DEPARTMENT OF
MECHANICAL ENGINEERING

Scheme of Instruction and Syllabus
of
M.E. (Mechanical)

Specialization:

CAD/CAM

Full time / Part time
(2015-16)

UNIVERSITY COLLEGE OF ENGINEERING
(Autonomous)
Osmania University
Hyderabad – 500 007, Telangana, INDIA
Scheme of Instruction & Examination  
M.E. (Mechanical Engineering) 4 Semesters (Full Time)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Subject</th>
<th>Hours per week</th>
<th>Duration (Hrs)</th>
<th>Max. Marks</th>
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| 1      | Project + Seminar*             | -- 4          | 4              | --         | 100** 8 |

|        |                                |               |                |            |         |
| 1      | Dissertation                   | -- 6          | 6              | 200        | - 16    |

Note: Six core subjects, six elective subjects, two laboratory courses and two seminars should normally be completed by the end of semester II.

* One project seminar presentation.

** 50 marks to be awarded by guide and 50 marks to be awarded by viva-voice committee comprising Guide and two internal senior faculty members (subject experts)
### Scheme of Instruction & Examination

M.E. (Mechanical Engineering) 6 Semesters (Part Time)

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Note: Six core subjects, six elective subjects, two laboratory courses and two seminars should normally be completed by the end of semester IV.

* Project seminar presentation on the topic of Dissertation only

** 50 marks to be awarded by guide and 50 marks to be awarded by viva-voice committee comprising Guide and two internal senior faculty members (subject experts)
# M. E. Mechanical Engineering (CAD/CAM)

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CIE : Continuous Internal Evaluation    SEE : Semester End Examination
ME2301

AUTOMATION

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UNIT – I


UNIT – II


UNIT – III


UNIT – IV


UNIT – V


Suggested Reading:
ME2401

FINITE ELEMENT TECHNIQUES

Instructions  3 periods/week  Duration of university Examination: 3 hours
Credits  3  SEE: 70 Marks  CIE: 30 Marks

Objectives:

- To understand the theory and application of the finite element method for analyzing structural systems.
- To learn Approximation theory for structural problems as the basis for finite element methods.
- To learn formulations for a variety of elements in one, two, and three dimensions.
- To understand modeling and analysis of structures using planar, solid, and plate elements.

UNIT-I

UNIT-II
Analysis of trusses and frames: Analysis of plane truss with number of unknowns not exceeding two at each node. Analysis of frames with two translations and a rotational degree of freedom at each node. Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node for beam element.

UNIT-III
Finite element modeling of two dimensional stress analysis problems with constant strain triangles and treatment of boundary conditions. Two dimensional four noded isoparametric elements and numerical integration. Finite element modeling of Axisymmetrical solids subjected of axisymmetric loading with triangular elements. Convergence requirements and geometric isotropy.

UNIT-IV

UNIT-V

Suggested Reading:

ME2402

COMPUTER AIDED MODELLING & DESIGN

Instructions 3 periods/week Duration of university Examination: 3 hours
Credits 3 SEE: 70 Marks CIE: 30 Marks

UNIT-I
Introduction to CAD, Criteria for selection of CAD workstations, Shigle Design Process, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. 2D & 3D Geometric Transformations: Translation, Scaling, Rotation, Reflection and Shearing, conlatenation. Graphics standards: GKS IGES, PDES.

UNIT-II
Wire frame modeling: Curves: Curve representation. Analytic curves – lines, Circles, Ellipse, Conis. Synthetic curves – Cubic, Bezier, B-Spline, NURBS.

UNIT-III

UNIT-IV
Solid Modeling Techniques: Graph Based Model, Boolean Models, Instances, Cell Decomposition & Spatial – Occupancy Enumeration, Boundary Representation (B-rep) & Constructive Solid Geometry (CSG).

UNIT-V

Suggested Reading:
ME2403

COMPUTER INTEGRATED MANUFACTURING

Instructions 3 periods/week  
Duration of university Examination: 3 hours  
Credits 3  
SEE: 70 Marks  
CIE: 30 Marks

Objectives:

- To understand the need for CIM, evolution of CIM, fundamentals of CIM and the Concept of Concurrent Engineering.
- To know the role of database management of CIM and understand various types of CIM technologies and systems like DFMA, CAPP, MRP, Cellular Manufacturing, FMS etc.
- To understand the fundamental networking concepts that help in integrating all the important components of an enterprise and discuss the different types of CIM models developed by various industries. stand the new trends in manufacturing systems.

UNIT – I: Introduction to CIM

UNIT – II: CIM database and database management systems
Introduction, Manufacturing Data: Types, sources; Database Terminology, Database requirements, Database models, Database Management System, DBMS Architecture, Query Language, Structural Query Language (SQL): Basic structure, Data definition Language (Create, Alter, Drop, Truncate, View), Data Manipulation Language (store, retrieve, update, delete). Illustration of Creating and Manipulating a Manufacturing Database. SQL as a Knowledge Base Query Language. Features of commercial DBMS: Oracle, MySQL, SQL Access, Sybase, DB2. Product Data Management (PDM), Advantages of PDM.

UNIT – III: CIM Technology and Systems

UNIT – IV: Enterprise Wide Integration in CIM and CIM Models
Introduction to Networking, Principles of Networking, Network Terminology, Types of Networks: LAN, MAN, WAN; Selection of Network Technology: Communication medium, Network Topology, Medium access control Methods, Signaling methods; Network Architectures and Protocols: OSI Model, MAP & TOP,

CIM Models: ESPRIT-CIM OSA Model, NIST-AMRF Model, Siemens Model of CIM, Digital Equipment Corporation Model, IBM Concept of CIM.

UNIT – V: Future Trends in Manufacturing Systems

Suggested Reading:
3. P.Radhakrishnan, S.Subramanyam: CAD/CAM/CIM, New Age International
4. Alavudeen, Venkateshwaran: Computer Integrated Manufacturing, Printice-Hall India
ME2404

FAILURE ANALYSIS AND DESIGN

Instructions 3 periods/week Duration of university Examination: 3 hours
Credits 3 SEE: 70 Marks CIE: 30 Marks

Objectives:
- To explain the importance of Good design and various factors affecting it
- To explain the importance of Ergonomics and Aesthetics in good design.
- To understand the importance of various scientific methods available to solve problems arising from product initiation state to product delivery state.
- To understand the phenomenon & importance of Fracture, its determination by various methods also understand the effect of fatigue on crack propagation.

UNIT - I

UNIT- II

UNIT - III

UNIT – IV
APPLICATIONS OF FRACTURE MECHANICS Introduction –Through cracks emanating from holes – Corner cracks at holes – Cracks approaching holes-Combined loading-Fatigue crack growth binder- Mixed mode loading-Fracture toughness of weld metals-Service failure analysis

UNIT – V
FATIGUE CRACK PROPOGATION— Mechanism of fatigue crack initiation, propagation and growth, Fatigue data representation, Factors influencing Fatigue strength, Fatigue life prediction, prevention of fatigue failures, corrosion fatigue. Cumulative fatigue damage

Suggested Reading:
5. S T. Rolfe and J M Barsom, Fracture and Fatigue control in structure, Prentice Hall
COMPUTER AIDED MECHANICAL DESIGN AND ANALYSIS

Instructions 3 periods/week  Duration of university Examination: 3 hours
Credits 3  SEE: 70 Marks  CIE: 30 Marks

Objectives:
- To develop students knowledge and understanding of Bending of Plates.
- To understand the basics of designing pressure vessels against internal and external pressure loads. To understand the effect of thermal stress on pressure vessel.
- To understand the phenomenon of buckling in pressure vessels and usage of various methods available to prevent buckling of pressure vessels.
- To understand the importance of numerical methods in solving multi degree freedom dynamic analysis problems.

To understand various numerical methods available for solving eigen values problems

UNIT-I
Stresses in flat plates: Introduction, Bending of plate in one direction, Bending of plate in two perpendicular directions, Thermal stresses in plates, Bending of circular plates of constant thickness, Bending of uniformly loaded plates of constant thickness.

UNIT-II
Design of pressure Vessels: Introduction and constructional features of pressure vessels, stresses in pressure vessels, shrink fit stresses in built up cylinders, autofrettage of thick cylinders, thermal stresses and their significance. Stress concentration at a variable thickness, thickness transition in a cylindrical vessel, about a circular hole, elliptical openings, reinforcement design

UNIT-III
Buckling in vessels: Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure – collapse of thick walled cylinders or tubes under external pressure – Effect of supports on Elastic Buckling of Cylinders – Buckling under combined External pressure and axial loading.

UNIT-IV

UNIT-V

Suggested Reading:
CONTROL OF DYNAMIC SYSTEMS

Instructions: 3 periods/week  Duration of university Examination: 3 hours
Credits: 3  SEE: 70 Marks  CIE: 30 Marks

Objectives:
The goal of the course is to introduce students to the fundamentals of feedback control system theory and analytical design methods, and to apply the methods to the design of real-world systems.

- To introduce the concepts of control systems and develop the ability of formulating mathematical models and designing feedback control systems.
- To provide students with the necessary tools to analyze feedback (linear) controls systems.
- An ability to analyze, design, simulate, and experimentally validate linear and non linear control systems while taking into account practical limitations of operations.
- An understanding of negative and positive feedback systems and their application to circuit analysis and control system design.
- An understanding of frequency compensation and its application to linear and nonlinear control system design.

UNIT-I
Mathematical Modeling of physical systems, 1st, 2nd order and higher order systems, transient, steady state analysis, steady state errors, Performance Indices.

UNIT-II
Poles, zeros, zero and pole placements, Routh’s criteria, Root locus Technique, Bode plots, Nyquist criterion, Compensation circuits.

UNIT-III
State space method, state transition matrix, canonical forms, Diagonalisation, solutions of homogeneous and non homogenous equations, zero and pole placement using state space techniques, controllability and observability, state controllability matrix, state observability matrix.

UNIT-IV

UNIT-V
Stability Analysis Concept of stability, Stability in the sense of Lyapunov and absolute stability, autonomous systems, the invariance principle, linear systems and linearization, non autonomous systems, linear time varying systems and linearization.

Suggested Reading:
3. Anand Kumar, "Control System Theory", Prentice Hall India.
The goal of the Robotics course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, choose, and incorporate robots in engineering systems.

**Objectives:**
- To develop the student’s knowledge in various robot structures and their workspace.
- To develop student’s skills in performing spatial transformations associated with rigid body motions.
- To develop student’s skills in perform kinematics analysis of robot systems.
- To provide the student with knowledge of the singularity issues associated with the operation of robotic systems.
- To provide the student with some knowledge and analysis skills associated with trajectory planning.
- To provide the student with some knowledge and skills associated with robot control.

**UNIT-I**
Brief History, Types of robots, Overview of robot subsystems, resolution, repeatability and accuracy, Degrees of freedom of robots, Robot configurations and concept of workspace, Mechanisms and transmission, End effectors and Different types of grippers, vacuum and other methods of gripping. Pneumatic, hydraulic and electrical actuators, applications of robots, specifications of different industrial robots.

**UNIT-II**
Rotation matrices, Euler angle and RPY representation, Homogeneous transformation matrices, Denavit-Hartenberg notation, representation of absolute position and orientation in terms of joint parameters, direct kinematics.

**UNIT-III**
Inverse Kinematics, inverse orientation, inverse locations, Singularities, Jacobian, Trajectory Planning: joint interpolation, task space interpolation, executing user specified tasks.

**UNIT-IV**
Static force analysis of RP type and RR type planar robots, Dynamic analysis using Lagrangian and Newton-Euler formulations of RR and RP type planar robots, Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, Computed torque control, force control, hybrid control.

**UNIT-V**
Sensors and controllers: Internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder. Robot vision: image processing fundamentals for robotic applications, image acquisition and preprocessing. Segmentation and region characterization object recognition by image matching and based on features.

**Suggested Readings:**
**ME2308**

**OPTIMISATION TECHNIQUES**

<table>
<thead>
<tr>
<th>Instructions</th>
<th>3 periods/week</th>
<th>Duration of university Examination: 3 hours</th>
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<tr>
<td>Credits</td>
<td>3</td>
<td>SEE: 70 Marks</td>
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<td>CIE: 30 Marks</td>
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**UNIT – I**

**Simulation:** Introduction, Types of Simulation, Simulation Models, Monte Carlo Simulation, Random Number, Pseudo Random Number, Mid-Square Method of generating Random Numbers, Application & Limitation, Application of Simulation to Inventory Control and Queuing Problem

**UNIT – II**


**UNIT – IV Dynamic Programming:** Introduction- Bellman’s principle of optimality-Application of dynamic programming-Linear programming problem-Capital budgeting problem

**UNIT – V Classical Optimization:** Introduction; Unconstrained problems of maxima and minima, constrained problems of maxima and minima; Constraints in the form of equations – Lagrangian method; Constraints in the form of inequalities -Kuhn-tucker conditions.

**Suggested Reading:**
ME2309

VIBRATION ANALYSIS AND CONDITION MONITORING

Instructions  3 periods/week  Duration of university Examination: 3 hours
Credits 3  SEE: 70 Marks  CIE: 30 Marks

Objectives
- Fully understand importance of vibrations in mechanical design of machine parts that operate under vibratory conditions.
- Able to write differential equation of motion of vibratory system and understand free and forced modes of vibration.
- Able to obtain linear vibratory models of dynamic systems of varying complexity (SDOF, MDOF).
- Able to understand the various condition monitoring techniques available in the literature.
- Able to understand the various devices available to record interpret and understand the vibration data.

UNIT-I

UNIT-II
Two Degree of freedom systems. Bending vibrations of two degree of freedom systems, Steady state and transient characteristics of vibration, vibration absorber and vibration isolation.

UNIT-III

UNIT-IV

UNIT-V
Contaminant analysis, SOAP and other contaminant monitoring techniques.
Special vibration measuring techniques - Change in sound method, Ultrasonic measurement method, Shock pulse measurement, Kurtosis, Acoustic emission monitoring, Cepstrum analysis, Modal analysis, critical speed analysis, Shaft –orbit & position analysis.

Suggested Readings:
2. V.P.Singh, Mechanical vibrations, Dhanpat Rai Publications, 2015
ENGINEERING RESEARCH METHODOLOGY

Instructions: 3 periods/week

Duration of university Examination: 3 hours

Credits: 3

SEE: 70 Marks

CIE: 30 Marks

Objectives:

- To learn the research types, methodology and formulation.
- To know the sources of literature, survey, review and quality journals.
- To understand the research design for collection of research data.
- To understand the research data analysis, writing of research report and grant proposal.

Unit - I


Defining the Research Problem: Definition of Research Problem, Problem Formulation, Necessity of Defining the Problem, Technique involved in Defining a Problem.

Unit - II


Unit - III


Unit - IV

Data Collection: Collection of primary data, Secondary data, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data. Sample Design, Need for sampling, some important sampling definitions, Estimation of population, Role of Statistics for Data Analysis, Parametric V/s Non Parametric methods, Descriptive Statistics, Measures of central tendency and Dispersion, Hypothesis testing, Use of Statistical software.

Data Analysis: Deterministic and random data, Uncertainty analysis, Tests for significance: Chi-square, student’s t-test, Regression modeling, Direct and Interaction effects, ANOVA, F-test, Time Series analysis, Autocorrelation and Autoregressive modeling.

Unit - V


Suggested Reading:

1. C.R Kothari, Research Methodology, Methods & Technique; New Age International Publishers, 2004
5. Vijay Upagade and Aravind Shende, Research Methodology, S. Chand & Company Ltd., New Delhi, 2009
NEURAL NETWORKS AND FUZZY LOGIC

**Instructions**  
3 periods/week  

**Duration of university Examination:** 3 hours  

**Credits**  
3  

SEE: 70 Marks  
CIE: 30 Marks  

UNIT-I  


UNIT-II  

Adaptive fuzzy systems: Neural and Fuzzy intelligence, Fuzziness as multivalent, fuzziness in probabilistic world, randomness verses ambiguity.

UNIT-III  


UNIT-IV  

Introduction to Neural networks: Knowledge base information processing, general view of knowledge based algorithm, neural information processing, Hybrid intelligence, and artificial neurons.

UNIT-V  


**Suggested Reading:**

ME2312

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Instructions 3 periods/week  Duration of university Examination: 3 hours
Credits 3 SEE: 70 Marks  CIE: 30 Marks

UNIT-I


UNIT-II

Computer Vision: Perception, early processing, representation and recognition of scenes, Guzman’s algorithms of spurting objects in a scene, Waltz algorithm.

UNIT-III

Neural Language understanding problems, syntactic analysis, semantic analysis, augmented transition networks.

UNIT-IV

Knowledge representation (Logic): Representing facts in logic predicate logic, resolution, unification, question answering, mathematical theorem proving. Knowledge representation (Structured): Declarative representation, Semantic nets, procedural representation.

UNIT-V Learning: Learning as induction, failure drive learning, learning by teaching, learning through examples (Winston’s program) skill acquisition.

Suggested Reading:

ME2107

MECHANICS OF COMPOSITE MATERIALS

Instructions: 3 periods/week
Credits: 3
Duration of university Examination: 3 hours
SEE: 70 Marks
CIE: 30 Marks

UNIT-I


UNIT-II

Micromechanics of Composites: Mechanical properties-Prediction of Elastic constant, micromechanical approach, Halpin-Tsai equations, Transverse stresses. Thermal properties-Hygrothermal stresses, mechanics of load transfer from matrix to fibre.

UNIT-III

Macromechanics of Composites: Elastic constants of a lamina, relations between engineering constants and reduced stiffness and compliances, variation of lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation, inter-laminar stresses and edge effects. Simplified composite beam solutions. Bending of laminated beams.

UNIT-IV

Strength, fracture, fatigue and design: Tensile and compressive strength of unidirectional fibre composites,

Fracture modes in composites: Single and multiple fracture, de-bonding, fibre pullout and de-lamination failure, fatigue of laminate composites. Effect of variability of fibre strength.

Strength of an orthotropic lamina: Max stress theory, max strain criteria, maximum work (Tsai-Hill) criterion, quadratic interaction criteria. Designing with composite materials.

UNIT-V


Suggested Reading:

ME2109

THEORY OF ELASTICITY AND PLASTICITY

Instructions 3 periods/week  Duration of university Examination: 3 hours
Credits 3 SEE: 70 Marks  CIE: 30 Marks

UNIT-I

Basic Concepts of Stress: Definition, State of Stress at a point, Stress tensor, invariants of stress tensor, principle stresses, stress ellipsoid, derivation for maximum shear stress and planes of maximum shear stress, octahedral shear stress, Deviatoric and Hydrostatic components of stress, Invariance of Deviatoric stress tensor, plane stress.

UNIT-II

Basic concepts of Strain: Deformation tensor, Strain tensor and rotation tensor; invariants of strain tensor, principle strains, derivation for maximum shear strain and planes of maximum shear strain, octahedral shear strain, Deviatoric and Hydrostatic components of strain tensor, Invariance of Deviatoric strain tensor, plane strain.

UNIT-III

Generalized Hooke’s Law: Stress-strain relationships for an isotropic body for three dimensional stress space, for plane stress and plane strain conditions, differential equations of equilibrium, compatibility equations, Material (D) matrix for Orthotropic Materials.

UNIT-IV


UNIT-V

Analysis methods: Slab method, Slip line field method, uniform deformation energy method, upper and lower bound solutions. Application of Slab method to forging, wire drawing, extrusion and rolling processes.

Suggested Readings:

1. Timoshenko and Goodieer, Theory of Elasticity, Mcgraw Hill Publications 3rd Edition,

2. Madleson, Theory of Plasticity,

With effect from 2015 - 2016

ME2110

EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS

Instructions  3 periods/week  Duration of university Examination: 3 hours
Credits  3  SEE: 70 Marks  CIE: 30 Marks

Objectives:

- To understand the working principle of instruments used for cutting forces measurement and temperature measurement.
- To have knowledge of various precision measuring instruments for metallurgical studies.
- To understand the basic concept of experiment design for collection of data
- To learn the data analysis, optimization of experimental methods for better data.

Unit - I

Unit - II

Unit - III

Unit - IV
Experiment design & data analysis: Statistical methods, Randomized block design, Latin and orthogonal squares, factorial design. Replication and randomization. Data Analysis: Deterministic and random data, uncertainty analysis, tests for significance: Chi -square, student’s t-test. Regression modeling, direct and interaction effects. ANOVA, F-test. Time Series analysis, Autocorrelation and autoregressive modeling.

Unit - V

Suggested Reading:
4. Box and Jenkins; Time Series analysis, Forecasting and control, Holden Day, Sanfrancisco.
ME2601

DESIGN FOR MANUFACTURE

Instructions  3 periods/week  Duration of university Examination: 3 hours
Credits  3  SEE: 70 Marks  CIE: 30 Marks

UNIT-I


UNIT-II

Metallic Components Design: Metal extrusion, metal stamping, fine blanking, four slide parts, spring and wire forms, spun metal parts, cold headed parts, extruded parts, tube and section bends, rolled formed parts, power metal parts, forging electro forming parts, specialized forming methods, turned parts, machined round holes, drilled parts, milled parts.

UNIT-III

Metallic Components Design: Planned shaped and slotted parts, screw threaded contoured and internal ground parts, center less ground, electrical discharged, rolled furnished parts, electro chemical and advanced machine parts. Sand cast, die cast, investment cast and other cast products.

UNIT-IV

Non Metallic Components Design: Thermosetting plastic, injection moulded and rotational moulded parts, blow moulded, welded plastic articles, ceramics. Assembled Parts Design: Welded parts, arc, resistance, brazed and soldered parts, gear box assembly, bearing assembly.

UNIT-V


Suggested Reading:
ME2405

DATA BASE MANAGEMENT SYSTEMS

Instructions  3 periods/week  Duration of university Examination: 3 hours
Credits      3                        SEE: 70 Marks       CIE: 30 Marks

UNIT-I


UNIT-II

Relational model and relational database design: Structure of relational database, former query languages, commercial query languages. Modifying the database views. Pitfalls in relational database design and normalization.

UNIT-III

Network data model and hierarchical data model: data structure diagram, the DBTCCODASYL. Model data retrieval Update and set processing facility, Three structure diagram, data retrieval and update facility, virtual records.

UNIT-IV


UNIT-V

Distributed database, security and integrity: Design, transparency and autonomy, query processing, recovery, concurrency control, deadlock handling and coordinator selection. Security and integrity, near database application.

Suggested Reading:

ME2406

FRACTURE MECHANICS

Instructions  3 periods/week  
Credits  3  
Duration of university Examination: 3 hours  
SEE: 70 Marks  
CIE: 30 Marks

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

UNIT-V

Suggested Reading:
With effect from 2015 - 2016

ME2505

DESIGN OF PRESS TOOLS

Instructions 3 periods/week  Duration of university Examination: 3 hours  
Credits 3  SEE: 70 Marks  CIE: 30 Marks

UNIT – I


UNIT – II


UNIT – III


UNIT – IV


UNIT – V


Suggested Reading:

3. Eary & Reed, Shear Working of Metals, Prentice Hall, New Delhi, 1969
ME2506

DESKTOP OF DIES

Instructions: 3 periods/week
Credits: 3

Duration of university Examination: 3 hours
SEE: 70 Marks
CIE: 30 Marks

UNIT – I

UNIT – II

UNIT – III

UNIT – IV
Bulk metal forming tools – Forging dies – Definition – Influence of temperature and external pressure – Glossary words applicable in forming dies – Types of forging dies, open die forming closed die forging – Methods of open die forging – Allowance and tolerances applicable to closed die forging – Factors to be considered – Forging equipment – Layout of forge shop

UNIT – V

Suggested Reading:

1. Rusinoff S.E. Forging & forming Metals, Taraporewala, 1952
3. I.S. Standards, BSI, New Delhi
ME2206

COMPUTATIONAL FLUID DYNAMICS

Instructions  3 periods/week  Duration of university Examination: 3 hours
Credits  3  SEE: 70 Marks  CIE: 30 Marks

Objectives:
• To convert the conservation equations of fluid flow in differential form into algebraic equations and apply numerical methods to obtain solutions.
• To learn the finite difference method.
• To learn finite volume method and solution methodology for fluid flow problems.

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

UNIT- V

Suggested Reading:
ADDITIVE MANUFACTURING TECHNOLOGIES AND APPLICATIONS

Instructions: 3 periods/week  
Credits: 3  
Duration of university Examination: 3 hours  
SEE: 70 Marks  
CIE: 30 Marks

Objectives:

- To understand the fundamentals for additive manufacturing and how it is different and discuss about various types of liquid based, solid based and powder based AM technologies.
- To understand the various types of Pre-processing, processing, post-processing errors in AM. Also to know the various types of data formats and software’s used in AM.
- To know the various applications of AM in design analysis, aerospace, automotive, biomedical and other fields

UNIT – I


UNIT – II


UNIT – III


UNIT – IV

**AM Software's:** Need for AM software, Features of various AM software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor, SurgiGuide, 3-matic, Simplant, MeshLab.

**UNIT –V**


**Suggested Reading:**


With effect from 2015 - 2016

ME2113

FLEXIBLE MANUFACTURING SYSTEMS

Instructions 3 periods/week

Credits 3

Duration of university Examination: 3 hours

SEE: 70 Marks

CIE: 30 Marks

Objectives:

- To learn the evolution of flexible manufacturing systems, layouts human resources involvement.
- To know the manufacturing driving force, design scheduling of jobs, classification and coding technique.
- To familiarize with design models for processing and quality assurance, automated manufacturing and measuring systems.
- To understand the working of automated movement, storage systems, tool management, fault detection and relationship with workstations.

Unit - I

Evolution of Manufacturing Systems: FMS definition and description, General FMS considerations, Manufacturing cells, Cellular versus Flexible Manufacturing. Systems Planning: Objective, introduction planning, preparation guidelines, the project team, supplier selection, system description and sizing, facility preparation planning, FMS layouts. Human resources: staff considerations, team work, communication and involvement, the supervisor’s role, personnel selection, job classifications, employee training.

Unit - II


Unit - III

FMS Design – Using Bottleneck, Extended bottleneck models, Processing and Quality Assurance: Turning centres, Machining centre, construction and operations performed, axes, programming, and format information, work-holding and work-changing equipment, automated features and capabilities, cleaning and deburring – station types and operation description, importance to automated manufacturing, coordinate measuring machines, types, construction and general function, operation cycle description, importance to flexible cells and systems.

Unit - IV

Automated movement and storage systems–AGVs, Robots, automated storage and retrieval systems, storage space design, queuing carousels and automatic work changers, coolant and chip Disposal and recovery systems, auxiliary support equipment, cutting tools and tool Management – introduction, getting control of cutting tools, Tool Management, tool strategies, data transfer, tool monitoring and fault detection, guidelines, work holding considerations, General fixturing, Modular fixturing. FMS and the relationship with workstations – Manual, automated and transfer lines design aspects.
Unit - V

FMS: computer Hardware, Software, Communications networks and Nanotechnology — general functions, and manufacturing usages, hardware configuration, programmable logic controllers, cell controllers, communications networks. FMS implementation.

Suggested Reading:

WITH EFFECT FROM 2015-2016

ME2111

PRODUCT DESIGN AND PROCESS PLANNING

Instructions: 3 periods/week

Duration of university Examination: 3 hours

Credits: 3

SEE: 70 Marks

CIE: 30 Marks

Objectives:

- To learn the essential factors with innovative ideas to develop successive right product.
- To know the product reliability, copyrights, value Engineering in product design and cost estimation of product.
- To understand the various machining processes, improving tolerances methods, selection of materials and their importance.
- To understand the modern approaches, ergonomics considerations in product design, integration of design, manufacturing and production control.

Unit - I


Unit - II


Unit - III


Unit - IV


Unit - V

Role of computer in product design and management of manufacturing, creation of manufacturing data base, Computer Integrated Manufacturing, communication network, production flow analysis, Group Technology, Computer Aided product design and process Planning. Integrating product design, manufacture and production control.

Suggested Reading:

ME2431

CAD/CAM LABORATORY

Instruction  3 periods/week CIE  50 Marks
CREDITS  2

List of Exercises: CAD

1. Understanding of various CAD commands and creating simple objects
2. Understanding of holes, cuts and model tree relations
3. Creation shafts, rounds, chamfers and slots
4. Sketch Tools & Datum planes
5. Creation of objects by revolved features, patterns and copies, sweeps and blends
6. Creation of engineering drawing details such as dimensioning, sectional views, adding esthetics
7. Assembling of part models using constraints
8. Assembly operations - part modifications, adding another assembly features – display.

List of Exercises: CAM

1. Understanding of CNC Machines and CNC Programming and Creation of
2. 2-D contour Pockets, Slots 2. Drills and Facing, 2-D high Speed blend
3. Surface Roughing for Bottle die
4. Surface finishing for Phone die
5. Manufacturing of Crane Hook
6. Manufacturing of Connecting Rod
7. Manufacturing of Turbine Blade
8. 3-D Machining using ball nose cutters
ME2032

COMPUTATION LABORATORY

Instruction  3 periods/week  CIE  50 Marks
CREDITS  2

List of Experiments:

1. Introduction to Finite Element Analysis Software.
2. Static analysis of a corner bracket.
3. Statically indeterminate reaction force analysis.
4. Determination of Beam stresses and Deflection.
5. Bending analysis of a Tee-shaped beam.
6. Analysis of cylindrical shell under pressure.
8. Stress analysis in a long cylinder.
9. Solidification of a casting.
10. Transient Heat transfer in an infinite slab.
11. Transient Thermal stress in a cylinder.
12. Vibration analysis of a Simply supported beam.
13. Natural frequency of a motor generator.
14. Thermal – structural contact of two bodies.
15. Drop test of a container (Explicit Dynamics).