ACADEMIC REGULATIONS
COURSE STRUCTURE AND
DETAILED SYLLABUS

MECHANICAL ENGINEERING

For

M. Tech. (Advanced Manufacturing Systems)
(Two Year Full Time Programme)

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(Autonomous)
Kukatpally, Hyderabad – 500 085, Telangana, India.

2015
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**II SEMESTER**

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**IV – SEMESTER**

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JNTUH COLLEGE OF ENGINEERING HYDERABAD
M.Tech. (Advanced Manufacturing Systems) – Full Time w.e.f. 2015-16

Elective -1
1. Advanced Metal Forming
2. Vibration Analysis and Condition Monitoring
3. Design And Manufacturing Of MEMS

Elective -2
1. Theory Of Metal Cutting And Tool Design
2. Precision Engineering
3. Mechatronics

Elective -3
1. Advanced Casting and Welding Technology
2. Materials Technology
3. Industrial Robotics

Elective -4
1. Design For Manufacturing And Assembly
2. Additive Manufacturing
3. Production And Operations Management

Elective-5
1. Finite Element Methods
2. Quality Engineering in Manufacturing
3. Manufacturing Systems, Simulation Modeling & Analysis

Elective-6
1. Product Design and Development
2. Value Engineering and Total Quality Management
3. Flexible Manufacturing Systems

Elective-7
1. Quality & Reliability Engineering
2. Concurrent Engineering
3. Research Methodology

Elective-8
1. Nano Technology
2. Neural Networks and Fuzzy Logics
3. Scaling Laws and Micro Manufacturing
Prerequisites: Unconventional sources of machining

Objectives:
- To analyze and determine material fabrication processes.
- To use laboratory instrument doing routine metrological measurements.
- To operate regular machine shop equipment such as grinders, drill presses, lathes, milling machines, shapers and etc.
- To recognize engine machine tool requirements and be selective in the choice of tools.
- To setup and operate machines, index and determine machine speeds, feeds, and depth of cut requirements.
- To identify with numerical control machining and computer programming.
- To determine costs and establish basic programs in machine shop economics.

Course Outcomes:
- At the end of the course, the student will be able to understand the working principle of Electron beam, laser beam and laser hybrid welding processes.
- Able to understand different types of composite material characteristics, types of micro & macro machining processes.
- Understand the e-manufacturing & nano materials.

UNIT - I:
Surface treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapour deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT - II:

UNIT - III:

UNIT - IV:
Processing of ceramics: Applications, characteristics, classification. Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Area of application, finishing of ceramics.
Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

UNIT - V:
Fabrication of Microelectronic devices: Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in microelectronics, surface mount technology, Integrated circuit economics.
E-Manufacturing, nanotechnology, and micromachining, High speed Machining

TEXT BOOKS:
Prerequisites: Operations Research

Objectives: After doing this subject student should know
- the various optimization techniques for single variable optimization problem
- Direct search methods and Gradient methods for multi variable un constraint Optimization problems
- Formulate a Geometric Programming model and solve it by using Arithmetic Geometric in equality theorem
- Simulate the system
- Thorough of state of art optimization techniques like Genetic Algorithms, simulated Annealing

Outcomes: For a given system, as per customer requirement it is required to
- Formulate optimization problem.
- Solve the problem by using a appropriate optimization techniques.

UNIT- I:

UNIT- II:

UNIT- III:
Simulation – Introduction – Types- steps – applications: inventory & queuing – Advantages and disadvantages

UNIT- IV:
Integer Programming- Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method

UNIT- V:
Geometric Programming: Posynomials – Arithmetic - Geometric inequality – unconstrained G.P- constrained G.P(≤ type only)

TEXT BOOKS:
2. Optimization for Engineering Design, Kalyanmoy Deb, PHI

REFERENCE BOOKS:
1) S.D.Sharma / Operations Research
2) Operation Research / H.A.Taha /TMH
3) Optimization in operations research / R.L.Rardin
4) Optimization Techniques /Benugundu&Chandraputla / Pearson Asia.
5) Optimization Techniques theory and practice / M.C.Joshi, K.M.Moudgalya/ Narosa Publications
ADVANCED METAL FORMING
(Elective-1)

Prerequisites: Production Technology, Modern Manufacturing Processes, Manufacturing Technology.

Objectives:
- To study the basic concepts of metal forming techniques and to develop force calculation in metal forming process.
- To study the thermo mechanical regimes and its requirements of metal forming

Outcomes:
- Understand the fundamental theories of the finite element method and the finite difference method.
- Create well-founded and realistic process models within metal forming and casting.
- Master material models and other relevant in-data for virtual process modelling.

UNIT - I:
Fundamentals of Metal Forming: Classification of forming processes, mechanisms of metal forming: slab method, Upper and lower bound analysis, Deformation energy method and finite element method temperature of metal working, hot working, cold working, friction and lubricants.

UNIT - II:
Rolling of metals: Rolling processes, forces and geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations, Problems.

UNIT - III:
Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging, problems on flow stress, true strain and forging load.
Press tool design: Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive blanking dies, design of bending, forming and drawing dies.

UNIT - IV:
Extrusion: Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubes, production of seamless pipes. Problems on extrusion load.

UNIT - V:
Sheet Metal forming: Forming methods, Bending, stretch forming, spinning and Advanced techniques of Sheet Metal Forming, Forming limit criteria, defect in formed parts.
Advanced Metal forming processes: HERF, Electromagnetic forming, residual stresses, in-process heat treatment and computer applications in metal forming, problems on Blanking force, Blank diagram in Cup Diagram, Maximum considering shear.
Text Books:
2. Principles of Metal Working / Sunder Kumar

References:
1. Principles of Metal Working processes / G.W. Rowe
2. ASM Metal Forming Hand book.
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Advanced Manufacturing Systems) L T P C 4 0 0 4

VIBRATION ANALYSIS AND CONDITION MONITORING (Elective-1)

Prerequisites: Dynamics of Machinery

Objectives:
- To understand the Fundamentals of Vibration and its practical applications.
- To understand the working principle and operations of various vibration measuring instruments.
- To understand the various Vibration control strategies.

Outcomes: At the end of the course, the student will be able to
- Exemplify and summarise the causes and effects of vibration in mechanical systems and identify discrete and continuous systems.
- Model the physical systems in to schematic models and formulate the governing equations of motion
- Infer the role of damping and stiffness and inertia in machine tools
- Analyze the Rotating/reciprocating systems and able to compute the critical speeds.
- Analyze and design machine supporting structures, Vibration Isolators, Vibration Absorbers.
- Summarize the concept of mode, node and frequencies and calculate the free and forced vibration responses of multi degree of freedom systems through model Analysis.


UNIT-II FORCED VIBRATION OF SINGLE DEGREE OF FREEDOM SYSTEMS: Introduction, Response of an Undamped system under harmonic force, Total response, Beating Phenomenon. Response of a Damped System under Harmonic Force- Total Response, Quality Factor and Bandwidth, Response of a Damped system under the Harmonic Motion of the base, Fore Transmitted, Relative Motion.


UNIT-IV MULTI-DEGREE OF FREEDOM SYSTEMS: Introduction Modeling of Continuous systems as Multi-degree of Freedom systems, Using Newton's second law to derive equations of motion, Influence Coefficients. Potential and kinetic energy expressions in matrix form, Generalized coordinates and generalized forces, Using Lagrange’s equations to
derive equations of motion, Equations of motion of undamped systems in matrix form, Eigen value problem, solution of the Eigen value problems – solution of the characteristic equation, orthogonality of normal modes, repeated Eigen values.

UNIT-V DETERMINATION OF NATURAL FREQUENCIES AND MODE SHAPES:

REFERENCES:
1. Mechanical Vibrations/Groover/Nem Chand and Bros
2. Elements of Vibration Analysis by Meirovitch, TMH, 2001
5. Mechanical Vibrations/Debabrata Nag/Wiley
7. Mechanical Vibrations and sound engineering/ A.G.Ambekar/ PHI
DESIGN AND MANUFACTURING OF MEMS
(Elective-1)

Perquisites: Knowledge of MEMS

Objectives: To impart knowledge of design, fabrication and characterization of Micro Electro Mechanical systems.

Outcomes: At the end of the course, the student will be able to
- Synthesize and characterize nanomaterials for engineering applications
- Design and analyze methods and tools for micro and nano manufacturing.
- Improve the quality of MEMS by analysing the variables of the underlying micro and nano manufacturing method
- Select appropriate industrially-viable process, equipment and tools for a specific product.

UNIT - I:
Overview and working principles of MEMS and Microsystems: MEMS & Microsystems, Evolution of Micronfabrication, Microsystems & Microelectronics, Microsystems & miniaturization, Applications of MEMs in Industries, Micro sensors, Micro actuation, MEMS with Micro actuators Micro accelerometers, Micro fluidics

UNIT - II:

UNIT - III:
Engineering Mechanics for Microsystems Design: Static Bending of Thin plates, Mechanical Vibration, Thermo-mechanics, Fracture Mechanics, Thin- Film Mechanics, Overview of Finite Element Stress Analysis

UNIT - IV:

UNIT V:
Materials for MEMS & Microsystems and their fabrication: Substrates and Wafers, Active substrate materials, Silicon as a substrate material, Silicon compounds, Silicon Piezoresistors, Gallium Arsenide, Quartz, Piezoelectric Crystals and Polymers, Photolithography, Ion implantation, Diffusion and oxidation, Chemical and Physical vapor deposition, etching, Bulk micro manufacturing, Surface Micromachining, The LIGA Process.
TEXT BOOKS:
1. Tia-Ran Hsu, MEMS & Microsystems. Design & Manufacturing, TMH 2002
2. Foundation of MEMS/ Chang Liu/Pearson, 2012

REFERENCES:
THEORY OF METAL CUTTING AND TOOL DESIGN
(Elective-2)


Objectives:
- To impart the knowledge of basic methodology of metal cutting.
- To educate the student about the structure, working, forces involved in single point and multipoint cutting tools.
- To understand the concepts of tool life, machinability, wear, influence of heat.
- To design the jigs and fixtures required for machine tools.

Outcomes: Students can analyze the machining process in terms of input variables like
  - Speed, feed, depth of cut and their influence on surface roughness,
  - Metal removal rate, tool wear rate, machining time, energy, work done, heat distribution.

UNIT -I:

UNIT -II:
Single Point Cutting Tool: Various systems of specifications, single point cutting tool geometry and their inter-relation. Theories of formation of built-up edge and their effect, design of single point contact tools throwaway inserts.

UNIT -III:
Multi point Cutting Tools: Drill geometry, design of drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speed & feed – machining time – design - from cutters.
Grinding: Specifications of grinding of grinding wheel, mechanics of grinding, Effect of Grinding conditions on wheel wear and grinding ratio. Depth of cut, speed, machining time, temperature, power.

UNIT -IV:
Tool Life and Tool Wear: Theories of tool wear-adhesion, abrasive and diffusion wear mechanisms, forms of wear, Tool life criteria and machinability index. Types of sliding contact, real area of contact, laws of friction and nature of frictional force in metal cutting. Effect of Tool angle, Economics, cost analysis, mean co-efficient of friction.
Cutting Temperature: Sources of heat in metal cutting, influence of metal conditions. Temperature distribution, zones, experimental techniques, analytical approach. Use of tool-work thermocouple for determination of temperature. Temperature distribution in Metal Cutting.
UNIT -V:

TEXT BOOKS:
2. Fundamentals of Machining / Boothryd / Edward Arnold publishers Ltd. 1975

REFERENCE BOOKS:
1. Metal cutting theory and cutting tool design / V. Arshinov and G. Alekseev / Mir Publishers, Moscow
2. Fundamentals of Metal cutting and Machine tools / B.L Juneja, G. S. Sekhom and Nitin Seth / New Age International publishers
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Advanced Manufacturing Systems)                      L   T    P   C 
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PRECISION ENGINEERING                                                 
(Elective-2)

Perquisites: accuracy, tolerancing and dimensioning

Objectives:
• The student will be able to understand the striving need for precision and application.
• Motivate the students to learn about the advanced concepts of precision and ultra
  Precision Machining methods
• In addition, the student will enhance his/her knowledge in Precision Engineering and
  its applications.

Course Outcomes: At the end of the course, the student will be able to
• Apply fits and tolerances for parts and assemblies according to ISO standards.
• Apply selective assembly concept for quality and economic production.
• Assign tolerances using principles of dimensional chains for individual features of a part
  or assembly.
• Evaluate the part and machine tool accuracies.
• Analyze the causes for dimensional and geometrical errors prior to and during machining
  and suggest remedies

UNIT - I:
Concepts of Accuracy: Introduction – Concept of Accuracy of Machine Tools – Spindle and
Displacement Accuracies – Accuracy of numerical Control Systems – Errors due to
Numerical Interpolation Displacement Measurement System and Velocity Lags.

Geometric Dimensioning and Tolerancing: Tolerance Zone Conversions – Surfaces, Features, Features of Size, Datum Features – Datum Oddly Configured and Curved Surfaces as Datum Features, Equalizing Datums – Datum Feature of Representation – Form Controls, Orientation Controls – Logical Approach to Tolerancing.

UNIT - II:
Datum Systems: Design of freedom, Grouped Datum Systems – different types, two and
three mutually perpendicular grouped datum planes; Grouped datum system with spigot and
recess, pin and hole; Grouped Datum system with spigot and recess pair and tongue – slot
pair – Computation of Transnational and rotational accuracy, Geometric analysis and
application.

UNIT - III:
Tolerance Analysis: Process Capability, Mean, Variance, Skewness, Kurtosis, Process
Capability Metrics, Cp, Cpk, Cost aspects, Feature Tolerances, Geometric Tolerances.
Tolerance Charting Techniques: Operation Sequence for typical shaft type of components,
Preparation of Process drawings for different operations, Tolerance sheets and centrally
analysis, Examples. Design features to facilitate machining; Datum Features – functional
and manufacturing. Components design – Machining considerations, Redesign for
manufactured, Examples
UNIT – IV:
Surface finish, Review of relationship between attainable tolerance grades and different machining process. Cumulative effect of tolerances sure fit law, normal law and truncated normal law.

UNIT - V:
**Fundamentals of Nanotechnology**: System of nanometer accuracies – Mechanism of metal Processing – Nano physical processing of atomic bit units. Nanotechnology and Electrochemical atomic bit processing. MEASURING SYSTEMS PROCESSING :In processing or in-situ measurement of position of processing point-Post process and on-machine measurement of dimensional features and surface-mechanical and optical measuring systems.

TEXT BOOKS:

REFERENCE BOOKS:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Advanced Manufacturing Systems) MECHATRONICS (Elective-2)

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Perquisites: Actuators, sensors & Micro controllers

Objective:
To provide the student with the knowledge of sensors, transducers, various types of actuators used in mechatronics systems and also the use of PLCs and mechatronics design.

Course Outcomes: At the end of the course, the student will be able to
- Model, analyze and control engineering systems.
- Control the behaviour of a process using appropriate sensors, transducers and actuators.
- Develop PLC programs for a given task.
- Evaluate the performance of mechatronic systems.

UNIT-1:

UNIT-II:
Motion control Algorithms: Significance of feed control loops, shortfalls, fundamental concepts adaptive and fuzzy control, fuzzy logic compensatory control of transformation and deformation non – Z inearities

UNIT III:
Architecture of intelligent machines: Introduction to microprocessor and programmable logic controllers and identification of system, system design classification. Motion control aspects in design

UNIT IV:
Manufacturing Data bases: data base management systems, CAD/CAM data bases, Graphic data base, Introduction to object oriented concepts, Object oriented model languages interface, Procedure and Methods in creation, edition and manipulation of data

UNIT – V:
Machine Vision: Future and Pattern Reorganization Methods, Concepts of Precision and cognition in decision making
TEXT BOOK:
1. Introduction to Mechatronics and Measurement Systems, Tata McGraw Hill

REFERENCES:
1. Designing Intelligent Machines, Michel B. Histand and David G. Alciatore, Open University London
2. Control Sensors and Actuators, ICW. Desiha, Prentice Hall
ADVANCED CASTING AND WELDING TECHNOLOGY
(Elective-3)

Prerequisites: Production Technology, Heat transfer, FEM.

Objectives:
- To study the metallurgical concepts and applications of casting and welding process.
- To acquire knowledge in CAD of casting and automation of welding process.

Course Outcomes: At the end of the course, the student is able
- To impart the knowledge of advanced welding and casting techniques.
- To apply computer aided engineering to welding and casting.
- To analyse the advanced welding and casting processes and can relate variables with performance measures.

UNIT – I:
Laser Beam Welding: Types of lasers, equipment, power calculation, applications, dual laser beam welding, use of fibre optics in LBW.

Friction Stir Welding: Details of process and process parameters, specific applications.

Electron Beam Welding: The interaction of electron beam with matter, mode of heat generation, mode of energy losses, details of the equipment, product design for EBW, case studies.

Ultrasonic Welding: Propagation of ultrasonic waves in matter, mode of joint formation, joint types and design of product for ultrasonic welding, details of equipment and case studies, cutting and gauging, flame cutting, plasma arc welding, laser assisted cutting.

UNIT – II:

UNIT - III:
Investment casting, shell moulding, squeeze casting, vacuum casting, counter-gravity flow - pressure casting, directional and monocrystal solidification, squeeze casting, semisolid metal casting, rheocasting.

UNIT – IV:
Solidification, Gating and Risering, Nucleation and grain growth, solidification of pure metals, short and long freezing range alloys. Gating and risering design calculations, Fluidity and its measurement.

UNIT – V:
CAE Of Welding And Casting: Design of weldment, application of finite element method in welding – determination of distortion in weldments, modeling of temperature distribution - case studies. Design for casting, application of finite element method in casting -
determination of hot spots, location of turbulence and other defects, modeling of flow in molds, modeling of heat transfer in castings – case studies.

**REFERENCE BOOKS:**
M.Tech. I Year I-Sem (Advanced Manufacturing Systems)  
M.Tech. (AMS) (FT) w.e.f. 2015-16

MATERIALS TECHNOLOGY  
(Elective-3)

Perquisites: Mechanics of solids

Objectives:
- To make the students to understand on elastic, plastic and fractured behaviour of engineering materials.
- To train the students in selection of metallic and non-metallic materials for the various engineering applications.

Course Outcomes:
- Apply phase transformation phenomena to improve the performance of materials.
- Apply principles of deformation to modify structure and properties of materials.
- Characterize and evaluate materials for specific applications.
- Design metallurgical processes to produce products as per specifications.
- Evaluate products using non-destructive testing methods and modify processes.
- Identify mechanisms for protecting engineering materials from degradation.
- Synthesize ceramic, polymer, composite and non-ferrous materials.
- Design advanced materials for aerospace, biological, nuclear and high temperature applications.
- Apply project management techniques effectively to address issues related to metallurgical industries.
- Practice professional ethics and engage in lifelong learning for improved professional advancement, moral and human values.

UNIT – I:  
Elasticity in metals and polymers, mechanism of plastic deformation, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, strain and strain rate on plastic behavior, super plasticity, deformation of non-crystalline material.

UNIT – II:  
Griffith’s Theory, stress intensity factor and fracture Toughness, Toughening Mechanisms, Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson – Miller Parameter, Deformation and Fracture mechanism maps.
UNIT – III:
Fatigue, Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and Paris Law, Effect of surface and metallurgical parameters on Fatigue, Fracture of non-metallic materials, fatigue analysis, Sources of failure, procedure of failure analysis.

UNIT – IV:
Selection for Surface durability, Corrosion and Wear resistance, Relationship between Materials Selection and Processing, Case studies in Materials Selection with relevance to Aero, Auto, Marine, Machinery and Nuclear Applications. Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep

UNIT – V:
Modern Metallic Materials: Dual Phase Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Intermetallics, Ni and Ti Aluminides, Smart Materials, Shape Memory alloys, Metallic Glass, Quasi Crystal and Nano Crystalline Materials.

TEXT BOOKS:

REFERENCE BOOK:
## INDUSTRIAL ROBOTICS

**Prerequisites:** Kinematics of machinery

**Objectives:**
To teach students the basics of robotics, construction features, sensor applications, robot cell design, robot programming and application of artificial intelligence and expert systems in robotics.

**Course Outcomes:** After doing this course, the student should be able to
- Understand the evolution, classification, structures and drives for robots.
- To teach the students about the kinematic arrangement of robots and its applications in the area of manufacturing sectors
- To expose the students to build a robot for any type of application

### UNIT I


### UNIT II

**Motion Analysis and Control:** Manipulator kinematics, position representation, Basic and Composite Rotation Matrices, Equivalent Axis and Angle – Euler Angles - Homogeneous transformation, D-H Notation, D-H Transformation Matrix, Forward & Inverse transformations, problems on planar & spatial manipulators.

### UNIT III

Differential Kinematics, Jacobian Formulation, problems, manipulator path control: Slew, Joint Interpolated & Straight line motions, trajectory planning: Joint space scheme, Cartesian space scheme, Cubic Polynomial fit without and with via point, blending.

### UNIT IV

**Robot Dynamics:** Lagrange – Euler & Newton - Euler formulations, problems on two link planar manipulators.

### UNIT V

**Robot Cell Design and Control:** Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work cell design, Work cell control, Inter locks, Error detection, Work cell controller.

**Robot Applications:** Material transfer, Machine loading/unloading. Processing operations, Assembly and Inspection, Future Applications.
TEXT BOOKS:

REFERENCE BOOKS:
1. Industrial robotics / MikellP.Groover / McGraw Hill
3. Introduction to Robotics Mechanics & Control/ John J.Craig/Pearson
4. Robot Analysis/Lung Wen Tsai/John Wiley & Sons
5. Robotics & Control/RK Mittal & IJ Nagrah/ Tata Mc-GrawHill
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M.Tech. I Year I-Sem (Advanced Manufacturing Systems)                L    T    P    C
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DESIGN FOR MANUFACTURING AND ASSEMBLY
(Elective-4)

Prerequisites: Steps in design process, creativity and Machining process, metal joining and extrusion process

Objectives: At the end of this course the student should be able to apply the design for manufacturing principles in casting, welding, forming, machining and assembly, by considering various manufacturing constraints.

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

• Understand the quality aspects of design for manufacture and assembly.
• Apply Boothroyd method of DFM for product design and assembly.
• Apply the concept of DFM for casting, welding, forming and assembly.
• Identify the design factors and processes as per customer specifications.
• Apply the DFM method for a given product.

UNIT I:
Introduction: Design philosophy – Steps in Design process – General Design rules for Manufacturability – Basic principles of designing for economical production – Creativity in design.

UNIT II:
MACHINING PROCESS: 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 – Use of Solidification Simulation in casting design – Product design rules for sand casting.

UNIT III
FORGING – Design factors for Forging – Closed die forging design – Location of parting lines of dies – Drop forging die design – General design recommendations

UNIT IV:

UNIT V:
DESIGN FOR ASSEMBLY: General design guidelines for Manual Assembly- Development of Systematic DFA Methodology- Assembly Efficiency- Classification System for Manual handling- Classification System for Manual Insertion and Fastening- Effect of part symmetry on handling time- Effect of part thickness and size on handling time- Effect of weight on handling time- Effect of symmetry, Further design guidelines.

TEXT BOOKS:

REFERENCE BOOKS:
4. Product Design/ Kevin Otto and Kristin Wood/ Pearson Education
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Advanced Manufacturing Systems)ADDITIVE MANUFACTURING
(Elective-4)

Prerequisites: Prototyping, Stereo lithography Apparatus, Models & specifications, Rapid tooling.

Objectives: To educate students with fundamental and advanced knowledge in the field of Additive manufacturing technology and the associated Aerospace, Architecture, Art, Medical and industrial applications.

Course outcomes:
- 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
and Disadvantages, Case studies. Electron Beam Melting (EBM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies


**UNIT – IV**


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

**UNIT – V**


**Suggested Reading:**
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PRODUCTION AND OPERATIONS MANAGEMENT
( Elective 4)

Prerequisites: Operations Research, Production Planning and Control

Objectives:
• Understand the importance of Production operations management
• Know the aggregate planning & work study and MRP

Course Outcomes: At the end of the course, the student is able to
• Understand the importance of production and operations Management, for getting the Competitive edge
• Do value analysis for a given product and design the plant layout for the specified production system.
• Do Aggregate planning, MRP Work study, and scheduling
• able to apply the project management techniques

UNIT- I
Overview of Production & Operations Management (POM): Introduction-Definition-Importance- Historical Development of POM-POM scenario today

Product & Process design: Role of product development- Product development process-Tools for efficient product development(briefly)- Determination of process characteristics-Types of processes and operations systems- Continuous –Intermittent-Technology issues in process design- Flexible Manufacturing Systems- Automated Material Handling Systems

UNIT -II

UNIT- III
Aggregate Planning: Definition- Objectives-Basic strategies for aggregate production planning- Aggregate production planning method-Transportation model- Master Production Scheduling.

UNIT - IV
Quality Management: Economics of quality assurance-Control charts for variables and for attributes –Acceptance sampling plans-Total Quality Management-ISO 9000 series standards-Six sigma
UNIT - V


Project management: PERT- Critical path determination- Probability of completing project in a given time- CPM- Types of floats- Critical path determination- Crashing of simple networks- Optimum project schedule.

TEXT BOOKS:
3. Industrial Engineering and Management: Dr. Ravi Shankar- Galgotia.

REFERENCES:
1. Modern Production and Operations Management: Buffa, Wiley
2. Theory and Problems in Production and Operations Management: SN Chary TMH.
3. Operations Management 8e Process and Value Chains: Lee Krajewskiet. all Pearson
ADVANCED MANUFACTURING PROCESSING AND SYSTEMS LAB

Prerequisites: Advanced Manufacturing Process
Course Objectives: Understand the CNC programming
Course: Should be able to write a CNC program for given part
Note: Conduct any Ten exercises from the list given below:

1. Write a program at the machine or off line. Setup the machining operation and perform standard given on lathe operations to develop a simple part (with linear and circular interpolations).

2. The bolt on the drawing made of AlMg1 is to be made on a CNC lathe in higher batch quantity. Prepare the manufacturing process with the MTS CNC Simulator including following steps: define workpart zero, set up the processing sequence, determine tools, fixtures and technological data; generate, set up, test and correct the program at the CNC simulator. A bolt with an external diameter of Ø100 mm and the length of 93 mm is to be clamped for the test.

3. The jig plate on the drawing is to be produced on a CNC vertical milling machine from a blank of Al-alloy dimensioned 100 x 100 x 50 mm. Prepare the production on the CNC Simulator, work out the process layout and set-up form.

4. The contour plate on the drawing is to be produced on a CNC vertical milling machine from a blank of Al-alloy dimensioned 100 x 70 x 25 mm. Prepare the production on the MTS CNC Simulator, work out the process layout and set-up form.

5. Write a program to perform taper turning operations on Al-alloy workpiece of 40mm dia.
6. Write a program to perform thread cutting operations on Al-alloy workpiece of 40mm dia.
7. Write a program to perform rectangular and circular grooves on Al-alloy workpiece using CNC milling machine.
8. Robotic programming using SCARA
9. Low cost automation using pneumatic system – single cylinder exercise
10. Low cost automation using pneumatic system – double cylinder exercise
11. Metal cutting operations using EDM / ECM
12. Metal Cutting operations using AJM
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SOFT SKILLS LAB
(Activity-based)

Prerequisites: None

Course Objectives

- To improve the fluency of students in English
- To facilitate learning through interaction
- To illustrate the role of skills in real-life situations with case studies, role plays etc.
- To train students in group dynamics, body language and various other activities which boost their confidence levels and help in their overall personality development
- To encourage students develop behavioral skills and personal management skills
- To impart training for empowerment, thereby preparing students to become successful professionals

Learning Outcomes

- Developed critical acumen and creative ability besides making them industry-ready.
- Appropriate use of English language while clearly articulating ideas.
- Developing insights into Language and enrich the professional competence of the students.
- Enable students to meet challenges in job and career advancement.

INTRODUCTION

Definition and Introduction to Soft Skills – Hard Skills vs Soft Skills – Significance of Soft/Life/Self Skills – Self and SWOT Analysis and

1. Exercises on Productivity Development
   - Effective/Assertive Communication Skills (Activity based)
   - Time Management (Case Study)
   - Creativity & Critical Thinking (Case Study)
   - Decision Making and Problem Solving (Case Study)
   - Stress Management (Case Study)

2. Exercises on Personality Development Skills
   - Self-esteem (Case Study)
   - Positive Thinking (Case Study)
   - Emotional Intelligence (Case Study)
   - Team building and Leadership Skills (Case Study)
   - Conflict Management (Case Study)

3. Exercises on Presentation Skills
   - Netiquette
   - Importance of Oral Presentation – Defining Purpose- Analyzing the audience-Planning Outline and Preparing the Presentation- Individual & Group Presentation- Graphical Organizers- Tools and Multi-media Visuals
   - One Minute Presentations (Warming up)
   - PPT on Project Work- Understanding the Nuances of Delivery- Body Language – Closing and Handling Questions – Rubrics for Individual Evaluation (Practice Sessions)

4. Exercises on Professional Etiquette and Communication
   - Role-Play and Simulation- Introducing oneself and others, Greetings, Apologies, Requests, Agreement & Disagreement….etc.
• Telephone Etiquette
• Active Listening
• Group Discussions (Case study)- Group Discussion as a part of Selection Procedure- Checklist of GDs
• Analysis of Selected Interviews (Objectives of Interview)
• Mock-Interviews (Practice Sessions)
• Job Application and Preparing Resume
• Process Writing (Technical Vocabulary) – Writing a Project Report- Assignments

5. Exercises on Ethics and Values
Introduction — Types of Values - Personal, Social and Cultural Values - Importance of Values in Various Contexts
• Significance of Modern and Professional Etiquette – Etiquette (Formal and Informal Situations with Examples)
• Attitude, Good Manners and Work Culture (Live Examples)
• Social Skills - Dealing with the Challenged (Live Examples)
• Professional Responsibility – Adaptability (Live Examples)
• Corporate Expectations

Note: Hand-outs are to be prepared and given to students.
Training plan will be integrated in the syllabus.
Topics mentioned in the syllabus are activity-based.

SUGGESTED SOFTWARE:
The following software from 'train2success.com'
  o Preparing for being Interviewed
  o Positive Thinking
  o Interviewing Skills
  o Telephone Skills
  o Time Management
  o Team Building
  o Decision making

SUGGESTED READING:
12. The Hindu Speaks on Education by the Hindu Newspaper
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AUTOMATION IN MANUFACTURING

Prerequisites: Advanced Manufacturing Process

Objectives:
- Lower Cost and Improve Time-to-Market
- Automation investment life-cycle analysis
- Empowered teams of talented employees
- Partnering with automation suppliers
- On-line process analysis
- Procedural process control
- Information integration and data warehousing

Outcomes: Student will be able to
- Analyze online processes
- Understand how to lower the cost & improve the time to market
- Analyze life cycles of a product
The importance of Information integration and data warehousing

UNIT-I:

UNIT-II:

UNIT -III:

UNIT-IV:
Transfer lines, Fundamentals of Automated Production Lines, Storage Buffers, and Applications of Automated Production Lines. Analysis of Transfer Lines with no Internal Storage, Analysis of Transfer lines with Storage Buffers.
UNIT-V:

**Automated Assembly Systems**, Fundamentals of Automated Assembly Systems, Design for Automated Assembly, and Quantitative Analysis of Assembly Systems - Parts Delivery System at Work Stations, Multi-Station Assembly Machines, Single Station Assembly Machines, Partial Automation.

**TEXT BOOKS:**
1. Automation, Production systems and computer integrated manufacturing, Mikel P. Groover/ Pearson Eduction.

**REFERENCE BOOKS:**
1. CAD CAM : Principles, Practice and Manufacturing Management / Chris Mc Mohan, Jimmie Browne / Pearson edu. (LPE)
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GEOMETRIC MODELING

Prerequisites: CAD/CAM

Objectives:
- Making the student understand how graphics created in computer world is the main goal of this course.
- Using colors in different places and for different objects is also one of the goals of the course.
- Learning how to rescale, transmit (shift), shear (skew), and rotate different graphical objects is another goal.
- Animating some simple graphics is the last aim of the course.

Course Outcomes: After doing this course, the student should be able to
- Do 2D & 3D transformations
- Develop cubic splines, Bezier curves and B-spline curves
- Write equations of surfaces, quadratic surfaces and analyze mathematically

Unit – I:
Geometrical Modeling: Introduction, History, Geometrical representation, Linear Algebra Boolean Algebra, Vectors, Matrices, Equations for curves- Intrinsic and Explicit, parametric equations of curves, conic curves and points on curves, Problems

Unit – II:
Transformations: 2-D and 3D Transformations, translation, Rotation, Homogeneous space, Scaling, stretching, Mirror reflection, Composite Transformations and problems

Unit – III:
Cubic splines: Algebraic and geometric force of cubic spline, parametric space of a curve, blending functions, Problems
Bezier curves: Berestein’s polynomials, equations, control points, convex hull property, truncating and subdividing composite and Rational Bezier curves, Problems
B-Spline curves: Uniform and non-uniform B-Spline basis functions, quadratic and cubic B-spline basis functions, NURBS, Problems

Unit – IV:
Surfaces: Explicit and Implicit equations of surfaces, quadratic surfaces, parametric equation of surfaces, Curve Nets and Embedded Curves, Generation, Mathematical Analysis, Applications of Bezier and B-Spline Surfaces, Surface patches. Problems

Unit – V:
Solids: Parametric and Tricubic solids, sweep solids, Topology of models, graph and boolean based models. Constructive solid Geometry (CSG), B-rep models. Problems

Text Books:
2. CAD/CAM concepts and Applications, Alavala, PHI
References:
1. Curves and surfaces for CAGD, Fifth Edition by Gerald Farin, Elsevier, India
2. Computer Graphics, Alavala, PHI, New Delhi
3. CAD/CAM by Ibrahim Zeid, Tata McGraw Hill.
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M.Tech. I Year II-Sem (Advanced Manufacturing Systems)                            L   T    P   C
FINITE ELEMENT METHODS                                                          4    0    0   4
( Elective – 5)

Perquisites: None

Objectives:
• To equip students with fundamentals of finite element principles.
• To enable them to understand the behavior of various finite elements and to be able to select appropriate elements.
• To solve physical and engineering problems with emphasis on structural and thermal engineering applications.

Course Outcomes: At the end of the course, the student will be able to
• Understand the Finite Element Formulation procedure for structural Problems.
• Understand the representation and assembly considerations for Beam and Frame elements.
• Analyze Plane stress, Plane strain, axi-symmetric Problems.
• Formulate and solve simple heat transfer and fluid mechanics problems
• Identify significant applications of FEM in Manufacturing.

UNIT - I
Introduction to FEM: basic concepts, application of FEM, general description, advantages of FEM, comparison of FEM with other methods : finite difference method, variational method, Galerkin Method, basic element shapes, interpolation function. Virtual energy principle, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, basic equations of elasticity, strain displacement relations.

UNIT - II

UNIT - III
2-D problems – CST, force terms, stiffness matrix and load vector, boundary conditions, Iso-parametric element, Quadric element, shape functions, Numerical Integration, 3-D problems – Tetrahedran element, Jacobian matrix, stiffness matrix.

UNIT - IV
Scalar field problems – 1-D Heat conduction – 1-D fin element – 2-D heat conduction problems, torsion.

UNIT - V
Dynamic considerations, Dynamic equations, consistent mass matrix, Eigen values, Eigen vector, natural frequencies, mode shapes, modal analysis.
TEXT BOOKS
1. Finite Element Methods, Alavala, PHI

REFERENCE BOOKS:
QUALITY ENGINEERING IN MANUFACTURING
(Elective – 5)

Prerequisites: Metrology and machine tools

Objectives:
• To impart through knowledge in various latest measurement systems such as laser metrology, coordinate measuring machines and electro-optical devices.
• To train them in the area of precision and quality manufacturing.

Course Outcomes: At the end of the course students will be able to
• Apply quality systems, principles, concepts.
• Utilize appropriate math, measurement and statistical tools.
• Technology to improve processes, product quality, and to enhance productivity.

UNIT- I
LASER METROLOGY AND PRECISION INSTRUMENTS

UNIT- II
CO-ORDINATE MEASURING SYSTEM

UNIT- III
OPTO ELECTRONICS AND VISION SYSTEM

UNIT- IV
QUALITY IN MANUFACTURING AND DESIGN ENGINEERING
– cost of quality – design review - concurrent engineering – improving the effectiveness of product development.

UNIT –V
QUALITY MANAGEMENT SYSTEM AND CONTINUOUS IMPROVEMENT Need for quality management system – design of quality management system – quality management system requirements – ISO 9001 and other management system and models – basic quality engineering tools - statistical process control – techniques for process design and improvement – Taguchi methods for process improvement – six sigma.

REFERENCES:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year II-Sem (Advanced Manufacturing Systems)  
MANUFACTURING SYSTEMS, SIMULATION MODELLING AND ANALYSIS
(Elective-5)

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Prerequisites: Operations Research, Optimization Techniques and Applications and Probability Statistics.

Objectives: None

Course Outcomes: After doing this course, a student should be able to
- Identify a type of system based on type of its dynamics, ways of analyzing system
- Develop simulation model for dynamic discrete-event stochastic system and analyze for specified steady-state performance measures

UNIT - I

UNIT - II

UNIT - III

UNIT - IV
Output data analysis – Types of Simulation w.r.t output dat analysis – warmup period- Welch algorithm – Approaches for Steady – State Analysis – replication – Batch means methods – comparisons

UNIT –V
Applications of Simulation – flow shop system – job shop system – M/M/1 queues with infinite and finite capacities – Simple fixed period inventory system – Newboy paper problem.

TEXT BOOKS:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year II-Sem (Advanced Manufacturing Systems) PRODUCT DESIGN AND DEVELOPMENT (Elective-6)

Prerequisites: Production Technology

Course Objectives:
- Understand the customer requirements
- Understand the concept of generation and selection by various methods.
- Understand the Product architecture & Industrial design

Course Outcomes:
- After doing this course, the student should be able to understand the need of Industrial Product & Development, customer needs & Design aspects of new products.
- Able to involve customer into the development of new products and managing requirements.
- Able to understand the design of experiments and technical analysis.
- Know product architecture.
- Investigate the customer requirement and survey of problems.
- Design for manufacture and do prototyping.

UNIT- I
Introduction: Need for IPPD – strategic importance of product development – integration of customer, designer, material supplier and process planner, Competitor and costumer – behavior analysis

UNIT- II

UNIT- III
Industrial design: Assessing the need for industrial design, impact – design process
Integrate design process – assessing the quality of industrial design.
ROBUST DESIGN-introduction, various steps in robust design.

UNIT- IV
UNIT –V

**Design for manufacturing:** Definition – Estimation of Manufacturing cost – reducing the component costs and assembly costs – cost of supporting production. Minimizing System complexity.

**Prototyping:** Prototype basics – Principles of prototyping – planning for prototypes – Economic analysis. Understanding and representing tasks – baseline project planning – accelerating the project execution.

**TEXT BOOKS**

**REFERENCE BOOKS:**
JNTUH COLLEGE OF ENGINEERING HYDERABAD

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VALUE ENGINEERING AND TOTAL QUALITY MANAGEMENT  
(Elective-6)

Perquisites: None

Objectives:
• TQM utilizes four main elements.
• Quality defined by customer.
• Top leadership responsibility for quality improvement.
• Increased quality through systematic analysis of work processes.

Course Outcomes:
At the end of the course student should be able
• To carry out value analysis for a given product so as to improve value of the product.
• To implement TQM concept in the given organization.

Unit- I
Introduction to Value Management Definition of value management History of values analysis Value Analysis verses Value Engineering Today’s Opportunities Project selection Assembling the team

Unit - II
Information gathering Design documents - drawings, specifications, etc. Material / component cost Cost Models Annual Purchase Values and Quantities Commodity data Sample components Reject rates Warranty data Commercial consideration Supplier Suggestions/Supplier Walk-through

Unit- III
Analysis of function-cost relationship Define functions Analysis of Cost of Functions Select target function(s) • Idea generation Creativity Brainstorming Process Idea starters Idea forms • Evaluation of Ideas Eliminate the Noise Estimate of Savings Cost to Implement Time to Implement Ranking of Ideas – A, B, C, D Evaluation Tools Selecting the Best Ideas • Development of Implementation Plans • Reporting • Management of Implementation plans

UNIT- IV
Introduction to Quality Management

STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY
UNIT- V
TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT
Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools.Seven new management tools.Bench marking and POKA YOKE.
QUALITY SYSTEMS ORGANIZING AND IMPLEMENTATION

TEXT BOOKS:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year II-Sem (Advanced Manufacturing Systems)  

FLEXIBLE MANUFACTURING SYSTEMS  
(Elective- 6)

**Prerequisites:** None

**Objectives:** Learn different types of FMS. Designing and analyzing the same using simulation and different analytical techniques. Helps to learn the tool management in FMS & to handle the production management problems in planning, loading, scheduling, routing and breakdown in a typical FMS.

**Course Outcomes:** At the end of the course, the student shall be able to
- Classify and distinguish FMS and other manufacturing systems including job-shop and mass production systems.
- Explain processing stations and material handling system used in FMS environments.
- Design and analyze FMS using simulation and analytical techniques.
- Understand tool management in FMS.
- Analyze the production management problems in planning, loading, scheduling, routing and breakdown in a typical FMS.

**Unit-I**
Understanding of FMS: Evolution of Manufacturing Systems, Definition, objective and Need, Components, Merits, Demerits and Applications Flexibility in Pull and Push type

**Unit- II**
Classification of FMS Layout: Layouts and their Salient features, Single line, dual line, loop, ladder, robot centre type etc.

**Unit- III**
Processing stations: Salient features Machining Centers, Turning centre, Coordinate measuring machine (CMM), Washing/ Deburring station

**Unit- IV**
Material Handling System: An introduction, Conveyor, Robots, Automated Guided Vehicle (AGV), Automated Storage Retrieval System (ASRS) Management technology: Tool Management, tool magazine, Tool preset, identification, Tool monitoring and fault detection, routing, Production Planning and Control, Scheduling and loading of FMS

**Unit- V**
Design of FMS: Performance Evaluation of FMS, Analytical model and Simulation model of FMS Case studies: Typical FMS problems from research papers

**Text books:**

**References**
JNTUH COLLEGE OF ENGINEERING HYDERABAD

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QUALITY & RELIABILITY ENGINEERING
(Elective 7)

Prerequisites: Probability & Statistics

Objectives:
- To make the students to understand the various quality control techniques and to construct the various quality control charts for variables and attributes and also the design concepts for reliable system and maintenance aspects in industries.
- Quality and reliability engineering.
- Key outcomes of strategic thinking and strategic planning are focused vision, meaningful missions, prioritized goals, aligned objectives, rational metrics.

Outcomes: At the end of the course student able to
Draw the X-bar or R-chart, P-chart & C-charts
Assess the reliability of the systems

UNIT- I

UNIT- II

UNIT- III

UNIT- IV
CONCEPT OF RELIABILITY Definition – reliability vs quality, reliability function – MTBF, MTTR, availability, bathtub curve – time dependent failure models – distributions – normal, weibull, lognormal – Reliability of system and models – serial, parallel and combined configuration – Markove analysis, load sharing systems, standby systems, covariant models, static models, dynamic models.

UNIT- V
DESIGN FOR RELIABILITY AND MAINTAINABILITY Reliability design process, system effectiveness, economic analysis and life cycle cost, reliability allocation, design methods, parts and material selection, derating, stress-strength and analysis, failure analysis, identification determination of causes, assessments of effects, computation of criticality.
index, corrective action, system safety – analysis of down-time – the repair time distribution, stochastic point processes system repair time, reliability under preventive maintenance state dependent system with repair. MTTR – mean system down time, repair vs replacement, replacement models, proactive, preventive, predictive maintenance maintainability and availability, optimization techniques for system reliability with redundancy heuristic methods applied to optimal system reliability.

REFERENCES:
CONCURRENT ENGINEERING
(Elective-7)

Prerequisites: Production & Operation Management

Objective: To provide a systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support.

Course Outcomes:
- Understand the need of concurrent engineering and strategic approaches for product design.
- Apply concurrent design principles to product design.
- Design assembly workstation using concepts of simultaneous engineering.
- Design automated fabricated systems – Case studies.

UNIT - I:
Introduction: Extensive definition of CE - CE design methodologies - Organizing for CE - CE tool box collaborative product development

Use Of Information Technology: IT support - Solid modeling - Product data management - Collaborative product commerce - Artificial Intelligence - Expert systems - Software hardware co-design.

UNIT - II:
Design Stage: Life-cycle design of products - opportunity for manufacturing enterprises - modality of Concurrent Engineering Design. Automated analysis idealization control - Concurrent engineering in optimal structural design - Real time constraints.

UNIT - III:
Manufacturing Concepts and Analysis: Manufacturing competitiveness - Checking the design process - conceptual design mechanism – Qualitative, physical approach - An intelligent design for manufacturing system.

UNIT - IV:

Project Management: Life Cycle semi realization - design for economics - evaluation of design for manufacturing cost.

UNIT - V:
Concurrent mechanical design - decomposition in concurrent design - negotiation in concurrent engineering design studies - product realization taxonomy - plan for Project Management on new product development – bottleneck technology development.

TEXT BOOK:

REFERENCES:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

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RESEARCH METHODOLOGY  
(Elective-7)

Prerequisites: None

Objectives:
- To introduce various types of Research Design
- To introduce various sampling techniques, statistical analysis and interpreting of the results.

Course Outcomes: Following successful completion of the course, students should be able to demonstrate
- familiarity with scientific methodology in general the ability to reflect on methodological problems in general and in relation.
- To the multi-disciplinary aspects of science as well as their own research the ability to critically analyze and assess research methods used in published research results the ability
- To identify their own requirements for further knowledge development in relation to methodological problems

UNIT- I:
INTRODUCTION

UNIT- II:
RESEARCH DESIGN 8

UNIT- III:
SAMPLING DESIGN 8

UNIT- IV:
PROCESSING AND ANALYSIS OF DATA 9
UNIT- V:
INTERPRETATION, REPORT WRITING 10

REFERENCES:
Prerequisites: None

Objectives:
- To expose the students to the evolution of Nano systems, to the various fabrication techniques.
- Also to impart knowledge to the students about nano materials and various nano measurements techniques.

Course outcomes:
- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multidisciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context.
- A recognition of the need for, and an ability to engage in life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

UNIT- I:
OVER VIEW OF NANOTECHNOLOGY 6 Definition – historical development – properties, design and fabrication Nanosystems, working principle, applications and advantages of nano system. Nanomaterials – ordered oxides – Nano arrays – potential health effects

UNIT –II:

UNIT- III:
UNIT- IV:

UNIT–V:

REFERENCES:
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NEURAL NETWORKS AND FUZZY LOGICS  
(Selective-8)

Perquisites: None

Objectives:
- Understand the concepts of artificial neural Networks
- Understand the topology of multi layer perception
- Understand the recurrent neural networks
- Understand the concepts of fuzzy logics

Course Outcomes: One should be able to develop neural networks and fuzzy logics to a system and analyze.

UNIT-I  
Evolution of neural networks; Artificial Neural Network: Basic model, Classification, Feed forward and Recurrent topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Fundamentals of connectionist modeling: McCulloch – Pits model, Perceptron, Adaline, Madaline.

UNIT-II  

UNIT-III  

UNIT-IV  

UNIT-V  
Basic structure and operation of Fuzzy logic control systems; Design methodology and stability analysis of fuzzy control systems; Applications of Fuzzy controllers. Applications of fuzzy theory.
Suggested Reading:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year II-Sem (Advanced Manufacturing Systems)  
SCALING LAWS AND MICRO MANUFACTURING  
(Elective-8)

Prerequisites: Unconventional machining process

Objectives:
Understanding the micro machining processes like abrasive jet micro machining, electro discharging micro machining, nano policing, Micro forming and welding etc

Course outcomes: After doing this course, the student should be able to
- Understand various micro machining processes
- Learn about nano polishing and micro forming and welding

UNIT- I

UNIT- II

UNIT-III

UNIT- IV

UNIT- V

REFERENCES:
5. Jain V.K., Advanced Machining Processes, Allied Publishers, Delhi, 2002
ADVANCED COMPUTER AIDED DESIGN AND ANALYSIS LABORATORY

Prerequisites: CAD/CAM theory

Course Objectives: Aware of CAD software for various applications

Outcomes: At the end of doing this lab student should able to draw the 2 dimensional & three dimensional objects using CAD software, Truss, Beam, Frame & Bucking analysis by using appropriate softwares.

Note: Conduct any Ten exercises from the list given below:

1. Two-dimensional drawing using CAD software.
2. Three-dimensional drawing using CAD software.
3. Various Dimensioning and tolerancing techniques on typical products using CAD software.
4. Assembly and animation of simple assemblies like screw jack, bolt-nut mechanism, etc.
5. Truss analysis using FEA software.
7. Frame analysis using FEA software.
8. Buckling analysis of columns using FEA software.
9. Harmonic analysis using FEA software.
10. Fracture analysis using FEA software.
11. Analysis of laminated composites using FEA software.
12. Couple-field analysis using FEA software.
13. Modal Analysis
14. Transient dynamic analysis.
15. Spectrum analysis.
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M.Tech. I Year II-Sem (Advanced Manufacturing Systems)  

SEMINAR

Prerequisites: None

Course Objectives:
- Reading and understand of the research papers publish in the relevant field.

Course Outcomes:
At the end of the course, the student will be able to:
- Identify and compare technical and practical issues related to the area of course specialization.
- Outline annotated bibliography of research demonstrating scholarly skills.
- Prepare a well organized report employing elements of technical writing and critical thinking
- Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.
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COMPREHENSIVE VIVA VOCE

Prerequisites: Knowledge of All the subjects of I year I sem & II semester

Objectives: Having Idea of awareness of concepts of subjects studied during the I year I Semester & II semester.

Course Outcomes:
- Comprehend the knowledge gained in the course work
- Infer principles of working of mechanical components
- Demonstrate the ability in problem solving and to communicate effectively

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PROJECT PHASE-I

Prerequisites: None

Course Outcomes:
- Identify a topic in advanced areas of Advanced Manufacturing systems, materials
- Review literature to identify gaps and define objectives & scope of the work
- Employ the ideas from literature and develop research methodology
- Develop a model, experimental set-up and / or computational techniques necessary to meet the objectives.

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PROJECT PHASE-II & DISSERTATION

Prerequisites: None

Course Outcomes:
- Identify methods and materials to carry out experiments/develop code
- Reorganize the procedures with a concern for society, environment and ethics
- Analyze and discuss the results to draw valid conclusions
- Prepare a report as per the recommended format and defend the work.
- Explore the possibility of publishing papers in peer reviewed journals/conference proceedings.