



Gwani Software



TRAINING DEPARTMENT
(Knowledge & Expertise)

MatLab Curriculum

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equivalent to

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TRAINING DEPARTMENT

MatLab

General Description: - This course is intended to provide basic operational skills in working with MatLab to solve selected algebraic mathematical & scientific problems.

Aims: - The aims of this course are to:

1. To give trainee practical knowledge on working in MatLab.
2. Avail the trainee with the common commands available in MatLab.
3. Drill trainee running commands to solve algebraic problems in MatLab.
4. Avail the trainee with how to plot different graphs using MatLab on sample data.
5. Introduces the trainee to techniques used in entering algebraic problems into MatLab.

Objectives: - The trainee at the end of the training session should be able to:

- Know how to install and launch MatLab on a computer system
- Know how to type used common commands available in MatLab
- Know how to solve selected algebraic problems using MatLab.
- Plot different graphs on sample data using MatLab.
- Enter algebraic problems into MatLab.

Target Audience: - This course should be taken by mathematicians, engineers, scientists, computer scientist, Computer Instructors teaching MatLab, and anyone interested in solving algebraic problems using computer system.

Pre-requisite:- There is no any course acting as a pre-requisite to this course, however getting started with computers and the internet is an added advantage.

Approximate Duration: - This course requires 21 hours of class session with practical where needed.

Method of Assessment: - The trainee is to be assessed with practical periodic assessment jobs and an examination.

Methodology: - The class takes a lesson discusses it and practices it and move to next, then a practical job relevant to the question is given to the trainee and the trainee performance is assessed. The class then moves to the next lesson in the same manner, until all the lessons are adequately covered.

Recommended resource materials: - The following are required for additional study regarding this course.

Day 1	Definition: Matrix laboratory, applications in mathematics & engineering, how to launch it, introduce matlab command window. Use of helpwin, helpdesk, demo & Techdocs.
Day 2	Matrices & Magic Squares: entering matrices e.g. $A = [16 \ 3 \ 2 \ 13; 5 \ 10 \ 11 \ 8; 9 \ 6 \ 7 \ 12 \ 4 \ 15 \ 14 \ 1]$ discuss use of space & comma within row, use of comma or semi colon within column, the resultant matrix displayed. <i>Exercise</i> <i>The trainee to create different matrices.</i>
Day 3	Matrices arithmetic & transpose: calculating row sums as column vector – $\text{sum}(A')$ calculating sum of elements on the main diagonal – $\text{diag}(A)$ calculating sum of it – $\text{sum}(\text{diag}(A))$, use of fliplr .
Day 4	Use of subscripts: using subscripts i, j sum rows of matrix and then sum column. Discuss overflow and underflow errors.
Day 5	Cloning of matrices and adding values: using subscript, clone of a matrix – $X=A$ add an element to the clone – $X(4,5)=17$ Use of colon operator as in $1:10$ (row vector of integers from 1 to 10. $100:-7:50$ Product $100 \ 93 \ 86 \ 79 \ 72 \ 65 \ 58 \ 51$ $0:\pi/4:\pi$ Produces $0 \ 0.7854 \ 1.5708 \ 2.3562 \ 3.1416$.
Day 6	Use of colon operator in matrices: $-A(1:k,j)$ is the 1^{st} k element of j th column of A $\text{Sum}(A(1:4,4))$ or

	Sum(A(:,end)) Discuss use of magic function to produce magic squares B=magic(4)
Day 7	Expressions: building blocks of expressions variables, numbers, operators & functions, Discuss how to build common expression like Z=sqrt (besselk (4/3, rho-i)).
Day 8	Working with matrices: Generating matrices using the following functions – zeros, ones, rand & randn as in Z=zeros(2,4) F=5*ones(3,3) N=fix(10*rand(1,10)) R=randn(4,4) Discuss use of load as in load magik.dat.
Day 9	Deleting Rows & Columns: X(:,2)=[] -delete 2 nd column of matrix X. Discuss error encounter during deleting a single element and X (:,2) = [].
Day 10	Format command: importance of format command on results should be discussed. Format short –x Format short e –xxx Format short g –xxx Format long Format long e Format long g Format bank Format rat Format hex Discuss the format, is automatically saved for future calculations.
Day 11	Suppressing output: importance of suppressing output during entering matrices. Use of semi colon to suppress out as in A=magic(100); Discuss command line editing using positioning keys, home keys and ctrl key.
Day 12	Graphics: plotting of x,y graphs as in T=0:pi/100:2*pi; Y=sin(t); Plot (t,y) <i>Exercise</i> <i>The trainee should plot different graphs on given values of x and y</i> Discuss the use of hold on command to add graph to an existing graph.
Day 13	Graphics continued: use of subscripts as in subplot (m,n,p) where mxn images are produce and p locate each particular plot. <i>Exercise</i>

	<p style="text-align: center;"><i>The trainee should try this</i></p> <pre style="text-align: center;">t=0:pi/10:2*pi; [X,Y,Z]=cylinder(4*cos(t)); Subplot(2,2,1) Mesh(x) Subplot(2,2,2):mesh(y) Subplot(2,2,3):mesh(Z) Subplot(2,2,4):mesh(X,Y,Z)</pre>
Day 14	<p>Graphics continued: working with imaginary & complex data as in – Plot(real(z),imag(z)) Use it in T=0:pi/10:2*pi; Plot (exp(i*t),'-0')</p>
Day 15	<p>Graphics continued : controlling axes of plot as in Axis([xmin xmax ymin ymax]) and to assign default as in Axis square Axis equal Axis auto (returns to default) Axis on (same as in auto) Grd on Grd off</p>
Day 16	<p>Graphics continued – Axis labels and titles as in Xlabel('students score') Ylabel('students name') Ylabel('students name') Title('graph of score in matlab') Text(1,-1/3, 'The modal score')</p>
Day 17	<p>Environment – Use of who and whos command to see the environment features use of clear command to delete all variables use of diary command.</p>
Day 18	<p>Linear Algebra – Producing inverse of a matrix as in X=A' Producing symmetric matrix as in A'* A Producing determinant of matrix as in D=det(A) Producing eigenvalues of matrix as in E=eig(A)</p>
Day 19	<p>Arrays – Use of dot for arrays multiplication, list of array operators should be discussed.</p> <p style="text-align: center;"><u>Exercise</u> <i>Trainee should create and use arrays from sample data.</i></p>

Day 20	<p>Multivariate Data – Use of statistical data as in $(i,j)^{th}$ element to be the i^{th} observation of the j^{th} variable.</p> <p>The heart rate, weight & hours of exercise per week sample data to be used in the class.</p> <p>Calculation of mean as in $X = \text{mean}(D)$</p> <p>Calculation of standard deviation as in $Y = \text{std}(D)$</p> <p>Discuss scalar expansion and the find function</p>
Day 21	<p>Flow control:- Demonstrate the use of the following flow controls-</p> <p>If statements, Switch statements, For loop While loops Break statements.</p> <p style="text-align: center;"><u>Exercise</u> <i>Use of the flow control to obtain results.</i></p>
Day 22	Revision