APPROVED SYLLABUS OF
M.TECH COURSE
CAD/CAM
(Academic Year 2009-10)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
KAKINADA
COURSE STRUCTURE AND SYALLABUS FOR
M. TECH. (CAD/CAM)

Name of the Course: CAD/CAM

Course Structure and Scheme of Evaluation (Semester-wise)

Name of the Subjects	Hrs/Week		Evaluation (marks)			
	Lecturer	Practical	Internal Marks	External		Total
				Theory	Practical	
I Semester						
1. Numerical Methods for Partial Differential Equation	4	-	40	60	-	100
2. Computer Aided Design	4	-	40	60	-	100
3. Stress Analysis & Vibration	4	-	40	60	-	100
4. Finite Element Analysis	4	-	40	60	-	100
5. Design & Optimization	4	-	40	60	-	100
6. Elective – I	4	-	40	60	-	100
7. Computer Aided Design & Optimization Laboratory	-	4	40	-	60	100
II Semester						
1. Computer Aided Manufacturing	4	-	40	60	-	100
2. Flexible Manufacturing Systems	4	-	40	60	-	100
3. Industrial Robotics	4	-	40	60	-	100
4. Design of Hydraulics & Pneumatic Systems	4	-	40	60	-	100
5. Automation in Manufacturing	4	-	40	60	-	100
6. Elective – II	4	-	40	60	-	100
7. Computer Aided Machining & Robotics Laboratory	-	4	40	-	60	100
III Semester						
Seminar	-	-	-	8	-	-
IV Semester						
Project	-	-	-	24	-	Grade *

Elective I	**Elective – II**
1. Mechatronics	1. Intelligent Manufacturing Systems
2. Design for Manufacturing	2. Computer Aided Process Planning
3. Manufacturing Methods & Mechanics of Composites	3. Computational Fluid Dynamics

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA
NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS

Unit-I: Introduction to finite difference formula: Parabolic Equations: Introduction – Explicit finite difference approximation to one dimensional equation Crank _ Nicholson implicit method – derivation boundary conditions

Unit-II: Alternate direction implicit (ADI) method finite difference in cylindrical and spherical polar coordinates.

Convergence stability and consistency: Definitions of local truncation error and consistency convergence analysis – stability analysis by matrix method eigen value von Newmann stability methods, global rounding error-local truncation error-lax`s equation theorem.

Unit-III: Hyperbolic Equations : Analytical solution of 1st order quasi linear equation – numerical integration along a characteristic lax wenderoff explict method

CFI condition wenderoff`s implicit approximation - propagation of discontinues - Numerical solution by the method of characteristics.

Unit-IV: Elliptic Equations: Introduction - Finite differences in polar co-ordinates – formulas for derivative near a curved boundary - analysis of the discretization error of the five point approximation to polman`s equation over a rectangle

Unit-V: Systematic iterative methods for large linear systems – necessary and sufficient condition for convergence of iterative methods – stones implicit methods.

Finite Element Method: weighted residual method - variations method – division of the region into elements linear element – Galerkin formulation.

References:

"Numerical Solution of partial differential equations; Finite Differences methods", G.D. Smith, Brunel University , Clarandon Press Oxford.

"The Finite Difference Methods in Partial Differential equation"A.R. Mitchel and D.F. Grnra, John Wiley.

"Numerical Methods for Engineers and scientists" "Joe D. Hoffman, Mc Graw Hill

"Applied Finite Element Analysis," Larry J. Segerlind, John Wiley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA
COMPUTER AIDED DESIGN

UNIT I :
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.

UNIT II:
GEOMETRICMODELLING: Types of mathematical representation of curves, wire frame models wire frame entities parametric representation of synthetic curves her mite 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 Bi-cubic 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 (Brep), Constructive Solid Geometry (CSG).

UNIT VI :
CAD/CAM Exchange : Evaluation of data – exchange format, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.

UNIT VII:
Design Applications : Mechanical tolerances, Mass property calculations, Finite Element Modeling and Analysis and Mechanical Assembly.

UNIT VIII
Collaborative Engineering: Collaborative Design, Principles, Approaches, Tools, Design Systems.

TEXT BOOKS:
1. CAD/CAM Theory and Practice / Ibrhim Zeid / Mc Graw Hill international.

REFERENCE BOOKS :
1. Mastering CAD/CAM / Ibrhim Zeid / Mc Graw Hill international.
2. CAD/CAM / P.N.Rao / TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

STRESS ANALYSIS AND VIBRATIONS

Unit-I: Two dimensional elasticity theory in Cartesian coordinates, plane stress problem in polar coordinates Thick cylinders, Rotating discs – stress concentration.

Unit II: Torsion of non circular prismatic sections, rectangular and axisymmetric.Circular plates, introduction to shell theory – contact stresses.

Unit–III: Single degree freedom, two degree freedom system without and with damping – Free and forced vibrations. Transient vibrations.

Unit- IV: Transient vibrations of single and two degree systems, multi-degree systems –applications of matrix methods continuous systems.

Unit -V: Free and forced vibrations of strings bars and beams. Principle of orthogonality – classical and energy methods.

References:

Timoshenko and Goodier, " Theory of elasticity"

Den Hartog J.P., "Advanced strength of materials"

Den Hartog J.P., "Mechanical Vibrations ". Dover Publications

Thomson W.T., "Theory of Vibrations with Applications" CBS Publishing

Rao S.S. "Mechanical Vibrations" Addison Wesley Longman.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA
FINITE ELEMENT ANALYSIS

UNIT -I:
Introduction to FEM: basic concepts, historical back ground, application of FEM, general description, comparison of fem with other methods, variational approach, Galerkin Methods

UNIT -II:
Co-ordinates, basic element shapes, interpolation function. Virtual energy principle, Rayleigh- Ritz method, 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 -III:
1-D structural problems – axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape function. Analysis of Trusses – Plane Truss and Space Truss elements.

UNIT -IV:
Analysis of beams – Hermite shape functions – stiffness matrix – Load vector – Problems 2-D problems –CST, LST, force terms, Stiffness matrix and load vector, boundary conditions.

UNIT – V:
Isoparametric element – quadrilateral element, Shape functions – Numerical Integration – sub parametric and superparametric elements. 3-D problems – Tetrahedran element – Jacobian matrix – Stiffness matrix

UNIT -VI:
Scalar field problems - 1-D Heat conduction – 1-D fin element – 2-D heat conduction problems – Introduction to Torsional problems.

UNIT -VII:
Dynamic considerations, Dynamic equations – consistent mass matrix – Eigen Values, Eigen Vector, natural frequencies – mode shapes – modal analysis.

UNIT – VIII:
Non linearity, Introduction, Non linear problems, geometric non linearity, non linear dynamic problems, analytical problems.

TEXT BOOKS:
1. Introduction to finite elements in engineering – Tirupathi K. Chandrupatla and Ashok D.Belagundu.

2. Concepts and applications of finite element analysis – Robert Cook

3. The finite element methods in Engineering – S.S. Rao - Pergamon, New York

4. An Introduction to Finite Element Methods – J. N. Reddy – Mc Graw Hill

5. The Finite element method in engineering science – O.C. Zienkowitz, Mc Graw Hill.

6. Finite Element Procedures in Engineering analysis – K.J Bathe

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

DESIGN OPTIMISATION

Unit- I: General Characteristics of mechanical elements, adequate and optimum design, principles of optimisation, formulation of objective function, design constraints, classification of optimization problems. Single and multivariable optimisation techniques

Unit- II: Technique of unconstrained minimization. Golden section, Random, Pattern and Gradient search methods, interpolation methods, equality and inequality constraints.

Unit-III: Direct methods and indirect methods using penalty function, Lagrange multipliers Geometric programming and stochastic programming Genetic algorithms.

Unit-IV: Engineering applications, structural-design application axial and transverse loaded members for minimum cost, maximum weight. Design of shafts and torsion members, design optimisation of springs.

Unit-V: Dynamics applications for two degree freedom system, vibration absorbers. Application in mechanisms.

References:-

Singerusu S. Rao, “Engineering Optimization -Theory and Practice” New Age.

Johnson Ray C, “Optimum Design of Mechanical elements” Wiley, John & Sons

Goldberg D. E., “Genetic Algorithms in search, Optimization and Machine” Addison-Wesley-NewYork.

Kalyanamoy Deb, “Optimization for Engineering Design Algorithms and Examples”
Prentice Hall of India.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

MECHATRONICS

(Elective - I)

Unit – I: Introduction: Definition of Mechantronics products, Design Considerations and Tradeoffs. Overview of Mechatronic products. Intelligent Machine vs Automatic Machine Economic and Social Justification.

Actuators and Motion Control: Characteristics of Mechanical, electrical, Hydraulic and pneumatic actuators and their limitations. Control parameters and system objectives.

Mechanical configurations. Popular control system configurations. S-curve, Motor/Load inertia matching. Design with linear slides.

Unit-II: Motion control Algorithms: significance of feed forward control loops, shortfalls, Fundamental concepts of adaptive and fuzzy – control. Fuzzy logic compensatory control of transformation and deformation non-linearities.

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 system, CAD/CAM Data bases, Graphic Data Base, Introduction to object oriented concepts, objects oriented model language interface, procedures and methods in creation, edition and manipulation of Data.

Unit-V: Sensor Interfacing : Analog and Digital Sensors for Motion Measurement, Digital Transducers, Human – Machine and Machine – Machine Interfacing devices and strategy. Machine Vision: Feature and Pattern Recognition methods, concepts of perception and cognition in decision making.

References

"Designing Intelligent Machines", open University, London.

Michel B. Histand and David G. Alciatore,

"Introduction to Mechatronics and Measurement systems", Tata MC Graw Hill.

1. C.W. Desi Iva, " Control sensors and actuators, " Prentice Hall.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

DESIGN FOR MANUFACTURING

(Elective - I)

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:
Materials: Selection of Materials for design – Developments in Material technology – criteria for material selection – Material selection interrelationship with process selection – process selection charts.

UNIT III: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.

UNIT IV:
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 V:
METAL JOINING: Appraisal of various welding processes, Factors in design of weldments – general design guidelines – pre and post treatment of welds – effects of thermal stresses in weld joints – design of brazed joints.

UNIT VI:
FORGING – Design factors for Forging – Closed die forging design – parting lines of dies – drop forging die design – general design recommendations

UNIT VII:
EXTRUSION & SHEET METAL WORK: Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, Deep Drawing – Keeler Goodman Forming Line Diagram – Component Design for Blanking.

UNIT VIII:
PLASTICS: Viscoelastic and creep behavior in plastics – Design guidelines for Plastic components – Design considerations for Injection Moulding – Design guidelines for machining and joining of plastics -

Text books:

1. Design for Manufacture / John Cobert / Adisson Wesley, 1995.
2. ASM Handbook, Vol.20.
3. Engineering Design- A Material and Processing Approach / George E. Deiter / McGraw Hill Intl., 2nd Edition, 2000.
4. Product design and Manufacturing / A.K Chitale and R.C Gupta / Prentice – Hall of India, New Delhi, 2003.
5. Design and Manufacturing / Surender Kumar & Goutham Sutradhar / Oxford & IBH Publishing Co. Pvt .Ltd., New Delhi, 1998.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

Manufacturing methods and Mechanics of Composites

(Elective- I)

Unit – I

Basic concepts and characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites,

Unit – II

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

Unit – III

Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.

Unit – IV

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

Unit – V

Coordinate transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

Unit – VI

Elastic behavior of unidirectional composites: Elastic constants of lamina, relation ship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

Unit – VII

Strength of unidirectional lamina: Micro mechanics of failure, Failure mechanisms, Strength of an orthotropic lamina, Strength of a lamina under tension and shear maximum stress and strain criteria, application to design. The failure envelope, first ply failure, free-edge effects. Micro mechanical predictions of elastic constants.

Unit – VIII

Analysis of laminated composite plates: Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

Text Books:

1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.
2. Engineering Mechanics of Composite Materials by Isaac and M.Daniel, Oxford University Press, 1994.

References:

1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.
2. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA
COMPUTER AIDED DESIGN & OPTIMISATION LABORATORY

- Creation of working drawing, creating geometry, constraining the profile, extracting a part using tools, creating pattern of holes, translating rotating, mirroring, managing the specification tree. Creating sheets and views, creating text and dimensions, creating an assembly, moving components, assembling existing components, creating bill of materials, creating wire frame and surface geometry using generative shape design and sweep tools. Generation of Ferguson's cubic surface patches, Bezier surface patches, Coons patches. Import and export of drawing from other software.

- Linear static analysis, Automatic calculation of rigid body modes, uses specified eigen value shift, lumped and consistent mass matrices. Buckling analysis, Jacobi inverse iteration techniques. Steady state harmonic response, mode superposition method, overall structural and damping, linear dynamic analysis, non linear static analysis, non linear dynamic analysis. Steady state heat transfer analysis problems. Transient heat transfer analysis. Familiarity with element library. Defining Boundary conditions, multipoint constraint familiarity with different types of loads. Solution techniques, direct and iterative solver. Results and analysis. Design optimization.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

COMPUTER AIDED MANUFACTURING

Unit – I: Introduction to Numerical Control –Components of CNC system –Types of CNC systems

Unit – II: Open loop and Closed Loop control Systems, Drives and Controls Interpolators for CNC machine tools

Unit – III: Principal Types of CNC machine tools and their constructional features Design considerations – Tooling for CNC – Sensors for Adaptive Control of CNC machine tools

Unit–IV: SMART manufacturing CNC part programming – Manual and computer assisted part programming – Post processors – CNC part programming with CAD/CAM systems.

Unit–V: Group technology, Part families. Classification and coding Production flow analysis, machine cell, design benefits.

References:

1. Yorem Koren, "Computer control of Manufacturing Systems" Mc Graw Hill
2. P. Groover, "Automation, Production systems and computer Integrated manufacturing" Prentice Hall of India
3. David Bedworth, "Computerinte Design and Manufacturing" TMH.
4. Ranky, Paul G., "Computer Integrated Manufacturing" Prentice Hall International.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

FLEXIBLE MANUFACTURING SYSTEM

Unit – I: Introduction to flexible manufacturing systems. Planning and scheduling and control of FMS. Knowledge based scheduling.

Unit – II: Hirerarchy of computer control. Supervisory computer.

Unit – III: Software for simulation and database of FMS. Specification and selection, trends, application of simulation software.

Unit –IV: Manufacturing data systems data flow, CAD/CAM considerations. Planning FMS database, just in time characteristics, Pull method, quality small lot sizes, work station loads, close supplier ties, flexible workforce – line flow strategy

Unit – V: Preventive maintenance. Karban system, implementation issues.

References:-

1. Jha N.K. " Hand Book of Flexible Manufacturing Systems" Academic Press.
2. Taiichi Ohno, Toyota " Production System Beyond Large Scale Production", Productivity Press India Pvt. Ltd.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA
INDUSTRIAL ROBOTICS

UNIT: I
Introduction: Automation and Robotics, Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, control system and dynamic performance, precision of movement.

UNIT: II
CONTROL SYSTEM AND COMPONENTS: basic concept and modals controllers control system analysis, robot activation and feedback components. Positions sensors, velocity sensors, actuators sensors, power transmission system.

UNIT: III
MOTION ANALYSIS AND CONTROL: Manipulator kinematics, position representation forward transformation, homogeneous transformation, manipulator path control, robot dynamics, configuration of robot controller.

UNIT: IV
END EFFECTORS: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design.

SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics.

UNIT: V
MACHINE VISION: Functions, Sensing and Digitizing-imaging, Devices, Lighting techniques, Analog to digital single conversion, Image storage, Image processing and Analysis-image data reduction, Segmentation feature extraction. Object recognition, training the vision system, Robotics application.

UNIT: VI
ROBOT PROGRAMMING: Lead through programming, Robot programming as a path in space, Motion interpolation, WAIT, SINGNAL AND DELAY commands, Branching capabilities and Limitations.

ROBOT LANGUAGES: Textual robot languages, Generation, Robot language structures, Elements in function.

UNIT: VII
ROBOT CELL DESGIN AND CONTROL: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detection, Work cell controller.

UNIT: VIII
ROBOT APPLICATION: Material transfer, Machine loading/unloading. Processing operation, Assembly and Inspection, Feature Application.

TEXT BOOKS:
1. Industrial robotics, Mikell P.Groover /McGraw Hill.

2. Robotics, K.S.Fu / McGraw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

DESIGN OF HYDRAULIC & PNEUMATIC SYSTEMS

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 circuits, accumulators Hydro pneumatic circuits principles of pneumatic circuit design.

Unit–V: Maintenance and trouble shooting of hydraulic and pneumatic circuits and components PLC Automation and use of Microprocessors.

References:-

S.R. Majumdar, "Oil Hydraulic Systems," Tata Mc. Graw Hill

S.R. Majumdar, " Pneumatic systems, principles and maintenance", / Tata Mc. GrawHill

Andrew Darr., "Hydraulics and pneumatics", Jaico Publishing Hoise.

Antony Espossito," Fluid power with applications", Prentice Hall.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA
AUTOMATION IN MANUFACTURING

UNIT I:
Fundamentals of Manufacturing Automation: Basic Principles of automation, types of automated systems, degrees of automation, Automation - reasons, Production operations and automation strategies- Plant Layout, production concepts and mathematical models -design the parts for automation. Automatic loading systems.

UNIT II:
High Volume Production Systems: Automated flow lines. Methods of work flow -transport transfer mechanism - buffer storage - Control functions - Automation for machining operations Design and fabrication considerations.

UNIT III:
Analysis of Automated Flow Lines: Analysis of transfer lines without storage -partial automation automated flow lines with storage buffers – implementing of automatic flow lines.

UNIT IV:
Assembly Systems and Line Balance: Manual assembly lines - line balancing problem - methods of line balancing - ways to improve line balancing - flexible manual assembly lines - automated assembly systems, Analysis of multi station assembly.

UNIT V:
Automated Material Handling: Types of equipment and functions, design and analysis of material handling system, conveyor system. Automated guided vehicle system, components, operation, types, design of automated guided vehicles and applications. Automated storage / retrieval systems - types, basic components and applications.

UNIT VI:
Group Technology: Part families, part classification and coding, machine Cell design, Benefits.

UNIT VII:
Computer Aided Process Planning: Planning function. Retrieval type. Process Planning System. Generative process, benefits and limitations.

Automatic Identification Technique: shop floor control-factory data collection system-bar code techniques.

UNIT VIII:
Automated Inspection And Testing: Automated inspection principles and methods-sensors techniques for automated inspection-techniques for automated inspection-contact and non-contact inspection methods-in process gauging, CMM's, construction, types, inspection probes, types, and applications. Machine vision, LASER Micrometer and optical inspection methods.

References:

1. Mikell P. Grower."Automation, Production Systems and CIM", PHI Pvt. Ltd., 1998
2. P. Radha Krishnan & S. Subrahamanyam and Raju"CAD/CAM/CIM", New Age International Publishers, 2003.
3. Singh,"System Approach to Computer Integrated Design and Manufacturing ", John Wiley, 1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,KAKINADA

INTELLIGENT MANUFACTURING SYSTEMS

(Elective - II)

UNIT I:

Computer Integrated Manufacturing Systems – Structure and functional areas of CIM system - CAD, CAPP, CAM, CAQC, ASRS. Advantages of CIM.

UNIT II:

Manufacturing Communication Systems – MAP/TOP, OSI Model, Data Redundancy, Top-down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing – System Components, System Architecture and Data Flow, System Operation.

UNIT III:

Components of Knowledge Based Systems – Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.

UNIT IV:

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

UNIT V:

Automated Process Planning – Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning.

UNIT VI:

Knowledge Based System for Equipment Selection (KBSES) – Manufacturing system design, Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure of the KBSES.

UNIT VII:

Group Technology: Models and Algorithms – Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation – Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method.

UNIT VIII:

Knowledge Based Group Technology - Group Technology in Automated Manufacturing System, Structure of Knowledge based system for group technology (KBSGT) – Data Baswe, Knowledge Base, Clustering Algorithm.

Text Books:

1. Intelligent Manufacturing Systems by Andre Kusaic.

2. Artificial Neural Networks by Yagna Narayana

3. Automation, Production Systems and CIM by Groover M.P.

4. Neural Networks by Wassarman.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

COMPUTER AIDED PROCESS PLANNING

(Elective-II)

Unit - I

Introduction to CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process planning system, feature recognition, methods.

Unit - II

Generative CAPP system: Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

Unit - III

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications.

Unit – IV

Selection of manufacturing sequence: Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.

Unit –V

Determination of machining parameters: reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes.

Unit –VI

Determination of manufacturing tolerances: design tolerances, manufacturing tolerances, methods of tolerance allocation, sequential approach**,** integration of design and manufacturing tolerances, advantages of integrated approach over sequential approach.

Unit –VII

Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods.

Unit –VIII

Implementation techniques for CAPP: MIPLAN system, Computer programming languages for CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

Text Books:

1. Automation , Production systems and Computer Integrated Manufacturing System – Mikell P.Groover
2. Computer Aided Design and Manufacturing – Dr.Sadhu Singh.
3. Computer Aided Engineering – David Bedworth

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

COMPUTATIONAL FLUID DYNAMICS

(Elective - II)

Unit – I

Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions. Derivation of finite difference equations.

Unit – II

Solution methods: Solution methods of elliptical equations – finite difference formulations, interactive solution methods, direct method with Gaussian elimination. Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm.

Unit – III

Hyperbolic equations: explicit schemes and Von Neumann stability analysis, implicit schemes, multi step methods, nonlinear problems, second order one-dimensional wave equations. Burgers equations: Explicit and implicit schemes, Runge-Kutta method.

Unit – IV

Formulations of incompressible viscous flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods.

Unit – V

Treatment of compressible flows: potential equation, Eluer equations, Navier-stokes system of equations, flowfield-dependent variation methods, boundary conditions, example problems.

Unit – VI

Finite volume method: Finite volume method via finite difference method, formulations for two and three-dimensional problems.

Unit – VII

Standard variational methods - 1: Linear fluid flow problems, steady state problems,

Unit – VIII

Standard variational methods – 2: Transient problems.

Text Book:

1. Computational fluid dynamics, T. J.Chung, Cambridge University press,2002.

Reference:

1. Text book of fluid dynamics, Frank Chorlton, CBS Publishers & distributors, 1985.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,KAKINADA

Computer Aided Machining & Robotics Laboratory

Features and selection of CNC turning and milling centers. Practive inpart programming and operation of CNC turning machines, subroutine techniques and use of cycles. Practice in part programming and operating a machining center, tool planning and selection of sequences of operations, tool setting on machine, practive in APT based NC programming. Practive in Robot programming and its languages. Robotic simulation using software. Robo path control, preparation of various reports and route sheets, Simulation of manufacturing system using CAM software, controller operating system commands.