THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI-23.

COURSE PATTERN FOR PG - COMPUTER SCIENCE - 2023-2024 ONWARDS

SL. No.	COURSE		Subject Code	Page No.	COURSE TITLE	Hrs.	Credits	CIA	Sem. Exam	Total
I SEMESTER										
1	Core	I			Advanced Java Programming	4	4	25	75	100
2	Core	II			Cloud Computing	4	4	25	75	100
3	Core	III			Software Project Management	5	4	25	75	100
4	Core	IV			Cryptography and Network Security	5	4	25	75	100
5	Core	V-P			Advanced Java Programming and HTML Lab	5	4	40	60	100
6	Core	VI			Distributed Operating Systems	5	4	25	75	100
7	SEC	I			Skill Enhancement Course - I : HTML & CSS	2	2	25	75	100
					TOTAL	30	26	190	510	700
II SEMESTER										
8	Core	VII			Database Systems	5	4	25	75	100
9	Core	VIII			Data Mining and Warehousing	5	4	25	75	100
10	Core	IX			Design and Analysis of Algorithms	5	4	25	75	100
11	Core	X-P			SQL and JavaScript lab	5	4	40	60	100
12	CBE	I			Discipline Specific Elective - I : Internet of Things	5	3	25	75	100
13	NME	I			Non-Major Elective - I : Principles of Computer Science	3	2	25	75	100
14	SEC	II			Skill Enhancement Course - II : JavaScript	2	2	25	75	100
					TOTAL	30	23	190	510	700
III SEMESTER										
15	Core	XI			Compiler Design	4	4	25	75	100
16	Core	XII			Machine Learning	4	3	25	75	100
17	Core	XIII			Statistical Analysis using R	4	4	25	75	100
18	Core	XIV-P			Machine Learning Lab using Python	5	4	40	60	100
19	CBE	II			Discipline Specific Elective - II : Parallel Processing	4	3	25	75	100
20	CBE	III-P			Discipline Specific Elective - III : Statistical Analysis using R and PHP Lab	4	3	40	60	100
21	NME	II			Non-Major Elective - II : Spread Sheet	3	2	25	75	100
22	SEC	III			Skill Enhancement Course - III : PHP	2	2	25	75	100
					TOTAL	30	25	230	570	800
IV SEMESTER										
23	CBE	IV			Discipline Specific Elective - IV : Advanced Computing Concepts	4	3	25	75	100
24	SEC	IV			Skill Enhancement Course - IV : Principles of Web Services	2	2	25	75	100
25	EA				Extension Activity	-	1	25	75	100
26	Project				Project	24	10	25	75	100
					TOTAL	30	16	100	300	400
					GRAND TOTAL	120	90	710	1890	2600

M.Sc.	Subject Code:	Core: I		Semester	I
Computer Science	**ADVANCED JAVA PROGRAMMING**	Int.	25	Hours	4
		Ext.	75	Credit	4

Objective : To impart knowledge on writing programs using advanced Java concepts such as Java JDBC, Swings, Threads, RMI and Servlet.

Outcome : Real time applications on database connectivity, GUI controls, fastening dynamic web page using Cookies and Client connectivity are studied.

Unit 1 Java Database Connectivity: Establishing connection – Creation of data tables – Entering data into tables – Table updating – Use of prepared statement.

Unit 2 Swings: JApplet class – Icons – Jlabel Control – JOptionPane class – JTextField control – JButton control – JCheckBox control – JRadioButton control – Menus – JSlidder control – JComboBox control – JTabbedPane control – JScrollPane control.

Unit 3 Threads: Life Cycle of a Thread – Creating and Running Threads – Method in the Thread class – Setting the Priority of a Thread – Applet involving Thread.

Unit 4 Remote Method Invocation: Remote Interface – Java.rmi – Server Package – Naming Class – Creating RMI Client and Server Classes.

Unit 5 Servlet: Servlet and Dynamic Web pages – 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.

Text Books:

1. The Complete Reference: JAVA 2, 7th Edition, Herbert Scheldt, Tata McGraw Hill, 2007.
2. Programming with Java, C. Muthu, Vijay Nicole Imprints Pvt. Ltd. Fourth Reprint, 2008.

Reference Books:

1. Java Programming Advanced Topics, Core Technology, 1st Reprint Joe Wigglesworth, Paula Lumby, Thomson Learning, 2001.
2. Java – Programmer's Reference, Herbert Schildt with Joe O' Neil, TMH, 2004.

M.Sc.	Subject Code:	Core: II		Semester	I
Computer Science	**CLOUD COMPUTING**	Int.	25	Hours	4
		Ext.	75	Credit	4

Objective : To provide knowledge on Cloud Computing fundamentals, concepts, issues, applications and implementations, virtualization and cloud resource management.

Outcome : Provides the knowledge on cloud computing concepts, architecture, infrastructure, services and application of virtualization concept.

Ability to discern and appropriate Cloud Providers, build skill to design simple cloud applications and exposure to the application areas of cloud computing

Unit 1 Cloud Computing Basics: Cloud computing definition – Characteristics – Benefit – Challenges – Distributed Systems – Virtualization – Service-oriented computing – Building Cloud Computing environments – Computing platforms & technologies – Cloud Models – Cloud Service Cloud concepts and Technologies.

Unit 2 Virtualization, Cloud Services and Platforms: Virtualization: Characteristics – Taxonomy types – Pros and Cons – Reference model – Types of clouds – Compute Service – Storage Services – Cloud Database Services – Application Services – Content Delivery Services – Deployment and Management Service – Identity and Access Management Services.

Unit 3 Cloud Platforms In Industry: AWS – Compute and storage Services – Azure Core concepts – Concept of Hadoop and MapReduce.

Unit 4 Cloud Application Design and Cloud Security: Cloud application design consideration – Design Methodologies – Reference architecture – Data storage approaches: SQL NoSQL – RESTful web service – Authentication – Authorization.

Unit 5 Cloud Applications: Scientific applications – Business and consumer applications – Cloud for education and Manufacturing industry

Text Books:

1. Mastering Cloud Computing: Foundations and Applications Programming, Buyya, Vecciola and Selvi, Tata McGraw Hill, 2013.
2. Cloud Computing: A Hands – On Approach, Arshdeep Bahga, Vijay Madisetti, Universities press (India) Pvt. limited 2016.

Reference Books:

1. Cloud Computing: Implementation, Management, and Security, Rittinghouse and Ransome, CRC Press, 2016.
2. Cloud Computing Web based application that change the way you work and collaborate online. Michael Miller, Pearson edition, 2008.
3. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Kris Jamsa, Jones & Bartlett Learning, 2012.

M.Sc.	Subject Code:	Core: III		Semester	I
Computer Science	**SOFTWARE PROJECT MANAGEMENT**	Int.	25	Hours	5
		Ext.	75	Credit	4

Objective : To learn the concepts of planning, monitoring and managing resources in executing a software project.

Outcome : To appreciate the techniques for IT projects to initiate, plan, execute and critically evaluate the projects and work in teams to deal the project with key tasks, critical path and a realistic timeline.

Unit 1 Introduction – Project – Software Project vs. other projects – Activities – Plan, Methods and Methodologies – Project categories – Management – Steps involved in project planning.

Unit 2 Project Evaluation: Evaluation of Projects – Cost benefit evaluation techniques – Process Models.

Unit 3 Software Effort Estimation Techniques: Expert Judgement, Analogy, Function points – COCOMO – Activity Planning: Objectives – Schedules and Activities – Network planning models: AOA and AOE – Forward and Backward Passes.

Unit 4 Risk Management – Resource Allocation.

Unit 5 Software Quality: Importance – ISO 9126 quality attributes – Metrics – Quality Management – Techniques to enhance software quality.

Text Book:

1. Software Project Management, 5th Edition, Bob Hughes, Mike Cotterell and Rajib Mall, Tata McGraw Hill Publishing Co., New Delhi, 2011.

Reference Book:

1. Software Project Management – A Practitioner's Approach, Bennatan, TMH, New Delhi, 1995.

M.Sc.	Subject Code:	Core: IV		Semester	I
Computer Science	**CRYPTOGRAPHY AND NETWORK SECURITY**	Int.	25	Hours	5
		Ext.	75	Credit	4

Objective : To learn the basics of Cryptographic Techniques and Methods, Network Security Protocols for Secure Transactions and about Malicious Software and System Security.

Outcome : Understands various Cryptographic Concepts and Algorithms.

Unit 1 Introduction: Security Goals – Cryptographic Attacks – Services and Mechanisms – Techniques – Traditional Symmetric key Cipher: Introduction – Kirchhoff's Principle – Cryptanalysis – Substitution Ciphers – Additive Cipher – Ceaser Cipher – Multiplicative Cipher – Play fair Cipher – One-Time Pad Cipher – Transposition Ciphers: – Keyed and Keyless Transposition – Stream and Block Cipher.

(Problems are included)

Unit 2 Mathematics of Cryptography: Divisibility – GCD – Euclidean Algorithm – Modular arithmetic operations – Congruence – Residues and Residue Operations – Mathematics of Asymmetric key cryptography: Prime – Checking for Primeness – Euler phi function – Fermat's little theorem – Euler theorem – Application of Euler theorem – Generating Primes.

(Theorem's proof not included and Problems are included)

Unit 3 Modern Cryptography: Symmetric Key Ciphers: – DES – AES – Public key Cipher: RSA – Message Integrity and Authentication – Message Integrity – Message Authentication – SHA 512 – Digital Signature: Introduction – Process – Services – Attacks – Digital Signature Scheme.

Unit 4 Network Security: Security at Application layer: Email architecture – Email Security – S/MIME – Security at Transport layer: – SSL architecture: Four Protocols – Security at Network layer: – IPSec modes – Protocol AH – ESP.

Unit 5 System Security: Definition – System – Users – Trust – Trusted systems – Malicious programs – Worms – Viruses – Intrusion detection system – Firewall – Construction and working principles.

Text Book:

1. Cryptography and Network Security, 2nd Edition, Behrouz A Forouzan and Debdeep Mukhopadhyay, MGH Education, 2014.

UNIT 1:

Chapter 1: 1. 1 to 1. 4

Chapter 3: 3. 2, 3. 3, 3. 4

UNIT 2:

Chapter 2: 2.1.2, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5

Chapter 9: 9.1.1, 9.1.3, 9.1.4, 9.1.5, 9.1.6, 9.1.7

UNIT 3:

Chapter 6: 6.1, 6.2.1, 6.2.2, 6.2.3 (key generation only), 6.3

Chapter 7: 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.2 (algorithms are not included), 7.3.1

Chapter 10: 10.2.1, 10.2.2, 10.2.3

Chapter 11: 11.1, 11.3

Chapter 12: 12.4

Chapter 13: 13.1 – 13.4, 13.5.1

UNIT 4:

Chapter 16: 16. 1.1, 16.1.2, 16.3

Chapter 17: 17.1.1 – 17.1.5, 17.1.8, 17.2

Chapter 18: 18.1, 18.2.1, 18.2.2

UNIT 5:

Chapter 19: 19.1, 19.2, 19.4 – 19.8

Reference Books:

1. Cryptography and Network Security Principles and Practices, William Stallings, PHI Learning Private Limited, New Delhi, 2008.
2. Cryptography and Network Security, Atul Kahate, Tata McGraw Hill Publications, New Delhi, 2008.

M.Sc.	Subject Code:	Core: V-P		Semester	I
Computer Science	**ADVANCED JAVA PROGRAMMING AND HTML LAB**	Int.	40	Hours	5
		Ext.	60	Credit	4

Objective : Java: To learn advanced Java programming such as JDBC, Swings, Threads, RMI and Servlet.

HTM & CSS: To comprehend Web designing by the tags such as list, tables, links, frames and framesets, cascading, inline style and embedding images for attractive Web page.

Outcome : Java: The JDBC manipulation operations, Swing, multithread, RMI and Servlet programming are learned

HTM & CSS: Web designing tags such as list, tables, frames and framesets, cascading and embedding images are learned to design attractive Web page.

Java Programming Exercises

1. Program that connects to a database using JDBC and does add, delete, modify and retrieve operations.
2. Program to design a simple calculator for basic arithmetic operations using Swing.
3. Program to implements a multi-thread application.
4. Program to demonstrate RMI.
5. Demonstrate server side programming using Java Servlet.

HTML & CSS Exercises

1. Design a Web page using

    a) Lists

    b) Tables

    c) Links

    d) Frames and Framesets

    e) Form Design

2. Create web pages using

    a) Cascading style sheets

    b) Embedded style sheets

    c) Inline style sheets

Reference Books:

1. Programming with Java, C. Muthu, Vijay Nicole Imprints Pvt. Ltd., 2008.
2. The Complete Reference: JAVA 2, 7th Edition, Herbert Scheldt, Tata McGraw Hill, 2007.
3. Java – Programmer's Reference, Herbert Schildt with Joe O' Neil, TMH, 2004.
4. Programming the World Wide Web, Third Edition, Robert. W. Sebesta, Pearson Education, 2007
5. World Wide Web design with HTML, Xavier. C, Tata McGraw Hill, New Delhi, 2000
6. Web enabled commercial application development using HTML, DHTML, Java script, Perl CGI, 2nd Revised edition, Ivan Bayross, BPB Publishing.

Practical Question Paper pattern: (Maximum 60 Marks)	
One Question from Java	Due Weightage to be granted on question's robustness
One Question from HTML/CSS	Less Weightage to be granted on question's robustness

M.Sc.	Subject Code:	Core: VI		Semester	I
Computer Science	**DISTRIBUTED OPERATING SYSTEMS**	Int.	25	Hours	5
		Ext.	75	Credit	4

Objective : To provide a clear description of the fundamental concepts and design principles of distributed operating systems.

Outcome : Issues in scheming a DOS, nuances of process communication are learned. Realize the importance of synchronization, different resource management approaches and implementation details of process migration and threads are learned.

Unit 1 Distributed Computing Systems: Evolution – Models – Distributed Operating System – Issues in designing DOS – Distributed computing environment.

Unit 2 Communication issues in distributed system: Protocols – Features of a good message passing system – Issues in IPC by message passing – Synchronization – Buffering – Process addressing – Failure handling – Group communication.

Unit 3 Synchronization: Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election algorithms.

Unit 4 Resource management: Desirable features of Global scheduling algorithm – Task assignment approach – Load balancing approach – Load sharing approach.

Unit 5 Process management: Desirable features of Good Process Migration Mechanism – Process Migration Mechanisms – Process Migration in Heterogeneous systems – Advantages of Process Migration – Threads.

Text Book:

1. Distributed System Concepts and Design, Pradeep K. Sinha, PHI Pvt. Ltd, 1998. (Chapters: 1.2, 1.3, 1.5 – 1.7, 2.5, 3.2 – 3.5, 3.8 – 3.10, 6, 7 and 8)

Reference Book:

1. Distributed Operating System, Andrew S. Tanenbaum, Addison Wesley Longman, (Singapore) Pvt. Ltd.

M.Sc.	Subject Code:	SEC: I		Semester	I
Computer Science	**SKILL ENHANCEMENT COURSE (SEC) – I: HTML & CSS**	Int.	25	Hours	2
		Ext.	75	Credit	2

Objective : To design simple Web pages using HTML (the Hypertext Markup Language) and CSS (Cascading Style Sheets).

Outcome : HTML provides the structure of the page, CSS the (visual and aural) layout, graphics and scripting to build Web pages and Web Applications.

Unit 1 Introduction To HTML: Designing A Home Page – HTML Document – Anchor Tag – Hyperlinks – Head and Body Sections – Header Section – Title – Links – Colourful Pages – Body Section – Heading – Horizontal Rule – Paragraph – Tabs – Images and Pictures.

Unit 2 Lists and List types – Table Handling – Frames – Forms and Forms elements – Drop Down List

Unit 3 Check Boxes – Radio Button – Text Field – Text Area – Password, Hidden, Submit and Reset Buttons

Unit 4 DHTML and Style Sheets – Defining Styles – Elements of Styles – Linking A Style Sheet to a HTML Document.

Unit 5 Inline Styles – External Style Sheets – Internal Style Sheets – Multiple Styles – Web Page Designing.

Text Books:

1. Programming the World Wide Web, 3rd Edition, Robert. W. Sebesta, Pearson Education, 2007
2. World Wide Web design with HTML, Xavier.C, Tata McGraw Hill, New Delhi, 2000

Reference Book:

1. Web enabled commercial application development using HTML, DHTML, Java script, Perl CGI, 2nd Revised edition, Ivan Bayross, BPB Publishing.

M.Sc.	Subject Code:	Core: VII		Semester	II
Computer Science	**DATABASE SYSTEMS**	Int.	25	Hours	5
		Ext.	75	Credit	4

Objective : To understand concepts and organization of database with specific reference to relational database.

Outcome : Data Base systems, data definition and manipulation languages and its applications, Relational query languages with relational algebra and enrichment on Normalizations are learned.

Database transaction and concurrency control and recoverability process and distributed database concepts are learned.

Unit 1 Introduction – Database system applications – Purpose of database systems – View of data: Data Abstraction – Instances and Schema – Data Model – Data base languages – Data Manipulation Languages – Data Definition Language – Relational databases – database design – Data Storage and Querying – Transaction Management – Database Architecture.

Unit 2 Structure of relational databases – Database schema – Keys – Schema diagram – Relational Query languages – relational operations – Formal Relational Query Language: Relational algebra – Tuple relational calculus – Domain relational calculus.

Unit 3 Functional dependency and Decomposition: Introduction – Functional dependency diagram and examples – Full Functional dependencies – Armstrong's Axioms for Functional dependencies – Decompositions: Lossy decomposition – Lossless-Join decomposition – Dependency preserving decomposition – Normalization: Normal forms – First, Second and Third Normal form – Boyce-Codd Normal form – Multi-valued dependencies and Fourth Normal form – Join dependencies and Fifth Normal form.

Unit 4 Transaction: Transaction concepts – Transaction atomicity and durability – Transaction isolation – Serializability – Transaction Isolation and Atomicity. Concurrency Control: Lock-based protocol – Timestamp based protocols – Validation based protocols.

Unit 5 Recoverability: Failure classification – Recovery and atomicity – Remote backup systems. Distributed databases: Homogeneous and Heterogeneous databases – Distributed data storage – Distributed transactions – Heterogeneous distributed databases.

Text Books:

1. Database System Concepts, 6th Edition, Abraham Silberschatz, Henry F. Korth& S. Sudharshan, McGraw Hill International (Indian Edition), 2014.

   UNIT: 1: Chapter: 1.1 – 1.9

   UNIT: 2: Chapter: 2.1 – 2.6, 6.1 – 6.3

   UNIT: 4: Chapter: 14.1, 14.2, 14.4 – 14.7, 15.1, 15.4, 15.5

   UNIT: 5: Chapter: 16.1, 16.3, 16.9, 19.1, 19.2, 19.3, 19.8

2. Database Systems Concepts – Design and Applications, 3rd Edition, Dr. S.K.Singh, Pearson Education, Dorling Kindersley (India) Pvt. Ltd. 2009.
   UNIT: 3: Chapter: 9.1, 9.2 (9.2.1 – 9.2.3), 9.3 and Chapter 10

Reference Book:

1. An Introduction to Data Base Systems, C. J. Date, A Kannan & S. Swamynathan, Eighth Edition, Pearson Education India, 2009.

M.Sc.	Subject Code:	Core: VIII		Semester	II
Computer Science	**DATA MINING AND WAREHOUSING**	Int.	25	Hours	5
		Ext.	75	Credit	4

Objective : To study the concepts of data mining techniques, algorithms and the concepts and design of data warehousing.

Outcome : Data mining and KDD process, issues in Data Mining, pre-processing, Association Rule Mining, Classification and Clustering as well as Data Warehousing concepts and issues are learned.

Unit 1 Introduction: Data mining – On What kind of data – Data mining functionalities – Classification of Data mining systems – Data mining task primitives – Integration of a data mining systems – Major issues in Data mining – Social implications of DM.

Unit 2 Data Pre-processing: Why pre-process the Data – Descriptive summarization – Data Cleaning – Data Integration and Transformation – Data Reduction – Data cube aggregation and attribute subset selection.

Mining Frequent Patterns: Basic concepts – Apriori algorithm – Generating association rules from frequent item sets – Improving the efficiency of Apriori – Mining various kinds of association rules – Mining multilevel, multidimensional and quantitative association rules.

Unit 3 Classification and Prediction: Definition – Issues regarding classification and prediction – Classification by decision tree induction – Bayesian classification – Naïve Bayesian Classification Rule based classification – Prediction – linear regression prediction – Accuracy and error measures – Evaluating the accuracy of a classifier and predictor.

Unit 4 Cluster analysis: Types of data in cluster analysis – Major clustering methods – Partitioning Methods: Classical partitioning methods – K Means and K – Medoids – Hierarchical Methods: Agglomerative, Divisive and BIRCH Hierarchical methods – Outlier analysis.

Unit 5 Data Warehousing: Introduction – Characteristics of a data warehouse – Data marts – Other aspects of data mart – Online analytical processing: OLTP & OLAP systems.

Developing a Data Warehouse: Why and how to build a data warehouse – Data warehouse architectural strategies and organizational issues – Design consideration – Data content – Meta data – Distribution of data – Tools for data warehousing – Performance considerations.

Text Books:

1. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers.

   UNIT: 1: Chapter 1

   UNIT: 2: Chapter2 up to 2.5.2 & Chapter 5.1, 5.2.1 – 5.2.3 and 5.3

   UNIT: 3: Chapter 6.1 – 6.3.3, 6.4 – 6.4.2, 6.5 – 6.5.2, 6.11, 6.12 and 6.13

   UNIT: 4: Chapter 7.1 to 7.4, 7.5.1 – 7.5.2 and 7.11

2. Data Warehousing concepts, techniques, products & applications, 2nd Edition, C. S. R. Prabhu, PHI.

   UNIT: 5: Chapters 1, 2 and 4.

Reference Books:

1. Data Mining, Pieter Adriaans, and Dolf Zantinge, Pearson Education, 1998.
2. Data Mining Techniques, Arun K Pujari, Universities Press (India) Pvt., 2003.
3. Insight into Data Mining Theory & Practice, K. P. Soman, Shyam Diwakar, and V. Ajay, Prentice Hall India, 2012.
4. Introduction to Data Mining with Case Studies, 2nd Edition, G. H. Gupta, PHI.

5. The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling, 3rd Edition, Ralph Kimball, and Margy Ross, Wiley, Jul 2013.

M.Sc.	Subject Code:	Core: IX		Semester	II
Computer Science	**DESIGN AND ANALYSIS OF ALGORITHMS**	Int.	25	Hours	5
		Ext.	75	Credit	4

Objective : To introduce the strategies of algorithms and evaluation of complexities.

Outcome : Various design techniques of algorithm, method to estimate and analyze its time complexity are learned.

Unit 1 Introduction – Algorithm – Specification – Performance analysis – Divide and Conquer – General method – Binary search – Finding the Maximum and Minimum – Merge sort – Quick sort.

Unit 2 The Greedy method – General method – Knapsack problem – Tree Vertex Splitting – Dynamic Programming – General method – Multistage graphs – All pairs shortest paths – Single-Source Shortest paths – Travelling salesperson problem.

Unit 3 Basic traversal and Search techniques – Binary Trees – Graphs – Connected Components and Spanning Trees – Biconnected Components.

Unit 4 Backtracking – General method – 8 Queens problem – Sum of Subsets – Graph Colouring – Hamiltonian Cycle – Branch and Bound – 0/1 Knapsack problem.

Unit 5 NP-Hard and NP-Complete Problem – Basic concepts – Cook's Theorem – NP-Hard Problems – Clique Decision problem – Case study.

Text Book:

1. Computer Algorithms, Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Galgotia Publications Pvt. Ltd, 2002.

Reference Books:

1. Computer Algorithms, Introduction to Design and Analysis, 3rd Edition, Sara Baase and Allen Van Gelde, Pearson Education, Delhi, 2002.
2. The Design and Analysis of Computer Algorithm, Aho, Hoporoft and Ullman, Pearson Education, Delhi, 2001.
3. Design Methods and Analysis of Algorithms, Basu S. K, PHI, 2006.

M.Sc.	Subject Code:	Core: X-P		Semester	II
Computer Science	**SQL AND JAVASCRIPT LAB**	Int.	40	Hours	5
		Ext.	60	Credit	4

Objective : SQL: To provide knowledge on Database query processing using SQL and PL/SQL for creation and processing databases.

JavaScript: Manipulation to create, dynamically updating content, control multimedia, animate images, and other Web objects using simple programs.

Outcome : SQL: Expertise in DDL and DML operations. Creation of SQL table, insertion and manipulation. Acquire knowledge SQL constraints and relational model. Gain knowledge over various functions, clauses and grouping function. Skill development over various Join operations. Developing skill with PL/SQL concepts, Cursors and Triggers.

JavaScript: XHTML tags along with JavaScript programming dynamically processes objects in Web designing are skilled-out.

SQL LAB

1 Data Definition Language: Create, Alter, Drop, Rename, Truncate Data Manipulation Language: Insert, Update, Delete, and Select.

2 Constraints: Not Null, Unique Key, Primary Key, Foreign Key, Check, Dropping a Constraint, Enabling & Disabling.

3 Data Control Language: Grant, Revoke, Roles Transaction Control: Commit, Rollback, Savepoint.

4 SQL SELECT Statements: Selecting All Columns, Selecting Specific Columns, Column Alias, Concatenation Operator, Arithmetic Operators, Comparison Conditions, Logical Conditions, ORDER BY Clause.

5 Functions: Single Row Functions, Character Functions, Number Functions, Date Functions, Conversion Functions, General Functions, Multiple Row Functions, Group Function Subquery: Subquery, Types of Subquery, Group Function, Having Clause.

6 Joins: Equijoins, Non – Equijoins, Joining Three Tables, Self Joins, Left Outer Joins, Right Outer Joins, Full Outer Joins, Cross Joins, Natural Joins Other Concepts: View, Index.

7 PL/SQL Programming: Control Structures and Loops.

8 DML Operations Using PL/SQL: Insert, Update, Delete, and Merge.

9 Cursor: Types of Cursor, Explicit Cursor, Explicit Cursor Attributes, Trigger: Trigger, Statement Trigger, Row Trigger, Using Conditional Operations, DML Operations.

10 Sequence and Stored procedures

JAVASCRIPT LAB

1 Input and Output Dialog box

2 Arrays

3 Functions

4 Number Object.

5 Date Object

6 String Object

7 Event Handling

Reference Books:

1. SQL, PL/SQL – The Programming Language of SQL, 3rd Edition, Ivan Bayross, BPB Publications, New Delhi, 2008.
2. Learning PHP, MYSQL, JavaScript, CSS&HTML5, Robin Nixon, O' Reilly
3. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, and AJAX, Black Book, Kogent learning solution Inc, Dream tech Press, 2012.
4. JavaScript 2.0 The complete Reference, Thomas A. Powell and Fritz Schneider, MGH, 2004.

Practical Question Paper pattern: (Maximum 60 Marks)	
One Question from SQL	Due Weightage to be granted on question's robustness
One Question from JavaScript	Less Weightage to be granted on question's robustness

M.Sc.	Subject Code:	CBE: I		Semester	II
Computer Science	**CORE BASED ELECTIVE (CBE) – I:** **DISCIPLINE SPECIFIC ELECTIVE (DSE) – I:** **INTERNET OF THINGS**	Int.	25	Hours	5
		Ext.	75	Credit	3

Objective : To understand the characterization and significance of the Internet of Things, recognize building blocks and their characteristics of IoT, appreciate the factors that contributed to the emergence of IoT, comprehend the revolution of Internet in Mobile Devices, Cloud & Sensor Networks, and design IoT based solutions that can benefit the society.

Outcome : The classification and implication of the Internet of Things, building blocks, applications of IoT in various areas, use mobile devices over Internet, cloud and sensor networks to design IoT based solutions are learned.

Unit 1 Introduction to IoT – Genesis – IoT and Digitization – IoT Impact – Convergence of IoT and OT – IoT Challenges. Smart Objects: Sensors – Actuators – Smart Objects – Micro-Electro Mechanical Systems – Sensor Networks.

Unit 2 Network Architecture and Design: New Network Architectures – Comparing IoT Architectures – A Simplified IoT Architecture – The Core IoT Functional Stack – IoT Data Management and Compute Stack.

Unit 3 Connecting Smart Objects: Communications Criteria – Topology – IoT Access Technologies.

Unit 4 Application Protocols for IoT: The Transport Layer – IoT Application Transport Methods – SCADA – COAP – MQTT.

Unit 5 Smart and Connected Cities: Strategy for Smarter Cities – Smart City IoT Architecture – Smart City Security Architecture – Smart City Use Cases.

Transportation: Transportation and Transports – Transportation Challenges – Use Cases for Transportation – IoT Architecture for Transportation.

Text Book:

1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton and Jerome Henry, Cisco Press, USA, 2017.

   Unit-1 Chapters 1 and Chapter 3

   Unit-2 Chapter 2

   Unit-3 Chapter 4

   Unit-4 Chapter 6

   Unit-5 Chapters 12 and 13

Reference Books:

1. The Internet of Things Enabling Technologies, Platforms, and Use Case, Pethuru Raj and Anupama C. Raman, CRC Press, USA, 2017.
2. Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry, Maciej Kranz, Wiley, United Kingdom, 2016.
3. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, John Wiley and Sons, United Kingdom, 2014.

M.Sc.	Subject Code:	NME: I		Semester	II
Computer Science	**NON-MAJOR ELECTIVE – I:** **PRINCIPLES OF COMPUTER SCIENCE**	Int.	25	Hours	3
		Ext.	75	Credit	2

Objective : To acquire knowledge in Computer Science, computer hardware, software, features and programming aids.

To understand Binary number system and principles of Boolean Algebra and also the concepts of database.

Outcome : Computer Science basics and prerequisites for programming such as Algorithm, Procedure and Flowchart writings are learned.

Computer peripherals, software types, basic logics in digital computers and introduction to database are learned.

Unit 1 Introduction to Computers: Definition – Classification of Computers: Analog, Digital and Hybrid Computers. Classification of Computer: Super, Mainframe, Maxi, Personal Computers and Terminals – Characteristics of Computers – Block diagram of a Digital Computer.

Unit 2 Input Devices: Keyboard, Mouse, and Joystick – Output Devices: Dot Matrix Printer, Laser Printer, Colour Inkjet Printer – Computer Software: Introduction – Operating System, Application software, Programming Languages, Query Languages – Examples.

Unit 3 Programming: Algorithms, Procedures, and Flow Charts: Symbols and concepts. Examples with Algorithm and Flowchart: Simple Interest, Degree, Radian and Gradient Conversion, Biggest of three numbers, Counting characters in a sequence.

Unit 4 Binary number system: Introduction, Decimal to Binary conversion – Boolean algebra: Introduction – Boolean Constants and Variables – 2 and 3 variables Logical Truth Tables: AND / OR / NOT / NAND / NOR / XOR – Basic Laws of Boolean algebra and De Morgan's laws.

Unit 5 Introduction to database systems: Basic concepts and definitions – data dictionary – database – Database system – Database Administrator – Database Approach – Database system environment – advantages and disadvantages of DBMS.

Text Books:

1. Fundamentals of Computers, Rajaraman, V, 2nd Edition, Prentice Hall India Limited.
2. Fundamentals of Information Technology, Alexis Leon & Mathews.
3. Digital Electronics, G. K. Kharate, Oxford University Press, 2010.
   (For UNIT: 4).
4. Database Systems Concepts, Designs and Application Second Edition, Shio Kumar Singh, Pearson Education. (For UNIT: 5).

Reference Books:

1. Introduction to Information Technology, 2nd Edition, Turban, Rainer and Potter, Willey Student New Delhi, 2012.
2. Using Information Technology – A Practical introduction to computers and communication, 3rd Edition., Stacey Sawyer, Brian K Williams, Sarah E Hutchinson, TMH, 1999.
3. An Introduction to Database Systems, 7th Edition, C. J. Date, Pearson Education, 2002.

M.Sc.	Subject Code:	SEC: II		Semester	II
Computer Science	**SKILL ENHANCEMENT COURSE (SEC) – II: JAVASCRIPT**	Int.	25	Hours	2
		Ext.	75	Credit	2

Objective : To learn basics of JavaScript (JS), a lightweight, interpreted, or just-in-time compiled scripting language that enables create dynamically updating content, control multimedia, animate images, and other Web objects

Outcome : JavaScript programming concepts, processing dynamic objects and Event handling are studied.

Unit 1 Exploring JavaScript – JavaScript and HTML Text – variables – Operators.

Unit 2 Expressions – Using try & catch – Conditionals – Looping.

Unit 3 Functions – DOM.

Unit 4 Event Handling – JavaScript Arrays – JavaScript Objects.

Unit 5 Validating user input with JavaScript Regular Expressions.

Text Book:

1. Learning PHP, MYSQL, JavaScript, CSS&HTML5, Robin Nixon, O' Reilly

Reference Books:

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, and AJAX, Black Book, Kogent learning solution Inc, Dream tech Press, 2012.
2. Internet & World Wide Web How to Program, 4th Edition, Harvey M. Deitel and Paul J. Deitel, Pearson Education, 2008.
3. JavaScript 2.0 The complete Reference, Thomas A. Powell and Fritz Schneider, MGH, 2004.
4. Web Enable Commercial Application Development Using HTML, DHTML, Java Script, Perl CGI, Ivan Bayross, 2000, BPB Publications

M.Sc.	Subject Code:	Core: XI		Semester	III
Computer Science	**COMPILER DESIGN**	Int.	25	Hours	4
		Ext.	75	Credit	4

Objective : To enlighten the students on the various phases of the compilation process from high level language into its low level counterpart.

Outcome : Different type of translators and the tools for constructing compilers, types of errors, importance of intermediate code generation, symbol tables and related data structures, optimizations and the method of machine code generation are learned.

Unit 1 Introduction to compilers – Compilers and translators – Assembly language – Macros – Structure of a compiler – Compiler writing tools – Bootstrapping – Lexical analysis – Role of lexical analyzer – Regular expression – Finite automata – Implementation of lexical analyzer.

Unit 2 Context Free Grammars – Derivation and parse trees – Parsers – Shift reduce parsing – Operator precedence parsing – Top down parsing – Predictive parsers – Simple precedence parser – LR parsers – Constructing SLR parser tables.

Unit 3 Syntax directed translation schemes – Implementation of syntax Directed translation schemes – Intermediate code – Postfix notation – Parse trees and Syntax trees – Three address code, quadruples and triples.

Unit 4 Symbol table – Contents of a symbol table – Data structures for symbol tables – Errors – Lexical phase errors – Syntactic phase errors – Time of detection – Panic mode – Error recovery in operator precedence parsing – Handling errors during reduction – Handling shift reduce errors – Semantic errors.

Unit	5	Code optimization – Principal sources of optimization – Loop optimization – DAG representation of basic blocks – Code generation – Problems in code generation – A simple code generator – Peephole optimization.

Text Book:

1. Principles of Compiler Design, Aho & Ullman, Narosa Publishing House, New Delhi, 2002.

Reference Books:

1. Introduction to Compiler Design, Torben, Egidius Mogensen, 2nd Edition, Springer International Publishing, Denmark, 2017.
2. Compiler Design: Theory, Tools, and Examples, Seth D. Bergmann, Rowan University, Open Educational Resources, New Jersey, 2017.
3. A Practical Approach to Compiler Construction, Des Watson, Springer International Publishing, UK, 2017.

M.Sc.	Subject Code:	Core: XII		Semester	III
Computer Science	**MACHINE LEARNING**	Int.	25	Hours	4
		Ext.	75	Credit	3

Objective : To Learn about Machine Intelligence and Machine Learning applications to real-world applications.

To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems and to perform evaluation of learning algorithms and model selection.

Outcome : Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc., the strengths and weaknesses of many popular machine learning approaches. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and unsupervised learning and able to design and implement various machine learning algorithms in a range of real-world applications.

Unit 1 Introduction : Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree Learning – Representation – Algorithm – Heuristic Space Search.

Unit 2 Neural Network Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms.

Unit 3 Bayesian and Computational Learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Naïve Bayes Classifier.

Unit 4 Instant Based Learning: K-Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Unit 5 Advanced Learning: Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution.

Text Book:

1. Machine Learning, Tom M. Mitchell, McGraw Hill Education (India) Private Limited, 2013.

   Unit 1: Chapter 1: P.Nos: 1 – 15

   Chapter 2: P.Nos: 25 – 45

   Chapter 3: P.Nos: 53 – 62

   Unit 2: Chapter 4: P.Nos: 81 – 116

   Unit 3: Chapter 6: P.Nos: 154 – 191

   Unit 4: Chapter 8: P.Nos: 230 – 245

   Unit 5: Chapter 10: P.Nos: 274 – 298

Reference Books:

1. Introduction to Machine Learning (Adaptive Computation and Machine Learning), Ethem Alpaydin, The MIT Press 2004.
2. Machine learning: An Algorithmic Perspective, Stephen Marsland, CRC Press, 2009.
3. Genetic Algorithms and Genetic Programming, Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, CRC Press Taylor and Francis Group.

M.Sc.	Subject Code:	Core: XIII		Semester	III
Computer Science	**STATISTICAL ANALYSIS USING R**	Int.	25	Hours	4
		Ext.	75	Credit	4

Objective : To learn the basics of Descriptive Statistics and hypothesis testing and to understand the applications of various correlation methods.

Outcome : Statistical knowledge provides the systematic data collection, survey and facts on data.

Unit 1 Descriptive Statistics: Measures of central tendency, arithmetic mean, geometric mean, harmonic mean, median and mode for grouped and ungrouped data.

Unit 2 Measures of dispersion, range, quartile deviation, variance, standard deviation, coefficient of variation, skewness and kurtosis.

Unit 3 Curve Fitting and Method of Least Squares: Curve fitting – Fitting of straight line – Fitting of second degree Parabola – Method of least squares.

Unit 4 Correlation Analysis: Definition of Correlation – Scatter diagram, Karl Pearson's coefficient of correlation, rank correlation.

Regression Analysis: Regression – Linear regression – Adjusted R-squared Residual Analysis.

Testing of Hypothesis: Null and Alternate Hypothesis – z-test, Student's-t test, Chi-squared test – Analysis of variance (one-way Anova).

Unit 5 Statistics with R – Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – Data Range, Frequencies, Mode, Mean and Median in R: Applying Trim Option, Applying NA Option – Measures of dispersion in R. Curve fitting in R – Testing the significance of Correlation coefficient and Regression in R. Hypothesis testing in R. Anova in R.

Text Books:

1. Fundamentals of Mathematical Statistics. Gupta S.C. and Kapoor V.K., Sultan Chand & Sons Publications, New Delhi.
2. Beginning R - The Statistical Programming Language, Mark Gardener, Wiley Publications, 2015

Reference Books:

1. Book of R. A First Course in Programming and Statistics. Tilman. Davies, July 2016, 832 pp. ISBN – 13: 978 – 1 – 59327 – 651 – 5.
2. Beginning R – An Introduction to Statistical Programming, Larry Pace, Apress.

M.Sc.	Subject Code:	Core: XIV-P		Semester	III
Computer Science	**MACHINE LEARNING LAB USING PYTHON**	Int.	40	Hours	5
		Ext.	60	Credit	4

Objective : Acquire skills in data analysis, aware on data manipulation and visualization packages preprocessing ability and EDA

Outcome : Knowledge on, data collection and structuring, basic data analysis techniques in Python, predictive models, machine learning techniques to real world problems, Python segmentation of the datasets, and to construct basic neural network for solving simple problems.

Python Machine Learning Exercises

1 Data Preprocessing and EDA

2 Linear Regression

3 Multilinear Regression

4 Logistic Regression

5 Decision Tree

6 Naïve Bayesian Theorem

7 KNN Algorithm

8 K Means Clustering Algorithm

9 Hierarchical Clustering Algorithm

10 Neural Networks

Reference Books:

1. Machine Learning, Tom M. Mitchell, McGraw Hill Education (India) Private Limited, 2013.
2. Introduction to Machine Learning (Adaptive Computation and Machine Learning), Ethem Alpaydin, The MIT Press 2004.
3. Machine learning: An Algorithmic Perspective, Stephen Marsland, CRC Press, 2009.
4. Genetic Algorithms and Genetic Programming, Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, CRC Press Taylor and Francis Group.
5. Python: The Complete reference, Martin C. Brown, MGH, 2001.

M.Sc.	Subject Code:	CBE: II		Semester	III
Computer Science	**CORE BASED ELECTIVE (CBE) – II: DISCIPLINE SPECIFIC ELECTIVE (DSE) – II: PARALLEL PROCESSING**	Int.	25	Hours	4
		Ext.	75	Credit	3

Objective : To provide basic knowledge on parallel processing systems with its architecture and software implementation procedure.

Outcome : Parallel Architecture, System Attributes, Program Partitioning and System Interconnect architecture are studied. Acquired skills on Linear and Non-Linear Pipelining and Instruction Pipeline Design. Acquaintance on SIMD Computer Architectures such as MasPar – 1, CM2 AND CM5 architectures. Awareness on Parallel Software and compilers for Parallel systems is gained.

Unit 1 Parallel Computer Models: State of computing – Computer Development Milestones – Elements of Modern computers – Evolution of computer architecture – System attributes to Performance – Multiprocessors and Multicomputers – Shared Memory Multiprocessors – Distributed Memory Multicomputers – A Taxonomy of MIMD Computers – Multivector and SIMD Computers – Vector Supercomputers – SIMD Supercomputers.

Unit 2 Program and Network properties – Conditions of Parallelism – Data and Resource Dependences – Hardware and Software Parallelism – Role of compilers – Program Partitioning and Scheduling – Grain Sizes and Latency – Grain Packing and Scheduling – Static Multiprocessor Scheduling – Program flow mechanisms – Control Flow versus Data Flow – Demand Driven Mechanisms – Comparison of Flow Mechanisms – System Interconnect architectures – Network Properties and Routing – Static Connection Networks – Dynamic connection Networks.

Unit 3 Pipelining and Superscalar Techniques: Linear Pipeline Processors – Asynchronous and Synchronous models – Clocking and Timing Control – Speed up, Efficiency and Throughput – Non-linear Pipeline Processors – Reservation and Latency analysis – Collision Free scheduling – Pipeline Schedule Optimization – Instruction Pipeline design – Instruction Execution phases – Mechanisms for Instruction Pipelining – Dynamic Instruction scheduling – Branch Handling techniques.

Unit 4 Multiprocessors and Multicomputers: Message Passing Mechanisms – Message Routing schemes – Deadlock and Virtual channels – Flow Control strategies – Multicast Routing algorithms – SIMD Computers: SIMD Computer organizations – Implementation Models – The CM-2 Architecture – The MasPar MP-1 Architecture – The Connection Machine-5 – Synchronized MIMD machine – The CM-5 Network Architecture – Control Processors and Processing Nodes – Interprocessor Communications.

Unit 5 Software for Parallel Programming: Parallel Programming models – Shared variable model – Message passage model – Data parallel model – Object oriented model – Functional and logic models.

Parallel Languages and Compilers: Languages features for Parallelism – Parallel Language Constructs – Optimizing Compilers for Parallelism – Dependence Analysis of Data arrays – Iteration space and dependence analysis – Subscript Separablility and Partitioning – Categorized dependence tests.

Text Book:

1. Advanced Computer Architecture, Parallelism, Scalability, Programmability, Kai Hwang, TMGH, New Delhi, 2001.

   UNIT: 1: Chapter – 1: 1.1 – 1.3 (Pages 1 – 32)

   UNIT: 2: Chapter – 2: 2.1 – 2.4 (Pages 51 – 95)
   UNIT: 3: Chapter – 6: 6.1 – 6.3 (Pages 265 – 296)
   UNIT: 4: Chapter – 7: 7.4, Chapter – 8: 8.4 – 8.5 (Pages 375 – 393, 447 – 467)
   UNIT: 5: Chapter – 10: 10.1 – 10.3 (Pages 547 – 577)

Reference Books:

1. Computer Architecture and Parallel Processing, Kai Hwang and Baye A. Briggs, McGraw Hill International Editions, Singapore, 1985.
2. Parallel Computing, Theory and Practice, Michael J. Quinn, McGraw Hill International Edition, Singapore 1994.

M.Sc.	Subject Code:	CBE: III-P		Semester	III
Computer Science	**CORE BASED ELECTIVE (CBE) – III-P: DISCIPLINE SPECIFIC ELECTIVE(DSE)–III: STATISTICAL ANALYSIS USING R AND PHP LAB**	Int.	40	Hours	4
		Ext.	60	Credit	3

Objective : R Programming: To study various data structure implementations, Statistical and textual data manipulations and web-oriented programming.

PHP: To create dynamic Web page, data processing, database accessibility and to study simple user accountability.

Outcome : R Programming: Data type and its structures, capability to handle data in various packages, and opinion on text reviews are studied.

PHP: Generation of dynamic Web page content, data processing, database accessibility and simple user involvement activities are studied

R Programming Exercises

1 Presentation of data Visualization.

2 Arithmetic Mean (AM), geometric mean, harmonic mean.

3 Mode, median, variance standard deviation

4 Absolute and relative measures of dispersion.

5 Problems on skewness and kurtosis.

6 Fitting of curves by least squares method.

7 Finding Correlation coefficient.

8 Rank correlation.

9 Regression analysis.

10 Interpret and report one-way ANOVA

PHP Exercises

1	Program that displays a different message based on time of day. For example page should display “Good Morning” if it is accessed in the morning.
2	Creation of a database and tables using MySQL.
3	Program to insert record into a table using MySQL.
4	Program to update table.
5	Program to select data and show into table format.
6	Program to drop table using MySQL.
7	Program to drop a database using MySQL.
8	Student Registration to Save and Display the Student Record.
9	Uploading Audio and Image.
10	Program that keeps track of how many times a visitor has loaded the page.

Reference Books:

1. Fundamentals of Mathematical Statistics. Gupta S.C. and Kapoor V.K., Sultan Chand & Sons Publications, New Delhi.
2. Beginning R - The Statistical Programming Language, Mark Gardener, Wiley Publications, 2015.
3. Beginning R – An Introduction to Statistical Programming, Larry Pace, Apress.
4. Beginning PHP 5.3, Matt Doyle, Wiley Publishing, Inc. Indianapolis, 2010.
5. The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL, Alan Forbes, Createspace Independent Publishing Platform, 2015.
6. Learning PHP and MYSQL, Michele E. Davis, Jon A Philips, O’Reilly, 2007

Web Resource:

https://cran.r-project.org

Practical Question Paper pattern: (Maximum 60 Marks)	
One Question from R	Due Weightage to be granted on question's robustness
One Question from PHP	Less Weightage to be granted on question's robustness

M.Sc.	Subject Code:	NME: II		Semester	III
Computer Science	**NON-MAJOR ELECTIVE – II:** **SPREAD SHEET**	Int.	25	Hours	3
		Ext.	75	Credit	2

Objective : To make the students understand the concepts of Spread sheet.

Outcome : To appreciate the different modules of features in Spread sheet such as Charts, Engineering functions and advanced techniques.

Effective use of built-in functions to find solutions to the mathematical problems.

Unit 1 Introduction to Spread sheet – Spread sheet terminologies – Opening, Saving and Closing Workbook – Reposition of Worksheets, Inserting, Deleting, Copy and Renaming – Entering, Copying and Formatting of Data – Editing the Worksheet – Protecting the Worksheet – Calculation in a worksheet.

Unit 2 Formulas and Functions: Creating a Formula, Formula Auditing and Copying formulae – Use of relative and absolute References – Functions: Advantages, Inserting built-in functions – Built-in functions: Mathematical functions only, Statistical (Count, Sum, Averages, Min, Max, Correlation, Pearson, Standard Deviation and Variance), Date & Time and Engineering functions (Number Systems only).

Unit 3 Data Visualization: Charts – Chart elements – Titles, Legend, Data labels – Creating a New Chart, Formatting the Chat – Types of Charts (Column, Line, Pie, Bar, X Y Scatter, Histogram, and Waterfall).

Unit 4 PivotTables: Creating a PivotTable – Filtering and Sorting a PivotTable – Using Slicers to manipulate PivotTables – Creating a PivotChart.

Unit 5 Data Analysis: Filtering Data: Creating a Custom AutoFilter, Advanced Filter – Data Group, Ungroup and Subtotals – Data validation using Drop down – Searching using VLookup and HLookup functions.

Text Book:

1. Step-by-Step in Excel 2010, Joyce Cox, Joan Lambert and Curtisfrye, PHI Publications, New Delhi.

Reference Books:

1. Excel for Dummies, Gerg Harvey, John Wiley & Sons, 2016.
2. Excel Formulas and Functions: The Step by step Guide with Examples, Adam Ramirez, Excel Academy, 2020.
3. Data Analysis with Excel, Manisha Nigam, BPB Publications.
4. Excel Bible, Michael Alexander, Dick Kusleika, John Walkenbach, John Wiley & Sons, 2019.

Web References:

https://wiki.openoffice.org/wiki/Category:Calc_Guide_(Documentation)

https://support.microsoft.com/en-us/excel

M.Sc.	Subject Code:	SEC: III		Semester	III
Computer Science	**SKILL ENHANCEMENT COURSE (SEC)–III: PHP**	Int.	25	Hours	2
		Ext.	75	Credit	2

Objective : To design Web pages, database connectivity and manipulation using the open source general purpose server side scripting language PHP (short for Hypertext PreProcessor)

Outcome : Knowledge on PHP fundamental command, Form designing and MySQL connectivity and database manipulation activities are acquired.

Unit 1 PHP Language Basics – Functions – Decision and Looping. Strings – Arrays

Unit 2 Handling HTML Forms with PHP – Capturing Form Data with PHP – Dealing with Multi – Value Field. Generating Web Forms with PHP – Storing PHP Variables in Forms.

Unit 3 Creating File Upload Form – Accessing Information on Uploaded Files – Storing and Using an Uploaded Files. Preserving State with Query Strings, Cookies and Sessions

Unit 4 Introducing Databases and SQL – Connecting to MySQL from PHP – Making a Connection – Reading Data – Retrieving Data from MySQL with PHP – Manipulating MySQL Data with PHP.

Unit 5 Using MySQL and PHP Together: Creating forms to Display, Add, Edit, and Delete data.

Text Books:

1. Beginning PHP 5.3, Matt Doyle, Wiley Publishing, Inc. Indianapolis, 2010. (Unit – 1 to Unit – 4).
2. The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL, Alan Forbes, Createspace Independent Publishing Platform, 2015.(Unit – 5)

Reference Book:

1. Learning PHP and MYSQL, Michele E. Davis, Jon A Philips, O'Reilly, 2007

M.Sc.	Subject Code:	CBE: IV		Semester	IV
Computer Science	**CORE BASED ELECTIVE (CBE) – IV: DISCIPLINE SPECIFIC ELECTIVE (DSE)–IV: ADVANCED COMPUTING CONCEPTS**	Int.	25	Hours	4
		Ext.	75	Credit	3

Objective : To learn the current Technologies and trends in computing.

Outcome :
1. Genetic algorithms' optimizing techniques and methodologies,
2. Basic concepts in Artificial Intelligence,
3. Finger, hand, facial, eyes and voice metrics for authentication,
4. Basic design of embedded system,
5. Digital image processing for edge detection and pre-processing are learned.

Unit 1 Fundamentals of Genetic Algorithms: Evolution of Genetic Algorithms – Basic Concepts – Creation of Offsprings – Working Principle – Encoding – Fitness Function – Reproduction. Genetic Modeling: Inheritance operators – Cross over – Inversion and Deletion – Mutation operator – Convergence of Genetic Algorithm

Unit 2 Artificial Intelligence: Introduction: AI Problems – AI techniques – Tic-tac-toe problem – Problems, Problem Spaces – Search: Defining the problem as a State space search – Production Systems – Problem characteristics – Production System Characteristics. Game playing: Overview – The minimax search procedure

Unit 3 Biometrics: Authentication – Biometric Authentication – Key elements of Biometric Systems – Different types of Biometrics: Fingerprint and Hand geometry and their uses – Facial and Voice Recognition – Eye Biometrics: Iris and Retina scanning.

Unit 4 Embedded Systems: Definition – Classification – applications – purpose – Embedded system core – Microprocessor versus Microcontroller – DSP – RISC versus CICS – Harvard architecture – Von Neumann architecture – Memory – Sensors and Actuators. Communication interface: UART – USB – Bluetooth – WiFi – GPRS – Embedded Firmware – Task communication: shared memory and dead lock handling. (Only basics of task scheduling and task synchronization).

Unit 5 Digital Image Processing: Image Acquisition – Edge Detection using Robert, Sobel, and Prewitt masks – Edge detection using Laplacian mask – Edge linking.

Text Books:

UNIT 1 :-

1. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran, and G. A. Vijayalakshmi Pai, Synthesis and Applications, PHI, New Delhi, 2012 (Pages: 225 – 263, 271).

UNIT 2 :-

2. Artificial Intelligence, 2nd Edition, Elaine Rich and Kevin Knight, Tata McGraw Hill Publishers company Pvt. Ltd, 1991.

UNIT 3 :-

3. Biometrics – The Ultimate Reference, John D. Woodward, Jr., Nicholas M. Orlans, and Peter T. Higgins, Dreamtech Press, 2003.

UNIT 4 :-

4. Introduction to Embedded System, Shibu K V, TMGH, 2009.

UNIT 5 :-

5. Digital Image Processing, S. Jayaraman, S. Esakkirajan, and T. Veerakumar, TMH, 2008.

M.Sc.	Subject Code:	SEC: IV		Semester	IV
Computer Science	**SKILL ENHANCEMENT COURSE (SEC)–IV: PRINCIPLES OF WEB SERVICES**	Int.	25	Hours	2
		Ext.	75	Credit	2

Objective : To enable the student to be familiar with distributed services, XML and web services and to study the use of web services in B2C and B2B applications

Outcome : On completion of this course the learner should be able to understand the basics of web services and its importance in B2C and B2B applications, XML scripts, the design principles, SOAP and WSDL in enterprise application and the knowledge of UDDI.

Unit 1 Introduction: Concepts of Web Services – SOAP, WSDL, UDDI – Importance of Web Services – Evolution of Web Applications – Distributed Computing Platform – Web Services and Enterprises.

Unit 2 XML Fundamentals: XML document – XML Namespaces – XML schema Introduction.

Unit 3 Basic Web Services: SOAP Model – SOAP Messages – SOAP Encoding – SOAP RPC – Using Alternative SOAP Encodings – Document, RPC, Literal, Encoded SOAP.

Unit 4 WSDL: Structure – Interface – Types element – Binding – Services – Managing Descriptions – Extending WSDL – Using SOAP and WSDL.

Unit 5 UDDI: UDDI at a Glance – UDDI Business Registry – Specification – UDDI data structures – Accessing UDDI.

Text Book:

1. Developing Enterprise Web Services: An Architects Guide, Sandeep Chatterjee and James Webber, Prentice Hall, Nov 2003.

Reference Books:

1. XML: The Complete Reference, Heather Williamson, Tata McGraw Hill Education India.
2. Web Services: An Introduction, B. V. Kumar and S. V. Subramanya, Tata McGraw Hill Publishing Co., New Delhi, 2006.

M.Sc.	Subject Code:	EA		Semester	IV
Computer Science	**EXTENSION ACTIVITY**	Int.	25	Hours	-
		Ext.	75	Credit	1

Objective : Introduce and induce students to the live along with society, opportunities to use the target words and definitions during interesting, engaging, and contextualized activities

Outcome : Better lively-hood, social responsibility and enhance collective achievements among students.

M.Sc.	Subject Code:	PROJECT		Semester	IV
Computer Science	**PROJECT**	Int.	25	Hours	24
		Ext.	75	Credit	10

Objective : An individual or collaborative enterprise computerization with careful planning to achieve a particular aim /objective with self-study and team work.

Outcome : Events handling and decision making, changes in conditions, individual and team behavior or attitudes, computerization steps and progress toward a project's goals with specific, measurable, and meaningful work.