DEPARTMENT OF
MECHANICAL ENGINEERING

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

Specialization:
CAD/CAM

Full time / Part time

(2012-13)

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

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Subject</th>
<th>Periods per week</th>
<th>Duration (Hrs)</th>
<th>Max. Marks</th>
<th>Univ. Exam</th>
<th>Sessional</th>
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| Semester - II |                |                  |                |            |            |           |
| 1.             | Core            | 3 --             | 3              | 80         | 20         |           |
| 2.             | Core            | 3 --             | 3              | 80         | 20         |           |
| 3.             | Core / Elective | 3 --             | 3              | 80         | 20         |           |
| 4.             | Core / Elective | 3 --             | 3              | 80         | 20         |           |
| 5.             | Core / Elective | 3 --             | 3              | 80         | 20         |           |
| 6.             | Elective        | 3 --             | 3              | 80         | 20         |           |
| 7.             | Laboratory - II | -- 3             | --             | --         | 50         |           |
| 8.             | Seminar - II    | -- 3             | --             | --         | 50         |           |
| **Total**      |                | **18 6**         | **480**        | **220**    |            |           |

| Semester - III |                |                  |                |            |            |           |
| 1.             | Project Seminar*| -- 6             | --             | --         | 100**      |           |

| Semester - IV |                |                  |                |            |            |           |
| 1.            | Dissertation    | -- --             | --             | Viva - Voce (Grade ***)| -- |           |

Note: Six core subjects, Six elective subjects, Two Laboratory Courses and Two Seminars should normally be completed by the end of semester II.

* Project seminar presentation on the topic of Dissertation only  
** 50 marks awarded by the project guide and 50 marks by the internal committee.  
*** Excellent/Very Good/Good/Satisfactory/Unsatisfactory
### Scheme of Instruction & Examination

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

<table>
<thead>
<tr>
<th>Sl. No</th>
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With effect from the academic year 2012-2013

Scheme of Instruction & Examination of Post Graduate course in Mechanical Engineering with specialization in CAD/CAM.

Course duration: 4 Semesters (Full – time), 6 semesters (Part – Time)

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<tr>
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<td>Automation</td>
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<td>Finite Element Techniques</td>
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<td>3.</td>
<td>ME 510</td>
<td>Computer Aided Modeling and Design</td>
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<td>ME 505</td>
<td>Computer Integrated Manufacturing</td>
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<td>ME 556</td>
<td>Failure Analysis and Design</td>
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<td>ME 532</td>
<td>Computer Aided Mechanical Design and Analysis</td>
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**CORE SUBJECTS**

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<td>7.</td>
<td>ME 529</td>
<td>Control of Dynamic System</td>
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<td>ME 507</td>
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<td>Programming Methodology and Data Structures</td>
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<td>Optimization Techniques</td>
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<td>ME 534</td>
<td>Vibrations Analysis and Condition Monitoring</td>
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<td>Engineering Research Methodology</td>
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<td>ME 512</td>
<td>Neural Networks and Fuzzy Logic</td>
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<td>Artificial Intelligence and Expert Systems</td>
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<td>Mechanics of Composite Materials</td>
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<td>16.</td>
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<td>Theory of Elasticity and Plasticity</td>
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<td>17.</td>
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<td>Experimental Techniques and Data Analysis</td>
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<td>ME 557</td>
<td>Design for Manufacture</td>
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<td>19.</td>
<td>ME 558</td>
<td>Data Base Management Systems</td>
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<td>ME 559</td>
<td>Fracture Mechanics</td>
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<td>21.</td>
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<td>Design of Press Tools</td>
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<td>22.</td>
<td>ME 561</td>
<td>Design of Dies</td>
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<td>23.</td>
<td>ME 562</td>
<td>Computational Fluid Dynamics</td>
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<td>ME 520</td>
<td>Rapid Prototyping Principles and Applications</td>
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<td>ME 522</td>
<td>Flexible Manufacturing Systems</td>
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<td>Non-Traditional Machining &amp; Forming</td>
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<td>Product Design and Process Planning</td>
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**ELECTIVES**

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<td>CAD/CAM Lab (Lab –I)</td>
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<td>Computation Lab (Lab –II)</td>
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**DEPARTMENTAL REQUIREMENTS**

*Excellent/Very Good/Good/Satisfactory/Unsatisfactory*
With effect from the academic year 2012-2013

ME 501 AUTOMATION

Instructions
Duration of university Examination
University Examination
Sessional

3 periods/week
3 hours
80 Marks
20 Marks

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

Suggested Reading:

ME 508

FINITE ELEMENT TECHNIQUES

Instruction 3 Periods /Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

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 to axisymmetric loading with triangular elements.
Convergence requirements and geometric isotropy.

UNIT -IV
Steady state heat transfer analysis: One dimensional analysis of a fin and two dimensional conduction analysis of thin plate.
Time dependent field problems: Application to one dimensional heat flow in a rod.
Analysis of a uniform shaft subjected to torsion using Finite Element Analysis.

UNIT -V
Finite element formulation of three dimensional problems in stress analysis.
Finite Element formulation of an incompressible fluid. Potential flow problems
Bending of elastic plates. Introduction to non-linear problems and Finite Element analysis software.

Suggested Reading:

ME 510
COMPUTER AIDED MODELLING & DESIGN

Instruction: 3 Periods /Week
Duration of University Examination: 3 Hrs
University Examination: 80 Marks
Sessional: 20 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, concatenation. Graphics standards: GKS IGES, PDES.

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

UNIT-III
Surface Modeling: Surface entities, Surface Representation.
Analytic Surface – Plane Surface, Ruled Surface, Surface of Revolution, Tabulated Cylinder.
Synthetic Surface-Cubic, Bezier, B-spline, Coons.

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
Capabilities of Modeling & Analysis Packages such as solid works, Unigraphics, Ansys, Hypermesh. Computer Aided Design of mechanical parts and Interference Detection by Motion analysis.

Suggested Reading:
With effect from the academic year 2012-2013

ME 505

COMPUTER INTEGRATED MANUFACTURING

Instruction 3 periods/week
Duration of university Examination 3 hours
University Examination 80 Marks
Sessional 20 Marks

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

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
ME 556

FAILURE ANALYSIS AND DESIGN

Instruction 3 periods/week
Duration of university Examination 3 hours
University Examination 80 Marks
Sessional 20 Marks

UNIT - I
DESIGN FUNDAMENTALS

UNIT- II
DESIGN METHODS

UNIT - III
BUCKLING AND FRACTURE ANALYSIS 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
FRACTURE AND FATIGUE CRACK PROPOGATION
Failure analysis and determination of stress patterns from plastic Flow observations – Dynamic loading– Fracture types in tension—Fatigue crack growth— Fatigue life prediction- Cumulative fatigue damage- Stress theory of failure vessels-Thermal stress fatigue.

UNIT – V
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

Suggested Reading:
With effect from the academic year 2012-2013

ME 532

COMPUTER AIDED MECHANICAL DESIGN AND ANALYSIS

Instruction 3 Periods /Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

UNIT-I
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.

UNIT-II
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-III

UNIT-IV
Eigen Value Problems: Properties of Eigen values and Eigen Vectors, Torsional, Longitudinal vibration, lateral vibration, Sturm sequence. Subspace iteration and Lanczo’s method, Component mode synthesis, Eigen value problems applied to stepped beams and bars.

UNIT-V

(Note: The related algorithms and codes to be practiced by students)

Suggested Reading:

CONTROL OF DYNAMIC SYSTEMS

Instruction 3 Periods/week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

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
Non-Linear Systems

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.
ME 507

ROBOTIC ENGINEERING

Instruction 3 Periods/week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

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, sensor based motion planning: The Bug Algorithm, The Tangent Bug Algorithm, The Incremental Voronoi Graph.

UNIT-IV
Static force analysis of RP type and RR type planar robots, Dynamic analysis using Lagrangean and Newton-Euler formulations of RR and RP type planar robots, Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, force feedback, 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:

ME 509

PROGRAMMING METHODOLOGY AND DATA STRUCTURES

Instruction 3 periods / week
Duration of University Examination 3 hrs
University Examination 80 Marks
Sessional 20 Marks

UNIT- I
Programming Methodology: Introduction, Algorithm, Data Flow Diagrams, Decision Tree, Decision Table and Life Cycles of Project Development.

UNIT- II
Programming in ‘C’: Data types & Memory size, Expressions, Statements, Operators, Control flows, Arrays, Pointers, Structures, Functions, Dynamic Memory Allocation and Simple programs in Mechanical Engineering.

UNIT - III
Sorting and Searching Techniques: Selection sort, Quick sort, Radix sort, Heap sort. Linear search, Binary search trees and Applications in Mechanical Engineering.

UNIT - IV
Data Structures: Classification of Data Structures, Definitions of Linked Lists, Double Linked Lists, Stacks and Queues. Operations and Implementations of Stack, Queues and Linked List. General and Mechanical Engineering Applications

UNIT - V
Advanced Data Structures: Tree, Basic Terminology, Binary Trees, Operations on Binary tree, Tree traversals, Graph, Graph representation Adjacency matrix, Adjacency Lists and Applications.

Suggested Reading

ME 511

OPTIMISATION TECHNIQUES

Instruction 3 Periods/week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

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
Decision Theory: Introduction, Decision, Decision Making & Decision Theory, Types of Decisions, decision making process, Types of Decision making Environment:
Decision making under certainty – Expected Monetary Value (EMV), Expected Opportunity Loss (EOL) Criterion & Expected Value of Perfect Information (EVPI) Criterion
Decision making under risk- Criterion of Pessimism or Manimax, Criterion of Optimism or Maximin, Minimax Regret Criterion, Criterion of Realism & Criterion of Rationality
Decision making under uncertainty and Decision tree analysis: Introduction, Procedure of Constructing Decision Trees & Solution through Decision Tree Analysis.

UNIT – III

UNIT – IV

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:
ME 534

VIBRATION ANALYSIS AND CONDITION MONITORING

Instruction: 3 Periods /Week
Duration of University Examination: 3 Hrs
University Examination: 80 Marks
Sessional: 20 Marks

UNIT-I
Causes and effects of vibration. Vibrations of Single Degree, Two Degree and Multi Degree of freedom systems. Steady state and transient characteristics of vibration.

UNIT-II
Introduction to Condition Monitoring. Failure types, investigation and occurrences. Causes of failure, Characteristics of vibration – SHM, Periodic motion, Displacement, Velocity and acceleration. Peak to peak & RMS, linear and logarithmic scales and phase angle.

UNIT-III

UNIT-IV
Condition Monitoring through vibration analysis. Frequency analysis, Filters, Vibration signature of active systems, vibration limits and standards. Contaminant analysis, SOAP and other contaminant monitoring techniques.

UNIT-V
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 Reading:

4. Pox and Zenkins, Time Series Analysis.
With effect from the academic year 2012-2013

ME/Ph.D 521

ENGINEERING RESEARCH METHODOLOGY

Instruction 3 Periods/week
Duration of University Examination 3 Hrs.
University Examination 80 Marks
Sessional 20 Marks

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
Literature Survey: Importance of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet.

UNIT-III

UNIT-IV
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
4. Vijay Upagade and Aravind Shende, Research Methodology, S. Chand & Company Ltd., New Delhi, 2009
NEURAL NETWORKS AND FUZZY LOGIC

Instruction 3 Periods / Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

UNIT-I
Concepts of fuzzy sets: Introduction – Crisps sets, notation of fuzzy sets, basic concepts of fuzzy sets, operation, fuzzy compliment, union, intersection, Binary relation, Equivalence and similarity relations, belief and plausibility measures, probability measures, computability, relations, ordering morphisms, possibility and necessary measures.

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
Characteristics of artificial Neural Networks: Single Neural Networks, Multi Layer Neural Networks, Training of ANN – objective, supervise training, unsupervised training, overview of training.

Suggested Reading:
ME 513

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Instruction 3 Periods /Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

UNIT-I
Artificial Intelligence: Definition, Study of AI techniques, problems and Problems space, AI characteristics, Heuristics.

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:

ME 514

MECHANICS OF COMPOSITE MATERIALS

Instruction 3 Periods /Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 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
Analysis of plates and stress:
Plate equilibrium equations, Bending of composite plates, Levy and Navier solution for plates of composite materials. Analysis of composite cylindrical shells under axially symmetric loads.

Suggested Reading:
With effect from the academic year 2012-2013

ME 516

THEORY OF ELASTICITY AND PLASTICITY

Instruction: 3 Periods/week
Duration of University Examination: 3 Hrs.
University Examination: 80 Marks
Sessional: 20 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 Reading:
1. Timoshenko and Goodieer, Theory of Elasticity, Mcgraw Hill Publications 3rd Edition,
2. Madleson, Theory of Plasticity,
ME 517

EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS

Instruction 3 Periods /Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

UNIT-I

UNIT-II
Temperature Measurement: Circuits and instrumentation for different transducers viz, bimetallic, expanding fluid, electrical resistance, thermister, thermocouples, pyrometers.

UNIT-III
Metallurgical Studies: Optical and electron microscopy, X-Ray diffraction, Bragg’s Law and its application for studying crystal structure and residual stresses. Electron spectroscopy, electron microprobe.
Surface Measurements: Micro hardness, roughness, accuracy of dimensions and forms. 3-D co-ordinate measuring machines.

UNIT-IV
Experiment design & data analysis: Statistical methods, Randomised 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.
ME 557

DESIGN FOR MANUFACTURE

Instruction 3 periods/week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessional 20 Marks

UNIT-I
Introduction: General design principles for manufacturability, strength and mechanical factors, mechanisms selection, evaluation method, geometrical tolerances, tolerance control and utilization.

Economic Use of Raw Materials: Ferrous steel, hot rolled steel, cold finished steel, stainless steel, non ferrous materials aluminium, copper, brass, non metallic materials, plastics, rubber and composites.

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
Assembled Parts Design: Retension, bolted connection, screwed connections, flanged connections, centred connections, press fitted connections, surface finishing, plated parts, heat treated parts, NC machining, group technology, low cost automation, computer aided manufacture, product design requirements.

Case Studies: Identification of economical design and redesign for manufacture.

Suggested Reading:
With effect from the academic year 2012-2013

ME 558

DATA BASE MANAGEMENT SYSTEMS

Instruction 3 Periods /Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 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:
ME 559

FRACUTURE MECHANICS

Instruction 3 periods/ week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessional 20 Marks

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Fatigue Crack Growth: Fatigue crack growth test, stress intensity factor, factors affecting stress intensity factor – Variable amplitude service loading, retardation model.

UNIT-V


Suggested Reading:
UNIT-I

UNIT-II

UNIT-III

UNIT-IV

UNIT-V

Suggested Reading:

ME 561

DESIGN OF DIES

Instruction: 3 Periods /Week
Duration of University Examination: 3 Hrs
University Examination: 80 Marks
Sessional: 20 Marks

UNIT-I
Design principles for dies of thermo-plastic and thermo-setting components. Impression core cavities, strength of cavities, guide pillars and bushes, ejection systems, cooling methods, bolster types. Split moulds, methods of actuating the splits, moulds of threaded components, internal & external under cuts, moulds with under – feed systems. Design principles and standards for Transfer and compression moulding dies.

Design of Tools: Mould for a spindle component with sleeve, pin ejection. Mould with splits Multi-cavity mould with stripper plate, inserts, ejectors.

UNIT-II
Design of Dies for metal mould Castings, Die casting, Shell moulding.

Design of casting cavity, sprue, slug, fixed and movable cores, finger cam, core, pin, draft, ejector pins, ejector plate, gate, goose-neck, nozzle, over-flow, platen plunger, runner, slot, slide, vent, water line.

Design of hot chamber, cold chamber machines, vertical, horizontal., die locking machines, toggle and hydraulic systems, injection systems, rack and pinion, knockout pins and plates, hydraulic ejection, Other parts of die casting machines.

UNIT-III

UNIT-IV

UNIT-V

Suggested Reading:

3. I.S. Standards, BSI., New Delhi.
ME 542

**COMPUTATIONAL FLUID DYNAMICS**

**Instruction** 3 periods/week
**Duration of University Exam** 3 Hours
**University Exam** 80 Marks
**Sessional** 20 Marks

**UNIT-I**

**UNIT-II**
Classification of PDEs – Elliptic, parabolic and hyperbolic equations. Initial and boundary value problems.


**UNIT-III**

**UNIT-IV**

**UNIT- V**

**Suggested Reading:**
RAPID PROTOTYPING PRINCIPLES AND APPLICATIONS

Instruction 3 Periods/Week
Duration of University Examination 3 hours
University Examination 80 Marks
Sessional 20 Mraks

UNIT – I

UNIT – II


UNIT – III


UNIT – IV

Rapid Prototyping Software’s: Features of various RP software’s like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

UNIT – V

Suggested Reading:
ME 522

FLEXIBLE MANUFACTURING SYSTEMS

Instruction 3 periods/ week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessional 20 Marks

UNIT-I
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 supervisors role, personnel selection, job classifications, employee training.

UNIT-II
Group Technology: Concepts, classification and coding, benefits and relationship to FMS, design of group technology using rank order clustering technique.

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, workholding 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 the Academic Year 2012 – 2013

ME 568

NON-TRADITIONAL MACHINING AND FORMING

Instruction 3 periods/ week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessional 20 Marks

UNIT-I
Mechanical Process: Ultrasonic Machining-Definition-Mechanism of metal elements of the process- Tool feed mechanism. Theories of mechanics of causing effect of parameter applications.
Abrasive Jet Machining: Principles - parameters of the process, applications, advantages and disadvantages.
Water Jet Machining (WJM): Schematic diagram, equipment used, advantages and applications.

UNIT-II

UNIT-III
Plasma Arc Machining: Introduction-Plasma-Generation of Plasma and equipment Mechanism of metals removal, PAN parameters-process characteristics - type of torches applications.

UNIT-IV
Laser Beam Machining (LBM): Introduction-principle of generation of lasers Equipment and Machining procedure-Types of Lasers-Process characteristics-advantages and limitations-applications
Ion Beam Machining: Introduction-Mechanism of metal removal and associated equipment-process characteristics applications

UNIT-V

REFERENCE BOOKS:
1. New Technology Institution of Engineers - Bhattacharya - India
7. Modern Manufacturing Method - Adithan - New Age International (p) Limited –
PRODUCT DESIGN AND PROCESS PLANNING

Instruction 3 Periods /Week
Duration of University Examination 3 Hrs
University Examination 80 Marks
Sessional 20 Marks

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:
With effect from the academic year 2012-2013

ME 562

CAD/CAM LABORATORY

Instruction 3 periods/week
Sessional 50 Marks

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.

CAM
1. Understanding of CNC Machines and CNC Programming and Creation of 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
With effect from the academic year 2012-2013

ME 524

COMPUTATION LABORATORY

Instruction 3 periods/week
Sessional 50 Marks

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).