KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
M.Tech 1st YEAR (SEMESTER – I)

MECHANICAL ENGINEERING (Computer Aided Design/ Computer Aided Manufacturing)

Course No.	Course Title	Teaching Schedule		Marks				Duration of Exam
		L	P	Sessional	Theory	Practical	Total	
MT – 501	Modern Machining Technologies	4	-	50	100	-	150	3
MT – 503	Finite Element Methods	4	-	50	100	-	150	3
MT – 505	Manufacturing Planning & Control	4	-	50	100	-	150	3
MT – 507	Computer Aided Design	4	-	50	100	-	150	3
MT – 509	Concurrent Engineering	4	-	50	100	-	150	3
MT – 511	CAD Lab	-	3	50	-	50	100	3
Total		**20**	**3**	**300**	**500**	**50**	**850**	

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
M.Tech 1st YEAR (SEMESTER – II)
MECHANICAL ENGINEERING (Computer Aided Design/ Computer Aided Manufacturing)

Course No.	Course Title	Teaching Schedule		Marks				Duration of Exam
		L	P	Sessional	Theory	Practical	Total	
MT – 502	Design Optimization & Simulation of Engg. Systems	4	-	50	100	-	150	3
MT – 504	Robotics Engineering	4	-	50	100	-	150	3
MT – 506	Design Hydraulic & Pneumatic Systems	4	-	50	100	-	150	3
MT –	Elective – I	4	-	50	100	-	150	3
MT – 508	Computer Integrated Manufacturing Systems	4	-	50	100	-	150	3
MED – 510	Simulation Lab	-	3	50	-	50	100	3
Total		**20**	**3**	**300**	**500**	**50**	**850**	

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
M.Tech 2nd YEAR (SEMESTER – III)
MECHANICAL ENGINEERING (Computer Aided Design/ Computer Aided Manufacturing)

Course No.	Course Title	Teaching Schedule		Marks				Duration of Exam
		L	P	Sessional	Theory	Practical	Total	
MT – 513	Flexible Manufacturing Systems	4	-	50	100	-	150	3
MT -	Elective - II	4	-	50	100	-	150	3
MT – 515	Modern Machining Technologies Lab.	-	3	50	-	50	100	3
MT – 517	Project	-	4	100	-	100	200	3
MT – 519	Seminar – I	-	2	100	-	-	100	-
Total		**8**	**9**	**350**	**200**	**100**	**700**	

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
M.Tech 2nd YEAR (SEMESTER – IV)
MECHANICAL ENGINEERING (Computer Aided Design/ Computer Aided Manufacturing)

Candidate has to work on Dissertation Topic under the Dissertation Supervisor and at the end of semester he has to submit a hard bound report for evaluation by the DRC and External Examiner.

Elective – I

MT – 521 Strategic Technology Management
MT – 523 Vehicle Dynamics
MT – 525 Design of Air Conditioning System
MT – 527 Manufacturing Systems Engg.
MT – 529 Advanced Design of Mechanical System
MT – 531 Rapid Prototyping

Elective – II

MT – 512 Composite Materials
MT – 514 Reliability Based Design
MT – 516 Industrial Systems Engineering
MT – 518 Plant Equipment Design
MT – 520 Machine Tool Design
MT – 522 Design of Turbo Machines

MT-501 MODERN MACHINING TECHNOLOGIES

L	T	P	Total
4	-	-	4

Theory Marks: 100
Sessional Marks : 50
Duration of Exam: 3 Hours

Instructions: There will be eight (8) questions in total, two from each unit. Students are required to attempt any five questions selecting atleast one from each unit. All questions will carry equal marks. The use of non programmable scientific calculator will be allowed in the examination.

Unit 1: Introduction & Advanced Thermal Processes

Need and basic concepts; Classification; Energies employed in processes-AJM; WJM, USM, CM, ECM, EDM, IBM, EBM, IBM, PAM, HM; Ion Beam and Plasma Arc Machining—Their Principle, power source, torches, beam source, equipment, Process characteristics, advantages, applications & case studies

Unit 2: Mechanical Methods

Abrasive Jet Machining; Water Jet Machining; Ultrasonic Machining—Their operating principles, equipment, abrasive slurry. / material, process characteristics, material removal rate, applications & case studies, limitations.

Unit 3: Chemical and Electro-chemical Methods

Chemical Machining-Principle, equipment, advantages, chemical blanking, chemical milling, hydrogen embitterment, advantages & applications. Electro-chemical Machining-Principle, equipment, power supply, analysis of material removal, electrolytes and electrolyte system, dynamics and hydrodynamics of process, ECM tooling, tool design, applications & case studies. Electro-chemical Grinding & Honing—Process, accuracy, advantages, applications. Electro-chemical Deburring-Process and applications.

Unit 4: Thermal Methods

Electric Discharge Machining-Principle, electrode material and- manufacture, equipment, EDM tool design, process characteristics, gap flushing. Laser Beam Machining, Electron Beam Machining—Principle, power source, types of lasers, equipment, Process characteristics, advantages, applications & case studies. Hot Machining-Heat source, process, tool life, production rate

Recommended Books:

1. Nonconventional machining; **Mishra P.K.,** Institution of Engineers (I) Text Book Seiries, Narosa Publishing House, New Delhi, 1997
2. Modern machining processes; **Pandey P.C. & Shan H.S.**, Tata McGraw-Hili Publishing Co. Ltd., New Delhi, 1998
3. Production technology; **Gangopadhyay A.K., Ramananda B.S., Ranganathan M.V.,** HMT Bangalore, Tata McGraw-Hili Publishing Co. Ltd., New Delhi,
4. Principles of electro-chemical machining; **McGeogh J.A.,** Chapman and Hall, London,
5. Laser in machining; **Chryssolous G.,** Springer Publication, 1991
6. Nontraditional machining processes; **Springborn R.K.**,ASTME, Michigan, 1967

MT-503 FINITE ELEMENT METHODS

L	T	P	Total
4	-	-	4

Sessional marks : 50
Theory marks : 100
Duration of exam : 3 hrs

Instructions: There will be eight (8) questions in total, two from each unit. Students are required to attempt any five questions selecting atleast one from each unit. All questions will carry equal marks. The use of non programmable scientific calculator will be allowed in the examination.

UNIT-I GENERAL PROCEDURE OF FINITE ELEMENT METHOD

Basic concept of FEM, Engineering applications, Comparison of FEM with other methods of analysis, Discretization of the domain-Basic element shapes, discretization process, Interpolation polynomials, Selection of the order of the interpolation polynomial, Convergence requirements, Linear interpolation polynomials in terms of global and local coordinates,

Formulation of element characteristic matrices and vectors-Direct approach, variational approach, weighted residual approach, Assembly of element matrices and vectors and derivation of system equations together with their solution.

UNIT-II **HIGH-- ORDER AND ISO-PARAMETRIC ELEMENT FORMULATIONS**
Introduction, Higher order one-dimensional element, Higher order elements in terms of natural coordinates and in terms of classical interpolation polynomials, Continuity conditions, Iso-parametric elements, Numerical integration in one, two and three-dimensions.

UNIT-III **SOLID AND STRUCTURAL MECHANICS**
Introduction, Basic equations of solid mechanics, Static analysis-Formulation of equilibrium equations, analysis of trusses and frames, analysis of plates, analysis of three-dimensional problems, analysis of solids of revolution, Dynamic analysis-Dynamic equations of motion, consistent and lumped mass matrices, consistent mass matrices in global coordinate system, Dynamic response calculation using FEM

UNIT-IV **APPLICATIONS AND GENERALISATON OF THE FINITE ELEMENT METHOD**
Energy balance and rate equations of heat transfer, Governing differential equation for the heat conduction in three-dimensional bodies, Derivation of finite element equations for one-dimensional, two-dimensional, unsteady state and radiation heat transfer problems and their solutions, Solution of Helmholtz equation and Reynolds equation, Least squares finite element approach.

Recommended Books:

1. The Finite Element Method in Engineering – S.S. Rao, Pub.- Pergamon Press.
2. Numerical Methods in Finite Element Analysis—Klaus-Jurgen Bathe and Edwar L. Wilson, Pub.-PHI.
3. The Finite Element Method – O.C. Zienkiewicz – McGraw-Hill
4. The Finite Element Methods for Engineers – K.H. Huebner – Wiley, New York

MT-505 MANUFACTURING PLANNING AND CONTROL

L	T	P	Total
4	-	-	4

Sessional marks : 50
Theory marks : 100
Duration of exam : 3 hrs

Instructions: There will be eight (8) questions in total, two from each unit. Students are required to attempt any five questions selecting atleast one from each unit. All questions will carry equal marks. The use of non programmable scientific calculator will be allowed in the examination.

Unit 1: Material Planning

MPC system payoffs, managing the manufacturing process, management problems, techniques and system, the data base, manufacturing planning and control system, a frame work for MPC system, the system and the frame work, the system and material flow, material requirement planning in MPC, MRP-I, MRP-II, the basic MRP record, technical issue, processing frequency, lot sizing, safety stock and safety lead time, the MRP data base, using the MRP system.

Unit 2: Capacity planning

Capacity planning, the role of capacity planning in MPC system, management and capacity planning, data base requirements in capacity planning , layout of facilities, job design and work measurement, aggregate planning

Unit 3: Master production scheduling

Master production scheduling activity, the MPS environment, MPS technique, bill of material structuring for MPS, the final assembly schedule, shop floor control system with MPC system linkages, shop floor control techniques, the shop floor control examples, the shop floor control data base, using the shop floor control system

Unit 4: implementation of MPC system

Demand management in MPC, JIT in MPC system, implementation of MPC system, quality management, maintenance and reliability, supply change management, strategies for manufacturing excellence.

Recommended Books:

1. Manufacturing planning and control system, **Thomas E.Vollmann, Bery and Whybark**, Galgotia Publication, Greater Noida.
2. Production and Operation Management, Chary, Tata McGraw Hill, New Delhi

MT-507 COMPUTER AIDED DESIGN

L	T	P	Total
4	-	-	4

Sessional marks : 50
Theory marks : 100
Duration of exam : 3 hrs

Instructions: There will be eight (8) questions in total, two from each unit. Students are required to attempt any five questions selecting atleast one from each unit. All questions will carry equal marks. The use of non programmable scientific calculator will be allowed in the examination.

UNIT – I

Introduction: Introduction to CAD/CAM, Historical developments, Industrial look at CAD/CAM, Introduction to CIM; Basics of geometric and solid modeling, explicit, implicit, intrinsic and parametric equations, coordinate systems.

Transformations: Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations, orthographic and perspective projections, reconstruction of 3-D objects.

UNIT – II

Curves: Algebraic and geometric forms, tangents and normal, blending functions reparametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves.

Surfaces: Algebraic and geometric forms, tangents and normal, blending functions, reparametrization, sixteen point form, four curve form, plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, bezier surface, B-spline surface.

UNIT – III

Solids: Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation, cell decomposition, spatial occupancy enumeration.

Automation and Numerical Control: Introduction, fixed, programmable and flexible automation, types of NC systems, MCU and other components, NC manual part programming, coordinate systems, G & M codes, Part program for simple parts, computer assisted part programming.

UNIT – IV

Group Technology: Part families, part classification and coding, production flow analysis, Machine cell design, Advantages of GT

Recommended Books :

1. CAD/ CAM by Groover and Zimmer, Prantice Hall.
2. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
3. Numerical Control and Computer Aided Manufacturing by Kundra, Rao & Tiwari, TMH.
4. CAD/CAM (Principles, Practice & Manufacturing Management) by Chirs Mc Mohan & Jimmie Browne, Published by Addison- Wesley.

MT-509 CONCURRENT ENGINEERING

L	T	P	Total
4	-	-	4

Sessional marks : 50
Theory marks : 100
Duration of exam : 3 hrs

Instructions: There will be eight (8) questions in total, two from each unit. Students are required to attempt any five questions selecting atleast one from each unit. All questions will carry equal marks. The use of non programmable scientific calculator will be allowed in the examination.

UNIT-I

INTRODUCTION

Extensive definition of CE – CE design methodologies – Organizing for CE – CE tools box collaborative product development.

USE OF INFORMATION TECHNOLOGY

IT support – Solid modeling – Product data management – Collaborative product commerce – Artificial Intelligence – Expert systems – Software hardware co-design.

UNIT-II

DESIGN STAGE

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

UNIT-III

MANUFACTURING CONCEPTS AND ANALYSIS

Manufacturing competitiveness – Checking the design process – conceptual design mechanism – Qualitative physical approach – An intelligent design for manufacturing system – JIT system – low inventory – modular – Modeling and reasoning for computer based assembly planning – Design of Automated manufacturing.

UNIT-IV

PROJECT MANAGEMENT

Life Cycle semi realization – design for economics – evaluation of design for manufacturing cost – concurrent mechanical design – decomposition in concurrent design – negotiation in concurrent engineering design studies – product realization taxonomy – plan for Project Management on new product development – bottleneck technology development.

Recommended Books:

1. Anderson MM and Hein, L.Berlin, "Integrated Product Development", Springer Verlog, 1987.
2. Cleetus, J. "Design for Concurrent Engineering", Concurrent Engg. Research Centre, Morgantown, WV, 1992.
3. Andrew Kusaik, "Concurrent Engineering: Amomation Tools and Technology", Wiley, John and Sons Inc. 1992.
4. Prasad, "Concurrent Engineering Fundamentals: Integrated Product Development", Prentice Hall, 1996.
5. Sammy G Sinha, "Successful Implementation of Concurrent Product and Process", Wiley, John and Sons Inc, 1998.

MT- 511 COMPUTER AIDED DESIGN LAB.

L	T	P	Total
-	-	3	3

Sessional marks : 50
Practical marks : 50
Duration of exam : 3 hrs

The students will be required to carry out the following exercises using software packages (e.g. Pro Engineer/ I-deas/ Solid Edge, Catia etc.).

1. Implement simple programmes for the graphics representation of

   (i) Transformation and projections.
   (ii) Conic Sections, cubic splines, and B-splines.
   (iii) Surfaces- Bilinear, Bicubic surface patch and Bezier surface.

2. CAD Modelling Assignments.

   (i) Construction of simple machine parts and components.
   (ii) Modelling of machine components.
   - Surface of a Diffuser section, Propeller.
   - Gear blank and other mechanical parts.
   - Mechanical assembly of parts.