safety systems: Introduction- engine . specifications with regard power, speed, rque, no. of cylinders and arrangement, lubrication and cooling etc.

Safety: Introduction, safety systems - seat belt, air bags, bumper, anti lock brake system (ABS), wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control.

UNIT-IV

Engine emission control: Introduction - types of pollutants, mechanism of formation, concentration measurement, methods of controlling- engine modification, exhaust gas treatment-thermal and catalytic converters - use of alternative fuels for emission control - National and International pollution standards
Engine service: Introduction, service details of engine cylinder head, valves and valve mechanism, piston-connecting rod assembly, cylinder block, crank shaft and main bearings, engine reassembly-precautions.

TEXTBOOKS:
2. Automobile Engineering / William Crouse, TMH Distriburs

REFERENCE BOOKS:
Department of Mechanical Engineering

B.Tech- 8th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 7th semester & FSI Model)

Course Title: Industrial Engineering and Management  
Course Code: ME 4447

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Course Objective(S):

The course content enables students :

1. Increase the productivity by eliminating waste and non value adding (unproductive) operations and improving the effective utilization of resources.
2. Enable interface engineering facilities and their operations for converting resources in products and services which are in turn supplied the customer.
3. Establish methods for improving the operations and controlling the production costs in industries.
4. Impart the Knowledge about Industrial Engineering and Management concepts and its applications.
5. Emphasis the importance of work study, Operations management, Value analysis, HRM and quality control aspects.
6. Impart the knowledge about Project Management techniques

Course Outcomes:

At the end of the course students are able :

1. Develop the simplest work methods and establish one best way of doing the work.
2. Select the site and develop a systematic layout for the smooth flow of work without any interruptions
3. Understand how improve productivity and profitability by implementing work study and SQC methods.
4. Select and maintain skilled and sufficient manpower perform various functions.
5. Implement Project Management techniques estimate expected completion time and optimal cost of the projects
UNIT I


Designing Organizational Structures : Basic concepts related Organization - Depart mentation and Decentralization, Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure) and their merits, demerits and suitability.

UNIT II

Plant location, definition, facrs affecting the plant location, comparison of rural and urban sites-methods for selection of plant- Matrix approach, Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart. Line balancing.

Work study - Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts. Work measurement- definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation. Work Sampling – definition, steps involved, standard time calculations, and differences with time study.

UNIT -III

Materials Management-Objectives, Invenry – functions, types, associated costs, invenry classification techniques-ABC and VED analysis. Invenry Control Systems-Continuous review system-periodical review system, Sres Management and Sres Records, Purchase management, duties of purchase of manager, associated forms

Inspection and quality control, types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non-assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans-OC curves. Introduction TQM-Quality Circles, ISO 9000 series procedures

UNIT IV

Introduction PERT / CPM : Project management, network modeling-probabilistic model, various types of activity times estimation-Programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method (CPM)-critical path calculation-crashing of simple of networks.
Introduction  Human Resource Management: Functions of HRM, Job Evaluation, different types of evaluation methods. Job description, Merit Rating.- difference with job evaluation, different methods of merit ratings, wage incentives,

TEXT BOOKS:

REFERENCES :
Course Title: Advanced Materials  
Course Code: ME 4448

Course Objectives:

- Learn different types of composite materials.
- Understand the manufacturing methods of the composite materials.
- Understand the properties and uses of reinforcement fibres.
- Learn the principles, types and applications of alloys.
- Understand the reasons the properties of nanomaterials in comparison those of bulk materials.

Course Outcomes:

- Understand the need and explain different types of composite materials.
- Summarize the various methods for manufacturing of the composite materials.
- Distinguish between the properties and uses of different reinforcement fibres.
- Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
- Infer the reasons for the variation in the properties of nanomaterials in comparison those of bulk materials.

UNIT-I


Manufacturing Methods: Auclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

UNIT-II


Metal Matrix and Ceramic Matrix Composites: Manufacturing of ceramic matrix & metal matrix composites and their applications, stress strain relations for MMC and CMC.
UNIT- III

Functionally Graded Materials: Types of Functionally graded materials-classification- different systems- Preparation- Properties and applications of functionally graded materials.

Shape Memory Alloys: Introduction-Shape memory effect- Classification of shape memory alloys- Composition-Properties and applications of shape memory alloys.

UNIT-IV


TEXTBOOKS:
I. Nano material by A.K. Bandyopadyay, New age 'publishers
2. Material science and Technology- Cahan

REFERENCE BOOKS:
Department of Mechanical Engineering

B.Tech- 8th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 7th semester & FSI Model)

Course Title: Cellular Manufacturing Systems

Course Code: ME 4449

L T P C
3 1 0 4

Course Objectives:

The course content enables students to:

1. Understand the concept and applications of cellular manufacturing system
2. Distinguish the coding systems, production flow analysis and component flow analysis.
3. Apply the essential algorithms and data structures on cellular manufacturing systems.
4. Analyze the factors in cell design consideration
5. Analyze the factors influencing the effectiveness, efficiency and utilization for cellular manufacturing and its implementation issues.
6. Understand the scheduling and production control activities in Cellular manufacturing and its benefits.

Course Outcomes:

At the end of the course students are able:
1. Understand the concept and applications of cellular manufacturing system
2. Distinguish the coding systems, production flow analysis and component flow analysis.
3. Apply the essential algorithms and data structures on cellular manufacturing systems.
4. Analyze the factors in cell design consideration
5. Analyze the factors influencing the effectiveness, efficiency and utilization for cellular manufacturing and its implementation issues.
6. Understand the scheduling and production control activities in Cellular manufacturing and its benefits.

Unit – I

Introduction, Historical background, concept of group machining, Terminologies associated with Cellular manufacturing, cell characteristics objectives of cellular manufacturing, areas of applications of Cellular Manufacturing, benefits – introduction of Cellular Manufacturing, factors influencing
success of Cellular Manufacturing, comparison between tradition and Cellular Manufacturing System.

Unit – II
Classification and coding systems, flow analysis, production flow analysis, component flow analysis, introduction cell formation techniques, design and manufacturing attributes, cell formation techniques such as rank order clustering, similarity coefficient methods, Classification Identification Algorithms, Bond Energy Algorithms, Data Structures and its influence on solutions, other facrs in cell design consideration.

Unit – III
Processing exceptional Cell Manufacturing, facrs influencing, study of elementary models, algorithms for evaluation of cells such as measures of effectiveness, machine utilization, grouping efficiency, cell efficiency, cell evaluation by points method, measure of cell flexibility, selection of solution, cell size, number of cells and its influence, performance of cells.

Unit – IV
Production control activities in cell manufacturing, scheduling in cell manufacturing, study of elementary models, line balancing in cellular manufacturing, study of elementary models, invenry control in cellular manufacturing, study of elementary models.

Implementation issues in Cellular Manufacturing, economic justification of cellular manufacturing, benefits of cellular manufacturing, organizational and behavioral issues in the implementation of cellular manufacturing Case study on application of cellular manufacturing

Text Books:
1. BS Nagendra Parashar (2009), Cellular Manufacturing Systems and Integrated Approach, PHI Publications, New Delhi)
2. Andrew Kusaik, “Intelligent Manufacturing System”
3. Irani SA, “Cellular Manufacturing systems”

Reference Books:
Course Title: Computational Fluid Dynamics

Course Code: ME 4450

L T P C
3 1 0 4

Course Objectives:
The course enables the students:

1. Introduce them widely used techniques in the numerical solution of fluid flow equations.
2. Emphasize on ‘learning by doing’, as they will work on classroom projects and assignments.
3. Provide them with basic mathematical and numerical concepts of fluid flow and heat transfer problems.
4. Get exposed modern trends in CFD.
5. Enhance their skills related computer design and evaluation in fluid flow, critical thinking and lifelong learning.

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

1. Understand the basic principles of mathematics and numerical concepts of fluid dynamics.
2. Develop governing equations for a given fluid flow system.
3. Adapt finite difference techniques for fluid flow models.
4. Apply finite difference method for heat transfer problems.
5. Solve computational fluid flow problems using finite volume techniques.
6. Get familiarized modern CFD software used for the analysis of complex fluid-flow systems.

Syllabus

UNIT- I: Governing equations for basic fluid flow 18Hrs (13L + 5T)
Introduction CFD, Basic Philosophy of CFD, Governing equations of fluid dynamics (Mass Equation), Governing equations of fluid dynamics (Newn’s Equation), Governing equations of fluid dynamics (Energy Equation), Incompressible Inviscid flows sources, Vortex flow model.
UNIT II: Implementation of finite difference techniques in fluid flow
15Hrs (12L + 3T)
Transformations and grids, MacCormack’s method, finite differences, discretization, consistency, stability, fundamentals of fluid flow modeling, elementary finite difference quotients, implementation aspects of finite difference equations.

UNIT III: Application of finite difference technique in heat transfer
15Hrs (11L + 4T)
Finite difference applications in heat conduction and convection- Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer.

UNIT IV: Finite Volume Methods & Overview on Commercial Packages
12 Hrs (9L + 3T)
Introduction of finite volume methods in computational fluid dynamics, Approximation of surface integrals, volume integrals, interpolation and differentiation practices, Cell Centered formulation, LAX-Wendroff time stepping
Aspects of CFD computations with commercial packages Like ZN Tur and Fluent.

Text Books:
2. Computational fluid flow and heat transfer, Niyogi, Pearson Publications.

References:
Department of Mechanical Engineering

B.Tech- 8th Semester

SYLLABUS

(Applicable for the batches admitted from 2013-14, 7th and 8th, Non-FSI & 7th semester & FSI Model)

Course Title: Power Plant Engineering  
Course Code: ME 4451

L T P C
3 1 0 4

Course Objectives:

The course content enables students:

1. Give insight regarding different sources of energy
2. Familiarize with Equipment, Plant layout, principle of working of various systems
3. Familiarize with Power Plant Economics and Environmental Considerations

Course Outcomes:

At the end of the course students are able:

4. Describe construction, working principles and advantages of steam and hydroelectric power plants.
5. Describe working principles of diesel and gas turbine power plants
6. Apply the concepts of non-conventional energy sources
7. Outline different technologies adopted in nuclear power plants
8. Apply pollution control techniques, economic analysis in power plants

UNIT – I

Introduction the Sources of Energy:

Steam power plant: Plant Layout, Working of different Circuits, coal handling, choice of handling equipment, Ash handling systems.

Combustion process: overfeed and underfeed fuel beds, traveling grate skers, spreader skers, rert skers, pulverized fuel burning system, cyclone furnace, FBC and Dust collectors.

UNIT – II

Diesel power plant: Introduction –Plant layout with auxiliaries – fuel supply system, air starting equipment – super charging.

UNIT – III

Hydro projects and plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped srage plants.


Direct energy conversion: Solar energy, Fuel cells, MHD generation.

UNIT – IV
Nuclear power station: Nuclear fuel – fertile materials – Nuclear reacr – reacr operation.

Types of reacrs: Pressurized water reacr, Boiling water reacr, fast Breeder Reacr, Gas cooled Reacr.

Power plant economics and pollution: Capital cost, investment of fixed charges, operating costs, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand facr, average load, load facr, diversity facr – related exercises.

Pollution: Introduction- pollution from thermal power plants-pollution from nuclear power plants- pollution from hydroelectric power plants.

TEXT BOOK :

REFERENCES :
1. Power plant Engineering/ Ramalingam/ Scietech Publishers
6. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications