JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech. (CAD/CAM)
COURSE STRUCTURE AND SYLLABUS

I Year – I Semester

<table>
<thead>
<tr>
<th>Category</th>
<th>Course Title</th>
<th>Int. marks</th>
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<tr>
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<td>Mechanical Behaviour of Materials Stress Analysis and Vibration Rapid Prototyping Technologies</td>
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<td>Automation in Manufacturing Computer Aided Process Planning Performance Modeling and Analysis of Manufacturing Systems</td>
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<td>Numerical Methods for Partial Differential Equations Production and Operations Management</td>
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I Year – II Semester

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<td>Intelligent Manufacturing Systems Special Manufacturing Process Design Optimization</td>
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<td>Advanced Mechatronics Design and Manufacturing of MEMS and Micro Systems Fuzzy Logic and Neural Networks</td>
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II Year - I Semester

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II Year - II Semester

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M.Tech – I year I Sem. (CAD/CAM)

ADVANCED CAD

UNIT- I:
CAD Tools: Definition of CAD Tools, Graphics standards, Graphics software: requirements of graphics software, Functional areas of CAD, Efficient use of CAD software.

UNIT- II:
Eometricmodelling: Classification of wireframe entities, Curve representation methods, Parametric representation of analytic curves: line, circle, arc, conics, Parametric representation of synthetic curves: Hermite cubic curve, Bezier curve, B-Spline curve wire , NURBS, Curve manipulations.

UNIT- III:
Surface Modeling : Classification of surface entities, Surface representation methods, Parametric representation of analytic surfaces: plane surface, ruled surface, surface of revolution, tabulated cylinder, Parametric representation of synthetic curves: Hermite cubic surface, Bezier surface, B-Spline surface , Blending surface, Surface manipulations.

UNIT- IV:

UNIT- V:
Evaluation Criteria: Evaluation criteria of CAD software, Data exchange formats: GKS, IGES, PHIGS,CGM, STEP
Dimensioning and tolerances: Linear, angular, angular dimensions, maximum material condition (MMC), Least material condition (LMC), Regardless of feature size (RFS).

TEXT BOOKS:
1. CAD/CAM Concepts and Applications/ Alavala/ PHI.

REFERENCES :
1. CAD/CAM Principles and Applications/ P.N.Rao/TMH/3rd Edition
2. CAD/CAM /Groover M.P./ Pearson education
3. CAD / CAM / CIM, Radhakrishnan and Subramanian/ New Age
4. Principles of Computer Aided Design and Manufacturing/ Farid Amirouch/ Pearson
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech – I year I Sem. (CAD/CAM)

UNIT - I
Computer Aided Programming:
General information, APT programming, Examples APT programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors. Introduction to CAD/CAM software, Automatic Tool Path generation.

UNIT - II
Tooling for CNC Machines:
Interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers. DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages and disadvantages of DNC, adaptive control with optimization, Adaptive control with constrains, Adaptive control of machining processes like turning, grinding.

UNIT - III
Post Processors for CNC:
Introduction to Post Processors: The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor. DAPP—based Post Processor: Communication channels and major variables in the DAPP—based Post Processor, the creation of a DAPP—Based Post Processor.

UNIT - IV
Micro Controllers:

UNIT - V
Computer Aided Process Planning:

TEXT BOOKS:
1. CAD/CAM Concepts and Applications/ Alavala/ PHI
2. CAD/CAM Principles and Applications, P.N.Rao, TMH

REFERENCES:
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age
M.Tech – I year I Sem. (CAD/CAM)

ADVANCED FINITE ELEMENT METHODS

UNIT-I:
Introduction to FEM, basic concepts, historical background, applications of FEM, general description, comparison of FEM with other methods, variational approach, Glerkin’s Methods. 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-II:
1-D Structural Problems: Axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape functions and problems.
Analysis of Trusses: Plane Trusses and Space Truss elements and problems

UNIT-III:

UNIT-VI:

UNIT-V:

TEXT BOOKS:
1. Finite Element Methods: Basic Concepts and applications, Alavala, PHI.

REFERENCES:
2. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu, Prentice – Hall
5. Finite Element Method – Krishna Murthy / TMH
6. Finite Element Analysis – Bathe / PHI
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech – I year I Sem. (CAD/CAM)

MECHANICAL BEHAVIOUR OF MATERIALS
(Core Elective – I)

UNIT-I:
Introduction to Deformation Behaviour: Concept of stresses and strains, engineering stresses and strains, Different types of loading and temperature encountered in applications, Tensile Test - stress-strain response for metal, ceramic and polymer, elastic region, yield point, plastic deformation, necking and fracture, Bonding and Material Behaviour, theoretical estimates of yield strength in metals and ceramics.

UNIT-II:
Elasticity Theory: The State of Stress and strain, stress and strain tensor, tensor transformation, principal stress and strain, elastic stress-strain relation, anisotropy, elastic behaviour of metals, ceramics and polymers.

Yielding and Plastic Deformation: Hydrostatic and Deviatoric stress, Octahedral stress, yield criteria and yield surface, texture and distortion of yield surface, Limitation of engineering strain at large deformation, true stress and true strain, effective stress, effective strain, flow rules, strain hardening, RambergOsgood equation, stress -strain relation in plasticity, plastic deformation of metals and polymers

UNIT-III:
Microscopic view of plastic deformation: crystals and defects, classification of defects, thermodynamics of defects, geometry of dislocations, slip and glide, dislocation generation - Frank Read and grain boundary sources, stress and strain field around dislocations, force on dislocation - self-stress, dislocation interactions, partial dislocations, twinning, dislocation movement and strain rate, deformation behavior of single crystal, critical resolved shear stress (CRSS), deformation of poly-crystals - Hall-Petch and other hardening mechanisms, grain size effect - source limited plasticity, Hall-Petch breakdown, dislocations in ceramics and glasses.

UNIT-IV:
Fracture: fracture in ceramics, polymers and metals, different types of fractures in metals, fracture mechanics - Linear fracture mechanics -KIC, elasto-plastic fracture mechanics - JIC, Measurement and ASTM standards, Design based on fracture mechanics, effect of environment, effect of microstructure on KIC and JIC, application of fracture mechanics in the design of metals, ceramics and polymers

UNIT-V:
Deformation under cyclic load - Fatigue: S-N curves, Low and high cycle fatigue, Life cycle prediction, Fatigue in metals, ceramics and polymers

Deformation at High temperature: Time dependent deformation - creep, different stages of creep, creep and stress rupture, creep mechanisms and creep mechanism maps, creep under multi-axial loading, microstructural aspects of creep and design of creep resistant alloys, high temperature deformation of ceramics and polymers.

REFERENCES:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech – I year I Sem. (CAD/CAM)

STRESS ANALYSIS AND VIBRATION
(Core Elective – I)

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 freedom systems, multi-degree of freedom systems —
applications of matrix methods, continuous systems.

UNIT -V:
Free and forced vibrations of strings bars and beCAD/CAM. Principle of orthogonality - classical and
energy methods.

REFERENCES:
2. Advanced strength of materials / Den Hortog J.P./Torrent
4. Theory of Vibrations with Applications/ Thomson W.T./ CBS Publishing
5. Mechanical Vibrations/ Rao S.S./ Addison Wesley Longman
M.Tech – I year I Sem. (CAD/CAM)

RAPID PROTOTYPING TECHNOLGIES
(Core Elective – I)

Unit – I

Unit – II

Unit – III

Unit – IV

Unit – V

TEXT BOOKS:

REFERANCE BOOKS:
Jawaharlal Nehru Technological University Hyderabad

M.Tech – I year I Sem. (CAD/CAM)

Automation in Manufacturing
(Core Elective – II)

UNIT – I
Over View of Manufacturing and Automation: Production systems, Automation in production systems, Automation principles and strategies, Manufacturing operations, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers.

UNIT – II:

UNIT – III:

UNIT – IV:

UNIT – V:
Quality Control and Support Systems: Quality in Design and manufacturing, inspection principles and strategies, Automated inspection, contact Vs non contact, CMM. Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.

REFERENCES:
2. Automation, Production Systems and CIM/ Mike J P. Grower/PHI
M.Tech – I year I Sem. (CAD/CAM)

COMPUTER AIDED PROCESS PLANNING
(Core Elective – II)

UNIT-I:

UNIT-II:

UNIT-III:
Process Engineering and Process Planning: Experience based planning- Decision table and Decision trees- Process capability analysis- Process planning- Variant process planning- Generative approach- Forward and backward planning, Input format, AI.

UNIT-IV
Computer Aided Process Planning Systems: Logical Design of process planning- Implementation considerations-Manufacturing system components, Production Volume, No. of production families- CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP.

UNIT-V

REFERENCE BOOKS:
UNIT I:

UNIT II:

UNIT III:
Queuing Model: Notation for queues – Examples of queues in manufacturing systems – Performance measures – Little’s result – Steady state analysis of M/M/m queue, queues with general distributions and queues with breakdowns – Analysis of a flexible machine center.

UNIT IV:

UNIT V:

REFERENCES:
1. Performance Modelling of Automated Manufacturing Systems/ Viswanadham, N and Narahari, Y/ Prentice Hall of India, New Delhi, 1994
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech – 1 year I Sem. (CAD/CAM)

NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS
(Open Elective – I)

UNIT-I:
Introduction to finite difference formula- Parabolic Equation: 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 co-ordinates.

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 explicit method.


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:
Systemactic iterative methods for large linerar systems – necessary and sufficient condition for convergence of iterative methods – stones implicit methods.


REFERENCES:
PRODUCTION AND OPERATIONS MANAGEMENT
(Open Elective – I)

UNIT - I
Operation Management: Definition – Objectives – Types of production systems – historical development of operations management – Current issues in operation management.

UNIT - II

UNIT - III

UNIT - IV

UNIT – V

REFERENCES:
6. Production and Operation Management / Panner Selvam / PHI.
Features and selection of CNC turning and milling centers. Practice in part programming and operation of CNC turning machines, subroutine techniques and use of cycles. Practice in part programming and operating a machining center, tool panning and selection of sequences of operations, tool setting on machine, practice in APT based NC programming. Practice 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.