SCHEME OF COURSE WORK

Course Details:

Course Title	**: NUMERICAL SIMULATION LAB (MATLAB)**		
Course Code	**: 22ME11S1**	**L T P C**	**: 1 0 2 2**
Program:	**: B. Tech.**		
Specialization:	**: Mechanical Engineering**		
Semester	**: IV**		

Course Outcomes (COs):

At the end of the course, the student will be able to

CO1:	use MATLAB commands to perform matrix operations
CO2:	illustrate plotting of two dimensional and three dimensional plots
CO3:	use MATLAB commands to solve linear and non-linear equations
CO4:	solve engineering optimization problems
CO5:	solve mechanical engineering problems

Program Outcomes (POs):

At the end of the program, the students will be able to

PO1	Apply the knowledge of mathematics, science, engineering fundamentals to solve complex mechanical engineering problems
PO2	Attain the capability to identify, formulate and analyze problems related to mechanical engineering
PO3	Design solutions for mechanical system components and processes that meet the specified needs with appropriate consideration for public health and safety.
PO4	Perform analysis, conduct experiments and interpret data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions
PO5	Select and apply appropriate techniques from the available resources and current mechanical engineering and software tools.
PO6	Carry out their professional practice in mechanical engineering by appropriately considering and weighing the issues related to society.
PO7	Understand the impact of the professional engineering solutions on environmental safety and legal issues.
PO8	Transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
PO9	Function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
PO10	Communicate fluently with the engineering community and society, and will be able to prepare reports and make presentations effectively.

PO11	Apply knowledge of the engineering and management principles to managing projects and finance in multidisciplinary environments.
PO12	Engage themselves in independent and life-long learning to continuing professional practice in their specialized areas of mechanical engineering

Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1				2	3				1			3
CO-2				2	3				1			3
CO-3				2	3				1			3
CO-4				2	3				1			3
CO-5				2	3				1			3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), put -: No Correlation

Program Specific Outcomes (PSOs):

The student must attain the knowledge and skills to

PSO-1	Design, analyse and optimize mechanical systems along with control mechanisms
PSO-2	Manufacture mechanical components by selecting effective processing methods and efficient tools
PSO-3	Design, analyse and evaluate thermal systems

Week	Topic / Contents	Course Outcomes	Sample questions	Teaching-Learning Strategy	Assessment Method & Schedule
1	Demonstration of first cycle of experiments				

1	MATLAB environment and commands	CO1	1. What is thecommand used for clearing the command window of MATLAB 2. What is thedifference between format short and	Lecturing Demonstration and conducting experiments on systems using	End Exam

Course Outcome Versus Program Specific Outcomes:

COs	PSO1	PSO2	PSO3
CO-1	3		2
CO-2	3		2
CO-3	3		2
CO-4	3		2
CO-5	3		2

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), put -: No Correlation

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Teaching-Learning and Evaluation

			format long?	MATLAB	
2	Linear Algebra and matrices	CO1	1. What is the command used for solving linear algebraic equation? 2. What is the command for finding the inverse?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
3	2-D and 3-D plotting	CO2	1. What is thecommand used for 2D plotting? 2. What is thecommand used for 3D plotting? 3. What is thecommand used for surface plot?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam

4	Finding the minimum of an unconstrained function	CO3	1. What is the command used for solving non- linear algebraic equation?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
5	Finding the minimum of an constrained function using tool box	CO3	1. What is the command used for opening the MATLAB tool box?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
6	Solutions to systems of linear equations	CO2	1. What is the command used for solving one variable non-linearequation?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
7	**Backlog class**				
8	**Review of** first cycle of experiments				
	Demonstration of second cycle of experiments				
8	Solutions to systems of nonlinear equations	CO3	1. What is the command used for solving two variable non-linear equation?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam

9	Calculate and plot the bending stress and deflection in different types of beams	CO4	1. Write deflection formula for cantilever beam in MATLAB form?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
10	Solve kinematic equations of slider crank mechanism	CO4	1.Write displacement and velocity equation of slider crank mechanism in MATLAB form?1	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam

11	Determine Eigen values (natural frequencies) and Eigen vectors (mode shapes) of cantilever beam	CO4	1. What is the commands used for finding the natural frequencies and mode shapes?	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
12	Calculate design parameters of closed coil helical sprigs and spur gears	CO5	1. Calculate mean and coil diameter, number of turns, deflection and stiffness of closed coil helical sprigs using MATLAB.	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
13	Calculate design parameters of spur gears.	CO5	1. Calculate module, beam strength of spur gear using MATLAB	Lecturing Demonstration and conducting experiments on systems using MATLAB	End Exam
	Backlog class				
	Review of second cycle of experiments				
	END EXAM				