Detailed syllabus of Skill Enhancement Course

Title of course   : **MATLAB PROGRAMMING**
Course Code   :**SEC337**
Nature of course   : **SKILL ENHANCEMENT COURSE**
Total credits   : **03**
Distribution of marks: 60 (PRACTICAL) + 40 (In-sem)

Course Objectives:
1. To introduce the students to MATLAB as programming and scientific computing tool.
2. To enable the students to solve basic problems and matrix operations using MATLAB.
3. To introduce the students to basic numerical techniques to solve first order ordinary differential equations, numerical integration
4. To familiarize the students with basic plotting tools available in MATLAB

Unit	Contents	L	T	P	M	Hours
Unit 1: Introduction to MATLAB	Starting MATLAB, working in command window, arithmetic operations, display formats, elementary maths built in functions, defining scalar variables, useful command for managing variables, script files	2	-	-	2	2
Practical	Aim: 1. To Understand the MATLAB Workspace a) start up MATLAB b) type commands in main window c) change current directory 2. To use MATLAB as a calculator: a) perform some arithmetic calculations b) understand the importance of operators, and functions c) use MATLAB's help files d) use functions like sin x , cos x , or |x | to solve problems 3. To understand the purpose of variables and how to create variables. 4. To write a script M-File (a list of	-	-	4	2	4

	MATLAB commands, saved in a file) with an emphasis on using appropriate comments					
Unit 2: Basic mathematical operations with arrays	1 and 2 dimensional arrays, addition and subtraction, array multiplication and division, element-by-element operations, generation of random numbers, analyzing arrays using built-in maths functions	2	-	-	7	2
Practical	Aim: 1. To learn how to create 1 and 2-D arrays, understand the advantages of the different ways of creating arrays including the standard format and the linspace command. 2. To access specific numbers in arrays using their position. 3. To use array commands to perform different arithmetic operations on arrays 4. To generate of random numbers	-	-	8	7	8
Unit 3: Graphics with MATLAB	Basic plot commands: plot, fplot, formatting a plot, subplots, basic 2D and 3D plots: Line plots, mesh and surface plots, contour, View command	2	-	-	8	2
Practical	Aim: 1. To perform exercises on using basic commands to plot 2D and 3D plots as mentioned above. 2. To learn different ways of formatting the plots using basic commands like xlabel, ylabel, axis, etc. 3. To learn how to have multiple graphs on the same figure using hold on/off commands 4. To create subplots and application of view command	-	-	8	8	8
Unit 4: Programming	Conditional statements, loops, nested loops, application of break	4	-	-	10	4

		L	T	P	M	
in MATLAB	and continue commands					
Practical	Aim: 1. To write simple programs involving loops using commands like for, while, if-else, return, etc.	-	-	16	10	16
Unit 5: Mathematical computing with MATLAB	5.1 Algebraic equations: Eigen values, Eigen vectors, solution of a system of linear equations.	5	-	-	13	L-5
	5.2 Introduction to ordinary differential equations (ODE), solution of first order ODE, numerical techniques: Trapezoidal rule, Simpson's rule.					
Practical	Aim: 1. To evaluate Eigen values and Eigen vectors of a given matrix 2. To solve a system of linear equations using Gauss elimination method and Gauss Seidel method 3. To solve a first order ODE by Euler's method and Runge Kutta method 4. To evaluate numerical integration by using Trapezoidal and Simpson's rule.	-	-	24	13	24

(L= Lecture, T= Tutorial, P = Practical, M = Marks)

Mode of In-semester assessment:
Examination (Theory + Practical)/Assignments/Notebook/Attendance   (Marks 40)

Mode of End-semester assessment:
Examination for 1 credit theory   (Marks 30)
Examination for 2 credit practical   (Marks 30)

Learner outcomes:
After the completion of these courses, the learner will be able to
1. Get a general understanding of the purpose of MATLAB.
2. Use MATLAB effectively to analyze and visualize data.
3. Have an in-depth understanding and use of MATLAB fundamental data structure.
4. Create and control simple plots and user interface graphics, objects in MATLAB.

5. Write simple programs to solve various numerical problems like solving a system of linear equations, perform numerical integrations, ODE, and so on.

Suggested readings:

1. A Guide to MATLAB - for Beginners and Experienced Users", 2nd Ed., Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Cambridge University Press, 2006.

2. Pratap Rudra, Getting started with MATLAB: A quick Introduction for Scientist and Engineers, Oxford University Press, 2010.

3. Wolfram S., The Mathematica, Cambridge University Press, 2003.