SCHEME OF COURSE WORK:

Course Details:

Course Title	Computations Lab					
Course Code	19ME2165	**LTPC**	**0**	**0**	**3**	**1.5**
Program	M.Tech.					
Specialization	Thermal Engineering					
Semester	I					
Prerequisites	**…….**					
Course to which is a prerequisite	NA					

Course Outcomes:

CO1	Apply various commands to do various matrix operations and plot 2D/3D figures to analyse data
CO2	Develop programs to find roots of an equation and solve system of linear equations
CO3	Create programs for interpolation and regression of give data
CO4	Develop programs to solve ordinary differential equations
CO5	Use software toolboxes to solve problems related to neural networks, fuzzy logic and genetic algorithms.

Program Outcomes:

PO Code	**Program Outcome (PO)**
PO1	exhibit in-depth knowledge in thermal engineering specialization
PO2	think critically and analyse complex engineering problems to make creative advances in theory and practice
PO3	solve problem, think originally and arrive at feasible and optimal solutions with due consideration to public health and safety of environment
PO4	use research methodologies, techniques and tools, and will contribute to the development of technological knowledge
PO5	apply appropriate techniques, modern engineering tools to perform modelling of complex engineering problems with knowing the limitations
PO6	understand group dynamics, contribute to collaborative multidisciplinary scientific research
PO7	demonstrate knowledge and understanding of engineering and management principles and apply the same with due consideration to economical and financial factors
PO8	communicate complex engineering problems with the engineering community and society, write and present technical reports effectively
PO9	engage in life-long learning with a high level of enthusiasm and commitment to improve knowledge and competence continuously
PO10	exhibit professional and intellectual integrity, ethics of research and scholarship and will realize the responsibility towards the community
PO11	examine critically the outcomes of actions and make corrective measures

Course Outcome Vs Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S							M			
CO2		S							M			
CO3		S		S					M			
CO4		S		S					M			
CO5		S		S					M			

S - Strongly correlated, M - Moderately correlated, Blank - No correlation

Assessment Methods:

Assignment/Quiz/Seminar/Case Study, Mid term exam and End term examination.

Teaching-Learning and Evaluation

Week	Title of the Experiment	CO	Sample Questions	Teaching-Learning Strategy	Assessment method & Schedule
1	Introduction to MATLAB		1. How to launch MATLAB 2. What are m-files?	Lecture and Practice on MATLAB	No evaluation, Practice session
2	Basic commands like representing arrays, matrices, reading elements of a matrix, row and columns of matrices, random numbers.		1. How to represent arrays, matrices in MATLAB 2. How to generate random numbers using MATLAB	Lecture and Practice MATLAB	Day to Day Evaluation and Record Submission, Mid term exam (week 9)
3	Transpose, determinant, inverse, Eigenvalues and Eigenvectors of a matrix		1. What are the MATLAB functions to transpose, find determinant and find inverse of a matrix? 2. What are the MATLAB functions to find eigen values and eigen vectors of a matrix?	Lecture and Practice MATLAB	Day to Day Evaluation and Record Submission, Mid term exam (week 9)
4	Plotting tools for 2 dimensional and 3 dimensional plots, putting legends, texts, using subplot tool for multiple plots.		1. Plot the variation of y v/s x if x = [1 2 3 4 5]; y = [1 4 9 16 25] 2. How do create subplots using MATLAB	Lecture and Practice MATLAB	Day to Day Evaluation and Record Submission, Mid term exam (week 9)
5	Write a program for finding the roots of an equation using (1) Bisection (2) Newton methods		1. Write a program to find roots of the equation $x^3 - 6x^2 + 11x - 6 = 0$ using bisection method. Show the results 2. Write a program to find the roots of the equation $x - \cos(x) = 0$ using Newton-Raphson method. Show the results	Lecture and Practice MATLAB	Day to Day Evaluation and Record Submission, Mid term exam (week 9)

<table>
<tr><td>6</td><td>Write a program for solving system of linear equations using Gauss elimination method</td><td></td><td>1. What is Gauss elimination method?</td><td>Lecture and Practice MATLAB</td><td>Day to Day Evaluation and Record Submission, Mid term exam (week 9)`</td></tr>
<tr><td>7</td><td>Write a program for finding natural cubic spline that interpolates a table of values</td><td></td><td>1. What are cubic splines?</td><td>Lecture and Practice MATLAB</td><td>Day to Day Evaluation and Record Submission, Mid term exam (week 9)</td></tr>
<tr><td>8</td><td>Revision of Cycle 1</td><td></td><td></td><td></td><td></td></tr>
<tr><td>9</td><td>Mid Term Examination</td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>Write a program for determining least square polynomial fit of degree m for given data</td><td></td><td>Fit a least square polynomial fit of degree 2 of the following data
<table><tr><td>x</td><td>-3</td><td>-2</td><td>-1</td><td>-0.2</td><td>1</td><td>3</td></tr><tr><td>y</td><td>0.9</td><td>0.8</td><td>0.4</td><td>0.2</td><td>0.1</td><td>0</td></tr></table></td><td>Lecture and Practice MATLAB</td><td>Day to Day Evaluation and Record Submission, Mid term exam (week 18)</td></tr>
<tr><td>11</td><td>Write a program for solving ordinary differential equation by numerical methods</td><td></td><td>Solve the equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ with y(0) = 0 and y(1) = 1 using numerical methods</td><td>Lecture and Practice MATLAB</td><td>Day to Day Evaluation and Record Submission, Mid term exam (week 18)</td></tr>
<tr><td>12</td><td>Training and testing data using neural networks</td><td></td><td>x=
[88067 42.7 60 1.9 1170
79380 42 60 2.1 1097
71672 35.5 60 2.3 1089
63855 33 60 2.5 954
58370 37 60 2.7 1030
53477 29 60 2.9 780</td><td>Lecture and Practice MATLAB</td><td>Day to Day Evaluation and Record Submission, Mid term exam (week 18)</td></tr>
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			51480 11.5 60 3.1 700 87680 44.7 54 1.9 1150 78375 45 54 2.1 1100 69948 40 54 2.3 1080 61740 35 54 2.5 1000 55848 43 54 2.7 800 49396 39 54 2.9 740 45100 28 54 3.1 720]; y = [2468 2545 2557 2119 1458 2311 2444 2399 2105 1813]; The input of a data of five variables is given as x and the corresponding output is y. Train and test a neural network using above data		
13	Interpretation of data using fuzzy logic toolbox		Problems to build systems using fuzzy logic tool box. How to assign fuzzy rules, use membership functions, use of fuzzy inference systems	Lecture and Practice MATLAB	Day to Day Evaluation and Record Submission, Mid term exam (week 18)
14	Solve optimization problems using genetic algorithms		Optimize the given 1-D nonlinear minimization problem using genetic algorithms tool bar. Eg: Min f(x)= x*sin(x)+x*cos(2*x) x € [0,10]	Lecture and Practice MATLAB	Day to Day Evaluation and Record Submission, Mid term exam (week 18)
15	Design a simple mechanical system using Simulink/SimMechanics		Model a vibrating mass in MATLAB with Simmechanics	Lecture and Practice MATLAB	Day to Day Evaluation and Record Submission,

					Mid term exam (week 18)
16	Revision of Cycle 2				
17	Revision of Cycle 1,2				
18	Mid Term Examination-II				
19-20	End Term Examination				