

Branch Name:	B.Sc. Mathematics
Program Code:	SC104
Course Name:	MATLAB Practical
Course Code:	2SC1040605
Pre-requisite Course:	

Course Objectives:

1. To understand the basic concept of formatted input-output functions in MATLAB.
2. To understand the MATLAB/ PYTHON/ SCILAB debugger.
3. To know about the Transform Cartesian to spherical coordinates using MATLAB.
4. To understand the returns the characteristic polynomial of a matrix using MATLAB.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
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Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Input-Output Statements in MATLAB/ PYTHON/ SCILAB: Data input, interactive inputs, reading/storing file data, output commands, formatted input-output functions.	44	25
2	Programming Techniques: Loops, Branches control structures, MATLAB/ PYTHON/ SCILAB programming, function subprograms, types of functions, function handles, errors and warnings, MATLAB/ PYTHON/ SCILAB debugger.	48	25
3	MATLAB/ PYTHON/ SCILAB Applications: The content of this unit is to be covered from the list given in Appendix A.	50	25
4	Symbolic Processing With MATLAB/ PYTHON/ SCILAB : Symbolic Expressions and Algebra, Algebraic and Transcendental Equations, Calculus, Symbolic Linear Algebra, ordinary and partial differential equation, Symbolic Tutors.	50	25

Reference Books:

1. "MATLAB and its Applications in Engineering" Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, Pearson.
2. Python Essential Reference (Developer's Library), 4th Edition by David M. Beazley, Addison – Wesley Professional.
3. An introduction to Scilab - CSE, IIT Bombay.

Coverage from the Reference for MATLAB:

UNIT-1

Chapter 5: 5.6

UNIT-2

Chapter 7: 7.3, Chapter 8: 8.9

UNIT-3

Appendix A: Table A.1:A.8

UNIT-4

Chapter 9: 9.3 only.

Additional commands for symbolic toolbox are to be covered from the list given below.

Appendix A:

Table A.1

Discrete Math\Number theoretic functions	
factor	Returns Prime factors.
factorial	Factorial function.
nchoosek	All combinations of N elements taken K at a time.
perms	All possible permutations.
gcd	Returns the greatest common divisor.
lcm	Returns the least common multiple.
primes	Generate list of prime numbers
isprime	Returns a logical array that is prime numbers.
rat, rats	Returns a rational fraction approximation.
mod	The mod function is useful for congruence relationships. Returns modulus after
rem	Rievtiusrionsn remainder after division.

Table A.2

Coordinate System Conversion	
cart2sph	Transform Cartesian to spherical coordinates.
cart2pol	Transform Cartesian to polar coordinates.
pol2cart	Transform polar to Cartesian coordinates.
sph2cart	Transform spherical to Cartesian coordinates.

Table A.3

Interpolation Functions	
interp1	Linear and cubic-spline interpolations of a function of one variable.
interp2	Linear interpolation of a function of two variables.
spline	Cubic-spline interpolation.
unmkpp	Computes the coefficients of cubic-spline polynomials.

Table A.4

Numerical Integration Functions	
quad	Numerical integration with adaptive Simpson's rule.
quadl	Numerical integration with adaptive Lobatto quadrature.
trapz	Numerical integration with the trapezoidal rule.
quadv	Vectorized quadrature.
dblquad	Numerically evaluate double integral.
triplequad	Numerically evaluate triple integral.

Table A.5

Numerical Differentiation Functions	
diff(x)	Computes the difference between adjacent elements in the vector x.
polyder	Differentiates a polynomial, a polynomial product, or a polynomial quotient.

Table A.6

ODE Solvers	
ode23	Nonstiff, low-order solver.
ode45	Nonstiff, medium-order solver.
ode113	Nonstiff, variable-order solver.
ode23s	Stiff, low-order.
ode23t	Moderately stiff, trapezoidal rule solver.
ode23b	Stiff, low-order solver.
ode15s	Stiff, variable-order solver.
Odeset	Creates integrator options structure for ODE solvers.
Deval	Evaluate solution of differential equation problem
bvp4c	Solve boundary value problems for ODEs.

Table A.7

Optimization	
fminbnd	Finds minimum of single-variable function.
fzero	Finds zero of single-variable function.
fminsearch	Multidimensional unconstrained nonlinear minimization
lsqnonneg	Linear least squares with non negativity constraints
fminunc	Find minimum of unconstrained multivariable function
fmincon	Find minimum of constrained nonlinear multivariable function
linprog	Solve linear programming problems

Table A.8

Statistical Functions	
erf(x)	Computes the error function $erf(x)$.
mean	Calculates the average.
median	Calculates the median.
std	Calculates the standard deviation.
var	Calculates the variance.
corrcoef	Correlation coefficients.
cov	Covariance matrix.

Symbolic Linear Algebra Functions	
Det	Returns the determinant of a matrix.
Eig	Returns the Eigen values (characteristic roots) of a matrix.
Inv	Returns the inverse of a matrix.
Poly	Returns the characteristic polynomial of a matrix.

List of Open Source Software/learning website:

1. <https://www.youtube.com/watch?v=EjskX-MSRIQ>
2. <https://www.youtube.com/watch?v=5a3bpKuBpgo>
3. https://www.youtube.com/watch?v=G8wmGa3fF_w
4. <https://www.youtube.com/watch?v=5tRmgd7rHdc&list=PLPhi9dVsEVfb8gBZDYq-D5Fi4Jlc1tltJ>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe Data input in MATLAB.	1 Remembering
CLO2	Discuss the knowledge on Branches control structures in MATLAB.	2 Understanding
CLO3	Use Symbolic Expressions and Algebra in MATLAB.	3 Applying
CLO4	Explain ordinary and partial differential equation in MATLAB.	4 Analysing
CLO5	Know ODEs to Justify boundary value problems.	5 Evaluating
CLO6	Create an example of linear programming problem and solve the example of it's by using MATLAB.	6 creating, 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	L	L			M						M	L	M	M	M	
CLO2	L			L	L								L		L	
CLO3	L	L			M				L				L		M	
CLO4		M		L										L	L	
CLO5	L	L			M				L				L		M	
CLO6	L	L	M		M				L		M		L		L	

H: High, M: Medium, L: Low