ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

for

M.Tech Two Year Degree Course

(A-19)

in

CAD/CAM

(Applicable for the batches admitted from2019-2020)

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
(An Autonomous Institution approved by UGC and affiliated to JNTUH)
(Accredited by NAAC with 'A' Grade and Accredited by NBA of AICTE)
Yamnampet, Ghatkesar, MalkajigiriMedchal District -501 301.

January, 2019

VISION

To emerge as a renowned center in mechanical engineering by following the best practices in teaching, learning and research

MISSION

1. Provide good academic environment for pursuing high quality undergraduate, Post graduate and Doctoral programmes in mechanical engineering that will prepare our graduates for outstanding professional careers
2. Provide service to practicing engineers, industry, government, educational and technical societies through effective engagement with these groups and by providing professional knowledge.
3. Ensure that our students are well trained in interpersonal skills, team work, professional ethics, practical industrial training and participate in professional society activities.
4. Conduct and proliferate high quality research work to students for lifetime of learning.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) OF M.Tech. CAD/CAM PROGRAMME:

PEO-I: To empower the students by providing necessary knowledge base, critical thinking and problem solving capabilities in the field of Computer Aided Design & Computer Aided Manufacturing (CAD/CAM) and allied fields so that they can excel in their profession, in industry, higher studies and Research & Development.

PEO-II: To develop core competencies in the field of CAD/CAM, so as to conduct experiments, comprehend, analyze, design and use appropriate techniques and tools to provide optimal solutions for the industry related problems

PEO-III: To inculcate the responsibility to the society at large by sensitizing regulatory and Intellectual Property related issues along with communication skills and to promote entrepreneurship with sufficient knowledge of project/ finance management techniques for ensuring their career success.

PEO-IV: To motivate the students not only to be excellent in academics, professional ethics, team work, leadership skills but also to be life long learners in upcoming technologies for successful professional career

PROGRAMME OUTCOMES (POs) OF M Tech CAD/CAM PROGRAMME:

POST GRADUATE ATTRIBUTES(GA)	PROGRAMME OUTCOMES(PO)
1:Scholarship of Knowledge Acquire in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyse and synthesise existing and new knowledge, and integration of the same for enhancement of knowledge	**1.** Post graduates will demonstrate their ability to acquire the state of the art knowledge and to expand frontiers in the field of CAD/CAM Engineering.
2.Critical Thinking Analyse complex engineering problems critically, apply independent judgement for synthesising information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.	**2.** Post graduates will demonstrate their abilities to analyze and evaluate complex engineering problems to make intellectual in CAD.CAM Engineering.
3.Problem Solving Think laterally and originally, conceptualise and solve engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.	**3.** Post graduates will demonstrate theability of problem solving skills to find optimal solutions in the area of CAD /CAM Technologies including the considerations of public health, safety, cultural society and environmental problems.
4.Research skill Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyse and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/ in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.	**4.** Post graduates will demonstrate the ability to carry out literature survey, design, conduct of experiments and to analyze the results using appropriate research methodologies. They should also contribute scientific knowledge in in CAD/ CAM areas either individually or in groups.
5.Usage of Modern tools Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.	**5.** Post graduates will demonstrate the ability to develop and use of appropriate techniques and tools for prediction and modeling of various engineering systems.

6.Collaborative and multidisciplinary work Possess knowledge and understanding of group dynamics, recognise opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others	**6.** Post graduates demonstrate ability to collaborate and engage in multidisciplinary tasks in scientific research.
7.Project Management and finance Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economical and financial factors.	**7.** Post graduates demonstrate ability to manage projects efficiently including considerations of economical and financial factors.
8.Communication Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.	**8.** Post graduates demonstrate ability in both oral and written communications.
9.Lifelong learning Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously	**9.** Post graduates demonstrate ability to learn latest developments independently and continuously developments in the field of CAD/CAM Technology.
10.Ethical Practises and Social responsibility Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainability development of society.	**10.** Post graduates shall acquire professional ethics and intellectual integrity in the consideration of impact of research outcomes for sustainable development of the society.

11.Independent and reflective Learning Observe and examine critically the outcomes of ones action and make corrective measures subsequently, and learn from mistakes without depending on external feedback	**11.** Post graduates shall learn from their mistakes and make corrective measures results on their own.

Department of Mechanical Engineering
M.Tech. (CAD/CAM)
Course Structure and Syllabus (CBCS)
Academic Regulations: 2019-2020

M.Tech.(CAD/CAM) I Year – I Semester:

Category	Code	Course Title	L	T	P	Credits	CIE marks	SEE marks
PC-1	**7W101**	Advanced CAD	3	-	-	3	30	70
PC-2	**7W102**	Advanced Finite Element Analysis	3	-	-	3	30	70
PC-3	**7W103**	Advanced Mechanics of Solids	3	-	-	3	30	70
PC-4	**7W104**	Design for Manufacturing & Assembly	3	-	-	3	30	70
PE-1	**7W106**	Mechatronics	3	-	-	3	30	70
	7W107	Nano Science and Nanotechnology						
AC-1	**7HC18**	Audit Course-1(English for Research Paper Writing) ***(Grade Evaluation)**	2	-	-	0	30	70
							Grade Evaluation	
Research Methodology	**7W105**	Research Methodologies and IPR	3	-	-	3	30	70
Lab-1	**7W171**	Advanced CAD &CAE Lab	-	-	4	2	30	70
Technical Seminar	**7W172**	Technical Seminar I	-	-	2	1	100	-
Total			**20**	**-**	**6**	**21**	**340**	**560**

L: Lectures; T: Tutorial; P: Practical; C: Credits
CIE: Continuous Internal Evaluation; **SEE:** Semester End Evaluation;
PC: Programme Core; **PE:** Programme Elective; **AC**: Audit Course;

M.Tech.(CAD/CAM) I Year – II Semester:

Category	Code	Course Title	L	T	P	Credits	CIE marks	SEE marks
PC-5	**7W208**	Advanced CAM	3	-	-	3	30	70
PC-6	**7W209**	FMS & Robotics	3	-	-	3	30	70
PC-7	**7W210**	Optimum Design of Mechanical Elements	3	1	-	4	30	70
AC-2	**7HC19**	Audit Course-1(Ethics. Moral, Gender Sensitization and Yoga) ***(Grade Evaluation)**	2	-	-	0	30	70
							Grade Evaluation	
PE-2	**7W211**	Performance Modeling of Automated Manufacturing Systems	3	-	-	3	30	70
	7W212	Micro Electro Mechanical Systems(MEMS)						
	7W213	Mechanical Vibrations & Condition Monitoring						
PE-3	**7W214**	3D Printing Technology& Additive Manufacturing	3	-	-	3	30	70
	7W215	Production and Characterization of Nano Materials						
Seminar	**7W273**	Technical Seminar II	-	-	2	1	100	--
Lab-2	**7W274**	CAM & Robotics Lab	-	-	4	2	30	70
Comprehensive Via	**7W275**	Comprehensive Viva	--	--	2	1	30	70
Miniproject		Mini Project with Seminar	***Evaluation in II Year I Sem**					
Total			**17**	**1**	**8**	**20**	**340**	**560**

L : Lectures**;** **T :**Tutorial; **P :**Practical**;** **C:**Credits
CIE: Continuous Internal Evaluation ,**SEE:** Semester End Evaluation
PC: Programme Core; **PE:**Programme Elective; **AC**: Audit Course

M.Tech.(CAD/CAM)II Year - I Semester:

Category	Code	Course Title	L	T	P	Credits	Marks	
							CIE	SEE
PC-8	**7W316**	Mechanics and Manufacturing Methods of Composites	3	-	-	3	30	70
OE	**7ZC31**	Business Analytics	3	--	--	3	30	70
	7WC17	Industrial Safety						
	7WC18	Operation Research						
	7WC19	Composites						
	7ZC32	Cost management of Engineering Projects						
	7MC17	Waste to Energy						
Mini Project	**7W376**	Mini Project with Seminars (Project Conducted in summer)	--	--	6	3	30	70
Project	**7W377**	Project Phase I with Seminar	-	-	10	5	30	70
Total			**6**	**--**	**16**	**14**	**120**	**280**

L: Lectures; T: Tutorial; P: Practical; C: Credits
CIE: Continuous Internal Evaluation; **SEE:** Semester End Evaluation
AC: Audit Course; **OE**: Open Elective.

M.Tech.(CAD/CAM) II Year - II Semester:

Category	Code	Subject	L	T	P	Credits	Marks	
							CIE	SEE
Poject	**7W478**	Project Phase II with Seminar	-	-	12	6	30	70
Dissertation	**7W479**	Dissertation and Defense Viva	-	-	--	7	30	70
Total			-	-	**12**	**13**	**60**	**140**

L : Lectures; T: Tutorial; P : Practical; C : Credits
CIE: Continuous Internal Evaluation; **SEE**: Semester End Evaluation

M.Tech. (CAD/CAM) I Year – I Sem.

ADVANCED CAD
(Programme Core)

L	T	P	C
3	-	-	3

CODE: 7W101 **CIE Marks:30,SEE Marks:30**

Course Objective:
To provide a comprehensive knowledge of various topics related to CAD. The topics include CAD Tools, Product life cycle through CAD collaborative design principles
.

Outcomes:
After completion of this course, student able to
Unit-1:dentify various CAD peripherals and learn concepts of various space curves
Unit-II:.demonstrate how to draw various surfaces with the CAD Tools
Unit-III. Demonstrate the different CAD data exchange standards design
Unit-IV.develope different geometric models with wire frame , surface and solid modeling methods
Unit-V. identify the importance the role of collaborative Engineering in product cycle
Unit-VI. Demonstrates the various stages of PLM with appropriate examples.

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1									X		
CO-2					X						
CO-3					X						
CO-4					X						
CO-5					X						
CO-6						X					

Unit – I
CAD Tools: Definition of CAD Tools, Graphics standards, Graphics software: requirements ofgraphics software, DDA and Bresenhams, algorithm for generating various figures, Functional areas of CAD, and efficient use of CAD software.**Basics of Geometric Modeling:** Requirement of geometric modeling, Geometric models, Geometricconstruction methods, modeling facilities desired.

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

UNIT-III

Geometric Modeling of Surfaces: Classification of surface entities, Surface representation methods, Parametricrepresentation of analytic surfaces: plane surface, ruled surface, surface of revolution, tabulatedcylinder, Parametric representation of synthetic curves: Hermite cubic surface, Bezier surface, B-Spline surface, Blending surface, Surface manipulations.

UNIT- IV:

Solid Modeling: Geometry and topology, Boundary representation, The Euler-Poincare formula, Euler operators, Constructive solid geometry: CSG primitives, Boolean operators, CSG expressions, Interior, Exterior, closure, Sweeping: linear and non-linear, Solid manipulations. **Geometric transformations**2D and 3D techniques, Perspective projection, orthotropic projection, isometricprojection, Hidden surface removal, shading, rendering.

UNIT-V

CAD/CAM Data Exchange: Evaluation of data-exchange format, IGES data representations and file structure and format, testing and verification, STEP Architecture, implementation, ACIS & DXF. **Design Applications:** Mechanical tolerances, Mass property calculations, and Mechanical Assembly, Assembly modeling, Mechanical Assembly representation schemes generation of assembly sequence and assembly analysis.

Unit – VI

Collaborative Engineering: Collaborative Design Approaches in Design and Development, Integratedproduct development, Collaborative Design, Collaborative Design Principles, Collaborative designTools, A web based virtual reality for collaborative product review and customization.

Product Life CycleManagement through CAD: Introduction – the path to PLM, PLM life cycle model, the threads of PLM (CAD, EDM, PDM, CIM), weaving threads in to PLM, Characteristics of PLM, PLM elements, developing PLM strategy

Note: Students will be given Engineering Component and student has to design the components and produce its drawing and present it as assignment.

TEXT BOOK:

1. CAD/CAM Theory and Practice / Ibrahim Zeid / Mc Graw Hill international.
2. CAD/CAM Concepts and applications /Chennakesava R. Alavala/PHI Learning Private Limited (2013)

REFERENCE BOOKS:

1. Mastering CAD/CAM / IbrhimZeid / Mc Graw lull international.
2. CAD / CAM / CIM, Radhakrishnan and Subramanian/ New Age
3. CAD/CAM Principles and Applications/ P.N.Rao/TMH/3rd Edition
4. Principles of Computer Aided Design and Manufacturing/ FaridAmirouche/ Pearson

M.Tech. (CAD/CAM) I Year – I Sem.

ADVANCEDFINITE ELEMENT ANALYSIS

(Programme Core)

L	T	P	C
3	-	-	3

CODE: 7W102 **CIE Marks:30; SEE Marks:70**

Course Objective: to familiarize the procedures and techniques of Finite element formulations for various mechanical Egg problems and apply them on CAD/CAM related projects/problems

Course Out Comes :

Unit-1: Student able to demonstrate the solution techniques for Finite Element Formulations of Mechanical Engineering Problems

Unit-2: Student able to solve stress analysis problems of frames ,beams and trusses with FEM Techniques

Unit-3: Student acquires knowledge of stress analysis of plates under bending with FEM formulation

Unit-4: Student gains knowledge and in position to apply FEM to solve Dynamics related problems.

Unit-5:Student will learn the method to convert heat transfer problems in to simple solvable equations through FEM

Unit-6: Student will get various ideas and approaches to handle Fluid Flow problems through FEM that leads to gain skills to develop CFD related applications.

Mapping	Po-1	P0-2	Po-3	P0-4	Po-5	P0-6	Po-7	P0-8	Po-9	Po-10	Po-11
CO-1		X			X						
CO-2		X			X						
CO-3		X			X						
CO-4		X			X						
CO-5		X			X						
CO-6		X			X						

Unit – I: Solutions of Finite Element Equations:

Introduction, Solution of Equilibrium Problems (boundary values problems), Guass elimination and Choleski methods, Solutions of Eigen value problems, Jacobi and power methods, Solution of propagation problems (initial value problems), Runga-Kutta method and finite difference method

Unit – II: **Analysis of Space truss and frame Elements:**

Introduction to truss and beam elements, Element formulation of space truss element and frame element, characteristics of stiffness matrices.

Unit – III:A**nalysis of structural plates:**

Introduction, Triangular membrane element, rectangular plate element, FEA of plates in bending, Analysis of triangular and rectangular plates bending.

Unit – IV:Analysis of free and forced undamped vibrations:

FE formulations of equation of motion, Natural frequencies and mode shapes of uniform stepped bars, beams and planer trusses, othogonilisation of modes, Dynamic response (forced vibration analysis) of stepped axial bar and beam.

Unit – V: Analysis of unsteady state Heat Transfer Problems:

Introduction to differential equations to unsteady state heat transfer problems, FE formulation, Time dependant temperature distribution in 1D fins and plane walls. Heat transfer problems with radiation.

Unit – VI: Analysis of Inviscid and incompressible flows:

Introduction to partial differential equations to steady state fluid flow, Potential function formulation, Stream function formulation, Finite element solutions, Numericals on 1D flow.Introduction to ANSYS software

TEXT BOOKS:

1. "The Finite Element Methods in Engineering", S.S. Rao, Heinemann, 4th Edition-2004.
2. Finite and Boundary Element methods in Engineering: O.P.Gupta, Oxford&IBH Publishing Co.Pvt.Ltd.
3. "Introduction to Finite Elements in Engineering", TirupathiR.Chandrupatla and Ashok D. Belagundu, Pearson Education (Singapore) Pte Ltd, 2006.

REFERENCE BOOKS:

1. "Concepts and Applications of Finite Element Analysis", Robert Cook, Wiley India, Pvt., Ltd., 4th Edition-2007
2. "An Introduction to Finite Element Methods", J.N. Reddy, Tata Mc Graw Hill, 2008.
3. "First Course in the Finite Element Method", Platteville Daryl Logan &Daryl Logan, Nelson Engineering, 2007.
4. "Finite Element Procedures", K.J. Bathe, PHI Learning, 2009.

M.Tech. (CAD/CAM) I Year – I Sem.
ADVANCED MECHANICS OF SOLIDS
(Programme Core)

L	T	P	C
3	-	-	3

CODE: 7W103 **CIE Marks:30; SEE Marks:70**

Course Objectives:
to provide subject knowledge of advanced topics of Mechanics of solids such as theries of shear centre,curvedbeam,torsion,columns and fracture mechanics.This will help them to analyse stresses in various mechanical structures.

Course Out Comes :
After completing the course, the students will :
Unit I: learn Basics of Energy Methods and applications in structural mechanics
Unit II: demonstrate Concept of shear centre, symmetric and un-symmetric bending
Unit III: analyze Bending stresses in curved beams
Unit IV: derive Torsion of circular and non-circular cross section beams, membrane analogy, torsion of thin-walled and multiply connected cross-section members
Unit V: apply theoretical on study on Elastic stability of columns using energy methods
Unit VI: learn the role fracture mechanics in failure of mechanical parts

Mapping	Po-1	P0-2	Po-3	P0-4	Po-5	P0-6	Po-7	P0-8	Po-9	Po-10	Po-11
CO-1		X			X						
CO-2		X			X						
CO-3		X			X						
CO-4		X			X						
CO-5		X			X						
CO-6		X			X						

Unit – I: **Energy Methods**:
Hooke's law and the Principle of Superposition, Work done by forces and the elastic strain energy stored, Reciprocal relation, generalized forces and displacements, Castigliano's first theorem, fictitious load method, Theorem of Virtual work, Castigliano's second theorem. Case studies of statically determinate and indeterminate structures, closed ring subjected to concentrated and uniform loads, stresses in chain links.

Unit – II: **Shear Centre**:
Bending axis and shear center; shear center for axi-symmetric and unsymmetrical sections. Unsymmetrical bending: Bending stresses in beams subjected to unsymmetrical bending; deflection of straight beams due to unsymmetrical bending.

Unit – III: **Curved bean theory& Contact Stresses**
Beams: Circumferential stress in curved beams, limitations, correction factors; Winkler Bach formula, Radial stresses in curved beams, Winkler Bach correction factors.
Contact stresses: Geometry of the Contact Surface, Method of Computing Contact Stresses, and Stress for Two Bodies in Line Contact: Loads Normal to Contact Area

Unit – IV: **Torsion**:
Torsion of a cylindrical bar of circular cross Section; Saint-Venant's semi-inverse method; Linear elastic solution; Prandtl elastic membrane (soap film) analogy; torsion of narrow rectangular cross sections; hollow thin wall torsion members, multiply connected cross sections.

Unit – V: **Elastic Stability of Columns**:
Concept of buckling, columns under one or more axial, concentrated load(s) and with / without eccentricity: Euler's buckling load, Secant and Johnson's formulae; treatment of column buckling stability problem as an Eigen-value problem, related case studies. Energy methods for buckling problems: theorem of stationary potential energy, energy and stability considerations, application to buckling problems, The Rayleigh-Ritz method

Unit – VI: **Introduction toFracture Mechanics**:
Why structures fail, the fracture mechanics approach to design, effect of material properties on fracture, Linear Elastic Fracture Mechanics (LEFM): stress concentration effect of flaws, the Griffith energy balance, the energy release rate, stress analysis of cracks, plane stress versus plane strain, fracture modes. Elastic—Plastic Fracture Mechanics (EPFM): crack tip opening displacement, Green's theorem, the J-contour integral. Design considerations: K as a failure criterion, J-integral as a fracture criterion

TEXT BOOK:

1. "Advanced Mechanics of Solids", Third Edition, L.S.Srinath, TATA McGraw-Hill
2. "Advanced Mechanics of Materials", Sixth Edition, Arthur P. Boresi, Richard J. Schmidt., Wiley International

REFERENCE BOOKS:

1. "Strength of Materials", Sadhu Singh"Fracture Mechanics: Fundamentals and Applications", Second Edition, T.L.Anderson, CRC Press

M.Tech. (CAD/CAM) I Year – ISem.
DESIGNFOR MANUFACTURING & ASSEMBLY
(Programme Core)

L	T	P	C
3	-	-	3

CODE: 7W104 **CIE Marks:30; SEE Marks:70**

Course Objective:

To explore the applications of design processes / methods in manufacturing &Assembly and art of creating cost effective product development.

Course Out Comes :

After completing the course, the students will :

Unit I: learn Basic principles of designing for economical production material for design development with charts

Unit II: Overview of various machining process, Redesigning of components for machining with suitable examples and various casting process

Unit III: Design principles for Punching, Blanking, Bending, Deep drawing etc. Design factors for forging

Unit IV: Develop the assemblies process, automatic assembly transfer system,assembly advantages

Unit V: Develop of the systematic DFA methodology, assembly, efficiency, classification system for material handling

Unit VI: Evaluate of part symmetry handling time

Mapping	Po-1	P0-2	Po-3	P0-4	Po-5	P0-6	Po-7	P0-8	Po-9	Po-10	Po-11
CO-1	X										
CO-2	X				X						
CO-3	X				X						
CO-4	X				X						
CO-5	X				X						
CO-6	X				X						

Unit – I: Introduction:

Design philosophy steps in Design process - General Design rules for manufacturability - basic principles of design Ling for economical production -creativity in design. Materials: Selection of Materials (or design Developments in Material technology - criteria for material selection - Material selection interrelationship with process selection process selection charts.

Unit – II: **Machining Process:**

Overview of various machining processes - general design rules for machining - Dimensional tolerance and surface roughness - Design for machining - Ease - Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

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

Unit – III: 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.

Forging: Design factors for forging - Closed die forging design - parting lines of die5 drop forging die design - general design recommendations.

Unit – IV: Extrusion & Sheet Metal Work: Design guidelines for extruded sections – Design principles for Punching, Blanking, Bending, and Deep Drawing - Keeler Goodman Forming Line Diagram - Component Design for Blanking. .

Unit – V: Assembly advantages:

Development of the assemble process, choice of-assemble method assemble advantages social effects of automation.

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

Unit – VI: Design of' Manual Assembly:

Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening;' effect of pal1 symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

TEXT BOOKS:

1. Geoffrey Boothroyd,"Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.
2. Engineering Design - Material & Processing Approach - George E. Deiter, McGraw Hill IntI. 2nd Ed. 2000.

REFERENCE BOOKS:

1. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. 1990.
2. A Delbainbre "Computer Aided Assembly London, 1992.

M.Tech. (CAD/CAM) I Year – I Sem.
MECHATRONICS
(Programme Elective-I)

L	T	P	C
3	-	-	3

CODE:7W106 **CIE Marks:30; SEE Marks:70**

Course Objectives:
1. To explain the role of multidisciplane subject
2. To provide knowledge in specification, design, implimentation, trouble shoot and maintenance of mechatronics systems

Course Out Comes :
After completing the course the students will learn:
Unit1: Mechatronics measurement systems, control systems, case studies, actuation systems.
Unit2: Modeling dynamic systems- first order and second order systems. Transfer functions
Unit3: Frequency response, performance specifications and stability. Closed loop controllers- P, PI, PID adaptive control.
Unit4: Introduction of microprocessor, and PLC and identification system
Unit5: Sensors in speed, position, stress, strain, acceleration and temperature measurement sensor. Machine vision
Unit6: Data base management system, CAD/CAM data bases, graphic database, and Oops concepts.

Mapping	Po-1	P0-2	Po-3	P0-4	Po-5	P0-6	Po-7	P0-8	Po-9	Po-10	Po-11
CO-1	X										
CO-2						X			X		
CO-3						X			X		
CO-4						X			X		
CO-5						X			X		
CO-6						X			X		

Unit-I:
Introduction: Definition of Mechatronics Measurement systems, Control systems, Microprocessor – based controller, Response of systems, the mechatronics approach, traditional and mechatronics designs, possible mechatronics design solutions, case studies of Mechatronic systems .
Actuators and Motion Control: Pneumatic, Hydraulic, Mechanical and Electrical actuation systems and their limitations, Motor/Load inertia matching. Design with linear slides.

Unit-II:
Dynamic responses of systems: Modeling dynamic systems, first- order systems, second – order systems Performance measures for second – order systems, system identification.

System transfer functions: The transfer function, first – order systems, second – order systems, Systems in series, systems with feedback loops, Effect of pole location on transient response.

Unit-III:
Frequency response: Sinusoidal input, phasors, frequency response, bode plots, performance specifications, and stability**.**
Closed Loop Controllers: Continuous and discrete processes, control modes, two-step mode, proportional mode, derivative control, integral control, PID controller, digital controllers, control system performance, controller tuning, velocity control, adaptive control.

Unit-IV:
Architecture of intelligent Machines: Introduction to Microprocessor and programmable logic controllers and identification of system, System design Classification. Motion control aspects in Design.

UNIT-V:
Sensors: Introduction, position and speed measurement, stress and strain measurement, temperature measurement vibration and acceleration measurement, pressure and flow measurement, semiconductor sensors and Micro electromechanical devices.
Machine Vision: Feature and Pattern Recognition methods, concepts of perception and cognition in decision making.

UNIT VI:
Manufacturing Data Bases: Data Base management system, CAD/CAM Data bases, Graphic Data Base, Introduction to object oriented concepts, objects oriented model language interface, procedures and methods increation, edition and manipulation of Data.

TEXT BOOK:
1. W. Bolton, "Mechatronics – Electronics Control Systems in Mechanical and Electrical Engineering", Pearson Education 3rd Edition.

REFERENCE BOOK:
2. Michel B. Histand and David G. A1ciatore, "Introduction to Mechatronics and Measurement systems", "Tata MC Graw".

M.Tech-CAD-CAM (ME) - I Year – I Sem.
NANO SCIENCE AND NANOTECHNOLOGY
(Programme Elective-I)

L	T	P	C
3	-	0	3

CODE:7W107 **CIE Marks:30; SEE Marks:70**

Course Objectives
The course aims at providing an overview of basic physics of solids and advanced topics in solid state materials of technological value, a working knowledge of the foundations, techniques, and key results of quantum mechanics and the basic principles of thermodynamics and to lay emphasis on the fundamentals

Course Outcomes	
1.	To show how diverse properties (electronic, thermal, optical) of solid materials can be related to interactions at the atomistic level.
2.	To deduce and verify macroscopic properties of solids using standard theoretical models and understand their significance in wider context of solid materials
3.	To show how solid state physics forms vital part of developing materials of technological value
4.	To achieve an understanding of the theory of quantum mechanics, and an ability to apply the quantum theory to important physical systems
5.	The objective of this course is to make the students acquire depth of knowledge in the concepts of statistical mechanics and thermodynamics.
6	To understand the phase diagrams of binary alloys systems

Mapping	**Po-1**	**P0-2**	**Po-3**	**P0-4**	**Po-5**	P0-6	**Po-7**	**P0-8**	**Po-9**	**Po-10**	**Po-11**
CO-1		**X**							**X**		
CO-2		**X**							**X**		
CO-3		**X**							**X**		
CO-4					**X**				**X**		
CO-5					**X**				**X**		
CO-6					**X**				**X**		

Unit-I:
Introduction to Nanotechnology**,** Crystal Structure: Introduction, arrangement of Atoms, two dimensional crystal structures

Unit-II: Three dimensional crystal structures, some examples of three dimensional crystals, planes in crystals and crystallographic directions,

Unit-III: Reciprocal lattice Bragg's law, reciprocal lattice vectors, diffraction conditions, Laue and Powder methods; Quasicrystals, Type of bonds – ionic, covalent and metallic bonds

Unit-IV: Why quantum mechanics? Matter waves, Length scales, De-Broglie hypothesis, Wave particle duality, Heisenberg's uncertainty principle, Schrodinger wave equation, Particle in one dimensional box

Unit-V: Finite Potential Wells and barriers: Periodic lattice, Energy gaps, Qualitative Description of the theory of conduction in Solids, Particle in 2-D box, Quantum Fluctuation and Discrete Quantum states, Concepts of Quantum Confinement

Unit-VI: Thermodynamics, phase diagrams and phase transformations

Textbooks:

1. Introduction to Nanotechnology by Charles P.Poole Jr & Frank J. Owens, Wiley India Pvt. Ltd.
2. Nanopahysics and nanotechnology by E.L.Wolfwillely VCH
3. A Textbook of Quantum Mechanics by P.M. Mathews and K. Venkatesan, Tata McGraw Hill Publishing Company Ltd.
4. Modern Quantum Mechanics by J.J. Sakurari, Addison Wesley Longman Inc.
5. Solid state Physics by Kittel
6. Nanotechnology:Principles and Practices by S.K. Kulkarni, Capital Publishing Company
7. Quantum mechanics by Pawling and Wilson
8. The Feynman lectures on Physics; Vol I to III
9. "Nanoscience and Nanotechnology: Fundamentals to Frontiers" by M.S. Ramachandra Rao and Shubra Singh, Wiley Publishers, 2013.

Reference Books:

1. Nanotechnology and Nano Electronics – Materials, devices and measurement techniques by WR Fahrner, Springer
2. Nanotechnology – science, innovation and opportunity by Lynn E Foster, Prentice Hall - Pearson education.
3. Encyclopedia of Nanotechnology by H.S. Nalwa

M.Tech. (CAD/CAM) I Year –I Sem
ENGLISH FOR RESEARCH PAPER WRITING
(Audit Couse –I)

L	T	P	C
2	-	-	0

CODE: 7HC18 **CIE Marks:30; SEE Marks:70**

Course Objectives
Understand how to improve writing skills and level of readability and ensure the good quality of paper at very first-time submission Syllabus

Course Outcomes	
1.	Planning for preperation of research paper by avoiding ambiguity and removing reduandancy
2.	Identifying who did what and preparing abstract which consists of body of the paper and expected outcomes
3.	Identifying key papers and writing literature review
4	Able to understand and identify the key skills required for writing the title and body of the research paper
5	Able to understand and identify the key skills required for writing the results and discussions, and conclusion
6	Able to write good quality research paper

Mapping	**Po-1**	**P0-2**	**Po-3**	**P0-4**	**Po-5**	P0-6	**Po-7**	**P0-8**	**Po-9**	**Po-10**	**Po-11**
CO-1								**X**			
CO-2								**X**			
CO-3								**X**			
CO-4	**X**							**X**			
CO-5								**X**			
CO-6	**X**							**X**		**X**	

UNIT-I:

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

UNIT- II:

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:

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

UNIT-V:

Skills are needed when writing the Methods, skills needed whenwriting the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT-VI

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. HighmanDay R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

M.Tech. (CAD/CAM) I Year – I Sem.
RESEARCH METHODOLOGIES &IPR

L	T	P	C
3	-	-	3

CODE:7W105 **CIE Marks:30; SEE Marks:70**

Course objectives:
This course is intended to familiarize the students with effective procedures and methodologies to conduct research and to gain an understanding of intellectual property.

Course Outcomes: At the end of this course, students will be able to	
1.	Understand research problem formulation.
2.	Analyze research related informationFollow research ethics
3.	Understand that today's world is controlled by Computer, Information Technology, but Tomorrow world will be ruled by ideas, concept, and creativity.
4	Understanding that when IPR would take such important place in growth of individualsand nation, it is needless to emphasis the need of information about Intellectual PropertyRight to be promoted among students in general & engineering in particular
5	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
6	Able to understand the recents trends and applications in IPR

Mapping	**Po-1**	**P0-2**	**Po-3**	**P0-4**	**Po-5**	P0-6	**Po-7**	**P0-8**	**Po-9**	**Po-10**	**Po-11**
CO-1	**X**			**X**							
CO-2				**X**							
CO-3				**X**				**X**			
CO-4				**X**						**X**	
CO-5				**X**						**X**	
CO-6	**X**			**X**							

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

Unit II:
Effective literature studies approaches, analysis Plagiarism, and Research ethics

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

Unit IV:
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit V:
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit VI:
New Developments in IPR: Administration of Patent System. IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Reference Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

M.Tech.(CAD/CAM) I Year – I Sem.
ADVANCED CAD & CAE LAB

L	T	P	C
-	-	4	2

CODE: 7W171 **CIE Marks:30; SEE Marks:70**

Course Objective:
to Exposure to CAD tools such as Pro-E & CATIA ,ANSYS and PROMODEL for use in mechanical engineering applications

Softwares: Pro-E orCatia, ANSYS and PROMODEL

1. Solid modeling features in modeling: blend revolve, sweep rib, tweak Blend cut etc.
2.3D-Modeling of truss bearing bracket
3.3D Modeling & Assembly of Oldham coupling
4.3D modeling various parts of knuckle joint & Assembly of Knuckle joint
5.3D modeling of plumber bearing
6. Static analysis of 3D truss structure
7. Structural static analysisof beams with distributed load and point loads
8. StructuralModal Analysis of cantilever beam
9. Thermal Analysis of composite slab.
10. Buckling Analysis of a column
11. Manufacturing cell process simulation
12. Process Simulation of Paint line

Pattern of Evaluation for Lab Subjects (100 marks)

For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 75 marks for end examination. Out of the 25 marks for internal, the distribution is as follows:

1. Day-to-Day Work	- 05 marks
2. Final Record and viva	- 05 marks
3. Average of two tests including viva	- 05 marks
4. Lab based project report and viva	- 05 marks
5. Project demo	- 05 marks
Total	**- 25 marks**

The end examination 75 marks shall be conducted by an external examiner and an internal examiner appointed by the Chief Superintendent of Examinations of the college. The marks are distributed as follows:

1. Procedure to experiment and calculation	- 15 marks
2. Conduct of experiment, observation, calculation	- 20 marks
3. Results including graphs, discussions and conclusion	-20 marks
4. Viva voce and record	- 20 marks
Total	**- 75 marks**

M.Tech. (CAD/CAM) I Year – I Sem.

TECHNICAL SEMINA-I

L	T	P	C
-	-	4	2

CODE: 7W172 **CIE Marks: 100**

Course Objective: To give sufficient technical life long skills to learn impact various engineering solutions in global products and process industries.

Course Outcomes: At the end of this course, students will be able to	
1.	Identify a research topic
2.	Collect literature
3.	Present seminar
4	Discuss the queries

There shall be two seminar presentations during I year I semester and I year II Semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the Department in a report form and shall make an oral presentation before the Departmental Committee, which shall consist of the Head of the Department, a senior Faculty Member and the Supervisor and will jointly evaluate the report and presentation. For each Seminar there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% to be declared successful.

In the First semester the report must be in the form of the review paper with a format used by IEEE / ASME etc. In the Second semester Technical Seminar in the form of Independent Review Paper must be of high quality fit for publication in a reputed Conference / journal.

The evaluation format for seminar is as follows:

Selection of topic, literature survey Review by the guide	10 marks
Final report and viva	10 marks
Level of content	15 marks
Presentation	20 marks
Discussion & Involvement	15 marks
Class notes	15 marks
Attendance	15 marks
Total	**100 Marks**

Contents:

- Identification of specific topic
- Analysis
- Organization of modules
- Naming Conventions
- Writing style
- Figures
- Feedback
- Miscellaneous

REFERENCES:

1. Teach Technical Writing in Two Hours per Week by Norman Ramsey
2. For Technical Seminar the student must learn few tips from sample seminars and correcting himself, which is continues learning process

NOTE: A student can use any references for this process, but must be shared in classroom.

M.Tech. (CAD/CAM) I Year – II Sem.

ADVANCED CAM

(Programme Core)

L	T	P	C
3	-	-	3

CODE:7W208 **CIE Marks:30; SEE Marks:70**

Course Objectives:

To be familiar with the principles &implementation o of automation and brief history, kinematics, programming of robots and applications.

Course outcomes:

Up on the completion of this course, students able to

UNIT-I: Describe various basic structures of NC/CNC machines
UNIT-II: Identify different types of control systems used in various CNC Machines
UNIT-III: Identify the different types of Post-Processors and their applications
UNIT-IV: Explain the concepts involved in FMS and automated quality control
UNIT-V: Analyze the selection of type robot manipulator for a given application
UNIT-VI: Deduce the expressions related to kinematics and dynamics of different robots.

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X										
CO-2									X		
CO-3									X		
CO-4									X		
CO-5									X		
CO-6									X		

UNIT - I

Tooling for CNC Machines: Interchangeable tooling system, preset and qualified tools, coolant fedTooling system, modular fixturing, quick change tooling system, automatic head changers. DNCSystems and Adaptive Control: Introduction, type of DNC systems, advantages arid disadvantages ofDNC, adaptive control with optimization, Adaptive control with constrains, Adaptive control ofMachining processes like turning, grinding.

UNIT - II

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: Communicationchannels and major variables in the DAPP-based Post Processor, the creation of a DAPP-BasedPost Processor.

UNIT - III

Micro Controllers: Introduction, Hardware components, I/O pins, ports, external memory:,counters,Timers and serial data I/O interrupts. Selection of Micro Controllers Embedded Controllers, Applications and Programming of Micro Controllers. Programming Logic Controllers (PLC's): Introduction, Hardware components of PLC, System, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC's in CNCMachines.

UNIT - IV

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 CAM software, Automatic Tool PathGeneration.

UNIT - V

Computer Aided Process Planning: Basic Steps in Developing a Process Plan, Principal Process PlanningApproaches, Computer Applications in a Manufacturing Plant, Key Aspectsof CAM in a Manufacturing System and Manufacturing Control, Feature Technology, Feature-BasedMethodologies, Basic Concepts of Feature recognition, Classification of Feature Recognition Systems,Feature detection, Feature Generation.

UNIT – VI

Computer Aided Inspection and qualityControl: Coordinate Measuring Machine, Limitations of CMM, Computer Aided Testing, OpticalInspection Methods. Artificial Intelligence, Knowledge-Based Systems, Expert Systems Technology, Applications of GeneticAlgorithm, Agent-Based Technology, Virtual Business, e-Commerce Technologies, Global ManufacturingNetworks, Digital enterprise technologies.

TEXT BOOKS:

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

REFERENCES:

1. Computer Control of Manufacturing Systems / YoramKoren / Mc Graw Hill. 1983.
2. Computer Aided Design Manufacturing – K. Lalit Narayan, K. Mallikarjuna Rao and M.M.M.
Sarcar, PHI, 2008.
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age
4. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Pearson
5. Computer Numerical Control Concepts and programming, Warren S Seames, Thomson.
6. Nanua Singh, Systems approach to computer integrated design and manufacturing, Wiley, 1996

Mode of Evaluation Quiz/Assignment/ Seminar/Written Examination

M.Tech. (CAD/CAM) I Year – II Sem.
FMS& ROBOTICS
(Programme Core)

L	T	P	C
3	-	-	3

CODE: 7W209 **CIE Marks:30; SEE Marks:70**

Course Objectives:
To be familiar with the principles &implementation o of automation and brief history, kinematics, programming of robots and applications.

Course outcomes:
Up on the completion of this course, students able to
1. Describe various basic structures of NC/CNC machines
2. Identify different types of control systems used in various CNC Machines
3. Identify the different types of Post-Processors and their applications
4. Explain the concepts involved in FMS and automated quality control
5. Analyze the selection of type robot manipulator for a given application
6. Deduce the expressions related to kinematics and dynamics of different robots.

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X										
CO-2	X										
CO-3	X				X						
CO-4	X										
CO-5	X										
CO-6	X										

Unit-I:
Introduction - Components of FMS - Application workstations - Computer control and functions - Planning,
Scheduling and control of FMS - Scheduling - Knowledge based scheduling - Hierarchy of computer control -
Supervisory computer.

Unit-II:
CAD/CAM Considerations for FMS:
FMS Planning, Software for simulation and database of FMS. Specification and selection, trends, application of simulation software, Planning FMS database. Just –In –Time Manufacturing System, Kanban system and Preventive maintenance.

Unit-III:
Software Simulation and Database of FMS: Automated material handling - System issues - Types of software - specification and selection - Application of simulation - Manufacturing datasystems - data flow - CAD/CAM considerations - Planning FMS database.

Unit-IV: Industrial Robotics:
Classification and structure of Robotic systems, Performance of Robots, structure of continuous path robot systems, drives and control systems, control approaches for robots. Applications of Robotics in Industry.

Unit-V: Robotic Kinematics and Dynamics: D-H Convention, Homegeneoustranformation, Link parameters and Joint parameters, Robot arm kinematics, the direct kinematics problem and inverse kinematic solutions, planning of manipulator trajectories, Forward Dynamics formulation, Examples on planar robotic manipulators.

Unit-VI: Robot Sensors and Programming:
robot sensors, range sensors, proximity sensors, touch sensors, force and torque sensors, programming, manual teaching, lead through teaching, programming languages, storing and operating task programs, robot selection and application.

TEXT BOOKS:

1. Mikell P. Grover, Automation, Production Systems and Computer Integrated Manufacturing, Second Edition, Pearson Education Asia, First Indian Reprint 2001.
2. N.K. Jha, "Handbook of Flexible Manufacturing Systems ", Academic Press Inc., 1991.
3. Mittal and Nagrath, 'Robotics and Control', Tata Mc Graw Hill.

REFERENCE BOOKS:

1. C. Ray Asfahl, Robots and Manufacturing automation, John Wiley and Sons New York-1992.
2. TaiichiOhno, Toyota, "Production System beyond Large-Scale production ", Productivity Press (India) Pvt.Ltd. 1992.
4. R.D.Klafter, T.A., Chnielewski and Michael Negin, 'Robotic Engineering-An integrated approach-Prentice Hall, New Delhi, 1994

M.Tech. (CAD/CAM) I Year – II Sem.
OPTIMUM DESIGN OF MECHANICAL ELEMENTS
(Programme Core)

L	T	P	C
3	-	-	3

CODE: 7W210 **CIE Marks:30; SEE Marks:70.**

Course Objectives:

The students will get a fundamental knowledge to optimization techniques
To provide optimization methods in engineering design a view of optimization weight, cost, stresses etc...

Course Outcomes:

After completing the course, the students will learn:
Unit I: Basics of optimization, considerations relevant to mechanical / structural systems
Unit II: Concepts and methods for single-variable unconstrained and constrained optimisation
Unit III: Concepts and methods for multi-variable unconstrained and constrained optimization
Unit IV: Techniques for nonlinear optimization
Unit V: Advanced optimization techniques
Unit VI: Optimisation of complex mechanical elements

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X										
CO-2					X						
CO-3					X						
CO-4										X	
CO-5										X	
CO-6										X	

Unit – I: Introduction:

Introduction, Engineering Applications of Optimization , Statement of an Optimization Problem , Design Vector , Design Constraints , Constraint Surface ,Objective Function , Objective Function Surfaces , Classification of Optimization Problems, Formulation of Single-Variable Optimization , Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints and Multivariable Optimization with Inequality Constraints.

Unit – II: Single VariableUnconstrainedOptimisation:

Search Methods: Unrestricted Search, Exhaustive Search, Dichotomous Search, Interval Halving Method, Fibonacci Method, Golden Section Method, Interpolation method: Quadratic Interpolation Method, Newton Method.

Unit – III: Multi-Variable Unconstrained optimisation:

Problem formulation; optimality conditions, Direct Search Method: Powell's method.

Indirect Search methods: Steepest descent method, Conjugate gradient method, Newton's method, Davidon-Fletcher-Powell (DFP) method, Broyden-Fletcher-Goldfarb-Shanno (BFGS) method.

Unit – IV: Multivariable Constrained optimisation:

Problem formulation, Necessary conditions for optimality (equality, inequality and mix of both types of constraints), sufficient conditions. Direct Method: Lagrangian method, Zoutendijk's method. Indirect Method: Basic Approach of the Penalty Function Method, Interior and exterior penalty function methods.

Unit – V: Advanced Optimisation Technique: Geometric Programming

Posynomial, Unconstrained Minimization Problem, Solution of an Unconstrained Geometric Programming Program, Primal–Dual Relationship and Sufficiency Conditions in the Unconstrained Case, Constrained Minimization , Solution of a Constrained Geometric Programming Problem, Primal and Dual Programs in the Case of Less-Than Inequalities, Geometric Programming with Mixed Inequality Constraints .

Unit–VI: Applications of Optimisation in Design and Manufacturing: Design of a 2-bar truss structure of for minimum weight; Minimum weight tubular column design to support a given load without overstressing and buckling, Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of helical coiled springs an, general optimization model of a machining process and optimization of arc welding parameters.

TEXTBOOK:

1. S.S.Rao, "Engineering Optimisation: Theory and Practice", Wiley Eastern Edition
2. Ray C. Johnson, "Optimum Design of Mechanical Elements", John Wiley & Sons

REFERENCE BOOKS:

1. Jasbir S. Arora, "Introduction to Optimum Design", McGraw Hill International Edition
2. Kalyanamoy Deb, "Optimisation for Engineering Design Algorithms and Examples", Prentice Hall of India
3. Optimal design – Jasbir Arora, Mc Graw Hill (International) Publishers

M.Tech. (CAD/CAM) I Year – II Sem.
PERFORMANCE MODELING OF AUTOMATEDMANUFACTURING SYSTEMS
(Programme Elective-II)

L	T	P	C
3	-	-	3

CODE: 7W211 **CIE Marks:30; SEE Marks:70**

Course Objectives:

Toprovideappropriateknowledgeandskills to understand the Simulation technicques /processes for Manufacturing Systems

Course Outcomes:

At the end of this course, student able to

1. Demonstrate modeling techniques of manufacturingystems
2. Apply simulation process for manufacture facilities
3. Explain the applications of queuing simulation
4. Understand the concepts of queuing networks
5. Model simple manufacturing activities withpetrinets
6. Demonstrate few simulation applications in manufacturing withpromode software

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X								X		
CO-2									X		
CO-3									X		
CO-4					X				X		
CO-5					X				X		
CO-6					X				X		

UNIT-I: Automated Manufacturing Systems

Introduction, Manufacturing Systems, Performance Measures, Computer-Controlled Machines, Material Handling Systems, Plant Layout, Computer Control Systems, Flexible Manufacturing Systems.

UNIT-II: Modeling of Manufacturing Systems & Control: Automated Manufacturing Systems – Modeling – Role of performance modeling – simulation models-Analytical models. Product cycle – Manufacturing automation – Economics of scale and scope – input/output model – plant configurations. Performance measures – Manufacturing lead time – Work in process – Machine utilization – Throughput – Capacity – Flexibility – Performability – Quality Control Systems – Control system architecture – Factory communications – Local area network interconnections – Manufacturing automation protocol – Database management system.

UNIT-III: Manufacturing simulation Processes:
Examples of stochastics processes – Poisson process - Discrete time Markov chain models – Definition and notation – Sojourn times in states – Examples of DTMCs in manufacturing – Chapman – Kolmogorov equation – Steady-state analysis. Continuous Time Markov Chain Models – Definitions and notation – Sojourn times in states – examples of CTMCs in manufacturing – Equations for CTMC evolution – Markov model of a transfer line.Birth and Death Processes in Manufacturing – Steady state analysis of BD Processes – Typical BD processes in manufacturing.

UNIT-IV
QUEUING SIMULATION APPLICATIONS:
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-V: **Queuing Networks:**
Examples of QN models in manufacturing – Little's law in queuing networks – Tandem queue – An open queuing network with feedback – An open central server model for FMS – Closed transfer line – Closed server model – Garden Newell networks.

UNIT-VI: Petrinets: Classical Petri Nets – Definitions – Transition firing and reach ability – Representational power – properties – Manufacturing models. Stochastic Petri Nets – Exponential timed Petri Nets – Generalized Stochastic Petri Nets – modeling of KANBAN systems – Manufacturing models

TEXT BOOKS

1. Performance Modelling of Automated Manufacturing Systems/ Viswanadham, N AndNarahari, Y/ Prentice Hall Of India, New Delhi, 1994.

References:
2. Probability And Statistics With Reliability, Queuing And Computer Science Applications/ Trivedi, K.S./ Prentice Hall, New Jersey, 1982.

3. Fundamentals Of Mathematical Statistics/ Gupta S.C. & Kapoor V.K./ 3rd Edition, Delhi, 1988

M.Tech. (CAD/CAM) I Year – II Sem.
Micro Electro Mechanical Systems(MEMS)
(Programme Elective-II)

L	T	P	C
3	-	-	3

CODE:7W212 **CIE Marks:30; SEE Marks:70**

Course Objective:
To introduce students to the concepts and applications MEMS.
Course Outcomes:
At the end of this course, students able to
1. Acquire knowledge on MEMS principles and applications.
2. Demonstrate basics of micro system
3. Learn mechanics principles for microsystem design
4. Realize the applications of Thermal fluid
5. Applygenaral approach to design amicro systems
6. Understand various types of Manufacturing of MEMS

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1					X						
CO-2					X						
CO-3					X						
CO-4	X										
CO-5		X									
CO-6					X						

UNIT - I:
Overview and Working Principles of MEMS and Microsystems
MEMS & Microsystems, Evolution of Micro fabrication, Microsystems & Microelectronics, Microsystems &Miniaturization, Applications of MEMS in Industries, Micro sensors, Micro actuation, MEMS with Microactuators Micro accelerometers, Micro fluidies.

UNIT - II:
Engineering Science for Microsystems Design and Fabrication:
Atomic structure of Matter, Ions and Ionization, Molecular Theory of Mater and Intermolecular Force,Doping of Semiconductors, The diffusion Process, Plasma Physics, Electrochemistry, Quantum Physics

UNIT - III:
Engineering Mechanics for Microsystems Design:
Static Bending of thin Plates, Mechanical Vibration, Thermo mechanics Fracture Mechanics, Thin-FilmMechanics, Overview of Finite Element Stress Analysis

UNIT - IV:

Thermo Fluid Engineering:

Overview of Basics of Fluid Mechanics in Macro and Meso scales, Basic equations in Continuum Fluiddynamics, Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible FluidFlow in Micro conduits, Fluid Flow in Sub micrometer and Nano scale, Overview of Heat conduction inSolids, Heat Conduction in Multilayered Thin films and in solids in sub micrometer scale.

UNIT-V:

Microsystems Design:

DesignConsiderations, Process Design Mechanical Design, Mechanical Design using FEM, Design of a SiliconDie for a Micro pressure Sensor.

UNIT - VI:

Materials for MEMS & Microsystems and Their Fabrication:

Substrates and Wafers, Active substrate materials, Silicon as a substrate material, Silicon Compounds,SiliconPiezoresistors, Gallium Arsenide, Quartz, Piezoelectric Crystals and Polymers, Photolithography,Ion implantation, Diffusion and oxidation, chemical and physical vapor deposition, Etching, Bulk micromanufacturing, Surface Micromachining, The LIGA Process

REFERENCES:

1. MEMs & Microsystems: Design & Manufacture/ Tai-Ran Hsu/Tata Mc-Graw Hill. ed. /2002
2. An Introduction to Microelectromechanical Systems Engineering/ Maluf, M. /Artech House, Boston, 2000
3. Micro robots and Micromechanical Systems/ Trimmer, W.S.N/ Sensors & Actuators, vol19, no.1989.
4. Applied Partial Differential Equations/ Trim, D.W/ PWS-Kent Publishing/ Boston 1990.
5. Fundamentals of Microfabrication. Madou, M/ CRC Press, Boca Raton, 1997.
6. The Finite Element Method in Thermomechanics/ Hsu, T.R / Alien & Unwin, London

M.Tech. (CAD/CAM) I Year – II Sem.
MECHANICAL VIBRATIONS & CONDITION MONITORING
(Programme Elective-II)

L	T	P	C
3	-	-	3

CODE: 7W213 **CIE Marks:30; SEE Marks:70**

Course Objective:
to provide knowledge to understand the importance of vibrations in mechanical design of machine parts that operate in vibratory conditions and be able to make free and forced (harmonic, periodic) vibration analysis of single and multi degree of freedom linear systems and Student will learn principles of condition monitoring for diagnostic of machines.

Course Out Comes :

1. Student should be ableto develop ability to analyze mechanicalvibrations and select elements for various vibration applications - with attention to amplitude and frequencies.
2. To analyze resonance conditions and Safety factors for machine members of multi degree freedom under steady state and periodic fatigue loads.
3. to derive vibration equations for continuous systems
4. To acquire procedure to analyze and designof vibration measurement devices.
5. to learn technique to evaluate random and non linear vibrations and Various types of monitoring techniques and their applications.

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1		X			X						
CO-2		X			X						
CO-3		X			X						
CO-4		X			X						
CO-5		X			X						
CO-6		X			X						

Unit I:VibrationsofSingle Degree of Freedom Systems:
Simple harmonic motion, Free and forced vibrations of damped and undamped systems; Simple harmonic excitation; steady state response forced vibrations; free transverse and torsion vibrations;

Unit II: Vibration of Systems with Two Degrees of Freedom:
Free vibration of spring coupled systems, Two degree freedom of mass coupled system, bending vibrations of two degree of freedom system, Forced vibrations of un damped two degree of freedom system, Forced damped vibrations, Vibration isolation, Close coupled system, Far coupled system, mode shapes and modal analysis

Unit III: **Vibration of Systems with Multi-degree of Freedom:**
Continuous Systems: Vibrating string, longitudinal vibration of rods, Torsional vibration of rods, and Euler equation for beams.

Approximate methods: Dunkerley lower bound method, Rayieigh's upper bound method, Holzer method, Stodola's methods

Unit IV: Experimental methods in vibration analysis:
Vibration instruments: exciters, transducers, analysers, measurement devices: vibrometers, velocity meters and accelerometers; Signal analysis techniques: time domain analysis, frequency domain analysis, amplitude and power spectra, coherence, auto and cross correlations, amplitude and frequency modulations; Tests for free and forced vibrations

Unit V: Condition Monitoring of Systems:
Introduction to Vibration and Condition Monitoring; Failure types, investigation and occurrences; Machinery Signatures and analysis; Wear and lubricant / contaminant monitoring and analysis; Introduction to Active Control of Structures

Unit VI:
Random Vibrations : Random phenomena, Time averaging and expected value, Frequency response function, Probability distribution, Correlation, Power spectrum and power spectral density, Fourier transforms, FTs and response.

Introduction to Vehicle dynamics: vehicle subjected to random vibrations (for example an uneven road), Introduction to nonlinear and random vibrations, Vibrations in turbines.

TEXTBOOK:

1. "Introductory Course on Theory and Practice of Mechanical Vibrations", J.S.Rao, K.Gupta, Revised second edition, New Age International Publishers
2. "Theory of Vibration with Applications", William T. Thomson, Marie Dillon Dahleh, Pearson Low Price Edition
3. "Condition Monitoring and Condition Based Maintenance", Dr. Prabhu, Teacher Training Institute, Bhopal

REFERENCE BOOKS:

1. "Mechanical Vibration and Shock Measurements", J.T.Broch, Bruel and Kjae Publication
2. "Mechanical Fault Diagnosis and Condition Monitoring", R.A.Collacott, Chapman and Hall Publishers
3. "Applications of Random Vibrations", N. C. Nigam, S. Narayanan, Narosa Publishers

M.Tech. (CAD/CAM) I Year – II Sem.
3D PRINTING TECHNOLOGY AND ADDITIVE MANUFACTURING
(Programme Elective-III)

L	T	P	C
3	-	-	3

CODE: 7W214 **CIE Marks:30; SEE Marks:70**

Course Objective:

To provide subject knowledge of advanced topics of Manufacturing Methods suchasAdditive manufacturing emphasizing the 3D printing Technology.

Course Outcomes:

1.learn Basics of Additive manufacture

2.demonstrate Concept of Additive Manufacture Process chain

3. able to demonstrate Liquid based Manufacture system.

4. able to demonstrate Solid based Manufacture system.

5. able to demonstrate powder based Manufacture system.

6.Able to discuss applications of AM

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1					X						
CO-2					X						
CO-3					X						
CO-4	X										
CO-5		X									
CO-6					X						

Unit-1.Introduction

Development of AM, Fundametals of AM, Classification of AM systems, Advantageous of AM, Standards on AM, Commonly used Terms.

Basics of 3D Printing: What is 3D Printing, Types of 3D Printing Technologies, In-depth of FDM/FFF printer, Slicing Software, 3D Printer Operation

Unit-2.Additive Manufacturing Process chain

Fundamentals of Automated fabrication Process, Process chain,3D Modeling, Data conversion and transmission, Checking and preparing, Building, Post processing

Unit-3.Liquid based additive Manufacturing Systems

3D Systems Sterolithography Apparatus, Stratasys Poly jet,Multi jet printing system,Rapid Freeze Prototyping, OptmecsAersol Jet Systems, Two photon Polymerisation,3D Cerams Ceramic Parts, Other notable Liquid based AM Systems

Unit-4. Solid Based Additive Manufacturing Systems

Stratasys Fused Deposition Modeling,Mcor Technologies Selective Deposition Lamination, Sciaky's Electron Beam AM, Fabrisonic's Ultrasonic Additing Manufacturing, Other notable Solid Based AM sytem

Unit-5. Powdered Based Additive Manufacturing

3D systems SLS, SLM solutions foe Selective Laser Melting,3D SYSTEM CJP Technology, BeAMs LMD systems,Electron Beam Melting, DMG MORI,s Hybrid AM,HP,s Multi Jet Fusion, Other notable Powered Based AM Systems.

Unit-6. AM Data Formats AND Application of AM

STL Format, STL File Problems, Tessellated Model, STL fILE REPAIR, Other translators, Stanadard representation of AM, Standards on AM.

Applications in Aero space, Automotive, Jewellery, coin, Tableware, marine and offshore etc.

Text Books:

1. Chee Kai Chua, Kah Fai Leong " 3D Printing and Additive Manufacturing Principles and Applications Fifth Addition,Kindle Text book store.
2.M.Adithan "Rapid Protoyping" Atalntic Publishers.

M.Tech-CAD-CAM (ME)- I Year – II Sem.

PRODUCTION AND CHARACTERIZATION OF NANOMATERIALS

(Program Elective-III)

L	T	P/D	C
3	-	0	3

CODE:7W215 **CIE Marks:30; SEE Marks:70**

OBJECTIVES
In this Subject students will learn about different physical methods, chemical methods, thermolysis rule and biological methods. For the synthesis of nanomaterials, students gain in depth of knowledge which will be helpful to them in the career to go forward successfully in the field of nanoscience and nanotechnology.

Course Outcomes:

1.Student acquires knowledge on advanced synthesis of nanomaterials via physical methods.

2 Student acquires knowledge on topdown and bottom up new synthesis methods for making nanomaterials.

3. Students learns advanced methods of synthesis via CVD, biological methods

4. Student acquires knowledge on advanced compositional and structural analysis of nanomaterials

5. Student acquires knowledge on advanced surface characterization techniquesapplied to nanomaterials

6. Student acquires knowledge on advanced electrical characterization techniques applied to nanomaterials

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1					X						
CO-2					X						
CO-3					X						
CO-4					X						
CO-5					X						
CO-6					X						

Unit-I: Introduction to synthesis of nanostructure materials, Bottom-up approach and Top-down approach with examples. Physical methods**:** Inert gas condensation, Arc discharge, RF-plasma, plasma arc technique, electric explosion of wires, laser ablation, laser pyrolysis,

Unit-II: Ball milling, molecular beam epitaxy, electrodeposition, rapid solidification (RSP), consolidation, Chemical methods**:** Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nanocrystals of semiconductors

and other materials by arrested precipitation, emulsion synthesis, sonochemical routes

Unit-III: Thermolysis route - spray pyrolysis and solvated metal atom dispersion, sol-gel method, solvothermal and hydrothermal routes, solution combustion synthesis, CVD method and other variants, Biological methods – use of bacteria, fungi**,**actinomycetes for nano-particle sythesis-magnetotaticbacteria for natural synthesis of magnetic nano-particles, role of plants in nano particle synthesis.

Unit-IV: Compositional and structural Characterization techniques**:** X-ray Photoelectron Spectroscopy (XPS), X-Ray topography, Energy Dispersive X-ray analysis (EDAX), Principles and applications of X-ray diffraction, Small angle X-ray diffraction and Wide angle X-Ray diffraction; electron diffraction, Electron probe microanalysis (EPMA), Ion beam techniques: SIMS & RBS, 3-D atom probe

Unit-V: Surface characterization Techniques: Scanning electron microscopy (SEM), Transmission electron microscopy, Basic principles and the applications of scanning probe techniques (SPM), Atomic force microscopy, scanning tunneling microscopy, Spectroscopic techniques:UV-Visible spectroscopy, Infrared (IR) & Fourier Transform infrared (FTIR) spectroscopy, Raman spectroscopy techniques: micro Raman and laser Raman; Photo luminescence spectroscopy

Unit-VI: Electrical characterization techniques: Hall measurement, Dynamic and static Current voltage (I-V) characteristics, capacitance, voltage measurements, I-V analysis by AFM and STM (STS), electron beam induced current measurement (EBIC), Magnetic & dielectric characterization: SQUID, VSM, MFM, Neutron diffraction, Dielectric measurements, impedance and ferroelectric measurements

Textbooks:

1. Inorganic Materials Synthesis and Fabrication by J.N. Lalena, D.A. Cleary, E.E. Carpenter, N.F. Dean, John Wiley & Sons Inc.
2. Introduction to Nano Technology by Charles P. Poole Jr and Frank J. Owens. Wiley India Pvt Ltd.
3. The Chemistry of nanomaterials: Synthesis, Properties and Applications, Vol-I by C.N.R. Rao, A. Muller and A.K. Cheetham
4. "Nanoscience and Nanotechnology: Fundamentals to Frontiers" by M.S. Ramachandra Rao and Shubra Singh, Wiley Publishers, 2013.

Reference books:

1. Encyclopedia of Nanotechnology by M.Balakrishna Rao and K.Krishna Reddy, Vol I to X, Campus books.
2. Encyclopedia of Nanotechnology by H.S. Nalwa
3. Nano: The Essentials – Understanding NanoScinece and Nanotechnology – by T.Pradeep; Tata Mc.Graw Hill

M.Tech.(CAD/CAM) I Year – II Sem.

TECHNICAL SEMINA-II

L	T	P	C
-	-	4	2

CODE: 7W273 **CIE Marks: 100**

Course Objective:

To give sufficient technical life long skills to learn impact various engineering solutions in global products and process industries.

Course Out comes: After studying this course, the students will be able to

1. Identify a specific research topic based on the emerging trends
2. Collect literature survey
3. Present series of seminars
4. Discuss the queries and incorporate the suggestions made
5. Prepare the research report as per the format
6. Should give final presentation on the topic selected

There shall be two seminar presentations during I year II semester For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the Department in a report form and shall make an oral presentation before the Departmental Committee, which shall consist of the Head of the Department, a senior Faculty Member and the Supervisor and will jointly evaluate the report and presentation. For each Seminar there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% to be declared successful.

In the First semester the report must be in the form of the review paper with a format used by IEEE / ASME etc. In the Second semester Technical Seminar in the form of Independent Review Paper must be of high quality fit for publication in a reputed conference / journal.

The evaluation format for seminar is as follows:

Selection of topic, literature survey Review by the guide	10 marks
Final report and viva	10 marks
Level of content	15 marks
Presentation	20 marks
Discussion & Involvement	15 marks
Class notes	15 marks
Attendance	15 marks
Total	**100 Marks**

Contents:

- Identification of specific topic
- Analysis
- Organization of modules
- Naming Conventions
- Writing style
- Figures
- Feedback
- Miscellaneous

REFERENCES:

Teach Technical Writing in Two Hours per Week by Norman Ramsey

For Technical Seminar the student must learn few tips from sample seminars and correcting himself, which is continues learning process

NOTE: A student can use any references for this process, but must be shared in classroom.

M.Tech. (CAD/CAM) I Year – II Sem.
CAM & Robotics LAB

L	T	P	C
-	-	4	2

CODE: 7W274 **CIE Marks:30; SEE Marks:70**

Course Objective:
ToExposure CAM tools such as XL turn &mill, 3DPrinting and Robotics for use in mechanical engineering applications

Equipment: ***CNC Lathe, CNC Mill, 3D Printer, Six Axis Robot.***

List of Experiments:
1. Part programme Simulation on lathe operations using XL Turn
2. Partprogramme Simulation on mill and drill operations using XL Mill
3. Exercise on Facing, Turning, Step Turning and Taper turning CNC Lathe
4. Exercise on Pattern repetition through sub program on CNC Lathe
5. Exercise on Thread cutting on CNC Lathe
6. Exercise on Profile cutting and pocket cutting on CNC Mill
7. Exercise on Mirroring on CNC Mill
8. Demo of Part loading on CNC Machines with XL Articulated Robot
9.3D Pinting of screw CAD Model
10.3DPrinting of Spur gear model
11. Writing a Pick and Place Program and Running the Program Line by Line and Running the Program continuously
12. Performing Pick and Place Tasks on Six Axis Robot: Recording Pick and Place positions, Performing Pick and Place Movements.

Pattern of Evaluation for Lab Subjects (100 marks):

For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 75 marks for end examination. Out of the 25 marks for internal, the distribution is as follows:

6. Day-to-Day Work	- 05 marks
7. Final Record and viva	- 05 marks
8. Average of two tests including viva	- 05 marks
9. Lab based project report and viva	- 05 marks
10. Project demo	- 05 marks
Total	- 25 marks

The end examination 75 marks shall be conducted by an external examiner and an internal examiner appointed by the Chief Superintendent of Examinations of the college. The marks are distributed as follows:

5. Procedure to experiment and calculation - 15 marks
6. Conduct of experiment, observation, calculation - 20 marks
7. Results including graphs, discussions and conclusion-20 marks
8. Viva voce and record - 20 marks

Total - 75 marks

M.Tech. (CAD/CAM) I Year -II SEM
COMPREHENSIVE VIVA

L	T	P	C
-	-	2	1

CODE: 7W275

CIE Marks:30; SEE Marks:70

Course Objective:

1. The main objective of this course is to prepare the students to face interview both at the academic and the industrial sector.
2. To Exhibit the strength and grip on the fundamentals of the subjects studied in I year IIsem

There shall be a Comprehensive Viva-Voce Examination in second semester of I year. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects, he/she studied during the M.Tech I Year II Sem course of study, and The Comprehensive Viva-Voce is valued for 100 marks. There are25 marks to be evaluated by the internal committee and 75 marks for the end semester evaluation by a committee constituted with internal members and external evaluator. A candidate has to secure a minimum of 50% of total marks subject to securing a minimum of 40% mark in external examination to be declared successful.

M.Tech. (CAD/CAM) I Year –II Sem
MINI PROJECT with SEMINAR

Course outcomes:
After studying this course, the students will be able to

1. Identify a research topic
2. Collect literature
3. Do project & write technical review paper
4. Present seminar
5. Discuss the queries and Publish research paper

In I year II semester, a project seminar shall be conducted and evaluated in II-year I-Semaster for 100 marks and for 3 credits. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and frame problem definition based on the literature- methodology- Experiment/simulate-obtain results , submit report to the Department and shall make an oral presentation before the Departmental Committee, which shall consist of the Head of the Department, a senior Faculty Member and the Supervisor and will jointly evaluate the report and presentation.

A Student has to concentrate on the following sections while writing technical paper or presenting seminar.
Contents:

- Identification of specific topic, Analysis
- Organization of modules, Naming Conventions
- Writing style, Figures
- Feedback
- Miscellaneous

REFERENCES:
1. Teach Technical Writing in Two Hours per Week by Norman Ramsey
2. For Technical Seminar the student must learn few tips from sample seminars and correcting himself, which is continues learning process

REFERENCE LINKS:

I. http://www.cs.dartmouth.edu/~scot/givingTalks/sld001.htm
II. http://www.cse.psu.edu/~yuanxie/advice.htm
III. http://www.eng.unt.edu/ian/guides/postscript/speaker.pdf

NOTE: A student can use any references for this process, but must be shared in classroom.

M.Tech. (CAD/CAM) II Year – I Sem.

MECHANICS AND MANUFACTURING METHODS OF COMPOSITES

L	T	P	C
3	-	-	3

CODE:7W316 CIE Marks:30; SEE Marks:70

Course Objective:
To introduce students to the concepts of composite materials along with stress analysis and theories of micro and macromechanics.

Course Outcomes:
At the end of this course, students able to
1. Inditify appropriate composite for given application
2. Derive various stress strain relations for composite lamina
3. Do investigate elastic behaviour of composites
4. Deduce failure mechanisms of composites
5. Applyanylitical approach to analyse composite vplates
6. Learn different manufacturing processes for composites

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X										
CO-2			X								
CO-3			X								
CO-4			X								
CO-5					X						
CO-6	X										

UNIT – I
Basic concepts and characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites, Fibres- Glass,
Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres.Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.

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

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

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

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

UNIT – V
Analysis of laminated composite plates: Introduction, thin plate theory, especially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory. Analysis of composite beams

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

TEXT BOOKS:
1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.

2. Engineering Mechanics of Composite Materials by Isaac and M.Daniel, Oxford University Press, 1994.

REFERENCES:
1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.

2. L. R. Calcote, Analysis of Laminated Composite Structures, VanNostrandRainfold, New York, 1969

M.Tech. (CAD/CAM) II Year –I Sem
BUSINESS ANALYTICS
(Open Elective)

L	T	P/D	C
3	0	0	3

CIE Marks:30; SEE Marks:70

CODE:7ZC31

Course objectives:

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with processes needed to develop, report, and analyze business data.
- Use decision-making tools/Operations research techniques.
- Mange business process using analytical and management tools.
- Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc

COURSE OUTCOMES:

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive Modeling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X										
CO-2					X						
CO-3					X						
CO-4					X						
CO-5											
CO-6											

SYLLABUS

Unit1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Unit 6: Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

References:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

M.Tech. (CAD/CAM) II Year –I Sem
INDUSTRIAL SAFETY
(Open elective)

L	T	P/D	C
3	0	0	3

CIE Marks:30; SEE Marks:70

CODE: 7WC17

OBJECTIVES
In this Subject students will learn about different physical methods, chemical methods, thermolysis rule and biological methods. For the synthesis of nanomaterials, students gain in depth of knowledge which will be helpful to them in the career to go forward successfully in the field of nanoscience and nanotechnology.

COURSE OUTCOMES:

1. Student acquires knowledge on different safety measured to be taken in industry

2.Student acquires knowledge on different maintenance and systems and service life cycle calculations

3. Students should demonstrate the wear behavior of different mechanical elements and and its preventive measures

4. Student acquires knowledge on different types of faults in machine tools and their general causes.

5. Student acquires knowledge on Periodic and preventive maintenance

6. Student acquires knowledge on procedures and Steps for periodic and preventive maintenance

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X		X								
CO-2	X		X								
CO-3	X		X								
CO-4	X		X								
CO-5	X		X								
CO-6	X		X								

Syllabus:

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light,

cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.

Unit-VI: Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

References:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

M.Tech. (CAD/CAM) II Year –I Sem
OPERATIONS RESEARCH
(Open elective)

L	T	P/D	C
3	0	0	3

CIE Marks:30; SEE Marks:70

CODE: 7WC18

Course Objectives:

The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

Course Outcomes:

CO1: Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.

CO2: Recognize and solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations

CO4: Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy

CO5: Analyze the performance measures of Queing system and calculate the EOQ for minimizing the total inventory cost

CO6: Apply simulation techniques for solving various types of problems and apply dynamic programming approach for obtaining optimal solutions

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X					X				X	X
CO-2	X					X				X	X
CO-3	X					X				X	X
CO-4	X					X				X	X
CO-5	X					X				X	X
CO-6	X					X				X	X

Syllabus Contents:
Unit 1: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2: Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4: Scheduling and sequencing - single server and multiple server models.

Unit 5: deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 6. Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

References:

1. H.A. Taha, Operations Research, an Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

M.Tech. (CAD/CAM) II Year –I Sem
COMPOSITES
(Open elective)

L	T	P/D	C
3	0	0	3

CIE Marks:30; SEE Marks:70

CODE: 7WC19

Course Objectives:

The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

Course Outcomes:

1. Student acquires knowledge on different types of composite materials and its applications
2. Student acquires knowledge on Mechanical Behavior of composites of different composite materials
3. Students should demonstrate the Manufacturing of Metal Matrix Composites and its properties
4. Student acquires knowledge on Manufacturing of Ceramic Matrix Composites and its properties
5. Student acquires knowledge on Manufacturing of Polymer Matrix Composites
6. Student acquires knowledge on Failure Criteria-strength ratio, maximum stress criteria

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X				X						
CO-2	X				X						
CO-3	X				X						
CO-4	X				X						
CO-5	X				X						
CO-6	X				X						

Syllabus:

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications.

UNIT–IV: Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–V: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – VI: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

M.Tech. (CAD/CAM) II Year –I Sem
COST MANAGEMENT OF ENGINEERING PROJECTS
(Open elective)

L	T	P	C
3	0	0	3

CODE: 7ZC32 **CIE Marks:30; SEE Marks:70**

Course objective: To provide the insights of various project management and cost control techniques for successful implementation and completion of the project.

Course Outcomes:

1. Student acquires knowledge on different costing system and Cost concepts in decision-making
2. Student acquires knowledge on Break-even Analysis, Cost-Volume-Profit Analysis and various decision-making problems
3. Students should demonstrate the Manufacturing of Metal Matrix Composites and its properties
4. Student acquires knowledge on different project management analysis
5. Student acquires knowledge on Project evaluation systems
6. Student acquires knowledge on different quantitative techniques

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X								X		
CO-2	X								X		
CO-3	X								X		
CO-4	X								X		
CO-5	X								X		
CO-6	X								X		

UNIT I

INTRODUCTION AND OVERVIEW OF THE STRATEGIC COST MANAGEMENT PROCESS: Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II

COST BEHAVIOR AND PROFIT PLANNING MARGINAL COSTING; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis (Theory). Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector.

UNIT III

BUDGETARY CONTROL: Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing

UNIT IV

PROJECT MANAGEMENT TECHNIQUES: Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis.

UNIT V

PROJECT EVALUATION:. Meaning of Project, Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of Project Manager. Importance Project site. Project execution Project cost control. Bar charts and Network diagram.

UNIT VI

QUANTITATIVE TECHNIQUES: For cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Books Recommended:

- Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
- Charles T. Horngren and George Foster, Advanced Management Accounting

References:

- Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
- Ashish K. Bhattacharya, Principles & Practices of CostAccounting A. H. Wheeler publisher
- N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

M.Tech. (CAD/CAM) II Year –I Sem
WASTE TO ENERGY
(Open elective)

L	T	P/D	C
3	0	0	3

CIE Marks:30; SEE Marks:70

CODE: 7MC17

Course objective: To provide the insights of utilizing various energy in waste and maintan the environmental sustainability

Course Outcomes:

1. Student acquires knowledge on utilization of energy in different types of energy

2. Student acquires knowledge on Biomass Pyrolysis and Manufacture of pyrolytic oils and gases
3. Students should demonstrate the Biomass Gasification process

4. Student acquires knowledge on Biomass Combustion process

5. Student acquires knowledge on Properties of biogas

6. Student acquires knowledge on Urban waste to energy conversion - Biomass energy programme in India.

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X										
CO-2	X										
CO-3	X										
CO-4	X										
CO-5	X										
CO-6	X										

Syllabus contents:

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion -

Unit-VI: Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

M.Tech. (CAD/CAM) I Year –II Sem
MINI PROJECT with SEMINAR

L	T	P	C
-	-	6	3

CIE Marks:30; SEE Marks:70

CODE: 7W376

Course outcomes:

After studying this course, the students will be able to

1. Identify a research topic
2. Collect literature
3. Do project & write technical review paper
4. Present seminar
5. Discuss the queries and Publish research paper

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	X										
CO-2				X							
CO-3							X				X
CO-4								X			
CO-5										X	
CO-6											

In II year I semester, a mini-project review shall be done by PRC for 100 marks and 3 credits. The students shall take up an industry-oriented mini-project between I year II semester and II year I semester.

The evaluation of the mini-project shall be done following the submission of a report by the students at the beginning of the II year I semester. The evaluation process shall carry 23 marks for continuous review of project progress and 70 marks for the report and a presentation of a seminar by the students covering the mini-project. The committee shall examine the project scope, the work done, and the knowledge gained by the students during the project time period. A candidate shall secure a minimum of 50% to be declared successful in Mini-Project.

M.Tech. (CAD/CAM) II Year –I Sem

PROJECT PHASE-I WITH SEMINAR

L	T	P	C
-	-	10	5

CIE Marks:30; SEE Marks:70

CODE: 7W377

In II year I semester, a project work review shall be done by PRC for 100 marks and for 5credits. The evaluation for the project reviews shall be done in 4 stages (not less than 4 weeks between two consecutive stages) including end semester evaluation.

Each stage project review shall carry marks Weightage and the end semester review shall carry 70marks. The Supervisor and External Examinar will examine the Problem Definition, Objectives, Scope of Work, Literature Survey and design in Project Phase- I. A candidate shall secure a minimum of 50% to be declared successful in Project Phase I. If candidate fails to fulfill minimum marks, he has to reappear during the supplementary examination.

M.Tech. (CAD/CAM) IIYear –II Sem

PROJECT PHASE II WITH SEMINAR

L	T	P	C
-	-	12	6

CIE Marks:30; SEE Marks:70

CODE: 7W478

In II year II semester, a project work review shall be done by PRC for 100 marks and for 6credits. The evaluation for the project reviews shall be done in 4 stages (not less than 4 weeks between two consecutive stages) including end semester evaluation.

Each stage project review shall carry marks Weightage and the end semester review shall carry 75marks. The Supervisor and External Examinar will examine the Problem Definition, Objectives, Scope of Work, Literature Survey and design in Project Phase- II. A candidate shall secure a minimum of 50% to be declared successful in Project Phase II. If candidate fails to fulfill minimum marks, he has to reappear during the supplementary examination.

M.Tech. CAD/CAM) IIYear –II SEM
Dissertation and Defense Viva

L	T	P	C
-	-	--	7

CIE Marks:30, SEE Marks:70

CODE: 7W479

For Project Evaluation (Viva Voce) in II Year II Sem. there are external marks of 100 for 7credits. HoD shall submit a panel of 3 examiners, eminent in that field. Principal will appoint one of them as examiner.

The thesis shall be adjudicated by examiner selected by the College. If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

If the report of the examiner is favourable, Project Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. Candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.