

SEMESTER – II
PEMAC20 - Elective II A: LaTeX and MATLAB

Year : I	Course Code :	Title Of The Course :	Course Type :	Course Category :	H/W	CREDITS	MARKS
SEM : II	PEMAC20	Elective II A : LaTeX and MATLAB	Theory	Elective	5	4	100

Course Objectives

1. Demonstrate the ability to type research papers in Latex software in a fluent manner.
2. To use and write script files (MATLAB programs) and enable the students to learn and use MATLAB software.

Course Outcomes (CO)

The Learners will be able to

1. Understand the mathematical basis of common algorithms in Latex.
2. Demonstrate the use of mathematical equations, tables and figures in Latex.
3. Demonstrate understanding and use of MATLAB software
4. Construct one dimensional array, two dimensional arrays and basic functions in MATLAB.
5. Recognize the power of mathematical modelling and analysis using MATLAB and be able to apply their understanding to their further studies.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	H	L	H	M
CO2	M	H	H	L	H	M
CO3	H	H	H	L	H	M
CO4	H	L	H	L	H	L
CO5	H	H	H	L	H	M

(L-Low, M-Moderate, H-High)

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	M
CO2	H	H	H	H	L	M
CO3	H	H	H	H	L	M
CO4	H	H	H	H	L	M
CO5	H	H	H	H	L	M

(L-Low, M-Moderate, H-High)

Course Syllabus

Unit I: Creating text using LATEX (15 Hours)

- 1.1 Fonts and Paragraphs(K1,K2,K3,K4,K4,K5,K6)
- 1.2 Lists(K1,K2,K3,K4,K5,K6)
- 1.3 Tables, Special Characters(K1,K2,K3,K4,K5,K6)
- 1.4 Line and page breaks, spacing(K1,K2,K3,K4,K5,K6)
- 1.5 Bibliography with Bibtex (K1,K2,K3,K4,K5,K6)
- 1.6 Create a document file to prepare a Chapter in a Book. (K1,K2,K3,K4,K5,K6)

Unit II: Math Mode, Graphics and special parts (15 Hours)

- 2.1 Mathematical symbols, Fractions (K1,K2,K3,K4,K5,K6)
- 2.2 Equations and arrays, Derivatives and Integrals (K1,K2,K3,K4,K5,K6)
- 2.3 Theorems and definitions (K1,K2,K3,K4,K5,K6)
- 2.4 Graphics (K1,K2,K3,K4,K5,K6)
- 2.5 Making special parts, front matter and back matter(K1,K2,K3,K4,K5,K6)
- 2.6 Create a Document file to prepare a research article.(K1,K2,K3,K4,K5,K6)

Unit III: Starting with MATLAB (15 Hours)

- 3.1 Starting MATLAB, MATLAB Windows (K1,K2,K3,K4,K5,K6)
- 3.2 Working in the command window (K1,K2,K3,K4,K5,K6)
- 3.3 Arithmetic operation with scalars, Using MATLAB as Calculator (K1,K2,K3,K4,K5,K6)
- 3.4 Display Formats, Elementary Math Built in Functions (K1,K2,K3,K4,K5,K6)
- 3.5 Defining Scalar Variables, Useful commands for managing variables (K1,K2,K3,K4,K5,K6)
- 3.6 Script Files (K1,K2,K3,K4,K5,K6)

Unit IV: Creating Arrays and Mathematical operations with Arrays (15 Hours)

- 4.1 Creating one dimensional array (K1,K2,K3,K4,K5,K6)
- 4.2 Creating two dimensional array (K1,K2,K3,K4,K5,K6)
- 4.3 The transpose operator, Addressing array as vector and matrix (K1,K2,K3,K4,K5,K6)
- 4.4 Using a colon in addressing arrays, Addition and Subtraction(K1,K2,K3,K4,K5,K6)
- 4.5 Array Multiplication, Array Division (K1,K2,K3,K4,K5,K6)
- 4.6 Element by element operations, using arrays in MATLAB built in MATLAB functions (K1,K2,K3,K4,K5,K6)

Unit V: Introduction to Systems (15 Hours)

- 5.1 System, System Boundary (K1,K2,K3,K4,K5,K6)
- 5.2 System components and their interactions, Environment (K1,K2,K3,K4,K5,K6)
- 5.3 Classification of systems (K1,K2,K3,K4,K5,K6)
- 5.4 According to complexity of system, nature and type of components (K1,K2,K3,K4,K5,K6)
- 5.5 Linear systems, Superposition theorem.(K1,K2,K3,K4,K5,K6)
- 5.6 Solution to linear non- homogeneous equations (4 unknowns). (K1,K2,K3,K4,K5,K6)

Books for study and reference:

Text Books:

1. Greenberg, Harvey J. "A simplified introduction to LATEX." University of Colorado at Denver, (2010).(Unit I and II)
2. Amos Gilat, MATLAB- An Introduction with Applications, John Wiley and Sons Inc., 2007.(Unit III -V)

Books for Reference:

1. Devendra K. Chaturvedi, Modeling and Simulation of Systems using MATLAB and Simulink, CRC press, 2010.
2. Edward A. Bender, An Introduction to Mathematical Modelling, Wiley Press, 1978.
3. Grätzer, G. Math into LATEX: An introduction to LATEX and AMS-LATEX. Springer Science & Business Media, 2013.

E- Resources:

1. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=ab4433ddb03085867fca6b70547c33b638bdad42>
2. http://www.os.ac.me/MS_kn.pdf
3. https://people.maths.bris.ac.uk/~madjl/course_text.pdf
4. <https://spoken-tutorial.org/>
5. <https://nptel.ac.in/>
6. https://swayam.gov.in/nc_details/NPTEL
7. <https://www.coursera.org/>

SEMESTER – III

PEMAE20 – ELECTIVE III A: PROGRAMMING WITH JAVA

Year: II SEM: III	Course Code: PEMAE20	Title of the Course: Elective III A: Programming With Java	Course Type: Theory	Course Category: Elective	H/W 4	CREDITS 3	MARKS 100
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Course Objectives

1. To learn a new platform independent language
2. To utilize Java in a variety of technologies and on different platforms.

Course Outcomes (CO)

The Learners will be able to

1. Understand the benefits and applications of OOP and distinguish C++ and JAVA.
2. Gain knowledge about operators and its types.
3. Define decision making statements and solve problems based on it.
4. Develop the program by manipulating classes and methods in the Java programming language.
5. Explore the Java programming by using arrays.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	H	L	M	H
CO2	M	H	H	L	M	H
CO3	M	H	H	L	M	H
CO4	M	M	H	L	M	H
CO5	H	H	H	L	M	H

(L-Low, M-Moderate, H-High)

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	M
CO2	H	H	H	H	L	M
CO3	H	H	H	H	L	M
CO4	H	H	H	H	L	M
CO5	H	H	H	H	L	M

(L-Low, M-Moderate, H-High)

Course Syllabus

Unit I: Fundamentals of Object - Oriented Programming (12 Hours)

- 1.1 Basic Concepts of Object Oriented Programming – Benefits of OOP (K1, K2, K3, K4, K5, K6)
- 1.2 Applications of OOP - Features of Java (K1, K2, K3, K4, K5, K6)
- 1.3 Java Differs from C and C++ - Java environment (K1, K2, K3, K4, K5, K6)
- 1.4 Java program structure (K1, K2, K3, K4, K5, K6)
- 1.5 Tokens – Statements (K1, K2, K3, K4, K5, K6)
- 1.6 Java programming style (K1, K2, K3, K4, K5, K6)
(Chapter 1: 1.3 – 1.5, Chapter 2: 2.2-2.3 and 2.9, Chapter 3: 3.5 – 3.7 and 3.12)

Unit II: Constants, Variables and Data Types, Operators and Expressions (12 Hours)

- 2.1 Constants – Variables – Data types – Declaration of variables (K1, K2, K3, K4, K5, K6)
- 2.2 Giving values to variables – Scope of variables – Symbolic constants (K1, K2, K3, K4, K5, K6)
- 2.3 Type casting – Getting values of variables – Standard default values (K1, K2, K3, K4, K5, K6)
- 2.4 Operators: Arithmetic, relational, logical, assignment, increment and decrement, conditional bitwise and special – Arithmetic expressions (K1, K2, K3, K4, K5, K6)
- 2.5 Evaluation of expressions – Operator precedence and associativity (K1, K2, K3, K4, K5, K6)
- 2.6 Mathematical functions (K1, K2, K3, K4, K5, K6)
(Chapter 4: 4.2 – 4.11, Chapter 5: 5.2 – 5.11, 5.14 – 5.15)

Unit III: Decision Making, Branching, Looping (12 Hours)

- 3.1 Decision making statements: if, simple if, if ... else (K1, K2, K3, K4, K5, K6)
- 3.2 Nesting of if ... else, else if ladder (K1, K2, K3, K4, K5, K6)
- 3.3 Switch statements and conditional operator (K1, K2, K3, K4, K5, K6)
- 3.4 Loop statements: while, do, for loops (K1, K2, K3, K4, K5, K6)
- 3.5 Jumps in loops (K1, K2, K3, K4, K5, K6)
- 3.6 Labeled loops. (K1, K2, K3, K4, K5, K6)
(Chapter 6: 6.2 – 6.8, Chapter 7: 7.2 – 7.6)

Unit IV: Classes, Objects and Methods (12 Hours)

- 4.1 Defining a class – Fields declaration – Methods declaration (K1, K2, K3, K4, K5, K6)
- 4.2 Creating objects – Accessing class members – Constructors (K1, K2, K3, K4, K5, K6)
- 4.3 Methods overloading – Static members – Nesting of methods (K1, K2, K3, K4, K5, K6)
- 4.4 Inheritance – overriding methods (K1, K2, K3, K4, K5, K6)
- 4.5 Final variables, methods and classes, Finalizer methods (K1, K2, K3, K4, K5, K6)
- 4.6 Abstract methods and classes - Methods with varargs – Visibility control. (K1, K2, K3, K4, K5, K6)
(Chapter 8: 8.2 – 8.18)

Unit V: Arrays, Strings and Vectors and Interfaces

(12 Hours)

- 5.1 One and two dimensional arrays (K1, K2, K3, K4, K5,K6)
- 5.2 Strings – Vectors (K1, K2, K3, K4, K5,K6)
- 5.3 Wrapper classes – Enumerated types (K1, K2, K3, K4, K5,K6)
- 5.4 Annotations – Defining interfaces (K1, K2, K3, K4, K5,K6)
- 5.5 Extending interfaces – Implementing interfaces (K1, K2, K3, K4, K5,K6)
- 5.6 Accessing interface variables (K1, K2, K3, K4, K5,K6)
(Chapter 9: 9.2 – 9.9, Chapter 10: 10.2 – 10.5)

Books for study and reference:

Text Book:

1. E. Balagurusamy – Programming with Java – Tata McGraw Hill Publication, 5rd Edition, 2014.

Books for Reference:

1. K. Arnold and J. Gosling – The Java Programming Language – Ed. 2, Publication 2000.
2. Cays Horstmann and Gary Cornell – Core Java Volume II, Publications 2001.
3. Phil Hanna – JSP 2.0: The Complete Reference – TMH, Edition 2, Publications 2003.

E- Resources:

1. <https://www.acs.ase.ro/Media/Default/documents/java/ClaudiuVinte/books/ArnoldGoslingHolmes06.pdf>
2. <https://ptgmedia.pearsoncmg.com/images/9780137081608/samplepages/013708160X.pdf>
3. <https://nitikesh.yolasite.com/resources/JSP%20complete%20reference.pdf>
4. <https://mu.ac.in/wp-content/uploads/2022/09/Core-JAVA.pdf>
5. <https://nptel.ac.in/>
6. https://swayam.gov.in/nc_details/NPTEL
7. <https://www.coursera.org/>

SEMESTER – III
PEMAG20– ELECTIVE III B: PROGRAMMING WITH R

Year : II SEM : III	Course Code : PEMAG20	Title Of The Course : Elective III B : Programming with R	Course Type : Theory & Practical	Course Category : Elective	H/W 4	CREDITS 3	MARKS 100
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Course Objectives

1. To master the use of R interactive environment with an understanding of the use of R documentation.
2. To use R for descriptive statistics and write multivariate models in R.

Course Outcomes (CO)

The Learners will be able to

1. Familiarize with basics of R software and built in function of R.
2. Identify the characteristics of datasets and plot the datasets in R using graphical methods.
3. Demonstrate understanding and use of for loop, if statement and break.
4. Implement the learning techniques and computing environment that are suitable for the applications under consideration.
5. Compute vectors and matrices, matrix inverse, eigen values and eigen vectors.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	H	L	M	H
CO2	M	H	H	L	M	H
CO3	M	H	H	L	M	H
CO4	M	M	H	L	M	H
CO5	M	H	H	L	M	H

(L-Low, M-Moderate, H-High)

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	M
CO2	H	H	H	H	L	M
CO3	H	H	H	H	L	M
CO4	H	H	H	H	L	M
CO5	H	H	H	H	L	M

(L-Low, M-Moderate, H-High)

Course Syllabus

Unit 1: Introduction to R language

(12 Hours)

- 1.1. Starting and quitting in R, Basic features in R(K1,K2,K3,K4,K5,K6)
- 1.2. Built in functions and online help(K1,K2,K3,K4,K5,K6)
- 1.3. Logical vectors (K1,K2,K3,K4,K5,K6)
- 1.4. Rational operators.(K1,K2,K3,K4,K5,K6)
- 1.5. Changing Directories, redirecting R output, Lists(K1,K2,K3,K4,K5,K6)
- 1.6. Data frames (K1,K2,K3,K4,K5,K6)

Unit II: Programming Statistical Graph

(12 Hours)

- 2.1 Plotting bar charts, dot charts(K1,K2,K3,K4,K5,K6)
- 2.2 Plotting Pie charts (K1,K2,K3,K4,K5,K6)
- 2.3 Plotting Histograms (K1,K2,K3,K4,K5,K6)
- 2.4 Plotting Box plot(K1,K2,K3,K4,K5,K6)
- 2.5 Plotting scatter plot (K1,K2,K3,K4,K5,K6)
- 2.6 Plotting QQ plots(K1,K2,K3,K4,K5,K6)

Unit III: Programming with R

(12 Hours)

- 3.1 For loop(K1,K2,K3,K4,K5,K6)
- 3.2 If statement(K1,K2,K3,K4,K5,K6)
- 3.3 while loop(K1,K2,K3,K4,K5,K6)
- 3.4 Newton's method for finding root(K1,K2,K3,K4,K5,K6)
- 3.5 Repeat loop, break and next statements(K1,K2,K3,K4,K5,K6)
- 3.6 Problems and Exercises(K1,K2,K3,K4,K5,K6)

Unit IV: Simulation in R

(12 Hours)

- 4.1 Monte Carlo simulation(K1,K2,K3,K4,K5,K6)
- 4.2 Generation of pseudo random numbers(K1,K2,K3,K4,K5,K6)
- 4.3 Bernoulli random variables(K1,K2,K3,K4,K5,K6)
- 4.4 Binomial random variables(K1,K2,K3,K4,K5,K6)
- 4.5 Poisson random variables(K1,K2,K3,K4,K5,K6)
- 4.6 Exponential random numbers(K1,K2,K3,K4,K5,K6)

Unit V: Computational Linear Algebra in R

(12 Hours)

- 5.1 Vectors and matrices in R(K1,K2,K3,K4,K5,K6)
- 5.2 Constructing matrix objects(K1,K2,K3,K4,K5,K6)

- 5.3 Accessing matrix elements(K1,K2,K3,K4,K5,K6)
- 5.4 Row and column names(K1,K2,K3,K4,K5,K6)
- 5.5 Matrix properties, Matrix multiplication and inversion(K1,K2,K3,K4,K5,K6)
- 5.6 Eigen values and Eigen vectors.(K1,K2,K3,K4,K5,K6)

Books for study and reference:

Text Book:

1. W. John Braun, Duncan J. Murdoch, A first course in statistical programming with R, Cambridge University Press, 2007.

Books for Reference:

1. Gardener, M. Beginning R: The statistical programming language, John Wiley & Sons 2012.
2. Martin, T. The Undergraduate Guide to R. A beginner's introduction to R programming Language, 2009.
3. Chambers, J. Software for data analysis: programming with R. Springer Science & Business Media, 2008.

E- Resources:

1. http://assets.cambridge.org/97805218/72652/frontmatter/9780521872652_frontmatter.pdf
2. http://students.aiu.edu/submissions/profiles/resources/onlineBook/A7E7d8_Beginning%20R%20statistics.pdf
3. <https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf>
4. <https://www.cs.upc.edu/~robert/teaching/estadistica/TheRBook.pdf>
5. <https://nptel.ac.in/>
6. https://swayam.gov.in/nc_details/NPTEL
7. <https://www.coursera.org/>
8. <https://spoken-tutorial.org/>

SEMESTER – III
PEMAF20 – ELECTIVE PRACTICAL: JAVA

Year: II	Course Code:	Title of the Course:	Course Type:	Course Category:	H/W	CREDITS	MARKS
SEM: III	PEMAF20	Elective Practical: Java	Practical	Elective	2	1	100

Course Objectives

1. To gain knowledge of object-oriented paradigm in the Java programming language.
2. To design & program stand-alone Java applications.

Course Outcomes (CO)

The Learners will be able to

1. Implement programs with classes.
2. Write programs that perform operations using arrays.
3. Develop the program by decision making statements and solve problems based on it.
4. Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language.
5. Take a problem, figure out the algorithm to solve it and write the code.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	H	L	M	H
CO2	M	H	H	L	M	H
CO3	M	H	H	L	M	H
CO4	M	M	H	L	M	H
CO5	H	H	H	L	M	H

(L-Low, M-Moderate, H-High)

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	M
CO2	H	H	H	H	L	M
CO3	H	H	H	H	L	M
CO4	H	H	H	H	L	M
CO5	H	H	H	H	L	M

(L-Low, M-Moderate, H-High)

Course Syllabus

PROGRAMS:

1. Solution of linear equations.(K1,K2,K3,K4,K5,K6)
2. Number and sum of integers between two given integers which are divisible by a number. (K1,K2,K3,K4,K5,K6)
3. Multiplication table. (K1,K2,K3,K4,K5,K6)
4. Verifying whether a given number is a palindrome. (K1,K2,K3,K4,K5,K6)
5. Generation of Fibonacci sequence. (K1,K2,K3,K4,K5,K6)
6. Sorting an array. (K1,K2,K3,K4,K5,K6)
7. Merging two sorted arrays. (K1,K2,K3,K4,K5,K6)
8. Product of two matrices. (K1,K2,K3,K4,K5,K6)
9. Transpose of a matrix. (K1,K2,K3,K4,K5,K6)
10. Replacing a substring with another. (K1,K2,K3,K4,K5,K6)

Books for study and reference:

Text Book:

1. E. Balagurusamy – Programming with Java – Tata McGraw Hill Publication 5th Edition, 2014.

Books for Reference:

1. K. Arnold and J. Gosling – The Java Programming Language – Ed. 2, Publication, 2000.
2. Cays Horstmann and Gary Cornell – Core Java Volume II, Publications, 2001.
3. Phil Hanna – JSP 2.0: The Complete Reference – TMH, Edition 2, Publications, 2003.

E- Resources:

1. <https://www.acs.ase.ro/Media/Default/documents/java/ClaudiuVinte/books/ArnoldGoslingHolmes06.pdf>
2. <https://ptgmedia.pearsoncmg.com/images/9780137081608/samplepages/013708160X.pdf>
3. <https://nitikesh.yolasite.com/resources/JSP%20complete%20reference.pdf>
4. <https://nptel.ac.in/>
5. https://swayam.gov.in/nc_details/NPTEL
6. <https://www.coursera.org/>

SEMESTER – III**PEMAH20 - ELECTIVE PRACTICAL: R**

Year : II SEM : III	Course Code: PEMAH20	Title Of The Course : Elective Practical: R	Course Type : Theory & Practical	Course Category : Elective	H/W 2	CREDITS 1	MARKS 100
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Course Objectives

1. To master the use of R interactive environment with an understanding of the use of R documentation.
2. To use R for descriptive statistics and write simple programs in R.

Course Outcomes (CO)

The Learners will be able to

1. Familiarize with basics of R software and built in function of R.
2. Identify the characteristics of datasets and plot the datasets in R using graphical methods.
3. Demonstrate understanding and use data frames.
4. Implement the learning techniques and computing environment that are suitable for the applications under consideration.
5. Compute vectors and matrices, matrix inverse, eigen values and eigen vectors.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	H	L	M	H
CO2	M	H	H	L	M	H
CO3	M	H	H	L	M	H
CO4	M	M	H	L	M	H
CO5	M	H	H	L	M	H

(L-Low, M-Moderate, H-High)

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	M
CO2	H	H	H	H	L	M
CO3	H	H	H	H	L	M
CO4	H	H	H	H	L	M
CO5	H	H	H	H	L	M

(L-Low, M-Moderate, H-High)

Course Syllabus

PROGRAMS:

1. Create a sequence and find the mean of numbers.(K1,K2,K3,K4,K5,K6)
2. Find the first 10 Fibonacci Numbers. (K1,K2,K3,K4,K5,K6)
3. Find the factors of a given number. (K1,K2,K3,K4,K5,K6)
4. Find the maximum and minimum of a given vector.(K1,K2,K3,K4,K5,K6)
5. Read the CSV file and display the content.(K1,K2,K3,K4,K5,K6)
6. Create m x n matrix and perform matrix operations.(K1,K2,K3,K4,K5,K6)
7. Create a bar plot of five subject marks.(K1,K2,K3,K4,K5,K6)
8. Create a data frame and display the details.(K1,K2,K3,K4,K5,K6)
9. Extract rows and columns from data frame(K1,K2,K3,K4,K5,K6)
10. Create a list containing strings, numbers and vectors(K1,K2,K3,K4,K5,K6)

Books for study and reference:

Text Book:

1. W. John Braun, Duncan J. Murdoch, A first course in statistical programming with R, Cambridge University Press, 2007.

Books for Reference:

1. Gardener, M. Beginning R: The statistical programming language, John Wiley & Sons, 2012.
2. Martin, T. The Undergraduate Guide to R. A beginner's introduction to R programming Language, 2009.
3. Chambers, J. Software for data analysis: programming with R. Springer Science & Business Media, 2008.

E- Resources:

1. http://assets.cambridge.org/97805218/72652/frontmatter/9780521872652_frontmatter.pdf
2. http://students.aiu.edu/submissions/profiles/resources/onlineBook/A7E7d8_Beginning%20R%20statistics.pdf
3. <https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf>
4. <https://www.cs.upc.edu/~robert/teaching/estadistica/TheRBook.pdf>
5. <https://nptel.ac.in/>
6. https://swayam.gov.in/nc_details/NPTEL
7. <https://www.coursera.org/>
8. <https://spoken-tutorial.org/>