## R19 COURSE STRUCTURE AND SYLLABUS

### I Year I Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Professional Core - I</td>
<td>Advanced Computer Aided Design</td>
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<td>Professional Core - II</td>
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<td>Professional Elective- I</td>
<td>1. Optimization Techniques &amp; Applications</td>
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<td></td>
<td>2. MEMS &amp; Micro Systems: Design &amp; Manufacturing</td>
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<td></td>
<td>3. Advanced Manufacturing Processes</td>
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<td>Professional Elective-II</td>
<td>1. Flexible Manufacturing Systems</td>
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<td></td>
<td>2. Theory of Elasticity &amp; Plasticity</td>
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<td>3. Quality Engineering in Manufacturing</td>
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### I Year II Semester

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<td>2. Advanced Tool Design</td>
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<td>3. Fuzzy Logic &amp; Neural Networks</td>
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### II Year I Semester

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<th>Credits</th>
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| Professional Elective- V | 1. Advanced Finite Element and Boundary Element Methods  
2. Smart Materials & Structures  
3. Intelligent Manufacturing Systems | 3 | 0 | 0 | 3 |
| Open Elective | Open Elective                                   | 3 | 0 | 0 | 3 |
| Dissertation | Dissertation Work Review - II                   | 0 | 0 | 12 | 6 |
| **Total**    |                                                  | 6 | 0 | 12 | 12 |

### II YEAR II - SEMESTER

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*For Dissertation Work Review - I, Please refer 7.8 in R19 Academic Regulations.*

### Audit Course I & II:
1. English for Research Paper Writing  
2. Disaster Management  
3. Sanskrit for Technical Knowledge  
4. Value Education  
5. Constitution of India  
6. Pedagogy Studies  
7. Stress Management by Yoga  
8. Personality Development through Life Enlightenment Skills
UNIT I:
Principles of Computer Graphics: Introduction, graphic primitives, point plotting, lines, Bresenham’s circle algorithm, ellipse, transformation in graphics, coordinate systems, view port, 2D and 3D transformation, hidden surface removal, reflection, shading and generation of characters.

UNIT II:
Cad Tools: Definition of CAD Tools, Types of system, CAD/CAM system evaluation criteria, brief treatment of input and output devices. Graphics standard, functional areas of CAD, Modeling and viewing, software documentation, efficient use of CAD software.
Geometric modelling: Types of mathematical representation of curves, wire frame models wire frame entities parametric representation of synthetic curves hermite cubic splines Bezier curves B-splines rational curves.

UNIT III:
Surface Modeling: Mathematical representation surfaces, Surface model, Surface entities surface representation, parametric representation of surfaces, plane surface, rule surface, surface of revolution, Tabulated Cylinder.

UNIT IV:
Parametric Representation of Synthetic Surfaces: Hermite Bicubic surface, Bezier surface, B-Spline surface, COONs surface, Blending surface Sculptured surface, Surface manipulation — Displaying, Segmentation, Trimming, Intersection, Transformations (both 2D and 3D).

UNIT V:
Geometricmodelling-3D: Solid modeling, Solid Representation, Boundary Representation (13-rep), Constructive Solid Geometry (CSG).

TEXT BOOKS:
1. CAD/CAM Concepts and Applications/ Alavala/ PHI
2. CAD/CAM /Groover M.P./ Pearson education
4. CAD/CAM Principles and Applications/ P.N. Rao/TMH/3rd Edition

REFERENCES:
1. CAD / CAM / CIM, Radhakrishnan and Subramanian/ New Age
2. Principles of Computer Aided Design and Manufacturing/ Farid Amirouche/ Pearson
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (DESIGN FOR MANUFACTURING/ DESIGN AND MANUFACTURING)

DESIGN FOR MANUFACTURING AND ASSEMBLY (Professional Core - II)

Prerequisites: Manufacturing Processes, Engineering Materials

Course Objectives: The objective of course is identify the manufacturing constraints that influence the design of parts and part systems. Students will be introduced to the Design for Manufacturability (DFM) methodology, and will be motivated to understand infeasible or impractical designs.

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:

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 - casting tolerances - use of solidification simulation in casting design - product design rules for sand casting.

UNIT - III:


UNIT-IV
Assemble Advantages: Development of the assemble process, choice of assemble method assemble advantages social effects of automation.

Automatic Assembly Transfer Systems: Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

UNIT-V:
Design of Manual Assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the 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, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

**TEXT BOOKS:**

**REFERENCES:**
1. Computer Aided Assembly London/ A Delbainbre/.
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (DESIGN FOR MANUFACTURING/ DESIGN AND MANUFACTURING)

OPTIMIZATION TECHNIQUES AND APPLICATIONS (Professional Elective - I)

Pre-requisites: Operations Research

Course Objectives: The main objectives of the course are: Learn

- Numerical optimization techniques for single variable and multi variable non-linear optimization problems.
- Sensitivity analysis on LPP queuing
- Simulation of annexing problem & inventory problem.
- Geometry cutting plane method & branch bound method for linear IPP.
- Meaning of stochastic programming problem simple problems for finding mean variance of random variables chance constrained algorithm.
- Formulation of GP model and solving it using arithmetic geometric inequality theorem.
- State of art nontraditional optimization technique, namely genetic algorithm simulated annealing & particle swarm optimization.

Course Outcomes: At the end of the course, the student is able to apply appropriate optimization techniques and solve.

- Based on the type of optimization problem like single variable or multivariable,
- Make sensitivity analysis to study effect of changes in parameters of LPP on the optimal solution without reworking.
- Simulate the system to estimate specified performance measures.
- Solve integer programming problem by either geometry cutting plane algorithm or branch band method.
- Apply chance constrained algorithm and solve stochastic linear programme.
- Formulate GP model and solve it.
- Solve given optimization problem by genetic algorithm or simulated annealing or PSO.

UNIT-I:

UNIT-II:

UNIT-III:

UNIT-IV:
Integer Programming: Introduction – formulation – Geometry 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 by Kalyanmoy Deb, PHI

REFERENCE BOOKS:
1. Operations Research by S. D. Sharma
2. Operation Research by H. A. Taha, TMH
3. Optimization in operations research by R. L Rardin
MEMS & MICRO SYSTEMS: DESIGN & MANUFACTURING (Professional Elective - I)

UNIT – I:

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 Memsys & 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.

REFERENCES:
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (DESIGN FOR MANUFACTURING/DESIGN AND MANUFACTURING)

ADVANCED MANUFACTURING PROCESSES (Professional Elective - I)

Prerequisites: Production Technology, Machine Tools, Metal Cutting, Material Science.

Course Objectives:
- To make acquainted the various unconventional manufacturing processes
- To know about the applications of advanced manufacturing processes (which are exceptional)
- To encourage the students for developing the models of Advanced Manufacturing Processes

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 beam 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, micromachining and High-speed Machining, basic principles, working, applications, advantages.

**TEXT BOOKS:**
3. Advanced Machining Processes by V.K.Jain, Allied Publications.

**REFERENCE BOOKS:**
5. Advanced Methods of Machining by J.A Mc Geough, Springer.
FLEXIBLE MANUFACTURING SYSTEMS (Professional Elective - II)

Prerequisites: Machine Tools, Basics of Industrial Engineering

Course Objectives:
- To Understand the role of Flexible Manufacturing Systems (FMS) in manufacturing
- To Understand the concept of Group Technology
- To Understand the concept of Cellular Mfg Systems
- To Understand the benefits of automation
- To Know types of manufacturing industries
- To have a basic knowledge of automation equipment
- To Understand logic control and associated technologies

Course Outcomes: At the end of the course, the student shall be able to:
- Develop FMS using the most appropriate technique.
- Implement FMS concept in a manufacturing environment
- Use various types of sensors and actuators in PLC implementations
- Explain the role of automation in manufacturing
- Tell the difference between Group Technology and Cellular Manufacturing
- Classify automation equipment and assembly systems into different categories.

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:
REFERENCE BOOK:
JAWAHarlAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (DESIGN FOR MANUFACTURING/ DESIGN AND MANUFACTURING)

THEORY OF ELASTICITY & PLASTICITY (Professional Elective - II)

UNIT – I:
Elasticity: Two-dimensional stress analysis - Plane stress - Plane strain - Equations of compatibility -
Stress function - Boundary conditions.
Problem in Rectangular Coordinates - Solution by polynomials - Saint Venent's principles -
Determination of displacement - Simple beam problems.
Problems in Polar Coordinates - General equations in polar coordinates - Stress distribution
symmetrical about axis - Strain components in polar coordinates - Simple and symmetric problems.

UNIT – II:
Analysis of Stress and Strain in Three Dimensions: Principle stresses - Homogeneous
deformations - Strain spherical and deviatoric stress - Hydrostatic strain.
General theorems: Differential equations of equilibrium and compatibility - Displacement -
Uniqueness of solution - Reciprocal theorem.

UNIT - III:
Bending of Prismatic Bars: Stress function - Bending of cantilever beam - Beam of rectangular
cross-section - Beams of circular cross-section.

UNIT – IV:
Plasticity: Plastic deformation of metals - Structure of metals - Deformation - Creep stress relaxation
of deformation - Strain rate condition of constant maximum shear stress - Condition of constant strain
energy - Approximate equation of plasticity.

UNIT – V:
Methods of Solving Practical Problems: The characteristic method - Engineering method -
Compression of metal under press - Theoretical and experimental data drawing.

REFERENCES:
2. An Engineering Theory of Plasticity/E.P. Unkovs/Butterworths
4. Theory of Plasticity for Engineers/Hoffman and Sacks/TMH
5. Theory of Elasticity and Plasticity/Sadhu Singh/ Khanna Publishers
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (DESIGN FOR MANUFACTURING/ DESIGN AND MANUFACTURING)

QUALITY ENGINEERING IN MANUFACTURING (Professional Elective - II)

UNIT-I:
Quality Value and Engineering: An overall quality system, quality engineering in production design, quality engineering in design of production processes. Loss Function and Quality Level: Derivation and use of quadratilie loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances. (N-type, S-type and L-type)

UNIT-II:
Tolerance Design and Tolerancing: Functional limits, tolerance design for N-type. L-type and S-type characteristics, tolerance allocation for multiple components. Parameter and Tolerance Design: Introduction to parameter design, signal to noise ratios, Parameter design strategy, some of the case studies on parameter and tolerance designs.

UNIT-III:
Analysis of Variance (ANOVA): NO-way ANOVA, One-way ANOVA, Two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.

UNIT-IV:
Orthogonal Arrays: Typical test strategies, better test strategies, efficient test strategies, steps in designing, conducting and analyzing an experiment. Interpolation of Experimental Results: Interpretation methods, percent contributor, estimating the mean.

UNIT-V:
ISO-9000 Quality System, BDRE, 6.-sigma, Bench marking, Quality circles Brain Storming — Fishbone diagram — problem analysis.

REFERENCES:
Prerequisite: None

Course Objectives:
- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to
- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I:
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II:
Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT-III:
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-IV:

UNIT-V:
TEXT BOOKS:
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:
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.
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (DESIGN FOR MANUFACTURING/ DESIGN AND MANUFACTURING)

ADVANCED CASTING & WELDING LAB (Lab - II)

List of Experiments:
1. Tensile Strength Evaluation of TIG Welded Specimens under variable conditions.
3. Tensile Strength Evaluation of MIG Welded Specimens under variable conditions.
5. Inclusion Analysis of Cast Specimens
6. Size Analysis of Grains for Cast Specimens under different input variables
7. Design of Runner & Riser
8. Non-Destructive Testing of Welded Joint
9. Study of Blow Moulding
10. Study of Injection Moulding

Note: Each experiment involves preparation of Joint/ Casting, specimen preparation, testing, evaluation and reporting may be chosen from the above list.
UNIT – I:
Oil hydraulic systems Hydraulic pumps, types and construction details, sizing and selection. Direction control valves, flow and pressure control valves.

UNIT – II:
Linear actuators types Piston rod design sizing and selection, Rotary actuators, hydraulic reservoir accumulators.

UNIT – III:
Design of hydraulic circuits, seals and packings, hydraulic servo techniques, cylinders and air motors.

UNIT – IV:
Sequencing and synchronizing circuits, accumulator, low cost automation Hydro circuits, accumulators, Hydro pneumatic circuits principles of pneumatic circuit design.

UNIT – V:
Maintenance and trouble shooting of hydraulic and pneumatic circuits, components, PLC Automation and uses of Microprocessors.

REFERENCES:
4. Fluid power with applications/ Antony Esponssito/ Prentice Hall
MANUFACTURING SYSTEMS: SIMULATION MODELLING & ANALYSIS (Professional Core - IV)

Course Objectives:
- Learn way of analyzing the systems.
- Classification of systems based nature of dynamics and knowledge of elements.
- To develop simulation model for dynamic discrete– event stochastic system.
- To run the model and collect the data.
- To analyze the output data of simulation for specified for performance measures bases on type of simulation and method of output data analysis.

Course Outcomes: At the end of course, student should able to
- Define the state of system W.R.T specified performance measures.
- Identify Dynamic Discrete- event stochastic system.
- Develop simulation model for the said system
- Analyze the model and present the results to specified confidence level.

UNIT - I:

UNIT - II:

UNIT - III:

UNIT - IV:
Output data analysis – Types of Simulation with respect to output data analysis – warm up 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 – New boy paper problem.
TEXT BOOKS:

REFERENCE BOOKS:
PREPARATION ENGINEERING (Professional Elective - III)

Pre-requisites: Machine Tools, Metrology

Course Objectives:
- To give the basic precision engineering methodology and state-of-the-art concepts for designing high-precision CNC machines and products.
- The course is specifically tailored to teach the novel design principles leading to improved machine performance and reliability.
- To apply the acquired knowledge to other design efforts and fields as well

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:

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 Charting Techniques: Operation Sequence for typical shaft type of components, Preparation of Process drawings for different operations, Tolerance worksheets and central analysis, Examples. Design features to facilitate machining; Datum Features – functional and manufacturing.
Components design – Machining considerations, Redesign for manufactured parts 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:
**Measuring Systems Processing**: In process 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 BOOK:**
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year II Sem. (DESIGN FOR MANUFACTURING/ DESIGN AND MANUFACTURING)

ADVANCED TOOL DESIGN (Professional Elective - III)

Prerequisite: Production technology

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

- Develop the conceptual design, manufacturing framework and systematic analysis of design problems on the machine tools apply the design procedures for different types of design problems such as gear box design, guide way
- Design, shaft loading and its associated parts, rolling bearings, die design and jigs and fixtures and so on.

UNIT – I:
Tool Materials:
Prosperities of materials: Tools steels, Cast Iron, Mild or low carbon steels, Non metallic and nonferrous materials, Heat treating

UNIT – II:
Design of Cutting Tools:
Single Point cutting tools: Milling cutters, Drills, Selection of carbide steels – Determination of shank size for single point carbide tools, Determining the insert thickness for carbide tools

UNIT – III:
Design of Jigs and Fixtures:
Basic principles of location and clamping: Locating methods and devices, Jigs-Definition Types, General considerations in the design of Drill jigs, Drill bushing, Methods of Construction. Fixtures-Vice fixtures, Milling, Boring Lathe Grinding fixtures.

UNIT – IV:
Design of Sheet Metal Blanking and Piercing Dies:

UNIT – V:
Design of Sheet Metal Bending, Forming and Drawing Dies:
Bending dies, drawing dies, forming dies, drawing operations, Variables that effect metal flow during drawing. Determination of blank size, Drawing force, Single, and double action draw dies.

TEXT BOOKS:
2. Production Technology/HMT/Tata McGraw Hill/

REFERENCES:
UNIT - I:

UNIT - II:

UNIT - III:

UNIT - IV:

UNIT - V:

REFERENCES:
5. Production and Operations Management/Chase/TMH
MATERIALS TECHNOLOGY (Professional Elective - IV)

Prerequisites: Mechanics of solids

Course Outcomes: At the end of the course, the student is able
- To understand on elastic, plastic and fractured behaviour of engineering materials.
- To do appropriate selection of metallic and non-metallic materials for the various engineering applications.

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:
Griffth’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:
Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep. 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.

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

TEXT BOOKS:

REFERENCES:
2. Engineering Materials Technology/James A Jacob Thomas F Kilduff/Pearson
Course Outcomes: At the end of the course the students will be able to

- To study the vibrations in machine elements and how to control them.
- Ability to analyze the mathematical model of linear vibratory system to determine its response
- Obtain linear mathematical models of real life engineering systems
- Determine vibratory responses of single and multi degree of freedom systems to harmonic, periodic and non-periodic excitation

UNIT – I:
Causes and effects of vibration, Vibration of single Degree and Multi Degree of freedom systems. Steady state and transient characteristics of Vibration.

UNIT – II:
Introduction to Condition Monitoring, Failures 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.

Text Books:

REFERENCES:
2. Mechanical Vibrations by SS Rao, PHI Publications
FUZZY LOGIC & NEURAL NETWORKS (Professional Elective - IV)

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Mapping and Recurrent Networks: Counter propagation –Self organization Map- Congnitron and Neocognitron- Hopfield Net- Kohonnen Nets- Grossberg Nets- Art-I, Art-II reinforcement learning

UNIT-V

TEXT BOOK:

REFERENCE BOOKS:
1. Fuzzy logic & Neural Networks/ Chennakesava R. Alavala/ New Age International, 2008
3. Fuzzy sets Fuzzy logic, Klir, G.J anfd Yuan B.B Prentice Hall of India Pvt. Ltd.,, New Delhi
4. Neural Networks and Fuzzy systems, Kosko.. Prentice hall of India Pvt. Ltd.,, New Delhi 1994
LIST OF EXPERIMENTS

1. Study of Pressure relief valve and Directional Control valves in Hydraulic System.
2. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/3 Direction Control Valve (Manual type).
3. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (Single Solenoid) using Push button momentary switch/using Latch Switch.
4. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (Solenoid Control) using Push button switch for varying flow rate using flow control valve/using Latch for varying flow rate using flow control valve.
5. Simulation of Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (manual control) using simulation software.
7. Study of pneumatic components:
   i. Air compressor along with air receiver tank
   ii. FRL unit
   iii. Control valves
9. Draw the circuit diagram to operate Double Acting Pneumatic Cylinder using 5/2 Direction Control Valve (solenoid) and Push button momentary switch/Latch Switch.
10. Draw the circuit diagram for speed control of single & Double Acting Pneumatic Cylinder.
Jawaharlal Nehru Technological University Hyderabad
M. TECH. I Year II Sem. (Design for Manufacturing/ Design and Manufacturing)

Simulation of Manufacturing Systems Lab (Lab – IV)

A. Manufacturing Simulation
The students will be given training on the use and application of the following software to manufacturing problems:

1. Auto MOD Software.
2. PROMODEL
3. SLAM-II
4. CAFIMS
5. Flexsim

They also learn how to write sub routines in C-language and interlinking with the above packages.

Problems for modelling and simulation experiments:

1. AGV planning
2. ASRS simulation and performance evaluation
3. Machines, AGVs and AS/RS integrated problems
4. JIT system
5. Kanban flow
6. Material handling systems
7. M.R.P. Problems
8. Shop floor scheduling etc.

B. Precision Engineering

1. Hydraulic and Pneumatic circuits
2. Closed loop control systems
3. Study of the chip formation in turning process
4. Study of operation of tool and cutter grinder, twist drill grinder, Centreless grinder
5. Determination of cutting forces in turning
6. Experiments in unconventional manufacturing processes-AJM and study of USM, EDM, Laser Machining and Plasma spraying
7. Inspection of parts using tool makers microscope, roughness and form tester
8. Study of micro-controllers, programming on various CNC machine tools and also controllers
9. Studies on PLC programming
10. Study and programming of robots
ADVANCED FINITE ELEMENT AND BOUNDARY ELEMENT METHODS
(Professional Elective - V)

Prerequisite: Strength of Materials, Mathematics, Heat Transfer and Vibrations.

Course Objectives:
- To Introduce the basic concepts of the finite element method, the boundary element method
- To discuss the advantages and limitations of each method
- To Demonstrate the capabilities of each method on a variety of problems

Course outcomes: After completing this course, the student should be able to
- Understand the background of mathematical equations used for development of modeling software modules to develop the various structural related applications
- Identify mathematical model for solution of common engineering problems.
- Solve structural, thermal, fluid flow problems.
- Use professional-level finite element software to solve engineering problems in Solid mechanics, fluid mechanics and heat transfer.

UNIT–I:
One Dimensional Problems: Formulation of Stiffness Matrix for a Bar Element by the Principle of Minimum Potential Energy, Properties of Stiffness Matrix, Characteristics of Shape Functions, Quadratic shape functions.
Analysis of Trusses: Derivation of Stiffness Matrix for Trusses, Stress and strain Calculations, Calculation of reaction forces and displacements.
Analysis of Beams: Derivation of Stiffness matrix for two noded, two degrees of freedom per node beam element, Load Vector, Deflection, Stresses, Shear force and Bending moment, Problems on uniform and stepped beams for different types of loads applied on beams.

UNIT–II:

UNIT–III:
Steady state heat transfer analysis: One Dimensional Finite Element analysis of fin and composite slabs. Two-dimensional steady state heat transfer problems: Derivation of Thermal Stiffness matrix for 2D heat transfer problems-CST, Derivation of thermal force vector for 2D heat transfer problems.
Dynamic Analysis: Formulation of mass matrices for uniform bar and beam Elements using lumped and consistent mass methods, Evaluation of Eigen values and Eigen vectors for a stepped bar and beam Problems.

UNIT–IV:
Plate Bending: Introduction – Plate behavior – C¹ (Kirchoff) Plate elements – C⁰ (Mindlin) Plate elements – Mindlin beam – More devices for C⁰ Plate elements – Boundary conditions - Analytical problems.
**Nonlinear finite element of solids**: Material Nonlinearities, objective rates, nonlinear elasticity, Plasticity, viscoplasticity, viscoelasticity

**UNIT V**:  
**Boundary Element Formulation for Electrostatic Problems**: Introduction, Basic Relation - Boundary condition, other relations. Discretization and Matrix Formulation – Determination of term C(p)m.

**Text Books**:  

**Reference Books**:  
1. Finite Element Methods by Alavala, PHI.  
2. Introduction to Finite Elements in Engineering by Tirupathi K. Chandrupatla and Ashok D. Belagundu.  
3. An Introduction to Finite Element Methods by J. N. Reddy, Mc Grawhill  
5. Concepts and Applications of Finite Element Analysis by Robert Cook, Wiley
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. II Year I Sem. (DESIGN FOR MANUFACTURING/ DESIGN AND MANUFACTURING)

SMART MATERIALS & STRUCTURES (Professional Elective - V)

UNIT - I
Overview of Smart Materials, Structures and Products Technologies.

UNIT - II

UNIT - III
Smart Sensor, Actuator and Transducer Technologies: Smart Sensors: Accelerometers; Force Sensors; Load Cells; Torque Sensors; Pressure Sensors; Microphones; Impact Hammers; MEMS Sensors; Sensor Arrays Smart Actuators; Displacement Actuators; Force Actuators; Power Actuators: Vibration Dampers; Shakers; Fluidic Pumps; Motors ; smart Transducers: Ultrasonic Transducers; Sonic Transducers.

UNIT - IV
Measurement, Signal Processing, Drive and Control Techniques: Quasi -static and Dynamic Measurement Methods; Signal conditioning devices; Constant voltage, Constant-current and Pulse drive methods; Calibration methods; Structural dynamics and Identification techniques; Passive, Semi-active and Active control; Feedback and feed forward/control strategies

UNIT - V
Design, Analysis, Manufacturing and Applications of Engineering Smart Structures and Products: Case studies incorporating design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering smart structures and products; Emphasis on structures, automation and precision manufacturing equipment, automotives, consumer products, sporting products, computer and telecommunications products, as well as medical and dental tools and equipment.

TEXT BOOKS:

REFERENCES:
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M. TECH. II Year I Sem. (DESIGN FOR MANUFACTURING/DESIGN AND MANUFACTURING)  

INTELLIGENT MANUFACTURING SYSTEMS (Professional Elective - V)  

UNIT - I:  

UNIT - II:  
Components of Knowledge Based Systems - Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.  

UNIT - III:  
Machine Learning - Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing.  

UNIT - IV:  

UNIT - V:  

TEXT BOOKS:  
1. Intelligent Manufacturing Systems/ Andrew Kusiak/Prentice Hall.  
2. Artificial Neural Networks/ Yagna Narayana/PHI/2006  
4. Neural networks: A comprehensive foundation/ Simon Haykin/ PHI.  

REFERENCES:  
1. Artificial neural networks/ B. Vegnanarayana/PHI  
2. Neural networks in Computer intelligence/ Li Min Fu/ TMH/2003  
Prerequisite: None

Course objectives: Students will be able to:
- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title and the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT-VI:
useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

TEXT BOOKS/ REFERENCES:
Prerequisite: None

Course Objectives: Students will be able to
- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches.
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:
Introduction:
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT-II:
Repercussions Of Disasters And Hazards:
Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT-III:
Disaster Prone Areas In India:
Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

UNIT-IV:
Disaster Preparedness And Management:
Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT-V:
Risk Assessment Disaster Risk:

UNIT-VI:
Disaster Mitigation:
Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.
TEXT BOOKS/ REFERENCES:
2. Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
Prerequisite: None

Course Objectives:
- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to
- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/REFERENCES:
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
Prerequisite: None

Course Objectives: Students will be able to
- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to
- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:

UNIT-II:

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:

UNIT-V:

TEXT BOOKS/ REFERENCES:
Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

UNIT-II:
Philosophy of the Indian Constitution: Preamble, Salient Features

UNIT-III:

UNIT-IV:
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions

UNIT-V:
UNIT-VI:


TEXT BOOKS/ REFERENCES:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:
- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:
- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

UNIT-II:
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:
Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers’ attitudes and beliefs and Pedagogic strategies.

UNIT-IV:
Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:
Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

TEXT BOOKS/ REFERENCES:


STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:
- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:
- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do’s and Don’t’s in life.
   i) Ahinsa, satya, astheya, bramhacharya and aparigraha
   ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
   ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:
1. “Yogic Asanas for Group Training-Part-I”: Janardan Swami Yogabhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
PREREQUISITES: None

COURSE OBJECTIVES:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

COURSE OUTCOMES: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:
Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:
Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont’s)
- Verses- 71,73,75,78 (do’s)

UNIT-III:
Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:
Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:
1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.