Department	**Computational Studies**			Programme: **M.Sc Computer Science**				
Semester	**First**			Course Category Code: **DSC**			*End Semester Exam Type: **LE**	
Course Code	**A23PCPL101**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	I M	ESE	TM
Course Name	**Programming In Java Lab**			**0**	**0**	**4**	**2**	**50**	**50**	**100**
Prerequisite	Basic Knowledge in java programming							
Course Outcome	*After completion of the course, the students will be able to*							BT Mapping (Highest Level)
	CO1	Demonstrate the basic concepts of OOPS						**K3**
	CO2	Implement the programming skills based on OOPS						**K3**
	CO3	Demonstrate the behavior of Exception handling and Multithreading						**K3**
	CO4	Implement the GUI techniques (Event handling, Applet and Swing).						**K4**
	CO5	Develop programming aspect with files and networking						**K4**

List of Experiment

1. Develop a java program that implements Classes & Objects
2. Develop a java program that implements Packages & Interfaces
3. Develop a java program that implements Inheritance
4. Develop a java program that implements Exception Handling
5. Develop a java program that implements Multithreading
6. Develop a java program that implements Applet
7. Develop a java program that implements Swing
8. Develop a java program that implements Event Handling Mechanisms
9. Develop a java program that implements Streams and Files
10. Develop a java program that implements Networking
11. Develop a java program that implements JDBC
12. Develop a java program that implements Java Beans

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. C. Muthu, *Programming with JAVA*, Vijay Nicole Imprints PrivateLimited, 2 Ed,Chennai, 2011
2. E. Balaguruswamy, “Programming with Java” , 5 th Edition, McGraw- Hill Education, 2014.

Reference Books

1. Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentals‖, 9 th Edition, Prentice Hall, 2013.
2. Java How to Program, 6th Edition, H. M. Dietel and P.J.Dietel, Pearson Education/PHI
3. Herbert Schildt, “Java – A Beginner‟s Guide”, McGraw- Hill Education, 6 th Edition, 2018.

*LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	3	3	3	3	2	2	2
2	3	3	2	3	2	3	3	2
3	2	2	3	3	2	3	3	2
4	3	3	2	2	2	3	3	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Internal Marks			End Semester Examination (ESE) Marks	Total Marks
	Model Exam	Record	Attendance	**50**	100
Marks	30	10	10		

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**			Programme: **M.Sc Computer Science**			
Semester	**First**			Course Category Code: **DSC**		*End Semester Exam Type: **LE**	
Course Code	**A23PCPL102**	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	I M	ESE	TM
Course Name	**ADVANCED DBMS LAB**	**0**	**0**	**4**	**2**	**50**	**50**	**100**
Prerequisite	BASCI KNOWLEDGE IN DATABASE							

Course Outcome	*After completion of the course, the students will be able to*	BT Mapping (Highest Level)
	CO1 Implement SQL commands.	**K2**
	CO2 Implement SQL commands	**K3**
	CO3 Implement DDL and DML programs.	**K3**
	CO4 Understand PL/SQL programs	**K4**
	CO5 Understand PL/SQL programs.	**K4**

List of Exercises

1. Study of Oracle DDL commands
 a. To create a table
 b. To alter a table
c. To drop a table
d. To create a view
e. To drop a view
2. Study of Oracle DML commands
    a. To insert, delete and update rows into a table
    b. To write a simple queries using SELECT
    c. To write queries using SELECT and WHERE clause
    d. To write queries using Logical operators
    e. To write queries using NULL
    f. To write queries using NVL function
    g. To write queries for pattern matching
    h. To write queries using order by clause
    i. To write queries using Distinct clause
    j. To write queries using Arithmetic Expressions
    k. To write queries using Arithmetic function
    l. To write queries using group function
    m. To write queries using Group By clause
    n. To write queries using Having clause
    o. To write queries using Character function
    p. To write queries using Date function
    q. To write queries using Sub queries
    r. To write queries using join
3. Program to learn Oracle DCL and TCL commands
4 Program to learn PL / SQL
    a. To create a cursor and trigger and work on that
    b. To create PL/ SQL code for expression
    c. To create PL/SQL code using control statement
    d. To create PL/SQL code using sub programs

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals

of Database Systems, Pearson Education, 7thEdition, 2016.
2. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, McGraw Hill,3rdEdition, 2014.
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts", McGraw-Hill Indian Edition, 7th Edition, 2013.
4. Kuhn,"RMAN Recipes for Oracle Database", Apress, 2nd Edition,2013.
5. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, Pearson Education, thEdition, 2006.

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

Correlation Level: 1 - Low, 2 - Medium, 3 – High

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	3	2	3	3	2	2	2
2	2	2	2	3	2	2	3	2
3	2	2	3	3	2	2	2	2
4	3	2	2	2	2	3	3	2
5	2	2	2	3	3	3	2	2

Evaluation Method

Assessment	Internal Marks			End Semester Examination (ESE) Marks	Total Marks
	Model Exam	Record	Attendance	50	100
Marks	30	10	10		

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**			Programme: **M.Sc Computer Science**				
Semester	**First**			Course Category Code: **DSC**		*End Semester Exam Type: **TE**		
Course Code	**A23PCPT101**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**PROGRAMMING IN JAVA**			**4**	**0**	**0**	**4**	**25**	**75**	**100**
Prerequisite	Basic knowledge in JAVA Programming									
Course Outcome	*After the completion of this course, the students will be able to:*							BT Mapping (Highest Level)		
	CO1	Develop solutions for a range of problems using object-orientedprogramming.						**K2**		
	CO2	Solve simple problems using the fundamental syntax and semantics of the Java - Programming language.						**K3**		
	CO3	Use the Java event-handling model to respond to events arising fromthe GUI - Components						**K3**		
	CO4	Acquire knowledge of threads and JDBC programming techniques inJava						**K4**		
	CO5	Learn to apply networking concepts through Java program						**K4**		
UNIT-I	**INTRODUCTION TO JAVA**						**Periods: 12**			
CLASSES AND OBJECTS: General Form of A Class - Creation of Objects - Usage of Constructors - 'this' Keyword- Constructor Overloading-Copy Constructors-Static Data Members - Static Methods- Finalize Method. INHERITANCE AND POLYMORPHISM: Inheriting Variables in a Class - Inheriting Methods in a Class - Inheritance And Constructors Abstract Classes - Final Classes.										**CO1**
UNIT-II	**INTERFACES AND PACKAGES**						**Periods: 12**			
INTERFACES AND PACKAGES: Interfaces-Structure of an Interface - Implementation of an Interface Interface Inheritance. Packages - Placing theClasses in a Package - Package HierarchyAccess Control Modifiers.APPLETS: The Life Cycle of an Applet -The Applet Class Development and Execution of a Simple Applet - Syntax Of Applet Tag- Methods in the Graphic Class										**CO2**
UNIT-III	**SWING**						**Periods: 12**			
SWING: JApplet class - Icons - JLabel Control - JOptionPane Class - JTextField Control JButton Control - JCheckBox Control - JRadioButton Control Menus. **EXCEPTION HANDLING:** Default Exception Handling - Exception and Error Classes - Catch Block Searching Pattern - Custom Exceptions. I/O STREAMS: Text And Binary Formats of Data Input Stream and Output Stream Classes - Reader and Writer Classes - Data Output Stream and Data Input Stream Classes.										**CO3**
UNIT-IV	**THREADS**						**Periods: 12**			
THREADS: Life Cycle Of AThread - Creating And Running Threads - MethodIn The Thread Class - Setting The Priority Of A Thread - Synchronization. **NETWORKING**:TCP Server Socket Class - TCP Socket Class.JAVA DATABASE CONNECTIVITY: Establishing AConnection - Creation Of DataTables Entering Data Into The Tables - Table Updating.										**CO4**
UNIT-V	**REMOTE METHOD INVOCATION**						**Periods: 12**			
REMOTE METHOD INVOCATION: Remote Interface-Java.Rmi.Server Package TheNaming Class - Creating RMI Client And Server Classes. SERVLET: Servlet and Dynamic Webpages Life Cycle of a Servlet a Simple Servlet Javax.Servlet Package Retrieving the Values Of Parameters. COOKIES: Creating a Cookie and Sending it to the Client – Retrieving the Stored Cookies										**CO5**
Lecture Periods: 60		**Tutorial Periods: -**		**Practical Periods: -**			**Total Periods: 60**			

Text Books

1. C. Muthu, *Programming with JAVA*, Vijay Nicole Imprints PrivateLimited, 2 Ed,Chennai, 2011
2. Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentals‖, 9 th Edition, Prentice Hall, 2013.
3. Java How to Program, 6th Edition, H. M. Dietel and P.J.Dietel, Pearson Education/PHI
4. Herbert Schildt, "Java – A Beginner‟s Guide", McGraw- Hill Education, 6 th Edition, 2018.

Reference Books

1.Herbert Schildt, Java 2: Complete Reference, Tata McGraw Hill, 5th Ed., 2009.

2.E. Balaguruswamy, "Programming with Java" , 5 th Edition, McGraw- Hill Education, 2014

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	2	3	3	3	2	2	2
2	2	3	2	3	2	3	2	2
3	3	2	3	3	2	3	3	2
4	3	2	2	2	2	3	2	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**			Programme: M.Sc **Computer Science**				
Semester	**First**			Course Category Code: **DSC**			*End Semester Exam Type: **TE**	
Course Code	**A23PCPT102**	Periods / Week			Credit		Maximum Marks	
		L	T	P	C		CAM	ESE	TM
Course Name	**ADVANCED DATABASE MANAGEMENT SYSTEMS**	**4**	**0**	**0**	**4**		**25**	**75**	**100**
Prerequisite	Knowledge of data structures and data base								
Course Outcome	*After the completion of this course, the students will be able to:*							BT Mapping (Highest Level)	
	CO1	Understand data modeling and database development process.						**K2**	
	CO2	Construct and normalize conceptual data models.						**K2**	
	CO3	Implement a relational database into a database management system						**K3**	
	CO4	Become proficient in using database query language.						**K3**	
	CO5	Understand the concept of Storage and File Structure						**K4**	
UNIT-I	**Introduction**				**Periods: 12**				
Introduction - DBMS Basic Concepts - Purpose of Database Systems – Database System Vs File system - Overall System architecture – DBA– Database Languages – Classifications – Data Models.									**CO1**
UNIT-II	**Entity relationship model**				**Periods: 12**				
Entity relationship model: Basic concepts- Mapping constraints – Primary Keys – Foreign Keys –Structural Constraints. – ER notations - ER model examples – Enhanced Entity Relationship Model: EER Concepts like Generalization, Specialization, Union, Category, Disjoint, Overlapping etc. EER model examples									**CO2**
UNIT-III	**Relational DataBase**				**Periods: 12**				
Relational DataBase Design – ER to Relational Mapping - Relational Model: Structure –Formal Query Languages – Relational Algebra – Informal Design Guidelines – Referential Integrity– Functional Dependencies – Normalization (I, II & III Third Normal Form)									**CO3**
UNIT-IV	**Relational algebra**				**Periods: 12**				
Relational algebra: Introduction, Fundamental Operations - Set operations- Natural Join, Division- Operators for grouping and ungrouping, relational comparison. SQL – Basics of SQL –DDL – DML – DCL – TCL Commands in detail with examples -PL/SQL: Stored Procedure Concepts – Procedure – Functions – Cursors – Triggers- Creating& Manipulating views									**CO4**
UNIT-V	**Storage and File Structure**				**Periods: 12**				
Storage and File Structure- File Organization - Overview of Physical Storage - Organization of Records in Files - Media - Data-Dictionary Storage - Magnetic Disks – RAID - Indexing and Hashing- Ordered Indices - Static Hashing - Dynamic Hashing. Transaction Concepts – ACID Properties – Concurrent Executions – Basic Concepts of locking and Log Based Recovery									**CO5**
Lecture Periods: 60	**Tutorial Periods: -**			**Practical Periods: -**			**Total Periods: 60**		
Text Books									
1. Abraham Silberschatz,Henry F. Korth, S. Sudarshan,"Database system concepts",6thedition, McGraw Hill Publication, 2011.									
Reference Books									
1 Ramez Elmasri and B. Navathe , "Fundamentals of Database Systems", (Chapters 1, 2, 3, 4.1, 7, 8, 9, 14),7th edition, Addison-Wesley, 2012.									

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	3	3	3	3	2	2	2
2	3	3	2	3	2	3	3	2
3	2	2	3	3	2	3	3	2
4	3	3	2	2	2	3	3	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**			Programme: **M.Sc Computer Science**				
Semester	**First**			Course Category Code: **DSE**			*End Semester Exam Type: **TE**	
Course Code	**A23PCPE101**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**DESIGN AND ANALYSIS OF ALGORITHMS**			**4**	**0**	**0**	**4**	**25 / 75 / 100**
Prerequisite	**Basic Knowledge in data structure**							
Course Outcome	*After the completion of this course, the students will be able to:*							BT Mapping (Highest Level)
	CO1	Learn the fundamentals of data structures with their implementation and its application						**K2**
	CO2	Learn to design and analysis of algorithms and in various algorithm design strategies						**K2**
	CO3	Give importance to find the complexity (order) of algorithms						**K3**
	CO4	Understand sorting and searching techniques						**K3**
	CO5	Understand sorting and searching techniques						**K4**
UNIT-I	**LINEAR DATASTRUCTURES**						**Periods: 12**	
Concepts Of Non-Primitive Data Structures - Storage Structure For Arrays - Stacks - Operations On Stacks - Queues - Priority Queues.								**CO1**
UNIT-II	**LINKED LINEAR LISTS**						**Periods: 12**	
Operations On Linked Linear Lists - Circularly Linked Lists - Doubly Linked Linear Lists. NON-LINEAR DATA STRUCTURE: Trees - Binary Trees – Tree Traversal - Operations On Binary Trees - AVL Trees - Storage Representation And Manipulations Of Binary Trees.								**CO2**
UNIT-III	**ALGORITHMS**						**Periods: 12**	
Algorithm Specification - Pseudo Code Conventions, Recursive Algorithms. DIVIDE AND CONQUER: General Method - Sequential Search - Binary Search - Finding The Maximum And Minimum - Merge Sort- Quick Sort- Insertion Sort - Selection Sort								**CO3**
UNIT-IV	**GREEDYMETHOD**						**Periods: 12**	
General Method - Knapsack problem - Job Sequencing With Deadlines - Optimal Merge Patterns – Spanning Tree - Minimum Cost Spanning Trees. ALGORITHM DESIGN METHODS: Sub goals - Hill Climbing and Working Backward - Heuristics - Backtrack Programming - Branch and Bound.								**CO4**
UNIT-V	**: DYNAMIC PROGRAMMING**						**Periods: 12**	
General Method - Multistage Graphs – Single-Source Shortest Paths: General Weights - All Pair Shortest Path - Optimal Binary Search Trees - 0/1 Knapsack - Traveling Salesperson Problem.								**CO5**
Lecture Periods: 60		**Tutorial Periods: -**		**Practical Periods: -**			**Total Periods: 60**	

Text Books

1.Jean-Paul Tremblay and Paul G.Sorenson, An introduction to data structures with applications, 2nd Ed, Tata McGraw Hill Publishing Company Limited, New Delhi, 1995. Units I and II

2.Ellis Horowitz, Sartaj Sahni, Fundamentals of Computer Algorithms, Galgotia Publications, New Delhi, 2007. Units III, IVa and V

3.S.E. Goodman and S.T. Hedetniemi, Introduction to the Design and Analysis of Algorithms, Tata McGraw Hill, International Edition, 1987.Unit: IV

Reference Books

1.Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer algorithms, Galgotia Publications Pvt. Ltd., New Delhi, 2004.

2.Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Data Structures and Algorithms, Addison Wesley, United States, 1987.

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	3	3	3	3	2	2	2
2	3	3	2	3	2	3	3	2
3	2	2	3	3	2	3	3	2
4	3	3	2	2	2	3	3	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**			Programme: **M.Sc Computer Science**				
Semester	**First**			Course Category Code: **DSE**			*End Semester Exam Type: **TE**	
Course Code	**A23PCPE102**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Internet of Things**			**4**	**0**	**0**	**4**	**25**	**75**	**100**
Prerequisite	BASICE KNOWLEDGE IN NETWORKS									
Course Outcome	*After completion of the course, the students will be able to*								BT Mapping (Highest Level)	
	CO1	Understand the Architectural Overview of IoT.							**K2**	
	CO2	Realize the concepts of IoT using Wireless Technologies.							**K2**	
	CO3	Understand the various IoT Protocols.							**K3**	
	CO4	Comprehend the idea of M2M							**K3**	
	CO5	Learn the IoT security in various domains							**K4**	

UNIT-I	**INTRODUCTION TO INTERNET OF THINGS**	**Periods: 12**	
Introduction - Physical design of IoT – Logical design of IoT – IoT Enabling Technologies – IoT levels & Deployment technologies. DEMYSTIFYING THE IoT PARADIGM: The Emerging IoT flavors-The Industrial Internet of Things – Consumer Internet of Things - Social Internet of things - Semantics for The Interoperable IoT- Cognitive IoT.			**CO1**
UNIT-II	**REALIZATION OF IoT ECOSYSTEM USING WIRELESS TECHNOLOGIES**	**Periods: 12**	
Introduction- Architecture for IoT Using Mobile Devices- Mobile Technologies for Supporting IoT Ecosystem- Mobile Use Cases for IoT – Low Power Wide Area Networking Topologies – Sigfox- Weightless – NwaveIngenu- Lora.			**CO2**
UNIT-III	**INFRASTRUCTURE AND SERVICE DISCOVERY PROTOCOLS FOR THE IOT ECOSYSTEM**	**Periods: 12**	
INFRASTRUCTURE AND SERVICE DISCOVERY PROTOCOLS FOR THE IOT ECOSYSTEM: Introduction- Layered Architecture for IoT – Protocol Architecture of IoT – Infrastructure Protocols-Device or Service Discovery for IoT – Protocols for IoT service Discovery. **INTEGRATION TECHNOLOGIES AND TOOLS FOR IOT ENVIRONMENTS:** Sensor and actuator networks.			**CO3**
UNIT-IV	**IOT AND M2M**	**Periods: 12**	
INTRODUCTION – M2M – Difference Between IoT and M2M – SDN and NFV for IoT. **DEVELOPING IOT:** IoT Design Methodology.			**CO4**
UNIT-V	**SECURITY MANAGEMENT OF AN IOT ECOSYSTEM**	**Periods: 12**	
Introduction Security Requirements of an IOT Infrastructure-Authentication, Authorization And Audit Trail (AAA) Framework-Defense In Depth-Security Concerns of Cloud Platforms-Security Threats of Big Data –Security Threats In Smartphones-Security Solutions For Mobile Devices-Security Concerns In IoT Components-Security Measures for IoT Platforms/Devices.			**CO5**

Lecture Periods: 60	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things Enabling Technologies, Platforms, and Use Cases", Taylor & Francis, CRC Press,1st Edition, 2017.
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things, A Hands-On Approach", Universities Press (INDIA) Private Limited, 1st Edition, 2015

Reference Books

1. Jan Holler, VlasiosTsiatsis, 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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	3	3	3	3	2	2	2
2	3	3	2	3	2	3	3	2
3	2	2	3	3	2	3	3	2
4	3	3	2	2	2	3	3	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**	Programme: **M.Sc. Computer Science**						
Semester	**First**	Course Category Code: **IDC**			*End Semester Exam Type: **TE**			
Course Code	**A23PCPT103**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE**	**3**	**1**	**0**	**4**	**25**	**75**	**100**
Prerequisite								

Course Objectives	To learn inference theory.		
	To Understand the concept of Permutations and combinations.		
	To study the concepts of Cyclic groups.		
	To understand the concept of Primitive recursive functions.		
	To Know the basic concepts of Boolean algebra.		
Course Outcome	*After completion of the course, the students will be able to*		BT Mapping (Highest Level)
	CO1	Gain knowledge of the applications of inference theory.	**K2**
	CO2	Known the applications of Permutations and combinations.	**K2**
	CO3	Recognize the basics of groups and subgroups**.**	**K4**
	CO4	Determine computable and non-computablefunctions**.**	**K3**
	CO5	Understand the concept Of Boolean Algebra.	**K3**

UNIT-I	**LOGIC**	**Periods: 12**	
Statements – Connectives – Truth Tables – Normal forms – Predicate calculus – Inference – Theory for Statement Calculus and Predicate Calculus – automata theorem proving.			**CO1**
UNIT-II	**COMBINATORICS**	**Periods: 12**	
Permutation and Combination - Mathematical Induction - Pigeon hole principle - Principle of Inclusion and Exclusion - generating function - Recurrencerelations.			**CO2**
UNIT-III	**ALGEBRAIC STRUCTURES**	**Periods: 12**	
Semi group - Monoid – Groups (Definition and Examples only) -Sub group - Cyclic group - Homomorphism of semi group, monoid and groups – Co sets and Lagrange Theorem.			**CO3**
UNIT-IV	**RECURSIVE FUNCTIONS**	**Periods: 12**	
Recursive functions - Primitive recursive functions - computable and non - computablefunctions.			**CO4**
UNIT-V	**LATTICES**	**Periods: 12**	
Partial order relation, Poset - Lattices, Hasse diagram - Boolean algebra.			**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Tremblay, J.P.and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", TataMcGrawHill Pub.Co. Ltd, New Delhi, 30th Reprint, 2011.
2. Rosen, K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill Pub.Co.Ltd. NewDelhi, Special Indian Edition, 7th Edition, 2011.
3. T.veerarajan , “Discrete Mathematics” , McGraw Hill Education , 2017.

Reference Books

1. Lidl and pitz., Applied Abstract Algebra, Springer - Verlag, New York, 1984.
2. K.H. Rosen, Discrete Mathematics and its Applications, Mc-Graw Hill BookCompany, 1999.
3. Koshy. "Discrete Mathematics with Applications” Elsevier Publications, 2006

Web References

1. http://www.mhhe.com//rosen.
2. https://nptel.ac.in/courses/111/104/111104026/
3. https://nptel.ac.in/courses/106/106/106106183/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	3	3	3	3	2	2	2
2	3	3	2	3	2	3	3	2
3	2	2	3	3	2	3	3	2
4	3	3	2	2	2	3	3	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**	Programme: **M.Sc Computer Science**						
Semester	**First**	Course Category Code: **SEC**			*End Semester Exam Type: **TE**			
Course Code	**A23PCPS101**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**FOG COMPUTING**	**4**	**0**	**0**	**2**	**100**	**-**	**100**
Prerequisite	**Basic knowledge in cloud**							

Course Outcome	*After completion of the course, the students will be able to*	BT Mapping (Highest Level)
	CO1 Compare the strengths and limitations of cloud computing	**K2**
	CO2 Identify the architecture, infrastructure and delivery models of cloud	**K2**
	CO3 Ability to discern and appropriate Cloud Providers.	**K3**
	CO4 Recognize the Energy Efficient and Market Oriented Cloud models.	**K3**
	CO5 Comprehend the need of Fog Computing in integrating IoT with Cloud	**K4**

UNIT-I	**Introduction**	**Periods: 6**
Introduction: Cloud Computing at a Glance - Historical Developments –Building Cloud Computing Environments – Computing Platforms and Technologies. Virtualization : Introduction – Characteristics of Virtualized Environments – Taxonomy of Virtualization Techniques – Virtualization and Cloud Computing – Pros and Cons of Virtualization – Technology Examples.		**CO1**
UNIT-II	**Cloud Computing Architecture**	**Periods: 6**
Cloud Computing Architecture: Cloud Reference Model – Types of Clouds – Economics of the Cloud. Cloud Platforms in Industry: Amazon Web Services: Compute Services – Storage Services – Communication Services – Additional Services. Google AppEngine: Architecture and Core Concepts – Application Life Cycle – Cost Model. Microsoft Azure: Azure core Concepts– SQL Azure.		**CO2**
UNIT-III	**Advanced Topics in Cloud Computing**	**Periods: 6**
Advanced Topics in Cloud Computing: Energy Efficiency in Clouds. Market Based Management of Clouds: Market-Oriented Cloud Computing – A Reference Model for MOCC – Technologies and Initiatives supporting MOCC. Federated Clouds / Inter Cloud: Characterization and Definition – Cloud Federation Stack – Aspects of Interest – Technologies for Cloud Federations.		**CO3**
UNIT-IV	**Fog Computing Fundamentals**	**Periods: 6**
Fog Computing Fundamentals: Introduction – Background and Motivation of Fog Computing – Fog Computing Basics – Fog Computing Services. IoT Resource Estimation Challenges and Modeling in Fog: Fog Resource estimation and its challenges. Self-aware Fog Computing in Private and Secure Sphere: Cloud, Fog and Mist Computing Networks- Self-aware Data Processing - Case study: Health monitoring – Patient Safety monitoring and training support – Smart house.		**CO4**
UNIT-V	**Urban IoT Edge Analytics**	**Periods: 6**
Urban IoT Edge Analytics: Design challenges – Edge-assisted Architecture – Information Acquisition and Compression – Content-aware wireless networking – Information availability. Leveraging Fog Computing for Healthcare IoT: Introduction – Healthcare Services in the Fog Layer – Data management – Event Mangagement – Resource Efficiency – Device management – personalization – Privacy and Security – System Architecture of Healthcare IoT – Case study.		**CO5**

Lecture Periods: 60	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education (India) Private Limited Publications, First Reprint, 2013. Units I, II, III

2. Amir M. Rahmani , Pasi Liljeberg, Preden, Axel Jantsch, “Fog Computing in the Internet of Things - Intelligence at the Edge”, Springer International Publishing, 2018. Units IV, V Books for Reference

Reference Books

1. Michael Miller, “Cloud Computing Web Based Applications that change the way you work and collaborate online”, Pearson Education, 2009.

2. Evangelos Markakis, George Mastorakis, Constandinos X, Mavromoustakis and Evangelos Pallis, “Cloud and Fog Computing in 5G Mobile Networks: Emerging advances and Applications”, The Institution of Engineering and Technology, 2017.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
1	2	3	3	3	3	2	2	2
2	3	3	2	3	2	3	3	2
3	2	2	3	3	2	3	3	2
4	3	3	2	2	2	3	3	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)				Total Marks
	Exam	Report	Assignment*	Attendance	
Marks	70	10	10	10	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**			Programme: **M.Sc Computer Science**				
Semester	**First**			Course Category Code: **DSE** *End Semester Exam Type: **TE**				
Course Code	**A23PCPE103**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Machine Learning**			**4**	**0**	**0**	**4**	**25 / 75 / 100**
Prerequisite	**Basic knowledge in Supervised and Unsupervised**							
Course Outcome	*After completion of the course, the students will be able to*							BT Mapping (Highest Level)
	CO1	Recognize the characteristics of Machine Learning techniques that enable to solve real world problems						**K2**
	CO2	Recognize the characteristics of machine learning strategies						**K2**
	CO3	Apply various supervised learning methods to appropriate problems						**K3**
	CO4	Identify and integrate more than one techniques to enhance the performance of learning						**K3**
	CO5	Create probabilistic and unsupervised learning models for handling unknown pattern						**K4**

UNIT-I	**Introduction to Machine Learning**	**Periods: 12**
Introduction ,Components of Learning , Learning Models , Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.		**CO1**
UNIT-II	**Supervised and Unsupervised Learning**	**Periods: 12**
Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perception, Multilayer Perception, Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors. Introduction to clustering, K-means clustering, K-Mode Clustering		**CO2**
UNIT-III	**Ensemble and Probabilistic Learning**	**Periods: 12**
Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking. Gaussian mixture models - The Expectation-Maximization (EM) Algorithm, Information Criteria, Nearest neighbour methods - Nearest Neighbour Smoothing, Efficient Distance Computations: the KD-Tree, Distance Measures.		**CO3**
UNIT-IV	**Reinforcement Learning and Evaluating Hypotheses**	**Periods: 12**
Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning. Motivation, Basics of Sampling Theory: Error Estimation and Estimating Binomial Proportions, The Binomial Distribution, Estimators, Bias, and Variance		**CO4**
UNIT-V	**Genetic Algorithms**	**Periods: 12**
Motivation, Genetic Algorithms: Representing Hypotheses, Genetic Operator, Fitness Function and Selection, An Illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning: Lamarkian Evolution, Baldwin Effect, Parallelizing Genetic Algorithms.		**CO5**

Lecture Periods: 60	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, 3rd Edition2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar " Foundations of Machine Learning", MIT Press,2012.
3. Tom Mitchell, "Machine Learning", McGraw Hill, 3rdEdition, 1997.
4. MACHINE LEARNING - An Algorithmic Perspective, Second Edition, Stephen Marsland, 2015.

Reference Books

1. CharuC.Aggarwal,"DataClassificationAlgorithmsandApplications",CRCPress,2014.
2. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.
3. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
4. Jiawei Han and Micheline Kambers and JianPei, "Data Mining Concepts andTechniques",3rd edition, Morgan Kaufman Publications, 2012.

COs/POs/PSOs Mapping

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2	3	3	2	3	2	3	3	2
3	2	2	3	3	2	3	3	2
4	3	3	2	2	2	3	3	3
5	2	2	2	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
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