JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

Course Structure and syllabi for
M.Tech-ME-CAD/CAM
for affiliated Engineering Colleges 2017-18

I YEAR I Semester

S. No	Course code	Subject	L	T	P	C
1.	17DBS101	Computational Methods	4	-	-	4
2.	17D04101	Advanced Finite Element Methods	4	-	-	4
3.	17D04102	Computer Integrated Manufacturing	4	-	-	4
4.	17D04103	Advances in Manufacturing Technology	4	-	-	4
5.	 17D04104 17D04105 17D04106	Elective – I Design for Cellular manufacturing system Design of Hydraulic & Pneumatic system Advanced Tool Design	4	-	-	4
6.	 17D04107 17D04108 17D04109	Elective – II a. Quality Engineering and Manufacturing b. Computer Aided Process Planning c Design For Manufacturing	4	-	-	4
7.	17D04110	Modeling And CNC Lab	-	-	4	2
		Total	24	-	-	26

I YEAR II Semester

S. No	Course code	Subject	L	T	P	C
1.	17D04201	Advanced Optimization Techniques	4	-	-	4
2.	17D04202	Industrial Robotics and Expert Systems	4	-	-	4
3.	17D04203	CNC Technology & programming	4	-	-	4
4.	17D04204	Mechatronics Applications in Manufacturing	4	-	-	4
5.	 17D04205 17D04206 17D04207	Elective – III a. Computer Graphics b. Global Integrated Manufacturing c. Computer Aided tools for Manufacturing	4	-	-	4
6.	 17D04208 17D04209 17D04210	Elective – IV a. Rapid Prototyping b. Artificial Intelligence & Expert Systems c. Processing of Composite Materials	4	-	-	4
7.	17D04211	CAD/CAM Lab	-	-	3	2
		Total	24	-	3	26

III SEMESTER

S. No	Subject Code	Subject	L	T	P	C
1.	17D20301 17D20302 17D20303	Elective V a) Research Methadology b) Human Values and Professional Ethics c) Intellectual Property Rights	4	-	-	4
2.	17D04301	Elective VI (MOOCS)	-	-	-	-
3.	17D04302	Comprehensive Viva – Voice	-	-	-	2
4.	17D04303	Seminar	-	-	-	2
5.	17D04304	Teaching Assignment	-	-	-	2
6.	17D04305	Project work phase – I	-	-	-	4

IV SEMESTER

S. No	Subject Code	Subject	L	T	P	C
1.	17D04401	Project work Phase – II	-	-	-	12

Project Viva Voce Grades:

A: Satisfactory
B: Not Satisfactory

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17DBS101) COMPUTATIONAL METHODS

Course objectives:

1. Students will demonstrate aptitude in standard numerical techniques for solving various classes of problems.
2. Students will learn the theory underlying the derivation of standard numerical techniques and the development of algorithms.
3. Modeling of engineering problems drawn from different disciplines of mechanical engineering.

UNIT–I

Introduction to numerical methods applied to engineering problems: Examples, solving sets of equations – Matrix notation – Determinants and inversion – Iterative methods – Relaxation methods – System of non-linear equations – computer programs

Numerical integration: Newton-Cotes integration formulas – Simpson's rules, Gaussian quadrature. Adaptive integration

Unit – II

Optimization: One dimensional unconstrained optimization, multidimensional unconstrained optimization –direct methods and gradient search methods, constrained optimization

Boundary value problems and characteristic value problems: Shooting method – Solution through a set of equations – Derivative boundary conditions – Rayleigh – Ritz method – Characteristic value problems.

Unit – III

Numerical solutions of partial differential equations: Laplace's equations – Representations as a difference equation – Iterative methods for Laplace's equations – poisson equation – Examples – Derivative boundary conditions – Irregular and non – rectangular grids – Matrix patterns, sparseness – ADI method – Finite element method.

Unit – VI

Parabolic partial differential equations: Explicit method – Crank-Nickelson method – Derivative boundary condition – Stability and convergence criteria – Finite element for heat flow – computer programs.

Hyperbolic partial differential equations: Solving wave equation by finite differences-stability of numerical method –method of characteristics-wave equation in two space dimensions-computer programs.

Unit – V

Curve fitting and approximation of functions: Least square approximation fitting of non-linear curves by least squares –regression analysis- multiple linear regression, non linear regression - computer programs.

Course outcomes:

1. To enable students to formulate and solve engineering problems that are not amenable to analytical methods.
2. To demonstrate the application of numerical methods to data analysis and optimal design.

TEXT BOOKS:

1. "Numerical Methods for Engineers", Steven C.Chapra, Raymond P.Canale Tata Mc-Graw hill
2. "Applied numerical analysis", Curtis F.Gerald, partick.O.WheatlyAddison-wesley,1989
3. "Numerical methods", Douglas J..Faires,Riched BurdenBrooks/cole publishing company,1998.Second edition.

REFERENCES:

1. "Numerical mathematics and computing", Ward cheney &David Kincaid Brooks/Cole publishing company1999,fourth edition.
2. "Mathematical methods for physics and engineering"Riley K.F.M.P.Hobson.&.Bence S.J.Cambridge university press,1999.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04101) ADVANCED FINITE ELEMENT METHODS

Objectives

1. To provide the mathematical foundations of the finite element formulation for engineering applications (solids, heat, fluids).
2. To expose students to some of the recent trends and research areas in finite elements.

UNIT – I Formulation Techniques: Methodology, Engineering problems and governing differential equations, finite elements., Variational methods-potential energy method, Raleigh Ritz method, strong and weak forms, Galerkin and weighted residual methods, calculus of variations, Essential and natural boundary conditions.

UNIT – II One-dimensional finite element methods: Bar elements, temperature effects. Element matrices, assembling of global stiffness matrix, Application of boundary conditions, Elimination and penalty approaches, solution for displacements, reaction, stresses, temperature effects, Quadratic Element, Heat transfer problems: One-dimensional, conduction and convection problems. Examples: - one dimensional fin,

UNIT – III Trusses: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses, temperature effects.
Beams and Frames: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses.

UNIT – IV
Two dimensional problems: CST, LST, four noded and eight nodded rectangular elements, Lagrange basis for triangles and rectangles, serendipity interpolation functions. Axisymmetric Problems: Axisymmetric formulations, Element matrices, boundary conditions. Heat Transfer problems: Conduction and convection, examples: - two-dimensional fin.
Isoparametric formulation: Concepts, sub parametric, super parametric elements, numerical integration.

UNIT – V
Finite elements in Structural Dynamics: Dynamic equations, eigen value problems, and their solution methods, simple problems.
Convergence: Requirements for convergence, h-refinement and p-refinement, complete and incomplete interpolation functions, pascal's triangle.

Outcomes : Students can able to solve below following problems.

1. Heat Transfer problem
2. Simple non-linear problem
3. Projection tensor
4. Constitutive equations
5. Equilibrium equation

TEXT BOOK:
Finite element methods by Chandraputla & Belagondu.

REFERENCES:
1. Finite element method in Heat transfer and fluid dynamics, J.N.Reddy, CRC press,1994
2. Finite Element Method, Zienckiwicz O.C. & R. L. Taylor, McGraw-Hill,1983.
3. Finite Element of Nonlinear continua, . J. N. Oden, McGraw-Hill, New York, 1971
4. Finite element procedures, . K. J. Bathe, Prentice-Hall, 1996

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04102) COMPUTER INTEGRATED MANUFACTURING

OBJECTIVES:

1. This course will enable the student
2. To gain knowledge about the basic fundamental of CAD.
3. To gain knowledge on how computers are integrated at various levels of planning and manufacturing
   gunderstand computer aided planning and control and computer monitoring.

Unit – I Introduction: Fundamental concepts in Manufacturing and Automation, Automation Strategies, Economic analysis in production, fundamentals of CAD / CAM, product cycle and CAD/CAM, Automation and CAD/CAM, Scope of CIM, Automated flow lines, Transfer mechanisms, methods of Line balancing.
Numerical control machines: Introduction- basic components of an NC system-the NC procedure- NC coordinate system, NC motion control system- application of numerical control-Economics of Numerical control.

Unit – II NC part programming: Introduction - The Bunch tape in NC - Tape code format - manual part programming. NC programming with manual data input.

Unit – III Computer controls in NC: NC controllers' technology - Computer Numerical Control (CNC), Direct Numerical control (DNC).
Group Technology: Part families, parts classification and coding, production flow analysis, Composite part concept, Machine cell design, benefits of GT.
Unit – IV Flexible Manufacturing Systems: Components of FMS, FMS Work stations, Material Handling Systems, and Computer Control system, FMS layout configurations and benefits of FMS.
Computer aided planning systems: Approaches to Computer aided Process Planning (CAPP) - Generative and Retrieval CAPP systems, benefits of CAPP, Material Requirement Planning(MRP), mechanism of MRP, benefits, and Capacity Planning.
Unit – V
Computer integrated manufacturing: Adaptive control machining systems. adaptive control optimization system, adaptive control constraint system, applications to machining processes, computer process monitoring, hierarchical structure of computers in manufacturing, and computer process control.

Outcomes: Students will be able to

1. Understand the importance of product development through CIM.Get knowledge of shop floor control , Computer Integrated Manufacturing andAutomation.

2. Adopt appropriate material handling and storage in an automated manufacturing environment.

3. Incorporate methods of utilization of appropriate features in CAD application enhancing productivity in design

TEXT BOOKS:

1. Automation, Production systems and Computer Integrated Manufacturing Systems – Mikel P.Groover, PHI Publishers

REFERENCES:

1. CAD/CAM - Mikell P.Groover, and Emory W.Zimmers.Jr. PHI Publishers
2. Computer Aided Design and Manufacturing, K.Lalit Narayan, K.Mallikarjuna Rao, MMM Sarcar, PHI Publishers
3. CAD/CAM/CIM, Radhakrishnan and Subramanian, New Age Publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04103) ADVANCES IN MANUFACTURING TECHNOLOGY

Objectives:

"Technology Generation and Practical Deployment for enabling industries to face global competition" as opposed to "Technology Acquisition and Adoption".
1.Provide an integrated, effective and practical platform for
2.Create facilities for teaching, training and research & development work for post-graduate studies in various fields of manufacturing technology
3.Link up with national and international colleges/ universities of excellence to impart the education, maintain quality & content of curriculum and award degree certificates in post-Graduation / Doctorates
4.Provide facilities for international and national subject experts to stay, teach and conduct research projects / programmes on mutual exchange and recognition basis

Unit - I

Surface Processing Operations: Plating and Related Processes, Conversion Coatings, Physical Vapor Deposition, Chemical Vapor Deposition, Organic Coatings, Porcelain Enameling and other Ceramic coatings, Thermal and Mechanical Coating Processes.

Unit - II

Un-conventional Machining Methods

Abrasive jet machining - Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent developments. Ultrasonic machining: Elements of the process, machining parameters, effect of parameters on surface finish and metal removal rate, mechanics of metal removal process parameters, economic considerations, applications and limitations.

UNIT III

Electro-Chemical Processes: Fundamentals of electro chemical machining, metal removal rate in ECM, Tool design, Surface finish and accuracy economics aspects of ECM.

Wire EDM Process: General Principle and applications of Wire EDM, Mechanics of metal removal, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy.

Unit - IV

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, principle, advantages, limitations, comparison of thermal and non-thermal processes.

Plasma Arc Machining: Principle, machining parameters, effect of machining parameters on surface finish and metal removal rate, applications, limitations

Unit - V

Laser Beam Machining: Principle, effect of machining parameters on surface finish, applications, and limitations.

Rapid Prototyping: Working principle, methods-Steriolithography, Laser sintering, Fused deposition method, applications and limitations.

OUTCOMES

1. Analyze technical problems, propose solutions and document with written and oral reports.
2. Employ technology for communications, data collection, analysis, simulation and control.
3. Use Basic Project management skills, project team work and ethical behavior.
4. Machine a variety materials using a conversational and CNC lathe, milling machine and grinder.
5. Use the basic manufacturing methods, measurements, automation and quality control.
6. Code PLCs and micro controllers for networking and system control applications.
7. Apply engineering design and project management principles.
8. Use CAD/CAM and apply it to engineering graphics and mechanical design.
9. Apply the basics of engineering materials, structures and to mechanical design.
10. Read blueprints, perform component measurements and utilize the Machinery's Handbook.

TEXT BOOKS:

1. Manufacturing Technology - P. N. Rao, TMH Publishers
2. Fundamentals of Modern Manufacturing, Mikell P. Groover, John Wiley & Sons Publishers

REFERENCES:

1.Production Technology - HMT
2.Manufacturing Science - Cambel
3.Welding Technology - R.S, Parmar,
4.Introduction to Nanotechnology - Poole and Owens, Wiley (2003). Outcomes

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04104) DESIGN FOR CELLULAR MANUFACTURING SYSTEM
ELECTIVE - I

OBJECTIVES: To impart knowledge on group technology, optimization algorithms, implementation of GT/CMS, Performance measurements and economical aspects of CMS.

UNIT I

INTRODUCTION

Introduction to Group Technology, Limitations of traditional manufacturing systems, characteristics and design of groups, benefits of GT and issues in GT.

UNIT II

CMS PLANNING AND DESIGN

Problems in GT/CMS - Design of CMS - Models, traditional approaches and non-traditional approaches -Genetic Algorithms, Simulated Annealing, Neural networks.

UNIT III

IMPLEMENTATION OF GT/CMS

Inter and Intra cell layout, cost and non-cost based models, establishing a team approach, Managerial structure and groups, batch sequencing and sizing, life cycle issues in GT/CMS
.

UNIT IV

PERFORMANCE MEASUREMENT AND CONTROL

Measuring CMS performance - Parametric analysis - PBC in GT/CMS, cell loading, GT and MRP - framework.

UNIT V

ECONOMICS OF GT/CMS:

Conventional Vs group use of computer models in GT/CMS, Human aspects of GT/CMS - cases.

Out Comes: At the end of this course the student should be able to understand

1. Concepts and applications of Cellular manufacturing systems
2. Traditional and non-traditional approaches of Problem solving
3. Performance measurement
4. Human and economical aspects of CMS.

TEXT BOOKS:

1. Askin, R.G. and Vakharia, A.J., G.T " Planning and Operation, in The automated factory-Hand Book: Technology and Management ", Cleland.D.I. and Bidananda, B (Eds), TAB Books , NY, 1991.
2. Kamrani, A.K, Parsaei, H.R and Liles, D.H. (Eds), " Planning, design and analysis of cellular manufacturing systems ", Elsevier, 1995.

REFERENCES

1. Burbidge, J.L. Group " Technology in Engineering Industry ", Mechanical Engineering pub.London, 1979. 2. Irani, S.A. " Cellular Manufacturing Systems ", Hand Book.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04105) DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS ELECTIVE –I

OBJECTIVES:

To impart students on the science, use and application of hydraulics and pneumatics as fluid power in Industry. Also to impart knowledge on the methodology of basic and advanced design of pneumatics and hydraulics systems.

UNIT I

OIL HYDRAULIC SYSTEMS AND HYDRAULIC ACTUATORS

Hydraulic Power Generators – Selection and specification of pumps, pump characteristics. Linear and Rotary Actuators – selection, specification and characteristics.

UNIT II CONTROL AND REGULATION ELEMENTS

Pressure - direction and flow control valves - relief valves, non-return and safety valves - actuation systems.

UNIT III HYDRAULIC CIRCUITS

Reciprocation, quick return, sequencing, synchronizing circuits - accumulator circuits - industrial circuits - press circuits - hydraulic milling machine - grinding, planning, copying, - forklift, earth mover circuits- design and selection of components - safety and emergency mandrels.

UNIT IV PNEUMATIC SYSTEMS AND CIRCUITS

Pneumatic fundamentals - control elements, position and pressure sensing - logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods - step counter method - compound circuit design - combination circuit design.

UNIT V INSTALLATION, MAINTENANCE AND SPECIAL CIRCUITS

Pneumatic equipments- selection of components - design calculations – application -fault finding - hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

OUTCOME:

It helps students to get knowledge on the need, use and application of fluid power and make them familiar to industrial design that lead to automation.

REFERENCES

1. Antony Espossito, “Fluid Power with Applications”, Prentice Hall, 1980.
2. Dudleyt, A. Pease and John J. Pippenger, “Basic fluid power”, Prentice Hall, 1987.
3. Andrew Parr, “Hydraulic and Pneumatics” (HB), Jaico Publishing House, 1999. 4. Bolton. W., “Pneumatic and Hydraulic Systems “, Butterworth –Heinemann, 1997. 5. K.Shanmuga Sundaram, “Hydraulic and Pneumatic Controls: Understanding made Easy" S.Chand & Co Book publishers, New Delhi, 2006 (Reprint 2009).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04106) ADVANCED TOOL DESIGN
ELECTIVE -I

OBJECTIVES: The purpose of this course is to make the students to get familiarized with the design of various tools that can be implemented for different mechanical operations.

UNIT I

INTRODUCTION TO TOOL DESIGN

Introduction –Tool Engineering – Tool Classifications– Tool Design Objectives – Tool Design in manufacturing- Challenges and requirements- Standards in tool design-Tool drawings - Surface finish – Fits and Tolerances - Tooling Materials- Ferrous and Non ferrous Tooling Materials- Carbides, Ceramics and Diamond -Non metallic tool materials-Designing with relation to heat treatment.

UNIT II

DESIGN OF CUTTING TOOLS

Mechanics of Metal cutting –Oblique and orthogonal cutting- Chip formation and shear angle - Single-point cutting tools – Milling cutters – Hole making cutting tools- Broaching Tools - Design of Form relieved and profile relieved cutters-Design of gear and thread milling cutters.

UNIT III

DESIGN OF JIGS AND FIXTURES

Introduction – Fixed Gages – Gage Tolerances –selection of material for Gages – Indicating Gages – Automatic gages – Principles of location – Locating methods and devices – Principles of clamping – Drill jigs – Chip formation in drilling – General considerations in the design of drill jigs – Drill bushings – Methods of construction –Thrust and Turning Moments in drilling - Drill jigs and modern manufacturing- Types of Fixtures – Vise Fixtures – Milling Fixtures – Boring Fixtures – Broaching Fixtures – Lathe Fixtures – Grinding Fixtures – Modular Fixtures – Cutting Force Calculations.

UNIT IV

DESIGN OF PRESS TOOL DIES

Types of Dies –Method of Die operation–Clearance and cutting force calculations- Blanking and Piercing die design – Pilots – Strippers and pressure pads- Presswork materials – Strip layout – Short-run tooling for Piercing – Bending dies – Forming dies – Drawing dies-Design and drafting.

UNIT V

TOOL DESIGN FOR CNC MACHINE TOOLS

Introduction –Tooling requirements for Numerical control systems – Fixture design for CNC machine tools- Sub plate and tombstone fixtures-Universal fixtures– Cutting tools– Tool holding

methods– Automatic tool changers and tool positioners – Tool presetting– General explanation of the Brown and Sharp machine.

OUTCOMES:

It helps the students to get familiarized with advanced tool design for various mechanical operations which includes cutting, jigs and fixtures, press tool dies and modern CNC machine tools.

REFERENCES:

1. Cyrll Donaldson, George H.LeCain, V.C. Goold, "Tool Design", Tata McGraw Hill Publishing Company Ltd., 2000.
2. E.G.Hoffman," Jig and Fixture Design", Thomson Asia Pvt Ltd, Singapore, 2004
3. Prakash Hiralal Joshi, "Tooling data", Wheeler Publishing, 2000
4. Venkataraman K., "Design of Jigs, Fixtures and Presstools", TMH, 2005
5. Haslehurst M., "Manufacturing Technology", The ELBS, 1978.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04107) QUALITY ENGINEERING AND MANUFACTURING
Elective-II

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

UNIT-I

Quality value and Engineering: An overall quality system, quality engineering in production design, quality engineering in design production processes.

UNIT-II

Loss function and quality level: Derivation and use of quadratile 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-III

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, Introduction to tolerance design, tolerance design using the loss function, identification of tolerance design factors.

UNIT-IV

Design of Experiments: Introduction, Task aids and Responsibilities for DOE process steps, DOE process steps description.

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-V

Orthogonal Arrays: Typical test strategies, better test strategies, efficient test strategies, conducting and analyzing an experiment.

Interpolation of experimental results: Interpretation methods, percent contribution, estimating the mean

ISO-9000 Quality system, BDRE, 6-sigma, bench marking, quality circles-brain storming-fishbone diagram-problem analysis.

Outcomes:

Students to know the importance of the quality in their life and can make it as their habbit in all their activities.

TEXT BOOKS:

1. Taguchi techniques for quality engineering/Philip J.Ross / McGraw Hill Intl. 2nd Edition, 1995.

REFERENCES:

1. Quality Engineering in Production systems/G.Taguchi, A.Elasayed et al/Mc.Graw Hill Intl. Edition, 1989.
2. Taguchi methods explained: Practical steps to Robust Design/Papan P.Bagchi/Prentice Hall Ind. Pvt. Ltd. New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04108) COMPUTER AIDED PROCESS PLANNING
Elective-II

Objectives : After studying this unit, you should be able to understand what is process planning and CAPP,

1. To know the various steps involved in CAPP
2. To classify the various methods of CAPP
3. To understand the feature recognition in CAP
4. Notable requirements for process planning systems are consistency, accuracy, and ease of application and completeness.

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.

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

Unit – II

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

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 – III.

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.

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 – IV

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 –V

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.

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

1: Generate the structure of automated process planning system and uses the principle of generative and retrieval CAPP systems for automation CO

2: Select the manufacturing sequence and explains the reduction of total set up cost for a particular sequence CO

3: Predict the effect of machining parameters on production rate, cost and surface quality and determines the manufacturing tolerances CO

4: Explain the generation of tool path and solve optimization models of machining processes CO

5: Create awareness about the implementation techniques for CAPP

Text Books:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04109) DESIGN FOR MANUFACTURING
Elective-II

Objectives :

Students are study to know the Design philosophy, maching and joining processes, and factors for design.

UNIT – I

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production-creativity in design.
Materials: Selection of materials for design-developments in material technology-criteria for material selection-material selection interrelationship with process selection-process selection charts.

UNIT - II

Machining processes: 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 – III

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

UNIT – IV

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 – V

Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.
Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

Outcomes:

Students are able to know to make Design of the different kinds of the products to manufacture.

Text Books:

1. Design for manufacture, John cobert, Adisson Wesley. 1995
2. Design for Manufacture by Boothroyd,

REFERENCES:

1. ASM Hand book Vol.20

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year I Sem. (CAD/CAM)

L	T	P	C
0	0	4	2

(17D04110) MODELLING AND CNC LAB

A – MODELLING

1.Generation of the following curves using "C" language

i. Bezier curves
ii. Splines
iii. B-Splines.

2.Generation of the following surfaces using "C" language

i. Bezier surfaces
ii. B-Splines surfaces

3. Generation of solids using "C"

i. Constructive solid geometry
ii. Boundary representation

4. Typical tasks of Modeling using PRO/E,IDEAS, CATIA solid modeling packages

Surface modeling
Solid Modeling
Drafting and
Assembly

B – ANALYSIS

FE Analysis using Ansys Package for different structures that can be descretised with 1-D,2-D & 3-D elements to perform the following analysis:

1. Static Analysis
2. Modal Analysis
3. Thermal Analysis
4. Transient analysis

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04201) ADVANCED OPTIMIZATION TECHNIQUES

COURSE OBJECTIVES

1. To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems
2. To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
3. To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

UNIT - I

Linear programming: Two-phase simplex method, Big-M method, duality, interpretation, applications.

Assignment problem: Hungarian's algorithm, Degeneracy, applications, unbalanced problems, traveling salesman problem.

UNIT - II

Classical optimization techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.

UNIT - III

Numerical methods for optimization: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT - IV Genetic algorithm (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,

Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT - V

Multi-Objective GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems .

Applications of Optimization in Design and Manufacturing systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a

machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

Outcomes: student will be able to

1.understand importance of optimization of industrial process management

2.apply basic concepts of mathematics to formulate an optimization problem
3.analyse and appreciate variety of performance measures for various optimization problems

Text Books:
1. Optimal design – Jasbir Arora, Mc Graw Hill (International) Publishers
2. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers
3. Engineering Optimization – S.S.Rao, New Age Publishers

REFERENCES:
1.Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers
2. Genetic Programming- Koza
3. Multi objective Genetic algorithms - Kalyanmoy Deb, PHI Publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04202) INDUSTRIAL ROBOTICS & EXPERT SYSTEMS

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.

UNIT I

INTRODUCTION AND ROBOT KINEMATICS

Definition need and scope of Industrial robots – Robot anatomy – Work volume – Precision movement – End effectors – Sensors. Robot Kinematics – Direct and inverse kinematics – Robot trajectories – Control of robot manipulators – Robot dynamics – Methods for orientation and location of objects.

UNIT II

ROBOT DRIVES AND CONTROL

Controlling the Robot motion – Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro hydraulic servo valves, electric drives – Motors – Designing of end effectors – Vacuum, magnetic and air operated grippers.

UNIT III

ROBOT SENSORS

Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces – Robotic vision system – Image Representation - Image Grabbing –Image processing and analysis – Edge Enhancement – Contrast Stretching – Band Rationing - Image segmentation – Pattern recognition – Training of vision system.

UNIT IV

ROBOT CELL DESIGN AND APPLICATION

Robot work cell design and control – Safety in Robotics – Robot cell layouts – Multiple Robots and machine interference – Robot cycle time analysis. Industrial application of robots.

UNIT V

ROBOT PROGRAMMING, ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Methods of Robot Programming – Characteristics of task level languages lead through programming methods – Motion interpolation. Artificial intelligence – Basics – Goals of artificial intelligence – AI techniques – problem representation in AI – Problem reduction and solution techniques - Application of AI and KBES in Robots.

Outcomes: Students are to the basics kinematics of robotics, and are able to understand the robot programming and also artificial intelligence and expert systems in robotics.

TEXT BOOK: 1. K.S.Fu, R.C. Gonzalez and C.S.G. Lee, "Robotics Control, Sensing, Vision and Intelligence", Mc Graw Hill, 1987.

REFERENCES

1. Yoram Koren," Robotics for Engineers' Mc Graw-Hill, 1987.
2. Kozyrey, Yu. "Industrial Robots", MIR Publishers Moscow, 1985.
3. Richard. D, Klafter, Thomas, A, Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Prentice-Hall of India Pvt. Ltd., 1984.
4. Deb, S.R." Robotics Technology and Flexible Automation", Tata Mc Graw-Hill, 1994.
5. Mikell, P. Groover, Mitchell Weis, Roger, N. Nagel, Nicholas G. Odrey," Industrial Robotics Technology, Programming and Applications", Mc Graw-Hill, Int. 1986.
6. Timothy Jordanides et al ,"Expert Systems and Robotics ", Springer –Verlag, New York, May 1991.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04203) CNC TECHNOLOGY & PROGRAMMING

Objectives: To study

1. Safety in the CNC environment
2. CNC Machine Tools compared to Manual Machine tools
3. Repeatability and Speed is the Key to CNC C. Programming
4. Manual Programming
5. CAD/CAM Programming CNC Lathe 1. Uses 2. Setups 3. Tooling 4. CNC Lathe Project
6. CNC Mill a. Uses b. Setups c. Tooling d. CNC Mill Project Course Topic

Unit – I

Introduction to CNC Machine tools: Evolution of Computerized control in manufacturing, Components, Working principle of CNC, DNC and Machining centers.

Constructional features of CNC machine tools: Introduction, Spindle drives, Transmission belting, axes feed drives, Slide ways, Ball screws.

Accessories: Work tables, Spindles, Spindle heads, Beds and Columns, Tooling – Automatic Tool changer (ATC).

Unit – II

Feedback devices: Introduction, Digital incremental displacement measuring systems, Incremental rotary encoders, Moire fringes, Digital absolute measuring system.

Electro-magnetic analogue position transducers: Principle, advantages, characterstics, Synchros, Synchro-Resolvers, Inductos, Laser interferometer.

Unit – III

Control Systems and interface: Open and closed loop systems, Micro processor based CNC systems, block diagram of typical CNC system, description of hard ware and soft interpolation systems, Standard and optional features of CNC control systems.

Unit – IV

APT programming: APT language structure, APT geometry, Definition of point, time, vector, circle, plane, patterns and matrices. APT motion commands: setup commands, point-to point motion commands, continuous path motion commands, post processor commands, control commands, Macro subroutines, Part programming preparation for typical examples.

Unit – V

Economics and Maintenance of CNC machine tools: Introduction, factors influencing selection of CNC machines, Cost of operation of CNC machines, Maintenance features of CNC machines, Preventive maintenance, Documentation, Spare parts, Training in Maintenance.

OUTCOMES: Upon completion of this course, the student will be able to:

1. Understand the basic procedures and concepts of programming, set up and operation of a CNC Machining Center.
2. Identify and understand the basic programming codes.
3. Create geometry and toolpaths from the specifications on a blueprint for simple parts using Mastercam programming software.
4. Identify and define the functions of the CNC machine control.
5. Set up the CNC machining center for manufacturing simple parts
6. Manufacture simple parts on the CNC machining center.

Text Books:

1. 1.Computer Numerical Control Machines – Dr.Radha Krishnanan, New Central Book Agency
2. 2.Computer Numerical Control Machines – Hans B.Keif and T. Frederick Waters Macmillan/McGraw Hill

References:

1. 1.CNC Machines – B.S. Aditahn and Pabla
2. 2.CNC Machining technology – Springer – Verlag
3. 3.Computer Numerical Machine tools - G.E. Thyer, NEWNES

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04204) MECHATRONICS APPLICATIONS IN MANUFACTURING

Course Objectives: The general objectives of the course are to enable the students to

1. Understand architecture of the mechatronics system design and characteristics of sensors and actuators and their selection for mechatronic systems.
2. Learn the basic concepts of microprocessor, microcontroller and PLC used in mechatronics system.
3. Learn underlying concepts of MEMS and its applications in micro-manufacturing.

UNIT I

INTRODUCTION

Introduction to Mechatronics - Systems - Mechatronics in Products - Measurement Systems - Control Systems - Traditional design and Mechatronics Design.

UNIT II

SENSORS AND TRANSDUCERS

Introduction - Performance Terminology - Displacement, Position and Proximity - Velocity and Motion - Fluid pressure - Temperature sensors - Light sensors - Selection of sensors - Signal processing - Servo systems.

UNIT III

MICROPROCESSORS IN MECHATRONICS

Introduction - Architecture - Pin configuration - Instruction set - Programming of Microprocessors using 8085 instructions - Interfacing input and output devices - Interfacing D/A converters and A/D converters –Applications - Temperature control - Stepper motor control - Traffic light controller.

UNIT IV

PROGRAMMABLE LOGIC CONTROLLERS

Introduction - Basic structure - Input / Output processing - Programming -Mnemonics Timers, Internal relays and counters - Data handling - Analog input / output - Selection of PLC

.

UNIT V

DESIGN AND MECHATRONICS

Designing - Possible design solutions - Case studies of Mechatronics systems.

Outcomes: At the end of the course the students shall be able to

1. Interface sensor and actuator for a mechatronic system.
2. Indigenously design and develop a mechatronic system.
3. Design and develop MEMS for various industrial applications.

TEXT BOOKS:

1. Michael B.Histand and David G. Alciatore, " Introduction to Mechatronics and Measurement Systems", McGraw-Hill International Editions, 1999.
2. Bradley, D.A., Dawson, D, Buru, N.C. and Loader, AJ, "Mechatronics ", Chapman and Hall, 1993.
3. Ramesh.S, Gaonkar, "Microprocessor Architecture, Programming and Applications" Wiley Eastern, 1998.
4. Lawrence J.Kamm, " Understanding Electro-Mechanical Engineering, An Introduction to Mechatronics ", Prentice-Hall, 2000.
5. Ghosh, P.K. and Sridhar, P.R., 0000 to 8085, "Introduction to Microprocessors for Engineers and Scientists ", Second Edition, Prentice Hall, 1995.

WEB REFERENCE:

1. www.cs.Indiana.edu.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04205) COMPUTER GRAPHICS
Elective-III

Objective: The students can understand the Basics of computer Graphics like drawing line, arc etc., Drawing of spline curves ,Creation of surfaces, Algorithms for 3D viewing, Available drawing standards

Unit - I

Introduction to computer graphics: Color CRT raster scan monitors, plasma display & liquid crystal display monitors, computer input devices, hard copy devices.

Raster scan graphics: Line drawing algorithms – DDA & Bresenham algorithms, circle generation, general function rasterization, displaying lines, characters and polygons

Unit - II

Filling algorithms: polygon filling, edge fill algorithm, seed fill algorithm, fundamentals of antialiasing and half toning.

Unit – III

Line CLIPPING: Simple visibility algorithm, Cohen-Sutherland subdivision line clipping algorithm, mid point sub division algorithm.

Polygon clipping: polygon clipping, reentrant polygon clipping – Sutherland – Hodgeman algorithm, character clipping, 3D- clipping.

Unit - IV

Transformations: Cartesian and homogeneous coordinate systems two dimensional and three dimensional transformations – scaling, rotation, Shearing, Zooming, viewing transformation, reflection, rotation about an axis, concatenation.

Unit - V

Rendering: Hidden line removal algorithms, surface removal algorithms, painters, Warnock, Z-buffer algorithm.

Shading algorithms: Constant intensity algorithm, Phong's shading algorithm, gourand shading algorithm, Comparison of shading algorithms.

Outcomes:The students can understand the following

1. Basics of computer Graphics like drawing line, arc etc.
2. Drawing of spline curves
3. Creation of surfaces
4. Algorithms for 3D viewing
5. Available drawing standards
6. Basics of computer Graphics like drawing line, arc etc.

Text Books:

1. Procedural elements for computer graphics-D.F.Rogers, Tata McGraw-Hill.
2. Computer Graphics-Donald Hearn & M.P. Bakers.
3. Computer graphics-Harrington.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04206) GLOBAL INTEGRATED MANUFACTURING
Elective-III

Objectives: Globaly Emphasizes the integration of manufacturing enterprise using computer-integrated manufacturing (CIM) technologies. It employs CAD/CAM interface and other CIMsubsystems, database management, facility layout, Grouptechnology, teamwork, and manufacturing operations.

UNIT –I

INTRODUCTION: Evolution of manufacturing, CAD/CAM and CIM – Globalization - Scope of CIM - Segments of generic CIM, computers and workstations, an overview of CIM software. World class manufacturing and its importance.

UNIT -II

GLOBAL MANUFACTURING ENTERPRISE: Global manufacturing revolution – Reconfigurable machine – Reconfigurable manufacturing system - Production design for globalization – Location of manufacturing plants – Global business strategies – Global strategic alliance – IT-based enterprise – Information transfer in manufacturing systems - PRIDE – Competitive advantage: Logistics – Strategic sourcing - Supply chain - The dilemma of globalization – Where manufacturing enterprises heading? (6)

UNIT -III

INTERNATIONAL LOGISTICS: Introduction – supply chain background - outbound logistics functions – inbound logistics functions – overall logistics activities – logistics intermediates. Economic importance. Logistics media: ocean ships (cargo types), air transportation, surface transportation. Terms of sale and payment. Documentation and insurance: cargo, hull, air, land transport – settlement of insurance – claims. Famine relief logistics – demand forecasting – sourcing models – packaging – managing inventories - site/route selection – warehousing and storage.

INTERNAL SOURCING: Introduction – why sourcing is global? – design of global sourcing system – global sourcing and procurement – issues in import and export.

FUTURE ISSUES IN INTERMEDIATE LOGISTICS: Overview – increase use of world-class logistics practices – multi-country trade alliances – one stop shopping concept – amodalism – environmental concerns – space transportation and exploration – The internet.

UNIT - IV

CNC TECHNOLOGY AND ROBOTIC SYSTEMS: Principles of numerical control, types of CNC machines, features of CNC systems, programming techniques, capabilities of a typical NC, CAM software, integration of CNC machines in CIM environment, DNC – FMS – objectives – components – FMS layout configurations – FMS classification – ERP. Material handling systems – basics and advanced: conveyor analysis, AGV analysis. Warehousing – storage and retrieval systems: AS/RS analysis. Overview of JIT. Robotic systems-types of robots and their performance capabilities, programming of robots, hardware of robots, kinematics of robots, product design for robotized manufacturing, applications of robots in manufacturing and

assembly. Process planning, variant and generative process planning methods – manual vs CAPP - AI in process planning.

UNIT V

MANUFACTURING SYSTEM SOFTWARE: CIM architecture - Production management system (PMS) - forecasting, master production schedule, MRP, capacity planning, shop floor control (SFC), factory data collection system (FDS) – Automatic data capture (ADC) method and its techniques – Bar code – types of bar codes – Data acquisition system - inventory management, product routing, job costing, marketing applications – Applications of ADC - Basics of networking concepts, networking devices.

VIRTUAL ORGANISATION: Paperless factory – Mobile office - Introduction of virtual reality and application - Virtual prototyping – Virtual manufacturing - Virtual instrumentation and measurement - Virtual enterprises

Outcomes: 1. Develop an understanding of computer-integrated manufacturing (CIM) and its impact on productivity, product cost, and quality.

2.Obtain an overview of computer technologies including computers, database and data collection, networks, machine control, etc, as they apply to factory management and factory floor operations.

3.Describe the integration of manufacturing activities into a complete system.

REFERENCES:

1. Donal F Wood, Anthony P Barone, Paul R Murthy and Daniel L Wardlow, “International logistics”, AMACOM, 2007.

2. Voram Koren, “The Global Manufacturing Revolution: Product – Process – Business Integration and Reconfigurable Systems”, Kindle Edition, 2011.

3. Mikell P Groover, “Automation of Production Systems and Computer Integrated Manufacturing”, Pearson Education, New Delhi, 2001.

4. Lee Kunwoo, “CAD/CAM/CAE Systems”, Addition, Wesley, USA, 1999.

5. Kant Vajpayee S, “Principles of Computer Integrated Manufacturing”, Prentice Hall, India, New Jersey, 2003.

6. Radhakrishnan P, Subramanyan S and Raju V, “CAD/CAM/CIM”, New Age International Pvt. Ltd, New Delhi,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04207) COMPUTER AIDED TOOLS FOR MANUFACTURING
Elective-III

OBJECTIVES:

The purpose of this course is to make the students to get familiarized with various computer aided tools that can be implemented in various industrial applications

UNIT I

COMPUTER AIDED MANUFACTURING

Manufacturing Processes – Removing, Forming, Deforming and joining – Integration Requirements. Integrating CAD, NC and CAM – Machine tools – Point to point and continuous path machining, NC, CNC and DNC – NC Programming – Basics, Languages, G Code, M Code, APT – Tool path generation and verification – CAD/CAM NC Programming – Production Control – Cellular Manufacturing

UNIT II

COMPUTER AIDED PROCESS PLANNING

Role of process planning in CAD/CAM Integration – Computer Aided Process Planning – Development, Benefits, Model and Architecture – CAPP Approaches – Variant, Generative and Hybrid – Process and Planning systems – CAM-I, D-CLASS and CMPP – Criteria in selecting a CAPP System.

UNIT III

COMPUTER AIDED INSPECTION

Engineering Tolerances – Need for Tolerances – Conventional Tolerances – FITS and LIMITS – Tolerance Accumulation and Surface quality – Geometric Tolerances – Tolerances Practices in design, Drafting and manufacturing – Tolerance Analysis – Tolerance synthesis – Computer Aided Quality control – Contact Inspection Methods – Non Contact Inspection Methods - Non optical.

UNIT IV

REVERSE ENGINEERING

Scope and tasks of Reverse Engineering – Domain Analysis – Process Duplicating – Tools for RE – Developing Technical data – Digitizing techniques – Construction of surface model – Solid part model – Characteristic evaluation – Software's and its application – CMM and its feature capturing – surface and solid modeling.

UNIT V

DATA MANAGEMENT

Strategies for Reverse Engineering Data management – Software application – Finding renewable software components – Recycling real time embedded software – Design experiments to evaluate a RE tools – Rule based detection for RE user interface – RE of assembly programs.

OUTCOME:

It helps the students to get familiarized with computer aided tools for various industrial applications which includes manufacturing, process planning, inspection, data management and reverse engineering.

REFERENCES

1. Ibrahim Zeid and R. Sivasubramanian, "CAD/CAM Theory and Practice", Revised First special Indian Edition, Tata Mc Graw Hill Publication, 2007
2. Catherine A. Ingle, "Reverse Engineering", Tata Mc Graw Hill Publication, 1994
3. Ibrahim Zeid, "Mastering CAD/CAM", special Indian Edition, Tata Mc Graw Hill Publication, 2007
4. David D. Bedworth, Mark R. Henderson, Philp M. Wolfe, "Computer Integrated Design and manufacturing", Mc Graw Hill International series, 1991
5. Linda Wills, "Reverse Engineering" Kluwer Academic Press, 1996
6. Donald R. Honra, "Co-ordinate measurement and reverse Engineering, American Gear Manufacturers Association.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04208) RAPID PROTOTYPING
Elective-IV

OBJECTIVES:

At the end of this course the students would have developed a thorough understanding of the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Rapid Prototyping Technologies.

Unit-I

Introduction: Need for the compression in product development, History of RP system, Survey of applications, Growth of RP industry and classification of RP system.

Stereo Lithography System: Principle, Process parameter, Process details, Data preparation, Data files and machine details, Applications.

Unit –II

Fusion Decomposition Modeling: Principle, process parameter, Path generation, Applications.

Solid ground curing: Principle of operation, Machine details, Applications,

Unit III

Laminated Object Manufacturing: Principle of Operation, LOM materials, Process details, Applications.

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer, Genisys Xs printer HP system 5, Object Quadra system.

Unit IV

LASER ENGINEERING NET SHAPING (LENS)

Rapid Tooling: Indirect Rapid tooling- Silicon rubber tooling- Aluminum filled epoxy tooling Spray metal tooling, Cast kriksite, 3Q keltool, etc, Direct Rapid Tooling Direct. AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft, Tooling vs. hard tooling.

Software for RP: STL files, Overview of Solid view, magics, imics, magic communication, etc. Internet based software, Collaboration tools.

Unit –V

Rapid Manufacturing Process Optimization: Factors influencing accuracy, Data preparation error, Part building error, Error in finishing, Influence of build orientation.

OUTCOME: It helps the students to get familiarized with the various methods of rapid prototyping technologies and rapid tooling.

TEXT BOOKS:

1. " stereo lithography and other RP & M Technologies**"**, Paul F.Jacobs, SME, NY 1996
2. " Rapid Manufacturing **",** Flham D.T & Dinjoy S.S, Verlog London 2001
3. "Rapid automated**"**, Lament wood, Indus Press New York.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04209) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS
Elective-IV

OBJECTIVES:

The student should be made to study the concepts of Artificial Intelligence. 1.Learn the methods of solving problems using Artificial Intelligence.

2. Introduce the concepts of Expert Systems and machine learning.

Unit-I

Artificial Intelligence : Introduction, definition, underlying assumption, Important of Al, Al & related fields State space representation, defining a problem, production systems and its characteristic, search and control strategies –Introduction, preliminary concepts, examples of Search , problems.

Uniformed or preliminary Concept: Examples of search problems, Uniformed or Blind Search, Informed Search, Or Graphs, Heuristic Search techniques- Generate and Test, Hill climbing, Best first search, Problem reduction, Constraint satisfaction, Means- Ends Analysis.

Unit-II

Knowledge Representation Issues: Representations and Mapping, Approaches, Issues in Kr, Types of knowledge procedural Vs Declarative, Logic programming, Forward Vs Backward reasoning, Matching, Non monotonic reasoning and it logic.

Use of Predicate Logic: Representing simple facts, Instance and is a relationships, Syntax and Semantics for Propositional logic, FOPL, and properties of Wffs, conversion to casual form, Resolution, Natural deduction

Unit III

Statistical and Probabilistic Reasoning: Symbolic reasoning under uncertainly, Probability and Bayes theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic

Unit-IV

Expert Systems: Introduction, Structure and uses, Representing and using domain knowledge, Expert System Shells. Pattern recognition, introduction, Recognition and classification process, learning classification patterns, recognizing and understanding speech.

Introduction to Knowledge Acquisition: Types of learning, General learning model, and performance measures.

Unit-V

Typical Expert Systems: MYCIN, Variants of MYCIN, PROSPECTOR DENDRAL, PRUFF etc.

Introduction to Machine Learning: Perceptons, Checker Playing examples, Learning, Automata, Genetic Algorithms, Intelligent Editors.

OUTCOMES: At the end of the course, the student should be able to:

1.Identify problems that are amenable to solution by AI methods.

2. Identify appropriate AI methods to solve a given problem.

3. Formalise a given problem in the language/framework of different AI methods.

4 Implement basic AI algorithms.

5. Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

TEXT BOOKS

1. " Artificial Intelligence**"** , Elaine Rich & Kevin Knight**,**M/H 1983
2. **"**Artificial Intelligence in Business**"**, Wendry B.Ranch**,** Science & Industry –Vol -II application, Ph 1985.
3. **"** A Guide to Expert System**"** Waterman, D.A., Addison,– Wesley inc. 1986.
4. **"**Building expert sys**tem"** Hayes, Roth, Waterman, D.A (ed), AW 1983.
5. **"**Designing Expert System**"**, S.M. and Kulliknowske Weis, London Champion Hull 1984.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
4	0	0	4

(17D04210) PROCESSING OF COMPOSITE MATERIALS

Elective-IV

Objectives

Students are able to study the composite materials its applications,and failure analysis of composite materials.

UNIT-I

Introduction to Composite Materials: Introduction ,Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber-Reinforced Composites and nature-made composites, and applications .

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

Processing methods: Autoclave, contact moulding, compression moulding, filament winding, man layup, pultrusion, vaccum assisted RTM .

UNIT-II

Macromechanical Analysis of a Lamina :Introduction ,Definitions: Stress, Strain ,Elastic Moduli,Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two-Dimensional Unidirectional Lamina, Plane Stress Assumption, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina,

UNIT-III

Hooke's Law for a Two-Dimensional Angle Lamina, Engineering Constants of an Angle Lamina, Invariant Form of Stiffness and Compliance Matrices for an Angle Lamina Strength Failure Theories of an Angle Lamina : Maximum Stress Failure Theory Strength Ratio,Failure Envelopes,Maximum Strain Failure Theory ,Tsai–Hill Failure Theory, Tsai–Wu Failure Theory, Comparison of Experimental Results with Failure Theories. Hygrothermal Stresses and Strains in a Lamina: Hygrothermal Stress–Strain Relationships for a Unidirectional Lamina, Hygrothermal Stress–Strain Relationships for an Angle Lamina

UNIT-IV

Micromechanical Analysis of a Lamina :Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi-Empirical Models ,Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion.

UNIT-V

Macromechanical Analysis of Laminates: Introduction , Laminate Code , Stress–Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate , Hygrothermal Effects in a Laminate, Warpage of Laminates

Failure, Analysis, and Design of Laminates : Introduction , Special Cases of Laminates, Failure Criterion for a Laminate, Design of a Laminated Composite, Other Mechanical Design Issues

Outcome: After learning the course the students should be able to

1. Analyse composites materials of various constituents and its applications.
2. Understand micromechanical and macromechanical failure analysis and design of laminal.
3. Design components for various applications using composites

Text Books:

1. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.
2. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley- Interscience, New York, 1980.
3. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw ,**Publisher:** CRC

REFERENCES:

1. 1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.
2. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M. Tech – I year II Sem. (CAD/CAM)

L	T	P	C
0	0	4	2

(17D04211) CAD/CAM LAB

CAD lab

OBJECTIVES:

1 To review and train in CAD modeling.

2. To train on various areas of finite element analysis of mechanical components.

CAM lab

1. To train on part programming and program generation from a CAD model.

2. To train on machining in various CNC machines.

3. To train on various modern measuring instruments.

PART A

Practice in part programming and operating of a machining centre tool planning and selection of sequences of operations.

Tool setting on a machine,

Practice in APT based NC programming.

PART B

1.Generation of part programs on CNC Lathe machine to perform the following operations:

i) Step Turning

ii) Taper Turning and

2.Part program for thread cutting using Canned cycle

3.Generation of part programs on CNC drilling machine

4.Generation of part programs on CNC milling machine to perform

i) Slot milling

ii) End milling and

5. Cutting tool path generation using any one simulation package for different machining operations

6. Graphical simulation of tool path

Suggested Software Packages: PRO/E, I-DEAS, Uni-graphics, Iron CAD, Edge-CAM etc.

. PART C

Practice in Robot programming and its languages.

Robot simulation using software. Robot path control

Simulation of Manufacturing system using CAM software, controller operating system commands

OUTCOMES:1. Students will be able to review and train in CAD modeling.

2. Students will be get trained on various areas of finite element analysis of mechanical components.

3.Students would get trained on part programming and program generation from a CAD model•

4.Students would get trained on machining in various CNC machines,Students would get trained on various modern measuring instruments

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M.Tech III semester (CAD/CAM)

L	T	P	C
4	0	0	4

(17D20301) RESEARCH METHODOLOGY
(Elective V-OPEN ELECTIVE)

UNIT I

Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

UNIT II

Sampling Design – steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design.
Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation.
Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

UNIT III

Correlation and Regression Analysis – Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

UNIT IV

Statistical Inference: Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multi-variate Analysis.

UNIT V

Report Writing and Professional Ethics: Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

Text Books:

1. Research Methodology:Methods And Techniques – C.R.Kothari, 2nd Edition,New Age International Publishers.
2. Research Methodology: A Step By Step Guide For Beginners- Ranjit Kumar, Sage Publications (Available As Pdf On Internet)

3. Research Methodology And Statistical Tools – P.Narayana Reddy And G.V.R.K.Acharyulu, 1st Edition,Excel Books,New Delhi.

REFERENCES:

1. Scientists Must Write - Robert Barrass (Available As Pdf On Internet)
2. Crafting Your Research Future –Charles X. Ling And Quiang Yang (Available As Pdf On Internet)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech III semester (CAD/CAM)

L	T	P	C
4	0	0	4

(17D20302) HUMAN VALUES AND PROFESSIONAL ETHICS
(Elective V-OPEN ELECTIVE)

Unit I:

HUMAN VALUES:Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

Unit II:

ENGINEERING ETHICS: Senses of Engineering Ethics- Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg‟s theory- Gilligan‟s theory- Consensus and controversy – Models of professional roles- Theories about right action- Self interest - Customs and religion –Uses of Ethical theories – Valuing time –Co operation – Commitment.

Unit III :

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

UNIT IV:

ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK: Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing riskSafety and the Engineer- Designing for the safety- Intellectual Property rights(IPR).

UINIT V:

GLOBAL ISSUES: Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics .

Text Books :

1. “Engineering Ethics includes Human Values” by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
2. “Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. “Ethics in Engineering” by Mike W. Martin and Roland Schinzinger – Tata McGrawHill– 2003.

4. “Professional Ethics and Morals” by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
5. “Professional Ethics and Human Values” by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran , Laxmi Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech III semester (CAD/CAM)

L	T	P	C
4	0	0	4

(17D20303) INTELLECTUAL PROPERTY RIGHTS
(Elective V-OPEN ELECTIVE)

UNIT – I

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

UNIT – II

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

UNIT – III

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

UNIT – IV

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.

Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

UNIT – V

New Development Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

TEXT BOOKS & REFERENCES:

1. Intellectual Property Right, Deborah. E. Bouchoux, Cengage Learing.
2. Intellectual Property Right – Nleashmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,