

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS)

Reaccredited with "B++" Grade by NAAC

(Affiliated to Periyar University)

SALEM - 16



PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

(LOCF)

M.Sc. DATA SCIENCE

2026-2028 BATCH

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1. INTRODUCTION

The Post-Graduate Program in Data Science is a two-year, four-semester curriculum thoughtfully designed to prepare students as competent and versatile data professionals. Recognizing the interdisciplinary nature of the field, the program integrates mathematics, statistics, computer science, and domain-specific applications to provide a balanced blend of theory and practice.

The first year focuses on building strong fundamentals through courses such as Fundamentals of Data Science, Mathematics for Data Science, *and* Statistics I & II. Computational skills are emphasized with Python Programming and its practical applications, along with Databases for Data Science, ensuring students acquire both analytical depth and technical proficiency.

From the second year onwards, the curriculum advances into specialized and industry-relevant domains. Core subjects such as *Machine Learning*, *Big Data Analytics*, and *Cloud Computing* equip students with tools and techniques central to modern data ecosystems. Additionally, industry-focused modules like Health Care Analytics expose learners to real-world applications of data science. Flexibility is provided through a wide range of electives, enabling specialization in emerging fields including Internet of Things (IoT), Natural Language Processing (NLP), Deep Learning, *and* Artificial Intelligence.

Experiential learning is a defining feature of the program. Multiple lab courses, a capstone Project with Viva Voce, and a mandatory Internship/Industrial Activity ensure that graduates are not only academically prepared but also industry-ready. The curriculum incorporates support for competitive examinations like *UGC NET/SET/JRF*.

Students are required to complete a minimum of 92 credits, with the opportunity to earn up to 16 additional credits through self-study, MOOC/NPTEL certifications, and skill-based activities. This structure encourages both academic rigor and self-directed learning, making the program an excellent foundation for professional careers or further research in the data science domain.

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR POST GRADUATE PROGRAMME	
Programme:	M.Sc. Data Science
Programme Code:	PGCS-DS
Duration:	2 Years [PG]
2. Programme Outcomes:	PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context. PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making. PO3: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational Goals. PO4: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment. PO5: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.
3. Programme Specific Outcomes (PSOs)	PSO1 - Placement To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions. PSO2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations. PSO3 - Research and Development Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development. PSO4 - Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world. PSO5 - Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

4. Highlights of the Revamped Curriculum

➤ Industry-Oriented and Student-Centric

The program integrates industrial components, hands-on training, and internships to meet the demands of industry and society. It includes skill enhancement modules and support for competitive exams, ensuring holistic student growth.

➤ Strong Core with Advanced Domains

A solid foundation is built with Mathematics, Statistics, Python, and Databases, progressing to Machine Learning, Big Data Analytics, and Cloud Computing. Industry-specific modules like Health Care Analytics bridge academics with practical needs.

➤ Electives in Emerging Technologies

Students can specialize through electives in IoT, NLP, Deep Learning, and Artificial Intelligence. These courses promote multi-disciplinary exposure and research aptitude, aligning with personal career aspirations.

➤ Experiential and Practical Learning

The curriculum emphasizes practice through lab courses, a mandatory internship, and a final capstone project with viva-voce. These components foster innovation, problem-solving, and readiness for real-world challenges.

➤ Holistic Development and Flexibility

Soft skills, articulation, and creativity are embedded alongside technical training. A flexible credit system (92–108 credits) with MOOC/NPTEL options encourages self-learning, innovation, and long-term adaptability.

5. Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome/ Benefits
I, II, III & IV	Elective Course An open choice of topics categorized under Discipline Centric	• Specialization in Emerging Fields Electives enable students to focus on advanced domains like IoT, NLP, Deep Learning, and Artificial Intelligence. This specialization equips them with cutting-edge knowledge and practical expertise. • Research and Innovation Skills By exploring electives, students develop a research-oriented mindset and innovative thinking. They learn to apply data science concepts to interdisciplinary and real-world problems. • Career and Industry Alignment Electives allow students to align their learning with career goals in industries such as healthcare, smart technologies, and AI-driven enterprises. This enhances employability and industry relevance. • Flexibility and Competitive Edge The choice of electives provides flexibility in shaping academic pathways. Graduates gain a competitive advantage, positioning them for advanced research, entrepreneurship, or leadership roles.
Extra Credits: For Advanced Learners		• To cater to the needs of peer learners / research aspirants.
Skills acquired from the Courses		• Knowledge, Problem Solving, Analytical ability, and Professional Competency.

Credit Distribution for PG Programme

Sem I	Credit	Hr.	Sem II	Credit	Hr.	Sem III	Credit	Hr.	Sem IV	Credit	Hr.
1.1 Core Course - CC I	5	6	2.1 Core Course - CC IV	5	5	3.1 Core Course - CC VI	5	6	4.1 Core Course - CC IX	5	6
1.2 Core Course - CC II	5	7	2.2 Core Course - CC V	4	5	3.2 Core Course - CC VII	4	4	4.2 Core Course - CC X	3	3
1.3 Core Course - CC III	4	7	2.3 Core Practical – I	5	6	3.3 Core Course - CC VIII	4	6	4.3 Elective (Discipline Centric) - VI	3	4
1.4 Elective (Discipline Centric) - I	3	5	2.4 Elective (Discipline Centric) – III	3	4	3.4 Core Practical - II	5	5	Core Practical - IV	2	3
1.5 Elective (Discipline Centric) - II	3	5	2.5 Elective (Discipline Centric) – IV	3	4	3.5 Core Practical - III	1	2	4.4 Core Course - Project with Viva Voce	7	10
			2.6 EDC – I	2	4	3.6 Elective – V	3	4	4.5 Professional Competency Skill - Practical	2	4
	-	-	2.7 Human Rights	1	2	3.7 EDC – II	2	3	4.6 Extension Activity	1	-
	-	-		-	-	3.8 Internship/Industrial Activity	2	-			
	20	30		23	30		26	30		23	30

6. Consolidated Semester wise and Component wise Credit distribution

Credits	Sem I	Sem II	Sem III	Sem IV	Total Credits
PART A	20	20	22	20	82
PART B					
(i) Extra Disciplinary Course	-	2	2	-	4
(ii) Human Rights	-	1	-	-	1
(iii) Internship/Industrial Activity	-	-	2	-	2
(iv) Professional Competency Skill	-	-	-	2	2
PART C					
(i) Extension Activity	-	-	-	1	1
Total	20	23	26	23	92

Part A component and Part B (i) will be taken into account for CGPA calculation for the postgraduate programme and the other components Part B and Part C have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the PG degree.

Total Credits: 92

EXTRA CREDITS FOR EXTRA SKILLS

Total Extra Credits-16 (17% of the total credits)

M.Sc. DATA SCIENCE

7. CURRICULUM DESIGN AND SCHEME OF EXAMINATION (APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2026-28) SEMESTER-I

Part	Course Code	Course Title	Course Type	Hrs. /Week L/T/P	Credits	CIA	ESE	TOTAL
Part A	26PDSCC1	Fundamentals of Data Science	Core Course – I	6	5	30	70	100
	26PDSCC2	Mathematics for Data Science	Core Course – II	7	5	30	70	100
	26PDSCC3	Statistics-I	Core Course – III	7	4	30	70	100
	26PDSDSEC1A / 26PDSDSEC1B	Internet of Things / Research Methodology for Computer Science	Elective – I	5	3	30	70	100
	26PDSDSEC2A/ 26PDSDSEC2B	Web Programming/ Java Programming	Elective -II	3	2	30	70	100
26PDSDSECQ2A/ 26PDSDSECQ2B	Web Programming- Practical/ Java Programming- Practical	2		1	40	60	100	
Total				30	20			
*Extra Skills (Out of College Hours)						*Credits	*Marks	
Value Education						-	-	
Physical Fitness Practice						-	-	
Productive Preparation for UGC NET/SET/JRF/TRB Competitive Examinations – I (26PDSSC1)						1	100	

*Extra credits are given for extra skills and courses qualified in MOOC/ NPTEL

PEDAGOGICAL APPROACHES TEACHING LEARNING STRATEGIES

- a) Chalk and talk
- b) Group-Learning and Teaching
- c) Individual Learning/ Self-Study
- d) Game Based Learning
- e) Technology Based Learning
- f) Peer Teaching
- g) Learning Through Problem solving
- h) Project Based Learning

8. METHODS OF EVALUATION AND ASSESSMENT

Methods of Evaluation-Theory		
Internal Evaluation	Continuous Internal Assessment Test	30 Marks
	Assessment Components	
	Model Examination and Attendance	
External Evaluation	End Semester Examination	70 Marks
	Total	100 Marks
Methods of Evaluation-Practical		
Internal Evaluation	Laboratory work assessment (best 2 out of 3)	40 Marks
	Viva-voce/ Lab quiz, Class Performance	
External Evaluation	End Semester Examination	60 Marks
	Record	
	Total	100 Marks
REVISED BLOOMS LEVEL		
BL1	Exhibits memory of previously learned material by recalling fundamental facts, terms, basic concept and answers about the selection.	
BL2	Demonstrate understanding of parts and Idea free organizing, comparing, translating, interpreting, giving descriptors and stating main ideas.	
BL3	Solve problems in new situation by applying acquired knowledge, facts, techniques and rules in different or new way.	
BL4	Examine and break information into parts by identifying motives or causes. Make inference and find evidence to support generalizations.	
BL5	Present and depend opinion by making judgement about information, Validity of ideas or quality of work based on a set of criteria.	
BL6	Compile information together into different way by combining elements in A new pattern or proposing alternative solutions.	

Evaluation Pattern

An academic year is divided into two semesters. The first semester is from June/ July to November/ December and the second semester is from November/ December to April/ May. A semester consists of 90 working days.

Evaluation consists of both Continuous Internal Assessment (CIA) and End Semester Examinations (ESE). The entire Undergraduate and Postgraduate Programmes offered by our college have various assessments for continuous internal evaluation. Relevant types of internal assessment are developed suiting the needs and requirements of each specific course. The various assessment components are quiz, snap test, viva-voce, seminar, listening comprehension, reading comprehension, problem solving, map reading, group discussion, panel discussion, assignment, field visit, poster presentation, open book test, writing composition, case study, online test, Book Review, Projects etc.

The CIA marks are read out and signed by the students in the respective classes on the day specified in the calendar. CIA is mandatory for all the students.

Internal Assessment Modes (Theory Course)

Any six of the assessment components	15 marks
Cycle Test (1) & Cycle Test (2)	5 marks
Model Examination	5 marks
Attendance	5 marks
Total	30 marks

Internal Assessment Modes (Practical Course)

Laboratory work assessment (best 2 out of 3)	20 marks
Viva-voce/ Lab quiz	10 marks
Class Performance	10 marks
Total	40 marks

Society Connect Project

Project Assessment	10 marks
Presentation and feedback from the society	10 marks
Participation in discussion	10 marks
Total	30 marks

Internal Assessment Modes (Project)

Project Assessment	15 marks
Participation in discussion	10 marks
Presentation	5 marks
Total	30 marks

PASSING MINIMUM

The candidate shall be declared to have passed the examination if the candidates secure not less than 35 marks out of 70 marks in the semester examination in each theory course and in total (CIA mark + Theory ESE) not less than 50 marks.

The candidates shall be declared to have passed the examination if she secures not less than 50 marks in total (CIA mark + Practical Exam mark) with minimum of 30 marks out of 60 marks in the Practical exam conducted by the University. There is no passing minimum for the record notebook. However, submission of the record notebook is necessary. Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Reappear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

Theory Course (Revised Bloom's Taxonomy)

Question Paper Model for PG

Intended Learning Skills	Maximum 70 marks Passing Minimum:50% Duration: Three hours
Memory Recall / Example / Counter Example / Knowledge about the Concept / Understanding	Part-A ($15 \times 1 = 15$ marks) Answer ALL questions Each question carries 1 marks
	Three questions from each UNIT
	Questions 1 to Questions 15
Description / Application (problem)	Part-B ($5 \times 5 = 25$ marks) Answer ALL questions Each question carries 5 marks
	Either-or-Type Both parts of each question from the same Unit
	Questions 16 (a) or 16(b) to Questions 20(a) to 20(b)
Analysis / Create / Evaluation	Part- C ($3 \times 10 = 30$ marks) Answer ANY THREE questions Each question carries 10 marks
	There shall be FIVE questions covering all the five units
	Question 21 to Question 25

Each question should carry course outcomes and cognitive level

For instance:

1. [CO1: BL₂] Question
2. [CO3: BL₁] Question

SEMESTER WISE INDEX

Semester	Course	Course Code	Page No.
I	Fundamentals of Data Science	26PDSCC1	13
I	Mathematics for Data Science	26PDSCC2	16
I	Statistics-I	26PDSCC3	19
I	Internet of Things /	26PDSDSEC1A /	22
	Research Methodology for Computer Science	26PDSDSEC1B	25
I	Web Programming/	26PDSDSEC2A/	28
	Java Programming	26PDSDSEC2B	31
I	Web Programming Practical/	26PDSDSECQ2A/	34
	Java Programming Practical	26PDSDSECQ2B	37

Programme Title	: M.Sc. Data Science	
Course Title	: CORE COURSE-I: FUNDAMENTALS OF DATA SCIENCE	
Course Code	: 26PDSCC1	Hours/Week:6
Semester	: I	Credits:5

COURSE OBJECTIVES:

To develop competency in data science, analytics, visualization, and AI-assisted technologies for solving practical problems.

COURSE OUTCOME:

On Completion of the Course the students will be able to

CO1: Understand the types of data and analytics, data science process, and its life cycle.

CO2: Apply math in data science.

CO3: Analyze the various data intensive operations and tools.

CO4: Evaluate the tools and methods for analyzing the data.

CO5: Apply, analyze, evaluate, and create data-driven solutions using contemporary and AI-enabled technologies.

SYLLABUS**Unit – I: Hours: 16**

Introduction of Data Science: Data Science - Data Science Venn diagram - Basic Terminology - Data Science Case Studies - Types of Data – Levels of data- Types of Data Analytics - Descriptive Analytics - Diagnostic Analytics- Predictive Analytics - Prescriptive Analytics - Five Steps of Data Science.

Unit – II: Hours:20

Mathematical Preliminaries - Basic Maths – Mathematics as discipline – Basic Symbols and terminology –Linear algebra - Basic Probability – Definitions- Probability – Bayesian vs frequentist – Compound events – Conditional probability – Rules of probability.

Unit – III: Hours: 18

Data Mining and Data Warehousing - Introduction to Data Warehousing – Design consideration of Data Warehouse - Data Loading Process – Data Mining – Data Mining techniques – Tools and platforms – Case study.

Unit - IV: Hours: 18

Visualizing Data - Exploratory Data Analysis – Developing the visual aesthetic – Chart types - Great Visualizations – Reading graphs – Interactive visualizations.

Unit - V:**Hours: 18**

Applications of Data Science – Emerging Trends in Data Collection and Analysis Techniques - AI-Integrated Tools for Data Processing and Visualization - Visualization Techniques - Application Development Methods in Data Science – AI-Assisted Tools and Frameworks for Application Development.

BOOKS FOR STUDY:

1. Ozdemir, Sinan. Principles of Data Science. Packt Publishing Ltd, 2016.
2. Maheshwari, Anil.” Data analytics made accessible”. Seattle: Amazon Digital Services, 2nd edition, 2023.
3. Skiena, Steven S. The Data Science Design Manual. Springer, 2017.

BOOKS FOR REFERENCE:

1. Hadrien Jean. Education, C. (2023). Data Science. Certybox Education.
2. Pierson, Lillian. Data Science for dummies. John Wiley & Sons, 2021.
3. Grus, Joel. Data Science from Scratch: First principles with python. O’Reilly Media, 2019.
4. Blum, Avrim, John Hopcroft, and Ravindran Kannan. Foundations of Data Science. Cambridge University Press, 2020.

WEB RESOURCES:

1. <https://www.analyticsvidhya.com/>
2. <https://www.simplilearn.com>
3. <https://www.ibm.com/in-en/topics/data-science>
4. <https://www.mygreatlearning.com/blog/what-is-data-science/>
5. <https://www.ibm.com/docs/en/watsonx/saas?topic=started-quick-start-tutorials>

Mapping of COs with Pos

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	2	1
CO2	3	3	2	2	1
CO3	3	3	2	2	2
CO4	2	3	3	3	2
CO5	3	3	3	3	3
Weightage of Course Contributed to each POs	14	14	11	12	9

Strong = 3**Medium = 2****Low = 1**

Level of Correlation between PSO's and CO's

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	2	2	3	1
CO3	3	2	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	3
Weightage	14	11	13	14	9
Weighted Percentage of Course Contribution to PSOs	2.80	2.20	2.60	2.80	1.80

Strong – 3**Medium – 2****Low – 1**

Programme Title : M.Sc. Data Science

Course Title : CORE COURSE -II: MATHEMATICS FOR DATA SCIENCE

Course Code : 26PDSCC2

Hours/Week: 7

Semester : I

Credits: 5

COURSE OBJECTIVES:

To build the mathematical background necessary to understand and implement in data science practical/research work.

COURSE OUTCOME:

On Completion of the Course the students will be able to

CO1: Understand vectors, matrices, and systems of linear equations for mathematical problem solving.

CO2: Apply subspaces, basis, and dimension to solve linear algebra problems.

CO3: Analyze orthogonality, projections, and determinants to solve linear algebra problems.

CO4: Apply eigenvalues, eigenvectors, matrix diagonalization, and complex vector concepts to solve linear differential equations.

CO5: Develop data analysis solutions using SVD, PCA, and linear transformations.

SYLLABUS

UNIT-I

Hours: 15

Vectors and Matrices - Vectors and Linear Combinations-Lengths and Angles from Dot Products-Matrices and Their Column Spaces-Matrix Multiplication AB and CR -Solving Linear Equations $Ax = b$ -Elimination and Back Substitution-Elimination Matrices and Inverse Matrices-Matrix Computations and $A = LU$ -Permutations and Transposes.

UNIT-II:

Hours: 22

The Four Fundamental Subspaces - Vector Spaces and Subspaces-Computing the Nullspace by Elimination: $A = CR$ - The Complete Solution to $Ax = b$ - Independence, Basis, and Dimension-Dimensions of the FourSubspaces.

UNIT-III:

Hours: 22

Orthogonality - Orthogonality of Vectors and Subspaces-Projections onto Lines and Subspaces-Least Squares Approximations-Orthonormal Bases and Gram-Schmidt-The Pseudoinverse of a Matrix Determinants – 3 by 3 Determinants and Cofactors-Computing and Using Determinants-Areas and Volumes by Determinants.

UNIT- IV:**Hours: 23**

Eigenvalues and Eigenvectors-Introduction to Eigenvalues: $Ax = \lambda x$ - Diagonalizing a Matrix-Symmetric Positive Definite Matrices-Complex Numbers and Vectors and Matrices-Solving Linear Differential Equations

UNIT-V:**Hours: 23**

The Singular Value Decomposition (SVD)-Singular Values and Singular Vectors-Image Processing by Linear Algebra-Principal Component Analysis (PCA by the SVD) - Linear Transformations-The Idea of a Linear Transformation-The Matrix of a Linear Transformation-The Search for a Good Basis.

BOOK FOR STUDY

1. Gilbert Strang, Introduction to Linear Algebra, Wellesley - Cambridge Press, Sixth Edition, 2023.

BOOKS FOR REFERENCE

1. David Lay, Steven Lay, Judi McDonald, Linear Algebra and Its Applications 5th Edition, Pearsons, 2015.
2. Sheldon Axler, Linear Algebra Done Right (Undergraduate Texts in Mathematics) 3rd Edition, Springer, 2015.
3. Jim Hefferon, Linear Algebra, Fourth edition, 2020.
4. Jeff M Philips, Mathematical Foundations for Data Analysis, 2021.

WEB RESOURCE:

1. <https://www.youtube.com/watch?v=579u2VemHB4>
2. <https://www.youtube.com/watch?v=lOgccAjZ6Z8>
3. <https://www.youtube.com/watch?v=UF59Mok4fsQ>

Mapping of COs with POs:

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	1	2	2	3	3
CO2	3	3	2	3	2
CO3	3	2	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contributed to each POs	13	13	11	15	14

Strong – 3**Medium – 2****Low - 1**

Level of Correlation between PSO's and CO's

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	3	3	3	3	1
CO3	3	3	3	2	2
CO4	3	3	3	2	3
CO5	3	3	3	2	2
Weightage	15	15	15	12	10
Weighted percentage of course contribution to PSOs	3.0	3.0	3.0	2.4	2.0

Strong – 3**Medium – 2****Low - 1**

Programme Title : M.Sc. Data Science

Course Title : CORE COURSE -III: STATISTICS-I

Course Code : 26PDSCC3

Hours/Week:7

Semester : I

Credits:4

COURSE OBJECTIVES:

To develop knowledge and understand fundamental concepts in probability and statistics.

COURSE OUTCOME:

On Completion of the Course the students will be able to

CO1: Organize, manage and present data.

CO2: Understand, describe, and calculate the measures of data and correlation.

CO3: Recognize and understand various probability distribution functions, calculate and interpret expected results

CO4: Estimate population parameters using sampling distributions and parameter estimation methods, and construct confidence intervals.

CO5: Apply probability concepts, laws and Bayes theorem to compute probabilities of simple and conditional events.

SYLLABUS

UNIT-I

Hours: 15

Introduction to Statistics-Introduction-Data Collection and Descriptive Statistics-Inferential Statistics and Probability Models-Populations and Samples-A Brief History of Statistics-Organization and Presentation of Data-Origin and development of Statistics, Scope, limitation and misuse of statistics. Types of data: primary, secondary, quantitative and qualitative data. Types of Measurements: nominal, ordinal, discrete and continuous data. Presentation of data by tables: construction of frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions.

UNIT-II:

Hours:22

Descriptive statistics-Introduction-Describing Data Sets-Frequency Tables and Graphs- Relative Frequency Tables and Graphs-Grouped Data, Histograms, Ogives, and Stem and Leaf Plots-Summarizing Data Sets-Sample Mean, Sample Median, and Sample Mode-Sample Variance and Sample Standard Deviation-Sample Percentiles and Box Plots- Chebyshev's Inequality-Normal Data Sets-Paired Data Sets and the Sample Correlation Coefficient- Correlation-Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations (for 3 variates only).

UNIT-III:**Hours:22**

Random variables and expectation-Random Variables-Types of Random Variables-Jointly Distributed Random Variables-Independent Random Variables-Conditional Distributions-Expectation-Properties of the Expected Value- Expected Value of Sums of Random Variables-Variance- Covariance and Variance of Sums of Random Variables-Moment Generating Functions-Chebyshev's Inequality and the Weak Law of Large Numbers-Special random variables-The Bernoulli and Binomial Random Variables-Computing the Binomial Distribution Function-The Poisson Random Variable- Computing the Poisson Distribution Function-The Hypergeometric Random Variable-The Uniform Random Variable- Normal Random Variables-Exponential Random Variables-The Poisson Process-The Gamma Distribution-Distributions Arising from the Normal-The Chi-Square Distribution-The t-Distribution-The F Distribution-The Logistics Distribution.

UNIT-IV:**Hours:23**

Distributions of sampling statistics-Introduction-The Sample Mean-The Central Limit Theorem-Approximate Distribution of the Sample Mean, How Large a Sample Is Needed?-The Sample Variance-Sampling Distributions from a Normal Population-Distribution of the Sample Mean, Joint Distribution of $\bar{X}$ and S -Sampling from a Finite Population-Parameter estimation-Introduction-Maximum Likelihood Estimators-Interval Estimates- Confidence Interval for a Normal Mean When the Variance is Unknown-Confidence Intervals for the Variance of a Normal Distribution - Estimating the Difference in Means of Two Normal Populations-Approximate Confidence Interval for the Mean of a Bernoulli Random Variable-Confidence Interval of the Mean of the Exponential Distribution-The Bayes Estimator.

UNIT-V:**Hours:23**

Basics and Elements of Probability-Random experiment, sample point and sample space, event, algebra of events. Definition of Probability: classical, empirical and axiomatic approaches to probability, properties of probability. Theorems on probability, conditional probability and independent events, Laws of total probability, Baye's theorem and its applications-Introduction-Sample Space and Events-Venn Diagrams and the Algebra of Events-Axioms of Probability-Sample Spaces Having Equally Likely Outcomes.

BOOKS FOR STUDY

1. Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier Academic Press, UK, Fifth Edition, 2023
2. Rohatgi V.K and Saleh E, An Introduction to Probability and Statistics, 3rd edition, John Wiley & Sons Inc., New Jersey, 2015.
3. Gupta S.C and Kapoor V.K, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand & Sons, New Delhi, 2014

BOOK FOR REFERENCE

1. Jim Frost, Introduction to Statistics: An Intuitive Guide for Analyzing Data and Unlocking Discoveries, 2020.

WEB RESOURCES:

1. <https://onlinestatbook.com/2/>
2. <https://www.simplilearn.com/tutorials/statistics-tutorial>

Mapping of COs with POs:

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
CO2	2	3	3	3	2
CO3	2	2	3	2	3
CO4	3	3	3	2	3
CO5	3	3	2	3	3
Weightage of course contributed to each POs	13	14	13	13	14

Strong – 3**Medium – 2****Low - 1****Level of Correlation between PSO's and CO's**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of course contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Strong – 3**Medium – 2****Low – 1**

Programme Title	:	M.Sc. Data Science	
Course Title	:	ELECTIVE I: INTERNET OF THINGS	
Course Code	:	26PDSSEC1A	Hours/Week:5
Semester	:	I	Credits:3

COURSE OBJECTIVE:

To understand the concepts, data, framework, standards, protocols, reliability, security and privacy involved in IoT

COURSE OUTCOME:

On Completion of the Course the students will be able to

- CO1:** Identify and describe the IoT ecosystem, architectures, enabling technologies, and communication protocols.
- CO2:** Apply IoT data processing frameworks, stream processing techniques, anomaly detection, and governance concepts in IoT environments.
- CO3:** Analyze IoT communication protocols, networking technologies, and IoT-based applications.
- CO4:** Evaluate IoT design methodology, Raspberry Pi architecture, and IoT system components for various IoT applications.
- CO5:** Assess IoT security, privacy, and reliability issues in IoT systems.

SYLLABUS**UNIT-I****Hours: 12**

IoT Ecosystem Concepts and Architectures - Introduction – IoT definition and evolution – IoT Architectures – OpenIoT Architecture for IoT/Cloud Convergence - Resource Management – IoT Data Management and Analytics - Communication Protocols – Internet of Things Applications- Scheduling Process and IoT Services Lifecycle - IoT enabling technologies – IoT levels and Deployments templates – Introduction to M2M - Difference between IoT and M2M – SDN and NFV for IoT.

UNIT-II**Hours: 12**

IoT Data and Framework Essentials - Introduction - Programming framework for IoT– The foundation of Stream processing in IoT- Continuous Logic processing system – Challenges and Future directions – Anomaly detection – Problem statement and definitions – Efficient incremental local modelling – IoT Governance.

UNIT-III**Hours: 20**

RF Protocols RFID, NFC: IEEE 802.15.4 - ZigBee - ZWAVE, THREAD - Bluetooth Low Energy (BLE) - IPv6 for Low Power and Lossy Networks (6LoWPAN) - Routing Protocol for Low power and lossy networks (RPL) - CoAP- XMPP - Web Socket- AMQP – MQTT – WebRTC - PuSH Architectural Considerations in Smart Object Networking - TinyTO Protocol. - Introduction to IoT based applications – Scenarios – Architecture overview – Sensors – The gateway – Data Transmission – Internet of Vehicles (IoV) – IoV Characteristics, technologies and its application.

UNIT-IV :**Hours: 16**

Developing Internet of Things - Introduction – IoT Design Methodology – Case study on IoT system for Weather monitoring – IoT Device - IoT physical devices and endpoints - Exemplary Device: Raspberry Pi - Linux on Raspberry Pi - Raspberry Pi interfaces – Programming Raspberry Pi and with python – Other IoT devices.

UNIT-V:**Hours: 15**

IoT Reliability, Security and Privacy - Introduction - Concepts - IoT Security Overview - Security Frameworks for IoT – Privacy in IoT networks – IoT characteristics and reliability issues - Addressing reliability.

BOOKS FOR STUDY:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things, A Hands -on Approach”, 1st Edition 2015, University Press, ISBN: 978-81-7371- 954-7
2. Buyya, Rajkumar, and Amir Vahid Dastjerdi, eds. Internet of Things: Principles and paradigms. Elsevier, 2016.
3. Hersent, Olivier, David Boswarthick, and Omar Elloumi. The internet of things: Key applications and protocols. John Wiley & Sons, 2011.

BOOKS FOR REFERENCE:

1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
3. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI, 1st Edition, 2015.

WEB RESOURCES:

1. <https://www.youtube.com/watch?v=FRxRT0DjE7A>
2. <http://dret.net/lectures/iot-spring15/protocols>
3. https://www.youtube.com/watch?v=drB_NEuE9vA

Mapping of COs with POs:

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	1	1	2	1
CO2	3	3	2	3	2
CO3	3	3	1	3	2
CO4	3	3	2	3	2
CO5	3	3	1	3	3
Weightage of course contributed to each POs	14	13	7	14	10

Strong – 3**Medium – 2****Low – 1****Level of Correlation between PSO's and CO's**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	2	3	3	2
CO5	3	2	3	3	3
Weightage	14	10	15	14	10
Weighted percentage of course contribution to PSOs	2.8	2.0	2.8	2.8	2.0

Strong – 3**Medium – 2****Low – 1**

Programme Title	: M.Sc. Data Science	
Course Title	: ELECTIVE I: RESEARCH METHODOLOGY FOR COMPUTER SCIENCE	
Course Code	: 25PDS DSEC1B	Hours/Week:5
Semester	: I	Credits:3

COURSE OBJECTIVE:

To develop an understanding of the research methods relevant to effectively address a research problem

COURSE OUTCOME:

On Completion of the Course the students will be able to

CO1: Develop an understanding of Research methods

CO2: Formulate a Research problem

CO3: Collect and Analyse data

CO4: Effectively write a research paper

CO5: Present the Paper more professionally.

SYLLABUS**UNIT-I: Hours:12**

Introduction to Research-Meaning, Objectives and Characteristics of research - Research Methods Vs. Methodology - Types of research- Research process - Criteria of good research - Research Project-Shaping a Research Project-Research Planning-Students and Advisors – Checklist.

UNIT-II: Hours:12

Literature Review -Reading and Reviewing - Hypotheses, Questions, and Evidence.

UNIT-III: Hours:20

Experiments for Computing-Experimentation-Statistical Principles - Writing a Paper-Organization-Good Style-Style Specifics-Punctuation-Mathematics-Algorithms- Graphs, Figures, and Tables -Other Professional Writing.

UNIT-IV: Hours:16

Presentation -Editing- Presentations-Slides-Posters-Ethic

UNIT-V:**Hours:15**

Report writing-Report writing using LATEX for a research problem

BOOKS FOR STUDY:

1. Kothari C. R. Research Methodology Methods and Techniques. 2nd ed. New Delhi: New Age, 2004.
2. Justin Zobel. Writing for Computer Science. 3rd ed. Springer-Verlag, 2014

BOOKS FOR REFERENCE:

1. Ranjit Kumar. Research Methodology -a step-by-step guide for beginners. 3rd ed. SAGE Publications India Pvt Ltd, 2011.
2. Panneerselvam R. Research Methodology. 2nd ed. New Delhi: Prentice Hall, 2014.

WEB RESOURCES:

1. <https://www.youtube.com/watch?v=j3wbbuOQmvw>
2. <https://www.youtube.com/watch?app=desktop&v=YLm3sXIKpHQ&t=515s>

Mapping of COs with POs:

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	2	3	2	2	3
CO3	3	2	1	3	2
CO4	2	3	3	3	2
CO5	3	3	3	2	2
Weightage of course contributed to each POs	13	14	12	12	11

Strong – 3**Medium – 2****Low - 1**

Level of Correlation between PSO's and CO's

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	1
CO2	3	2	3	2	2
CO3	3	2	3	2	2
CO4	3	2	3	2	2
CO5	3	2	3	2	2
Weightage	15	10	15	9	9
Weighted percentage of course contribution to PSOs	3.0	2.0	3.0	1.8	1.8

Strong – 3**Medium – 2****Low - 1**

Programme Title	:	M.Sc. Data Science	
Course Title	:	ELECTIVE II: WEB PROGRAMMING	
Course Code	:	26PDSASEC2A	Hours/Week:3
Semester	:	I	Credits:2

COURSE OBJECTIVE:

To introduce students about web application and state management.

COURSE OUTCOME:

On Completion of the Course the students will be able to

CO1: Understand the architecture of the .NET Framework and Windows application.

CO2: Apply Windows Forms controls, namespaces, and ADO.NET in .NET applications

CO3: Analyze ASP.NET web applications using Web Forms and server controls.

CO4: Evaluate state management and XML processing in .NET applications.

CO5: Design web applications using LINQ, data binding, and AJAX.

SYLLABUS**UNIT-I:****Hours: 9**

Overview of .NET Framework-CLR-CTS- Metadata and Assemblies-.NET Framework Class Library – BCL- Windows Forms – ASP.NET and ASP.NET AJAX-ADO.NET – Tools in the .NET Framework- New Features of .NET Framework: Portable Class Libraries - Introducing Windows Application-Introduction – Creating Windows Forms- Customizing a Form - Collecting User Input in windows Forms and Events-Buttons-Text Boxes- Check Boxes- Radio Buttons –Combo Boxes –Date and TimePicker – Calendar-List Boxes –Checked List Box –List View – Tree View.

UNIT-II:**Hours: 9**

Presentation and Informational Controls in Windows Forms and Events-Labeling- Link Label- Status Bar- Picture Box-Image List-Progress Bar-Tool Tip –MDI and Menus Creation - Data Types in C# -Type Conversions – Boxing and Unboxing - Namespace - Introduction – Adding a reference to the Namespace – Accessing a predefined Namespace through the using Directive - Introducing to ADO.net-Understanding ADO.NET- Creating Connection Strings –Creating a Connection to a Database- Creating a Command Object- Working with DataAdapters –Using DataReader work with Database.

UNIT-III:**Hours: 9**

ASP.NET-Life cycle- Specifying a Location for a Web Application -Single-File Page Model - Code- Behind Page Model- Adding controls to web form - Web Server Controls-The Control Class - The WebControl Class - The Button Control - The TextBox Control -The Label Control - The HyperLink Control -The LinkButton Control -The Placeholder Control - The HiddenField Control - The CheckBox Control -The RadioButton Control -The ListBox Control -The DropDownList Control -The Image Control -The ImageButton Control - The Table Control - Menus - Validation Server Controls - Master Page - Web.Config.

UNIT-IV:**Hours: 9**

State Management-Understanding the session object Sessions and the Event Model, Configuring, In-Process Session State, Out-of-Process Session state Application Object, Query strings, Cookies, ViewState, Global.asax- XML and .NET-Basics of XML, Create XML Document - Reading XML with XmlReader – Reading XML with XmlDocument - Working with XmlNode - Animations-Understanding WPF's Animation services – The Role of the Animation class types-The To, From and by properties – The Role of the Timeline Base Class – Authoring and Animation in C# Code – Controlling the pace of an animation – Reversing and Looping an Animation – The Role of StoryBoards.

UNIT-V:**Hours: 9**

LINQ-Introducing LINQ Queries- Standard Query Operators- Introducing LINQ to Dataset, SQL and XML- The LinqDataSource Control. Data Binding – Grid View, Details view, Forms view - ASP. NET AJAX-Understanding the need for AJAX, building a simple ASP.NET page without AJAX, Building a simple ASP.NET page with AJAX.

BOOKS FOR STUDY:

1. C# 2012 Programming Covers .NET 4.5 Black Book. Dreamtech press, Kogent Learning Solutions, 2013.
2. Liberty, Jesse, and Dan Hurwitz. Programming. NET Windows Applications. " O'Reilly Media, Inc.", 2004.
3. Troelsen, Andrew, and Philip Japikse, C# 6.0 and the .NET 4.6 Framework. Apress, 2015.

BOOKS FOR REFERENCE:

1. Albahan Joseph, and Ben Albahari. C# 5.0 in a NutShell: The Definitive Reference. “Orielly Media Inc”, 2012.
2. Anne Boehm, Joel. Murach's C# 2015. United States of America: Murach's, 2016.
Delamater. Mary. Anne Boehm. ASP.NET 4.5 Web Programming with C# 2012. United States of America: Murach's, 2013.
3. John Sharp. Microsoft Visual C# Step by Step. United States of America: Pearson Edition, 2018.
4. Price, Jason, and Mike Gunderlov. Mastering Visual C#.Net. John Wiley & Sons, 2006

WEB RESOURCES:

1. <https://www.youtube.com/watch?v=8ew1LgfWV6s>
2. <https://www.youtube.com/watch?v=jGwexlejAcM>
3. <https://www.youtube.com/watch?v=EWOENHkxJ0k>

Mapping of COs with POs:

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	1	1
CO2	3	3	2	2	2
CO3	3	3	3	2	3
CO4	2	3	3	3	2
CO5	3	3	3	3	3
Weightage of course contributed to each POs	14	14	13	11	11

Strong – 3**Medium – 2****Low - 1****Level of Correlation between PSO's and CO's**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	1	2
CO2	3	3	2	2	2
CO3	3	2	3	3	2
CO4	2	3	3	2	2
CO5	3	3	3	3	3
Weightage	14	13	13	11	11
Weighted percentage of course contribution to PSOs	2.8	2.6	2.6	2.2	2.2

Strong – 3**Medium – 2****Low - 1**

Programme Title : M.Sc. Data Science

Course Title : ELECTIVE II: JAVA PROGRAMMING

Course Code : 25PDSSEC2B

Hours/Week:3

Semester : I

Credits:2

COURSE OBJECTIVE:

To enable the students to understand and appreciate the need for Object Oriented Programming.

COURSE OUTCOME:

On Completion of the Course the students will be able to

- CO1** Understand the concepts of object-oriented programming
- CO2** Use Java programming language at a basic level and construct simple software Applications
- CO3** Understand classes, objects and implementing inheritance
- CO4** Analyze and understand the functionality of Inheritance, Interface and develop simple applications
- CO5** To develop software applications and services using Java code

SYLLABUS

UNIT-I:

Hours:9

Introduction to Java-Overview – Features - Fundamental OOPS concepts – JDK – JRE – JVM -Structure of a Java program - Data types – Variables – Arrays – Operators –Keywords - Naming Conventions - Control statements, Type conversion and Casting - Scanner - String - equals (), equalsIgnoreCase(), length ().

UNIT-II:

Hours:10

Classes and Objects-Class – Objects – Methods - Method Overloading - Constructors – Constructor Overloading - this keyword - usage of static with data and methods – Garbage Collection - Access Control - Inheritance-Concept – extends keyword - Single and Multilevel Inheritance – Composition – super keyword - Method Overriding - Abstract Classes - Dynamic Method Dispatch – Usage of final with data, methods and classes – Packages and Interfaces- Concepts - package and import keywords - Defining, Creating and Accessing a Package – Interfaces - Multiple Inheritance in Java, Extending and Initialising fields in Interfaces.

UNIT-III:**Hours:9**

Exception Handling-Exception handling- Types of Exceptions- try, catch, throw, throws and finally keywords - User defined Exceptions - JDBC-Database Connectivity- Types of JDBC drivers- Executing statements- Prepared statements- Callable statements - Mapping SQL types to Java- ResultSet Metadata.

UNIT-IV:**Hours:10**

Multithreading-Introduction - Life Cycle of a Thread, Thread class and Runnable Interface, Thread Priorities, Synchronisation. GUI Programming with JavaFX-JavaFX Basic Concepts – Packages - Stage and Scene Classes - Nodes and Scene Graphs – Layouts - The Application Class and the Lifecycle Methods - Launching a JavaFX Application - JavaFX Application Skeleton - Compiling and Running -Application Thread - JavaFX Controls-Label – Button – Image – RadioButton – CheckBox – ListView- ComboBox- TextField ScrollPane.

UNIT-V:**Hours:7**

Event-Event Handling – Input Event, Action Event and Window Event - Java Library-java.util – List, ArrayList.

BOOK FOR STUDY:

1. Schildt, Herbert. Java: The Complete Reference. McGraw-Hill Education Group, 2014.

BOOKS FOR REFERENCE:

1. Eckel, Bruce. Thinking in Java. 4th ed. Pearson Education, 2006.
2. Liang, Y. Daniel. Intro to Java Programming, Brief Version. Pearson Higher Ed, 2015.
3. Holmes, J. Barry, Joyce, T. Daniel. Object-oriented Programming with Java. Jones & Bartlett Learning. 2001

WEB RESOURCES:

1. <https://www.youtube.com/watch?v=eIrMbAQSU34>
2. <https://www.youtube.com/watch?v=sL9RmjAJLvI>
3. <https://www.youtube.com/watch?v=AX0e-Yi9f08>

Mapping of COs with POs:

CO/PO	PO1	PO2	PO3	PO4	PO5
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CO2	3	3	3	2	3
CO3	3	2	3	2	3
CO4	3	3	3	2	2
CO5	1	3	3	2	3
Weightage of course contributed to each POs	13	14	15	10	13

Strong – 3**Medium – 2****Low - 1****Level of Correlation between PSO's and CO's**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of course contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Strong – 3**Medium – 2****Low – 1**

Programme Title : M.Sc. Data Science
Course Title : Elective -II: WEB PROGRAMMING - PRACTICAL
Course Code : 26PDSSECQ2A **Hours/Week:2**
Semester : I **Credit:1**

COURSE OBJECTIVES:

To equip students with the knowledge and skills required to design and develop dynamic web applications using modern web technologies.

COURSE OUTCOME:

- CO1:** To provide a comprehensive understanding of the .NET Framework and its components.
- CO2:** To enable students to design and develop Windows and Web applications using C# and ASP.NET.
- CO3:** To introduce various data access techniques using ADO.NET and LINQ for effective backend integration.
- CO4:** To equip learners with practical skills in XML handling and application development using Visual Studio.
- CO5:** To familiarize students with modern web development techniques including state management and AJAX for enhanced user interaction.

SYLLABUS

- 1 Create a Basic Window and Web Application
- 2 Implement Checkbox, RadioButton, and List Controls in Window and Web Forms
- 3 Connect Windows Form to SQL Server Using ADO.NET
- 4 Design a Basic ASP.NET Web Form with TextBox and Button
- 5 ASP.NET Form Validation with RequiredFieldValidator and CompareValidator
- 6 State Management Using Session ViewState and Cookies
- 7 XML File Creation and Reading Using XmlDocument
- 8 Building simple ASP.NET page with AJAX

BOOKS FOR STUDY:

1. C# 2012 Programming Covers .NET 4.5 Black Book. Dreamtech press, Kogent Learning Solutions, 2013.
2. Liberty, Jesse, and Dan Hurwitz. Programming. NET Windows Applications. " O'Reilly Media, Inc.", 2004.
3. Troelsen, Andrew, and Philip Japikse, C# 6.0 and the .NET 4.6 Framework. Apress, 2015.

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1. Albahan Joseph, and Ben Albahari. C# 5.0 in a NutShell: The Definitive Reference. "Orielly Media Inc", 2012.
2. Anne Boehm, Joel. Murach's C# 2015. United States of America: Murach's, 2016.
3. Delamater. Mary. Anne Boehm. ASP.NET 4.5 Web Programming with C# 2012. United States of America: Murach's, 2013.
4. John Sharp. Microsoft Visual C# Step by Step. United States of America: Pearson Edition, 2018.
5. Price, Jason, and Mike Gunderlov. Mastering Visual C#.Net. John Wiley & Sons, 2006

WEB RESOURCES:

1. <http://www.w3schools.com/aspnet/aspnet.asp>
2. <http://csharp.net-tutorials.com/xml/introduction/>
3. <http://ajax.net-tutorials.com/basics/introduction/>
4. <http://www.c-sharpcorner.com/>

Mapping of COs with POs:

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
CO2	3	3	2	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contribute to each POs	15	15	10	15	15

Strong – 3**Medium – 2****Low - 1**

Level of Correlation between PSO's and CO's

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	1
CO2	3	2	2	3	2
CO3	3	2	2	3	2
CO4	3	3	3	3	3
CO5	3	2	2	3	2
Weightage	15	11	11	15	10
Weighted percentage of course contribution to PSOs	3.0	2.2	2.2	3.0	2.0

Strong – 3**Medium – 2****Low – 1**

Programme Title	: M.Sc. Data Science		
Course Title	: ELECTIVE II: JAVA PROGRAMMING – PRACTICAL		
Course Code	: 25PDS DSECQ2B	Hours/Week:	2
Semester	: I	Credit:	1

COURSE OBJECTIVES:

To enable students to design and develop efficient Java applications using object-oriented principles, GUI, database connectivity, and event-driven programming.

COURSE OUTCOME:

- CO1:** To understand Java basics, data types, control structures, and string handling
- CO2:** To apply object-oriented concepts like classes, inheritance, and interfaces in Java.
- CO3:** To Handle exceptions and connect Java applications to databases using JDBC.
- CO4:** To develop GUI applications and manage threads using JavaFX and multithreading.
- CO5:** To familiarize students with event handling and use Java utility classes like List and ArrayList.

SYLLABUS

1. Build a basic Java Program Using Scanner, Strings, and Type Casting
2. Create a Java Program Using Class, Arrays, and Average Calculation
3. Develop a Java Program Demonstrating Method and Constructor Overloading
4. Build the Model Java Classes Using Inheritance, Method Overriding
5. Implement a Java Program for Handling Arithmetic Exception Using try-catch-finally
6. Develop a Java Program for Inserting Data Using JDBC PreparedStatement
7. Program to Demonstrate Multithreading Using Thread Class
8. JavaFX Program to Create a Simple Form with Label, TextField, and Button Java
9. Program to Handle Button Click Event and Store Input Using ArrayList

BOOKS FOR STUDY:

1. Programming with Java: A Primer. McGraw Hill Education, E. Balagurusamy, Latest Edition.

BOOKS FOR REFERENCE:

1. Java: The Complete Reference. McGraw Hill Education, Herbert Schildt, Latest Edition.
2. Core Java Volume I – Fundamentals. Pearson Education, Cay S. Horstmann, Latest Edition.
3. Head First Java. O'Reilly Media, Kathy Sierra and Bert Bates, Latest Edition.

WEB RESOURCES:

1. <https://docs.oracle.com/javase/tutorial/>
2. <https://www.geeksforgeeks.org/java/>
3. <https://www.javatpoint.com/java-tutorial>
4. <https://www.w3schools.com/java/>
5. <https://stackoverflow.com/questions/tagged/java>

Mapping of COs with POs:

CO/PO	PO1	PO2	PO3	PO4	PO5
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CO2	3	3	2	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contribute to each POs	15	15	10	15	15

Strong – 3**Medium – 2****Low - 1**

Level of Correlation between PSO's and CO's

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	1
CO2	3	3	2	3	2
CO3	3	3	2	3	2
CO4	3	3	3	3	3
CO5	3	3	2	3	2
Weightage	15	15	11	15	10
Weighted percentage of course contribution to PSOs	3.0	3.0	2.2	3.0	2.0

Strong – 3**Medium – 2****Low - 1**