DEPARTMENT O F MECHANICAL ENGINEERING

M.Tech (CAD/CAM)

SUBJECTWISE CO STATEMENT – A19

S. NO	Course code	Course Name	CO	CO Statement
1	**7W101**	**ADVANCED CAD**	1	Identify various CAD peripherals and learn concepts of various space curves
			2	Understand difference between parametric and non-parametric curves and its geometric modeling techniques
			3	Demonstrate the mathematics to model various analytical and synthetic surfaces with parametric and non-parametric geometric modeling techniques
			4	Develop different 3D geometric models with Constructive Solid Geometry. Boundary Representations and able to perform Geometric transformations
			5	Understand the different CAD/CAM data exchange formats and its standards in engineering design
			6	Identify the important role of collaborative Engineering in product life cycle and demonstrates the various stages of PLM with appropriate examples.
2	**7W102**	**ADVANCED FINITE ELEMENT ANALYSIS**	1	Able to demonstrate the solution techniques for Finite Element Formulations of Mechanical Engineering Problems
			2	Solve stress analysis problems of frames ,beams and trusses with AFEA Techniques
			3	Acquires knowledge of stress analysis of plates under bending with AFEA formulation

			4	Gains knowledge and in position to apply AFEA to solve Dynamics related problems.
			5	Learn the method to convert heat transfer problems in to simple solvable equations through FEM
			6	Demonstrate different approaches to handle Fluid Flow problems through FEM that leads to gain skills to develop CFD related applications.
3	**7W103**	**ADVANCED MECHANICS OF SOLIDS**	1	Learn Basics of Energy Methods and applications in structural mechanics
			2	Demonstrate Concept of shear centre, symmetric and un-symmetric bending
			3	Analyze Bending stresses in curved beams
			4	Derive Torsion of circular and non-circular cross section beams, membrane analogy, torsion of thin-walled and multiply connected cross-section members
			5	Apply theoretical on study on Elastic stability of columns using energy methods
			6	Learn the role fracture mechanics in failure of mechanical parts
4	**7W104**	**DESIGN FOR MANUFACTURING & ASSEMBLY**	1	Learn Basic principles of designing for economical production material for design development with charts
			2	Overview of various machining process, Redesigning of components for machining with suitable examples and various casting process
			3	Design principles for Punching, Blanking, Bending, Deep drawing etc. Design factors for forging

			4	Develop the assemblies process, automatic assembly transfer system, assembly advantages
			5	Develop of the systematic DFA methodology, assembly, efficiency, classification system for material handling
			6	Evaluate of part symmetry handling time
5	**7W105**	**RESEARCH METHODOLOGIES AND IPR**	1	Understand the research problem formulation and analyse research related information.
			2	Follow research ethics
			3	Gain an understanding of how to write research proposals and reports
			4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
			5	Understand the essence of IPR in growth of individuals & nation and promote students identify IPR in general & engineering design and development
			6	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	**7W106**	**MECHATRONICS**	1	Understand elements of Mechatronics measurement systems, control systems, case studies, actuation systems.
			2	Able to model dynamic systems- first order and second order systems and understand Transfer functions
			3	Understand Frequency response, performance specifications and stability. Closed loop controllers-

				P, PI, PID adaptive control.
			4	Know different microprocessor and microcontrollers, and PLC and able to demonstrate the system
			5	Understand the different Sensors in speed, position, stress, strain, acceleration and temperature measurement sensor. Machine vision
			6	Learn different Data base management systems, CAD/CAM databases, graphic database, and Oops concepts.
7	**7W107**	**NANO-SCIENCE AND NANO-TECHNOLOGY**	1	Show how diverse properties (electronic, thermal, optical) of solid materials can be related to interactions at the atomistic level.
			2	Deduce and verify macroscopic properties of solids using standard theoretical models and understand their significance in wider context of solid materials
			3	Show how solid state physics forms vital part of developing materials of technological value
			4	Achieve an understanding of the theory of quantum mechanics, and an ability to apply the quantum theory to important physical systems
			5	Objective of this course is to make the students acquire depth of knowledge in the concepts of statistical mechanics and thermodynamics.
			6	Understand the phase diagrams of binary alloys systems
8	**7HC18**	**ENGLISH FOR RESEARCH PAPER WRITING**	1	Understand how to improve writing skills and level of readability
			2	Learn about what to write in each section
			3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission Syllabus
			4	Learn how to write Introduction and Literature review
			5	Write results and discussion section effectively

			6	Show command on manuscript writing
9	**7W171**	**ADVANCED CAD &CAE LAB**	1	Able to create models with different features of solid modeling and model bearings and brackets.
			2	Able to create complex machine 3D-components with different modeling software
			3	Assembling, detailing and drafting of the machine parts for manufacturing.
			4	Able Perform Static structural analysis of 3D truss beams with different boundary conditions
			5	Analysis of thermal composite slab and fins with different boundary conditions.
			6	Simulate Manufacturing cell process with conveyers.
10	**7M172**	**TECHINCAL SEMINAR-I**	1	Identify a research topic based on the area of interest in CAD/CAM specialization
			2	Collect literature based on the topic selected
			3	Prepare presentation for seminar and present the same
			4	Understand how to identify research gap
			5	Write review paper without any plagiarism
			6	Learn to carry our research independently
11	**7W208**	**ADVANCED CAM**	1	Describe various basic tooling of CNC Machines required.
			2	Understand Post Processors for CNC machine and able to demonstrate the structure of Post Processors.
			3	Identify the different types components of Microprocessor and microcontrollers in CNC

				machines
			4	Understand computer aided part programming and able to do the computer aided part programming independently.
			5	Understand the Computer Aided Process Planning and manual process planning softwares.
			6	Identify Computer Aided Inspection and quality Control equipments and femilarize the automated inspection procedures
12	**7W209**	**FMS& ROBOTICS**	1	Identify the different Components of FMS - Hierarchy of computer control - Supervisory computer
			2	Describe various basic components of CAD/CAM required in FMS systems
			3	Understand Software Simulation and Database of FMS required in automated industry.
			4	Understand structure of robots and robot systems, its drives and control systems.
			5	Demonstrate robotic kinematics and Dynamics Homogeneous transformations
			6	Know about Robot Sensors and Programming of robots.
13	**7W210**	**OPTIMUM DESIGN OF MECHANICAL ELEMENTS**	1	Basics of optimization, considerations relevant to mechanical / structural systems
			2	Concepts and methods for single-variable unconstrained and constrained optimization
			3	Concepts and methods for multi-variable unconstrained and constrained optimization

			4	Techniques for nonlinear optimization
			5	Advanced optimization techniques
			6	Optimization of complex mechanical elements
14	**7W211**	**PERFORMANCE MODELING OF AUTOMATED MANUFACTURING SYSTEMS**	1	Demonstrate modeling techniques of manufacturing stems
			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 with petrinets
			6	Demonstrate few simulation applications in manufacturing with PRO-MODE software
15	**7W212**	**MICRO ELECTRO MECHANICAL SYSTEMS(MEMS)**	1	Understand the Working Principles of MEMS and Microsystems, and its Applications of MEMS in Industries
			2	Apply Engineering Science for Microsystems Design and Fabrication.
			3	Analyze Engineering Mechanics for Microsystems Design
			4	Understand the Basics of Fluid Mechanics in Macro and Micro scales able to demonstrate thermo fluid engineering concepts.
			5	Learn design considerations in mechanical Design using FEM.
			6	Identify the Materials for MEMS & Microsystems and their Fabrication
16	**7W213**	**MECHANICAL VIBRATIONS &**	1	Able to develop ability to analyze mechanical vibrations and select elements for various vibration

		CONDITION MONITORING		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
			6	Able to understand random vibrations concepts and develop mathematical modeling.
17	**7W214**	**3D PRINTING TECHNOLOGY AND ADDITIVE MANUFACTURING**	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
18	**7W215**	**PRODUCTION AND CHARACTERIZATION OF NANOMATERIALS**	1	Acquires knowledge on advanced synthesis of nanomaterials via physical methods.
			2	Acquires knowledge on top down and bottom up new synthesis methods for making nanomaterials.
			3	Learns advanced methods of synthesis via CVD,

				biological methods
			4	Acquires knowledge on advanced compositional and structural analysis of nanomaterials
			5	Acquires knowledge on advanced surface characterization techniques applied to nanomaterials
			6	Acquires knowledge on advanced electrical characterization techniques applied to nanomaterials
19	**7W273**	**TECHINCAL SEMINAR-II**	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	6. Should give final presentation on the topic selected
20	**7W274**	**CAM & ROBOTICS LAB**	1	Able to do Part programme Simulation on lathe operations using XL Turn
			2	Able to do Part programme Simulation on mill operations using XL Mill
			3	Able to perform Facing, Taper turning and Pattern repetition through sub program on CNC Lathe
			4	Able to perform Profile cutting and pocket cutting on CNC Mill
			5	Demonstrate and develop 3D Printed components on FDM Machine.
			6	Able to demonstrate Part loading on CNC Machines with XL Articulated Robot

21	**7W275**	**COMPREHENSIVE VIVA**	1	Prepare the students to face interviews 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 and IIsem
22	**7W316**	**MECHANICS AND MANUFACTURING METHODS OF COMPOSITES**	1	Indentify appropriate composite for given application
			2	Derive various stress strain relations for composite lamina
			3	Do investigate elastic behavior of composites
			4	Deduce failure mechanisms of composites
			5	Apply analytical approach to analyse composite plates
			6	Learn different manufacturing processes for composites
23	**7ZC31**	**BUSINESS ANALYTICS**	1	Demonstrate knowledge of data analytics.
			2	Think critically in making decisions based on data and deep analytics.
			3	Use technical skills in predicative and prescriptive modeling to support business decision-making.
			4	Translate data into clear, actionable insights
			5	Mange business process using analytical and management tools.
			6	Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc
24	**7WC17**	**INDUSTRIAL SAFETY**	1	Acquire knowledge on different safety measured to be taken in industry

			2	Acquire knowledge on different maintenance and systems and service life cycle calculations
			3	Demonstrate the wear behavior of different mechanical elements and and its preventive measures
			4	Acquire knowledge on different types of faults in machine tools and their general causes.
			5	Acquire knowledge on Periodic and preventive maintenance
			6	Acquire knowledge on procedures and Steps for periodic and preventive maintenance
25	**7WC18**	**OPERATIONS RESEARCH**	1	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
			2	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
			3	Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy
			4	Analyze the performance measures of Queing system and calculate the EOQ for minimizing the total inventory cost
			5	Apply simulation techniques for solving various types of problems and apply dynamic programming approach for obtaining optimal solutions
			6	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
26	**7WC19**	**COMPOSITES**	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
27	**7ZC32**	**COST MANAGEMETNTS OF ENGINEERING PROJECTS**	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
28	**7MC17**	**WASTE TO ENERGY**	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.
29	**7W479**	**DISSERTATION AND DEFENCE VIVA**	1	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects
			2	Enables to apply modern tools and technologies for project works
			3	Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society
			4	Enhances communicative skills and team work
			5	The students learn the ability to work as an individual with multidisciplinary approach
			6	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects