MAHATMA GANDHI UNIVERSITY

Kottayam, Kerala

Undergraduate Programmes (HONOURS)
2025 Admission Onwards

SYLLABUS						
SIGNATURE COURSE						
Name of the College	St. Stephen's College, Uzhavoor					
Faculty/ Discipline	Mathematics					
Programme	BSc (Hons) Mathematics					
Course Coordinator	Jais Kurian					
Contributors	Dr. John Joy					
Course Name	Introductory Course on Data Science					
Type of Course	DSE					
Specialization title	Data Analysis					
Course Code	MG3DSEMATA08					
Course Level	200					
Course Summary	The course provides students with a solid foundation in data science and its various application areas. It helps them grasp core concepts and emerging technologies in the field while teaching them how to handle data at a large scale. Additionally, students will explore key concepts in data processing.					
Semester	3	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	The prerequisites for the introductory Data Science course include a basic understanding of programming, particularly in languages like Python, as these are commonly used for data analysis. A solid foundation in mathematics, especially statistics, probability, and linear algebra, is essential for grasping core data science concepts. Familiarity with basic statistics, such as mean, variance, and correlation, is important for interpreting data.					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Grasp the core concepts of data science.	U	PO1
2	Learn to critically evaluate the ethical issues related to privacy and data sharing.	U, A	PO6, PO8
3	Assess data analysis techniques for handling large datasets and demonstrate the end-to-end data science process.	An	PO2
4	Use various tools to visualize and present insights effectively.	S	PO3

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	1	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	3	-	3	-	-
CO 3	-	3	-	-	-	-	-	-	-	-
CO 4	-	-	3	-	-	-	-	-	-	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Fundamentals of Data Science and Data Representation			
	1.1	An introduction to Data Science	2	["1"]
	1.2	Types of Data	2	["1"]
	1.3	Four Level of Data	4	["1"]
	1.4	Five Steps of Data Science	4	["1"]
2	Data Ethics, Privacy and Governance in Data Science			
	2.1	The Five C's (Consent, Clarity, Consistency, Control & Consequences)	8	["2"]
	2.2	Ethics and Security Training, Regulations, Developing Guiding Principles	8	["2"]
3	Data Science Methods and Exploratory Data Analysis			
	3.1	Data Science Classification and Algorithms	5	["3"]
	3.2	Data Science Process	5	["3"]
	3.3	Data Exploration	6	["4"]
4	Big Data Technologies and Modern Data Management Systems			
	4.1	Big Data	5	["3"]
	4.2	NoSQL Movement	6	["3"]
	4.3	Introduction to Graph Databases	5	["3"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** The course adopts a student-centered and activity-based teaching methodology combining lectures, discussions, and application-oriented learning. A flipped classroom approach is used, where students review basic materials in advance, enabling classroom sessions to focus on conceptual clarity and active engagement. Module 1 is delivered through interactive lectures and examples to introduce fundamental concepts of data science and data representation. Module 2 emphasizes discussion-based learning, case studies, and group activities to develop ethical awareness and understanding of data privacy and governance. Module 3 focuses on analytical thinking through demonstrations, guided exercises, and exploratory data analysis activities. Module 4 is taught using lectures supported by examples and multimedia resources to introduce Big Data technologies and modern data management systems. Group discussions, assignments, and presentations are incorporated throughout the course to enhance communication and collaborative skills. Continuous assessment through tests, assignments, and participation ensures effective learning and engagement.

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Module Tests, Assignment, Debate, Quiz **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Written Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ Short answer - (5 out of 8) – 5 × 2 = 10 ◦ PART - B ◦ Short Essays - (5 out of 8) – 5 × 6 = 30 ◦ PART - C ◦ Essays - (3 out of 6) – 3 × 10 = 30

References

- 1. Ozdemir, Sinan. Principles of data science. Packt Publishing Ltd, 2016. 2. Loukides, Mike, Hilary Mason, and D. J. Patil. Ethics and data science. " O'Reilly Media, Inc.", 2018. 3. Kotu, Vijay, and Bala Deshpande. Data science: concepts and practice. Morgan Kaufmann, 2018. 4. Davy Cielen, Arno D. B. Meysman and Mohamed Ali, Introducing Data Science, Manning Publications, 2016.

Suggested Readings

- 1. Aggarwal, Charu C. Data mining: the textbook. Vol. 1. No. 3. New York: springer, 2015. 2. Cady, Field. The data science handbook. John Wiley & Sons, 2024. 3. Van Der Aalst, Wil, and Wil van der Aalst. Data science in action. Springer Berlin Heidelberg, 2016. 4. Carpineto, Claudio, and Giovanni Romano. Concept data analysis: Theory and applications. John Wiley & Sons, 2004. 5. Provost, Foster, and Tom Fawcett. Data Science for Business: What you need to know about data mining and data-analytic thinking. " O'Reilly Media, Inc.", 2013.

Affidavit

- We, St. Stephen's College, Uzhavoor, agree to appoint a new course coordinator for the proposed Data Analysis in the event of the unavailability of the currently nominated coordinator. This appointment will ensure the continued coordination of course delivery, assessments, and all related academic responsibilities necessary for the successful implementation of the specialization, for as long as the college offers this programme.
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SYLLABUS						
SIGNATURE COURSE						
Name of the College	St. Stephen's College, Uzhavoor					
Faculty/ Discipline	Mathematics					
Programme	BSc (Hons) Mathematics					
Course Coordinator	Jais Kurian					
Contributors	Dr. John Joy					
Course Name	Computational Data Analysis					
Type of Course	DSE					
Specialization title	Data Analysis					
Course Code	MG4DSEMATA08					
Course Level	200					
Course Summary	This course introduces students to computational techniques for data analysis using Python and Tableau. It covers data handling, exploratory analysis, basic statistical modelling, and machine learning implementation using Python. The course also develops skills in creating interactive dashboards and effectively communicating insights through data visualization.					
Semester	4	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	Students should have a basic understanding of statistics (mean, variance, correlation, probability concepts) and elementary linear algebra (matrices and vectors). Familiarity with basic mathematical reasoning is required. Prior exposure to an introductory Data Science or Statistics course is recommended, but prior programming knowledge is not mandatory as Python fundamentals are covered in Module 1.					

Course Outcomes (CO)

Number of COs		**5**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Demonstrate proficiency in Python programming for data analysis.	U, A	PO1, PO10
2	Perform data cleaning, transformation, and exploratory analysis.	A, An	PO2
3	Apply basic statistical and machine learning models computationally.	An	PO3
4	Create interactive dashboards and visual reports using Tableau.	E	PO9
5	Interpret analytical results and communicate insights effectively.	An, E	PO2, PO3

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	-	-	-	-	-	-	-	-	3
CO 2	-	3	-	-	-	-	-	-	-	-
CO 3	-	-	3	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	3	-
CO 5	-	3	3	-	-	-	-	-	-	-

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Foundations of Python Programming for Data Analysis			
	1.1	Introduction to programming concepts. Familiar with Google Colab, Anaconda and Jupyter Notebook	2	["1"]
	1.2	Python basics: variables, data types, operators and Control structures	5	["1"]
	1.3	Functions and basic scripting	3	["1"]
	1.4	Introduction to NumPy and Pandas	3	["1"]
2	Data Preprocessing, Statistical Analysis and Visualization			
	2.1	Descriptive statistics Data importing (CSV, Excel files) Data cleaning and missing value treatment Data filtering, sorting, grouping Correlation analysis, Outlier detection	10	["2", "3"]
	2.2	Data visualization using Matplotlib and Seaborn	6	["2", "3"]
3	Regression Analysis and Basic Machine Learning Concepts			
	3.1	Concept of dependent and independent variables	3	["3", "5"]
	3.2	Simple Linear Regression (equation of a straight line, least squares idea)	6	["3", "5"]
	3.3	Basic concept of clustering (grouping similar data – k-Means idea)	7	["3", "5"]
4	Data Visualization and Dashboard Development using Tableau			
	4.1	Introduction to Tableau interface	4	["4", "5"]
	4.2	Connecting datasets Creating charts and graphs Calculated fields and filters	6	["4", "5"]
	4.3	Dashboard design principles Interactive dashboard creation	5	["4", "5"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** The course adopts a **student-centered and practice-oriented teaching methodology** integrating lectures, live demonstrations, lab sessions, and project-based learning. A **flipped classroom approach** is followed, where students review basic materials in advance, enabling classroom sessions to focus on application and problem-solving. **Module 1** is taught through interactive lectures and live coding to introduce Python programming and data handling tools, while **Module 2** emphasizes hands-on lab sessions for data preprocessing, statistical analysis, and visualization. **Module 3** focuses on analytical understanding and model building through regression and basic machine learning techniques, and **Module 4** involves tool-based training for creating interactive dashboards using Tableau. Regular assignments, lab exercises, and a mini project reinforce learning, while continuous assessment through tests, practical performance, and presentations ensures active engagement and the development of computational, analytical, and communication skills.

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Module Tests, Assignment, Debate, Quiz **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Written Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ Short answer - (5 out of 8) – 5 × 2 = 10 ◦ PART - B ◦ Short Essays - (5 out of 8) – 5 × 6 = 30 ◦ PART - C ◦ Essays - (3 out of 6) – 3 × 10 = 30

References

- 1. Wes, McKinney, Python for Data Analysis (third edition), O'Reilly Media, 2022. 2. Gareth James et al., An Introduction to Statistical Learning (ISLR), Springer 2013 3. Joshua N. Milligan, Learning Tableau (third edition), Packt Publishing, 2019.

Suggested Readings

- 1. Allen B. Downey – Think Python: How to Think Like a Computer Scientist, Green Tea Press Wellesley, Massachusetts, 2002 2. David Diez, OpenIntro Statistics (forth edition), 2019. 3. https://www.tableau.com/resources

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2025 Admission Onwards

SYLLABUS						
SIGNATURE COURSE						
Name of the College	St. Stephen's College, Uzhavoor					
Faculty/ Discipline	Mathematics					
Programme	BSc (Hons) Mathematics					
Course Coordinator	Jais Kurian					
Contributors	Dr. John Joy					
Course Name	Mathematical Foundations for Data Analytics with Computational Tools					
Type of Course	DSE					
Specialization title	Data Analysis					
Course Code	MG5DSEMATA08					
Course Level	300					
Course Summary	This course provides a rigorous foundation in the mathematical concepts essential for data analytics, including multivariable calculus, probability, statistics, optimization, and linear algebra. It emphasizes the integration of theoretical principles with practical data analysis applications, enabling students to develop analytical and problem-solving skills. The course also incorporates the use of computational tools such as Python, GeoGebra, and Excel to facilitate the exploration, visualization, and implementation of mathematical concepts in real-world data contexts.					
Semester	5	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	Students are expected to have a foundational understanding of single-variable calculus, matrices and determinants, and introductory statistics, including concepts such as mean, variance, and basic probability. Familiarity with basic Python programming is desirable, as it supports the computational aspects of the course; however, it is not mandatory.					

Course Outcomes (CO)

Number of COs		**5**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Apply concepts of multivariable calculus, including partial derivatives and gradients, to formulate and analyze data-driven models.	A, An	PO1
2	Analyze random variables and probability distributions to interpret and model real-world data scenarios	An, E	PO1, PO2
3	Perform statistical inference and interpret regression models using both mathematical reasoning and computational techniques	A, An	PO3
4	Apply analytical and numerical methods to solve optimization problems arising in data analysis	A, An	PO3

Number of COs		5	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
5	Utilize matrix methods and computational tools (Python, Excel, GeoGebra) to represent, process, and analyze datasets effectively.	A, E	PO3, PO9

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	-	-	-	-	-	-	-	-	-
CO 2	3	2	-	-	-	-	-	-	-	-
CO 3	-	-	3	-	-	-	-	-	-	-
CO 4	-	-	3	-	-	-	-	-	-	-
CO 5	-	-	3	-	-	-	-	-	1	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Multivariable Calculus and Computational Visualization			
	1.1	Functions of two variables	2	["1"]
	1.2	Partial derivatives Gradient and directional derivatives	3	["1"]
	1.3	Taylor approximation (first order) Maxima and minima (basic)	2	["1"]
	1.4	Plotting 3D surfaces Visualizing gradients Numerical approximation of derivatives (Python and Geogebra)	6	["1"]

Module	Units	Course Description	Hrs	CO No.
2	Probability, Statistical Inference and Regression Analysis			
	2.1	Random variables Discrete & continuous distributions Expectation and variance Conditional probability Bayes' theorem Covariance & correlation	5	["2", "3"]
	2.2	Sampling Estimation Hypothesis testing (z-test, t-test) Simple linear regression (mathematical derivation) R^2 interpretation	6	["2", "3"]
	2.3	Visualizing normal distribution Computing correlation from dataset Performing regression using real dataset Interpreting p-values Comparing theoretical and computational results	5	["2", "3"]
3	Optimization Techniques and Gradient-Based Methods			
	3.1	Optimization problems Convex functions (basic idea) Gradient descent (conceptual derivation) Lagrange multipliers (introductory)	9	["4"]
	3.2	Implementing simple gradient descent Visualizing loss minimization	6	["4"]
4	Linear Algebra and Matrix Methods for Data Analysis			
	4.1	Matrix representation of data Rank and linear independence Eigenvalues & eigenvectors (introductory) Diagonalization concept	11	["5"]
	4.2	Matrix multiplication for dataset Computing eigenvalues numerically	5	["5"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** The course adopts a student-centered and application-oriented teaching methodology integrating lectures, demonstrations, computational activities, and problem-solving sessions. A flipped classroom approach is encouraged, where students review preparatory materials in advance, allowing classroom time to focus on conceptual understanding and application. Module 1 is taught through interactive lectures and visualization techniques to develop intuition in multivariable calculus, supported by computational tools such as Python and GeoGebra. Module 2 emphasizes analytical reasoning through problem-solving and real-data examples to understand probability, statistical inference, and regression analysis. Module 3 focuses on optimization techniques, combining theoretical explanations with numerical illustrations and visualization of algorithms such as gradient descent, while Module 4 uses concept-based lectures and computational exercises to demonstrate matrix methods for data representation and analysis. Throughout the course, students engage in guided exercises, computational assignments, and exploratory tasks using Python, Excel, and GeoGebra, with continuous assessment through tests, assignments, and presentations to ensure active participation and the development of strong mathematical, computational, and analytical skills.

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Module Tests, Assignment, Debate, Quiz **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Written Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ Short answer - (5 out of 8) – 5 × 2 = 10 ◦ PART - B ◦ Short Essays - (5 out of 8) – 5 × 6 = 30 ◦ PART - C ◦ Essays - (3 out of 6) – 3 × 10 = 30

References

- 1. Stewart, James. Calculus: Early Transcendentals. 8th ed. Cengage Learning, 2016. 2. Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong. Mathematics for Machine Learning. Cambridge University Press, 2020 3. McKinney, Wes. Python for Data Analysis. 3rd ed. O'Reilly Media, 2022. 4. Ross, Sheldon M. Introduction to Probability and Statistics for Engineers and Scientists. 5th ed. Academic Press, 2014. 5. Boyd, Stephen, and Lieven Vandenberghe. Convex Optimization. Cambridge University Press, 2004. 6. Strang, Gilbert. Linear Algebra and Its Applications. 4th ed. Cengage Learning, 2006.

Suggested Readings

- 1. Wasserman, Larry. All of Statistics: A Concise Course in Statistical Inference. Springer, 2004. 2. James, Gareth, Daniela Witten, Trevor Hastie, and Robert Tibshirani. An Introduction to Statistical Learning. Springer, 2013. 3. Downey, Allen B. Think Stats: Exploratory Data Analysis. 2nd ed. O'Reilly Media, 2014. 4. Grus, Joel. Data Science from Scratch: First Principles with Python. 2nd ed. O'Reilly Media, 2019. 5. Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow. 2nd ed. O'Reilly Media, 2019. 6. Lay, David C., Steven R. Lay, and Judi J. McDonald. Linear Algebra and Its Applications. 5th ed. Pearson, 2016

Affidavit

- We, St. Stephen's College, Uzhavoor and Jais Kurian, retain the copyright of this syllabus and expressly prohibit its distribution in complete form to any institution outside our own.
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2025 Admission Onwards

SYLLABUS						
SIGNATURE COURSE						
Name of the College	St. Stephen's College, Uzhavoor					
Faculty/ Discipline	Mathematics					
Programme	BSc (Hons) Mathematics					
Course Coordinator	Jais Kurian					
Contributors	Dr. John Joy					
Course Name	Linear Algebra for Data Analytics with Python					
Type of Course	DSE					
Specialization title	Data Analysis					
Course Code	MG6DSEMATA08					
Course Level	300					
Course Summary	This course offers a rigorous introduction to the fundamental concepts of linear algebra with a focus on their applications in data analytics. It covers essential topics such as vectors, matrices, eigenvalues, eigenvectors, and matrix factorizations, which form the mathematical foundation of modern data science, machine learning, and statistical modeling. The course integrates theoretical understanding with practical implementation using Python, enabling students to apply linear algebraic techniques to real-world data analysis problems. By the end of the course, students will have developed both a strong conceptual framework and the computational skills necessary for effective data-driven analysis.					
Semester	6	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	Here is a more **professional and refined version** of the prerequisites: --- **Prerequisites** Students are expected to have a foundational understanding of matrix algebra, including elementary row and column operations and the analysis of solutions to systems of linear equations. Familiarity with basic Python programming—such as syntax, control structures, and commonly used libraries—is desirable, as it supports the computational components of the course.					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Solve systems of linear equations and apply concepts of orthogonality and projections to minimize error in data analysis applications.	U, A	PO1, PO2
2	Apply the theory of positive definite matrices, eigenvalues, eigenvectors, diagonalization, and hyperplanes in mathematical modeling and data analysis.	A, An	PO2, PO3
3	Analyze spectral methods, including the spectral theorem, power method, and singular value decomposition (SVD), in the context of data analysis.	An	PO1, PO3

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
4	Utilize Python-based tools to perform linear algebra operations and solve data-driven problems effectively.	A, S	PO3, PO10

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	-	-	-	-	-	-	-	-
CO 2	-	3	3	-	-	-	-	-	-	-
CO 3	3	-	3	-	-	-	-	-	-	-
CO 4	-	-	3	-	-	-	-	-	-	3

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Vector Spaces, Linear Systems and Orthogonality			
	1.1	Vectors, Norms, and Inner Products	4	["1"]
	1.2	Review of Linear Systems and Gaussian Elimination	4	["1"]
	1.3	Orthogonality and Projections	4	["1"]
2	Eigenvalues, Matrix Theory and Geometric Structures			
	2.1	Positive definite matrices	3	["2"]
	2.2	Review of eigenvalues and eigen vectors and diagonalization	5	["2"]
	2.3	Notion of Hyperplanes	4	["2"]
3	Spectral Methods and Matrix Decomposition Techniques			
	3.1	Spectral Theorem	3	["3"]
	3.2	Power Method for Finding Eigenvectors & Eigenvalue Decomposition	5	["3"]
	3.3	Singular Value Decomposition (SVD) and its Computation	5	["3"]
4	Computational Linear Algebra using Python			
	4.1	Python Programming for Basic Matrix Operations Determinant and Inverse of a Matrix Solving Linear Systems	12	["4"]
	4.2	Python Programming for Eigenvalue and Eigenvector Computation. Singular Value Decomposition	11	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** The course adopts a student-centered and application-oriented teaching methodology integrating lectures, problem-solving sessions, and hands-on computational activities. A flipped classroom approach is encouraged, where students review foundational concepts in advance, enabling classroom sessions to focus on deeper understanding and application. Module 1 is delivered through interactive lectures and guided problem-solving to develop concepts in vector spaces, linear systems, and orthogonality, while Module 2 emphasizes conceptual clarity through examples and discussions on eigenvalues, matrix theory, and geometric interpretations. Module 3 combines theoretical instruction with analytical exercises to explore spectral methods and matrix decomposition techniques such as the power method and singular value decomposition. Module 4 focuses on practical implementation, where students apply linear algebra concepts using Python for matrix operations, solving systems, and computing eigenvalues and decompositions. Continuous assessment through assignments, computational exercises, tests, and presentations ensures active engagement and the development of strong analytical and computational skills.

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Module Tests, Assignment, Debate, Quiz **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Written Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ Short answer - (5 out of 8) – 5 × 2 = 10 ◦ PART - B ◦ Short Essays - (5 out of 8) – 5 × 6 = 30 ◦ PART - C ◦ Essays - (3 out of 6) – 3 × 10 = 30

References

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