KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

.

DEPARTMENT OF COMPUTER SCIENCE (PG)

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)

(2023 - 2024 onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

Coimbatore – 641029

Vision:

Developing the total personality of every student in a holistic way by adhering to the principles of Swami Vivekananda and Mahatma Gandhi.

Mission:

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Motivating the teachers in such a way that they become the role models in promoting Higher Education.

DEPARTMENT OF COMPUTER SCIENCE

Vision:

To inculcate Human, Moral and ethical values in the young minds of the students and thereby improving the total personality of the students.

Mission:

- To produce employable graduates to cater the needs of various industries.

PROGRAMME OUTCOMES (PO)

PO1 Understand the basic concepts, fundamental principles and scientific theories that are needed for higher learning and research.

PO2 Identify, formulate and analyze the complex situations to arrive acceptable solutions by applying domain specific knowledge, acquired through the programme.

PO3 Learn moral and ethical values and commit to professional ethics and responsibilities in the associated disciplines. Exercise social concern with the ability to act with awareness of issues in diversified domains to participate in the national development.

PO4 Ability to design, implement and evaluate a computational system to meet the desired needs within realistic constraints.

PO5 Realize the need for self and life-long learning to move along with the scientific and technological developments.

PO6 Ability to communicate and engage effectively with diverse stakeholders.

PO7 Analyze the impacts of computing on individuals, organizations and society.

PO8 Acquire skills of observing and drawing logical inferences from the scientific facts.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1 Impart the core knowledge in the areas such as Software Engineering, Data Communication, Networking and Security, Database Management, Web Technology, Operating System, Artificial Intelligence and other emerging areas in Computer Science.

PSO2 Provide well trained professionals to industries by enhancing the programming skills and new computing technologies through theoretical and practical knowledge.

PSO3 Train to solve real world problems by selecting appropriate techniques and best logic.

PSO4 Enhance the ability to design and develop software applications, to understand the basic concepts of hardware and to comprehend and apply mathematical and accounting principles.

PSO5 Make use of Computer Science techniques to one's own work as a member or a leader in a team to arrive conclusions and carryout projects.

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
COIMBATORE – 641 029

MASTER OF SCIENCE IN COMPUTER SCIENCE

Curriculum and scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2023-2024)

Semester	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam (hours)	Credits
				CIA	ESE	TOTAL		
I	23PCS101	Core Paper 1 - Data Structures using Python	6	25	75	100	3	4
	23PCS102	Core Paper 2 - Advanced Relational Database Management Systems	6	25	75	100	3	4
	23PCS1CL	Core Practical 1- Data Structures using Python Lab	6	40	60	100	3	4
	23PCS1CM	Core Practical 2- Advanced RDBMS Lab	6	40	60	100	3	4
	23PCS1E1	Major Elective 1	6	25	75	100	3	5
		Total	**30**	**-**	**-**	**500**	**-**	**21**
II	23PCS203	Core Paper 3- Advanced Java Programming	5	25	75	100	3	4
	23PCS204	Core Paper 4- Data Mining and Warehousing	5	25	75	100	3	4
	23PCS205	Core Paper 5- .Net Framework	5	25	75	100	3	4
	23PCS2CN	Core Practical 3 - Advanced Java Lab	5	40	60	100	3	4
	23PCS2CO	Core Practical 4 – .Net Lab	5	40	60	100	3	4
	23PCS2E2	Major Elective 2	5	25	75	100	3	5
		Total	**30**	**-**	**-**	**600**	**-**	**25**
III	23PCS306	Core Paper 6 – Web Technologies	6	25	75	100	3	4
	23PCS307	Core Paper 7- Big Data Analytics	6	25	75	100	3	4
	23PCS3CP	Core Practical 5- Web Technologies Lab	6	40	60	100	3	4
	23PCS3CQ	Core Practical 6- Big Data Analytics Lab	6	40	60	100	3	4
	23PCS3N1	Non Major Elective 1	4	25	75	100	3	4
		EDC Paper	2	100	-	100	3	2
		Total	**30**	**-**	**-**	**600**	**-**	**22**
IV	23PCS408	Core Paper 8- Internet of Things	4	25	75	100	3	4
	23PCS409	Core Paper 9 - Advanced Computing	5	25	75	100	3	4
	23PCS4CR	Core Practical 7- Internet of Things Lab	5	40	60	100	3	4
	23PGI4N2	Non Major Elective 2	4	100	-	100	3	4
	23PCS4Z1	Project and Viva voce	12~	20	80	100	-	6
		Total	**30**	**-**	**-**	**500**	**-**	**22**
Grand Total			**120**	**-**	**-**	**2200**	**-**	**90**

Note:

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

Major Elective Papers (2 papers are to be chosen from the following list of papers)

1. Network Security and Cryptography
2. Quantum Computing
3. Artificial Intelligence and Machine Learning
4. Digital Image Processing.

Non Major Elective Papers (2 papers are to be chosen from the following 2 papers)

1. **Information Security #**
2. Management Information System
3. Business Intelligence

#to be offered by the respective departments.
~ Not included in the Staff workload

Sub.Code & Title of the Extra Departmental Course (EDC):

23PCS3XL– EDC Paper 1 - Internet and Web Designing Lab

Note:
In core subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core subjects remain the same as stated below.

Tally Table:

Subject	No. of Subjects	Total Marks	Credits
Core – Theory / Practical / Project	17	1700	70
Major Elective Papers	2	200	10
EDC Paper	1	100	2
Non Major Elective Paper	2	200	8
Grand Total	**22**	**2200**	**90**

- 25 % CIA is applicable to all subjects except JOC and COP which are considered as extra credit courses.
- The students should complete any **MOOC On learning platforms like SWAYAM, NPTEL, Course era, IIT Bombay Spoken Tutorial etc.,** before the completion of the 5th semester and the course completed certificate should be submitted through the HOD to the Controller of Examinations. Extra credits will be given to the candidates who have successfully completed.

- **Onsite Training** preferably relevant to the course may be undertaken as per the discretion of the faculty or HOD.

Components of Continuous Internal Assessment

Components		Marks	Total
Theory			
CIA I	75	(75+75 = 150/10) 15	25
CIA II	75		
Assignment/Seminar		5	
Attendance		5	
Practical			
CIA Practical		25	40
Observation Notebook		10	
Attendance		5	
Project			
Review		15	20
Regularity		5	

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

1. Theory Examination:

CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K1 - K5 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 - K5 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

2. Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments	50	60
K4	Record Work	10	
K5			

3. Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report	60	80
K4	Viva voce	20	

SYLLABUS

First Year

(Semester – I)

Sub.Code:23PCS101

ProgrammeCode:**09**	**M.Sc.ComputerScience**		
Titleofthe Paper:	**Core Paper 1 - Data Structures using Python**		
Batch	Hours/Week	TotalHours	Credits
2023-2024	**6**	**90**	**4**

CourseObjectives

1. To Inculcate the Knowledge of various data structures and definitions.
2. To provide the use of data structure background for programming with Python.
3. To develop the proficiency for planning & organizing the data structures.

CourseOutcomes(CO)

K1 to K5	CO1	Students will get the knowledge of data structures and its usage
	CO2	Distinguish the Various data structures
	CO3	Skills to describe the data structures appropriately for programming
	CO4	Apply appropriate algorithms and data structures for various applications
	CO5	Implement Data Structures with Python coding

Syllabus

UNIT I **(18 Hours)**

Introduction to Python: Python – Features of Python – Data types in python – Built-in data types – sequences in python – sets – literals – operators in python - input and output – control statements: if, while, for, Arrays: creating an array – importing the array module – indexing and slicing on arrays – processing the arrays – viewing and copying arrays – dimensions of array.

UNIT II **(18 Hours)**

Strings and characters: creating, indexing, removing spaces from a string. – String testing methods – formatting the string – sorting – searching. Function: defining a function – calling a function – returning results from a function – returning multiple values from a string – Lists and Tuples: creating lists using range() function – updating the elements of list – methods to process lists- sorting the list elements- operations in dictionaries: dictionaries-dictionaries methods.

UNIT III **(18 Hours)**

Introduction & overview: Data Structures, Data Structure operations- Algorithm: Complexity, Time space, Trade off. Array, Records & Pointers: Introduction – Linear Array-Representation of Linear Array-Inserting and Deleting. Linked Lists: Introduction - Representation of Linked list in memory – Traversing a linked list – Insertion into a linked list – Deletion from linked list.

UNIT IV	**(18 Hours)**
Stacks & Queues, Recursion: Introduction – Stack – Array representation of stack – linked representation of stack – Recursion – Queues – linked representation – Dequeue – * Applications of Stack & Queue.	
UNIT V	**(18Hours)**
Trees: Binary Tree – Traversing Binary tree – Binary Search Tree.Sorting & Searching: Insertion – Selection sort – Bubble sort – Quick sort – Merge sort – Radix sort – Shell sort. Hashing.	
*Self-study and questions for examinations may be taken from the self-study portions also.	
Teaching Methods:	
Chalk and Talk/ Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class/peer Learning/Experiential Learning/Blended Learning.	
Text Book:	
1. Dr. R. Nageswara Rao, Core Python Programming, 2nd(Kindle Edition), 2017 (unit I & II) 2. Seymour Lipchitz, Adopted by G.A.V. PAI, Data Structures, Schaum's Outline, McGraw Hill Publications. 2013 & 2006 (Unit III, IV & V).	
Reference Books:	
1. Wiley, Data Structures and Algorithms Using Python, Wiley Student edition.2016. 2. Problem Solving in Data Structures & Algorithms Using Python, First edition, 2016.	

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	L
CO2	S	M	S	H	H
CO3	S	M	S	H	H
CO4	S	S	S	S	S
CO5	S	H	S	S	H

S–Strong **H**–High **M**–Medium **L**–Low

Sub.Code:23PCS102

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Paper 2 - Advanced Relational Database Management Systems**		
Batch	Hours/Week	TotalHours	Credits
2023-2024	**6**	**90**	**4**

CourseObjectives

1. To understand and apply the principles of data modelling using Entity Relationship and develop a good database design.
2. To understand the use of SQL and its syntax and apply Normalization.
3. To understand the concept of information retrieval.

CourseOutcomes (CO)		
K1 to K5	CO1	Student will master the basic concepts of Databases
	CO2	Student will have high level understanding of relational model and SQL.
	CO3	Student will be proficient in data Normalization
	CO4	Students will understand security concept and informational retrieval.
	CO5	Students will understand an analyze the technology in Cloud Database

Syllabus	
UNIT I	**(18 Hours)**
Overview of Database Systems: Managing data-File System versus DBMS- Advantages of DBMS-Describing and storing data in a DBMS -Database design: Database design and ER diagrams-Entities, Attributes and Entity sets-Relationship and relationship sets- Additional features of the E-R model-Conceptual design with E-R model-Logical database design-Introduction to Views-Destroying altering tables and views.	
UNIT II	**(18 Hours)**
Queries, Constraints and Triggers: Overview-the form of a basic SQL query-Union, Intersect and Except-Join types and conditions: Natural Join - Inner Join – Outer Join-Nested queries-Aggregate operators-Null values-Complex integrity constraints in SQL-Triggers and active databases.	
UNIT III	**(18 Hours)**
Transaction Management: The ACID properties-Transaction and schedule-Concurrent execution of transactions-Lock based concurrency control - Performance of locking* - Transaction support in SQL-Concurrency control: 2PL, Serializability and Recoverability-Introduction to lock management-Lock conversion-Dealing with deadlocks.	
UNIT IV	**(18 Hours)**
Schema refinement and normal forms: Introduction-Functional dependencies - Normal forms - Properties of decomposition-Normalization-Schema refinement in database design- Other kind of dependencies Security and Authorization : Introduction-Access control-Discretionary access control -Mandatory access control.	
UNIT V	**(18 Hours)**

Introduction to Cloud Databases: Database Options in the Cloud – The Changing Role of DBA in the Cloud – Moving the Databases to the Cloud. Information Retrieval: Introduction to IR - DBMS versus Information Retrieval - Indexing for text search – Web search engines – Managing text in DBMS.
*Self-study and questions for examinations may be taken from the self-study portions also.
Teaching Methods:
Chalk and Talk/ Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class/peer Learning/Experiential Learning/Blended Learning.
Text Book:
1. Ragu Ramakrishnan, Johannes Gehrke, **"Database Management Systems"**, 3rd Edition, Tata McGraw Hill Publication, 2003. 2. Wendy Neu, Viad Viasceanu, Andy Oram, Sam Alapati, **"An Introduction to Cloud Databases"** O'Reilly,2019.
Reference Books:
1. Elmarsri Navathe, Ranez Shankand, "Fundamentals of Database Systems", 5th Edition, Pearson Publication, 2008. 2. Silberschatz, Henry Korth, "Database System Concepts", 6th Edition, Tata McGraw Hill Publication, 2011.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	H	H
CO2	M	H	H	S	H
CO3	H	S	S	M	S
CO4	H	M	H	S	H
CO5	S	H	M	H	S

S–Strong **H**–High **M**–Medium **L** –Low

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Practical 1 – Data Structures using Python Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**6**	**90**	**4**

Course Objectives

1. To Inculcate the Knowledge of various data structures and definitions.
2. To provide the use of data structure background for programming.
3. To make a decision of appropriate data structure for programming.

Course Outcomes (CO)		
K1 to K5	CO1	Distinguish the Various data structures
	CO2	Skills to describe the data structures appropriately for programming
	CO3	Apply appropriate algorithms and data structures for various applications
	CO4	Evaluate the Various Data Structures with various applications
	CO5	Evaluate various Data Structures with different applications using Python

LIST OF PRACTICAL PROBLEMS

1. Array Creation and Operations.
2. Stack and Queue Operations.
3. Recursion, Infix to Postfix Conversion.
4. Implementation of Linked List.
5. Tree Traversals.
6. Graph-Shortest Path.
7. Searching-Linear, binary, Fibonacci.
8. Sorting-Radix, shell, Quick, Heap, Merge.

Teaching Methods:

Program Demonstration and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical – 25, Observation-10, Attendance – 5]

ESE: Two Questions will be given for each student. (3Hours/60marks)Record:10Marks

Algorithm, Coding and execution – 50 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Execution & viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	L
CO2	S	M	S	H	H
CO3	S	M	S	H	H
CO4	S	S	S	S	S
CO5	S	S	H	S	S

S– Strong **H** –High **M**–Medium **L**–Low

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Practical 2 – Advanced RDBMS Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**6**	**90**	**4**

Course Objectives

1. To define schema and creation of Databases.
2. To write SQL Queries to retrieve information from Databases.
3. To use host language interface with Embedded SQL.

Course Outcomes (CO)		
K1 to K5	CO1	Creation of Databases
	CO2	Retrieval of Information of Databases
	CO3	Use of Forms and Report writer packages
	CO4	Use of host language interface with Embedded SQL
	CO5	Use the role of Cloud architecture in the storage design

LIST OF PRACTICAL PROBLEMS

1. Queries to perform SET operations, Views, Aggregate Operators and Triggers.
2. Online Reservation System.
3. Personal Information.
4. Student Mark Processing.
5. Stock Maintenance.
6. College Admission
7. Cloud Database

Teaching Methods:

Program Demonstration and Hands on training using LCD Projector.

Guidelines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical – 25, Observation-10, Attendance – 5].

ESE: Two Questions will be given for each student. (3Hours/ 60 marks)Record: 10 Marks

Algorithm, Coding and execution – 50 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Execution &Viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	L
CO2	S	M	S	H	H
CO3	S	M	S	H	H
CO4	S	S	S	S	S
CO5	S	M	H	M	S

S– Strong **H** –High **M**–Medium **L**–Low

SYLLABUS

First Year

(Semester – II)

Sub.Code:23PCS203

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Paper 3 - Advanced Java Programming**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**4**

Course Objectives

1. To understand the basic concepts of Object oriented programming.
2. To inculcate the concepts of networking and graphics offering a GUI environment.
3. To educate the concepts of database management and essentials of Servlets.

Course Outcomes (CO)		
K1 to K5	CO1	Ability to understand the applications in OOPS paradigm.
	CO2	Students can establish Client-Server network and enable Multithreaded applications
	CO3	Will Effectively use Applets, Event and Construction of Bean API, providing a GUI environment,
	CO4	Capable of better Backend Management, can compose complex applications with Swings and Servlet.
	CO5	Develop applets for web applications and design GUI based applications

Syllabus	
UNIT I	**(14 Hours)**
Introduction: Inheritance: basics-Using super keyword- Multilevel inheritance – Overriding – Dynamic method dispatch – Abstract – Using final with inheritance. Packages and Interfaces: Packages- Access protection-Importing Packages. Interface – Defining interface- Variables in interface-Implementing an interface.	
UNIT II	**(16 Hours)**
Exception handling: Fundamentals – Using try and catch – Nested try statements - Throw – Throws – Finally – Using built in exceptions – Creating own exceptions. Multithreading: Thread model – Creating a thread- Using is Alive() and join() Thread priorities – Synchronization – Deadlock- Suspending ,resuming and stopping threads.File Input Stream-File Output Stream. Networking: Inet address TCP/IP client/ server sockets.- Datagrams. Applet Class: Applet basics-Applet Skeleton-A simple Applet-HTML Applet tag.	
UNIT III	**(15 Hours)**
Event handling: Event model - Event classes - Event Listener interface- Adapter classes.	

Graphics: Window Fundamentals - Working with graphics, color and font. AWT Controls Fundamentals – Labels-Buttons- Checkboxes-Lists – Text field – Layout managers - Menu bars and menus.

UNIT IV	**(15 Hours)**

JDBC: Connecting java with Oracle-Java Beans: Advantages – using BDK – JAR files

– Introspection- Developing simple bean using the BDK *.

UNIT V	**(15 Hours)**

Swing – Japplet – Icons and JLabel, JTextField, JPasswordField, JButton, JCheckBox, JRadioButton, JComboBox, JScroll panes - JTabbed panes – Trees – Tables.

Servlets – Simple Servlet – life cycle – Servlet API – Servlet Package.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class/peer Learning/Experiential Learning/Blended Learning

Text Book:

1. Herbert Schildt, "Java, The Complete Reference", Eighth edition, Tata McGraw Hill Publication, 2011.
2. E.Ramraj, P.Geetha, S.Muthukumaran Ädvanced Java Programming",YesDee Publishing, 2020

Reference Books:

1. Cay S. Horstmann, Gary Cornell, (2013), "Core Java®, Volume II—Advanced Features, Ninth Edition" Prentice Hall.
2. Hariom Choudhary, (2015),"Introduction to Java Programming, Comprehensive Version 2014-2015".

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	L
CO2	S	S	H	H	M
CO3	H	M	H	S	L
CO4	M	H	S	H	H
CO5	S	H	M	H	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code:23PCS204

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Paper4 - Data mining and Warehousing**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**4**

Course Objectives

1. To inculcate the basics of Data Mining and Data Warehousing.
2.
3. To recognize the various data mining and warehousing tools in the business environment/ state of the market.
4. To develop the proficiency for planning & applying the DM techniques.

Course Outcomes (CO)		
K1 to K5	CO1	Understand the basics of Data Mining & Data Warehousing.
	CO2	Identify the appropriate Data Mining techniques for problem solving
	CO3	Demonstration of various data mining techniques and warehousing tool
	CO4	Implement the methods and techniques to develop a small project
	CO5	Implement the methods and techniques to develop a small project

Syllabus	
UNIT I	**(14 Hours)**
Data Mining: Introduction - what is Decision tree? – Where to use Decision Trees – How the Decision Tree Works – Case Study – Strengths and Weaknesses. Neural Networks: What is Neural Network? – Where to use Neural Networks – How the Neural Networks – Case Study - Strengths and Weaknesses.	
UNIT II	**(16 Hours)**
Nearest Neighbor and Clustering: Where to use Clustering and Nearest-Neighbor Prediction – How Clustering and Nearest-Neighbor Prediction Work – Case Study - Strengths and Weaknesses. Genetic Algorithms: What are Genetic Algorithms – Where to use Genetic Algorithms– How the Genetic Algorithm works – Case Study - Strengths and Weaknesses.	
UNIT III	**(15 Hours)**
Rule Induction: Where to use Rule Induction – How Rule Induction Works – Case Study- Strengths and Weaknesses. Data Visualization: Data Visualization Principles- Parallel Coordinates – Visualizing Neural Networks–**Visualization of Trees***–State of the Industry.	
UNIT IV	**(15 Hours)**
Business Analysis: Reporting and Query Tools and Applications: Tool Categories – The Need for Applications - Cognos Impromptu – Applications. On-Line Analytical Processing (OLAP): Need for OLAP – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi-relational OLAP – Categorization of OLAP Tools *– State of the Market – OLAP Tools and the Internet.	
UNIT V	**(15 Hours)**

Data warehousing: Introduction – Data Warehousing Components – Overall Architecture – Data Warehouse Database – Sourcing, Acquisition, Cleanup, and Transformation Tools – Metadata – Access Tools – Data Marts – Data Warehouse Administration and Management – Information Delivery System. Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining.
*Self-studyandquestionsforexaminationsmaybetakenfromtheself-studyportionsalso.
Teaching Methods:
Chalk and Talk/ Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class/peer Learning/Experiential Learning/Blended Learning
Text Book:
1. Alex Berson , Stephen J.Smith, , Data Warehousing (2004), Data Mining & OLAP Tata McGraw Hill, 2004.
Reference Books:
1. Jiawei Han and Micheline Kamber,"Data Mining Concepts and Techniques", Morgn Kaufman Publishers, Second Edition, 2008. 2. Margaret H. Dunham, "Data mining introductory and advanced topics", Pearson education, 2003. 3. ReemaThareja, "Data Warehousing", Oxford University Press, First Edition, 2009.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	M	S	H	S
CO3	S	H	S	H	S
CO4	S	H	S	H	S
CO4	H	H	H	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub. Code: 23PCS205

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Paper5 - .Net Framework**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**4**

Course Objectives

1. To understand .Net framework features like portability and language interoperability concepts.
2. To understand the vb.Net and ASP.Net controls.
3. To understand how to work with database with the help of ADO.Net.

Course Outcomes (CO)		
K1 to K5	CO1	Student will be able to understand .Net framework concepts.
	CO2	Student will be able to remember VB.Net controls windows application.
	CO3	Student will be able to analyze how to use an ASP.Net controls and web application.
	CO4	Student will be able to create or apply database driven Windows application and ASP.Net web applications.
	CO5	Evaluate various Window and Web applications using VB.Net and ASP.Net

Syllabus	
UNIT I	**(15 Hours)**
Understanding .Net-The .Net strategy-The origins of .Net technology-The.Net framework-The CLR-Framework base classes-Visual studio .net-.Net languages-Benefits of .Net approach-VB.NET-new in vb.net-operators-conditionals & loops-Procedures, scope & exception handling.	
UNIT II	**(15 Hours)**
Windows forms and controls-General controls: Label, textbox, button, rich textbox, Link labels, check boxes, radio button, combo box, listbox, timer, progress bar.Container controls: Groupbox, panel, tab control-tooltip-splitters- menus-menu items- context menus-built in dialog box.	
UNIT III	**(15 Hours)**
ASP.NET:Webforms:Buttons,textboxes,labels,Literals,placeholders,checkboxes,radio buttons, tables, panels- images-image lists-tree and list view-toolbars-status bar and progress bars.	
UNIT IV	**(15 Hours)**
Image button, list boxes, drop downlist, hyperlink & link button-Validation controls: required field, regular expression, compare, range validators*-calendars-adrotators-html controls.	
UNIT V	**(15 Hours)**
Data access with ADO.Net - Binding controls to database*-database access with web applications-creating window services, web services-deploying applications.	
*Self-study and questions for examinations may be taken from the self-study portions also.	

Teaching Methods:
Chalk and Talk/ Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class/peer Learning/Experiential Learning/Blended Learning
Text Book:
1. E.Balagurusamy, "Programming in C# A Premier", TMH Publisher co Ltd, 2008. (UNIT I) 2. Steven Holzner, "Visual Basic.Net Programming Black Book", Dream Tech, 2008. (UNIT II.III.IV,V).
Reference Books:
1. Evangelos Petroustes, "Mastering Visual Basic.Net", BPB Publications, First Edition, 2002. 2. KoGENT Solutions Inc., ASP.NET 3.5 (Covers C# and VB 2008 codes) Black Book, Platinum Edition, Dreamtech press, 2010.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	S	H
CO2	M	H	H	S	H
CO3	H	S	H	S	H
CO4	H	H	H	S	H
CO4	L	M	S	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code:23PCS2CN

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Practical 3 – Advanced Java Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**4**

Course Objectives

1. The course inculcates the fundamentals and dynamics of OOPs paradigm.
2. To demonstrate the GUI and advanced functionalities enriching the development skill.
3. To simulate the industrial demands and expertise in the specified domain.

Course Outcomes (CO)		
K1 to K5	CO1	Students will be capable to understand and apply the better usage of OOPs concept.
	CO2	Proficient in developing GUI environment and event handling
	CO3	Establishing networks with socket programming and Sessions
	CO4	Simulates applications with Swings and Servlets.
	CO5	Solve problems using Java collection framework and I/O classes

LIST OF PRACTICAL PROBLEMS

1. Develop applications using package, polymorphism, inheritance and inner class.
2. Applications with applets and sockets.
3. Application with Swing and JDBC concepts.
4. Create applications with multithreading and file concepts.

Teaching Methods:

Program Demonstration, simulation, assignment, Discussion and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical– 25, Observation-10, Attendance– 5]

ESE: Two Questions will be given for each student (3Hours / 60 Marks)RecordWork-10MarksAlgorithm, Codingandexecution–5 0Marks

Particulars	**Program1 (Marks)**	**Program2 (Marks)**
Algorithm	5	5
Program Coding	15	15
Execution & viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	H	M	S	S	H
CO3	H	S	S	H	M
CO4	H	S	S	H	S
CO5	S	M	H	H	S

S– Strong **H** –High **M**–Medium **L**–Low

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Practical 4 – .NET Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**4**

Course Objectives

1. To educate the usage of .Net framework Environment.
2. To understand the usage of controls in .Net.
3. To create database application with ADO.Net.

Course Outcomes (CO)		
K1 toK5	CO1	Effective use of .Net framework concepts.
	CO2	Develop a working knowledge of VB.Net controls
	CO3	Student will be able to build well-formed web controls with validation
	CO4	Student will be able to create or apply database driven windows application and ASP.Net web applications.
	CO5	Implementation of various Window and Web applications using VB.Net and ASP.Net

LIST OF PRACTICAL PROBLEMS

1. Develop applications with windows controls.
2. Develop ADO.Net application to insert, delete and update records in database.
3. Develop a web site using Web controls.
4. Develop a web site with database connection.

Teaching Methods:

Program Demonstration, simulation, assignment, Discussion and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations: (Total Marks : 100)

CIA: Total marks– 40 [Practical– 25, Observation-10, Attendance– 5]

ESE: Two Questions will be given for each student (3Hours / 60 Marks)RecordWork-10MarksAlgorithm, Codingandexecution–5 0Marks

Particulars	**Program1 (Marks)**	**Program2 (Marks)**
Algorithm	5	5
Program Coding	15	15
Execution & viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	S	H
CO2	M	S	H	S	S
CO3	H	S	H	H	H
CO4	H	S	H	**S**	H
CO5	L	H	S	**S**	S

S– Strong **H** –High **M**–Medium **L**–Low

SYLLABUS

Second Year

(Semester – III)

Sub.Code:23PCS306

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Paper 6 - Web Technologies**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**6**	**90**	**4**

Course Objectives

1. To educate the benefits of proprietary and non-proprietary software.
2. To inculcate the significance of freeware Web Technologies.
3. To promote the web designing skills and data handling with Server-side scripts.

Course Outcomes (CO)		
K1 to K5	CO1	Will enhance their presentation skills in designing, recollecting Html tags.
	CO2	Students can escalate their web design and pruneitto perfection with stylesheets.
	CO3	Can enhance data manipulation at client end will have sound knowledge in data validation and handling dynamic data with Php Fundamentals.
	CO4	Handling challenges at backend, performing validation at Server end with PHP-MySQL suite.
	CO5	Evaluate the working of PHP and MySQL with different Web Servers.

Syllabus	
UNIT I	**(18 Hours)**
Introduction to HTML: what is html, how does it work – Working with Lists: creating different types of lists – Working with Images: inserting an image, the alt attribute, adding borders, alignment, using links with images, image maps – HTML Forms: designing a form, form controls: buttons, textboxes, checkboxes, radio buttons, select, legend tags – Frames: creating frames, horizontal and vertical frames, hyperlink targets to a frame.	
UNIT II	**(18 Hours)**
Introduction to CSS: what is CSS, how does it work – Including Styles: inline, internal, and external styles – Properties and Values in CSS – The CSS box model – Classes and IDs – Applying styles to blocks of information (div blocks)- containers.	
UNIT III	**(18 Hours)**
Introduction to PHP: creating and running a PHP script – Variables and Constants – Data types – Operators – Strings, echo command– Conditional Statements: exploring different conditional statements, defining nested if statements – Looping Statements: exploring different looping statements – Break, Continue, and Exit statements.	
UNIT IV	**(18 Hours)**

Functions in PHP: syntax, naming conventions, built in functions: string functions, math functions, date and time functions, understanding variable scopes, calling a function, recursion.

Arrays in PHP: Introduction to PHP – numeric arrays – associative arrays – multidimensional arrays – iterating through an array.

Working with Forms in PHP: using and manipulating different form elements, submitting form data, retrieving form data, get and post methods, displaying errors, include, require.

UNIT V	**(18 Hours)**

Connecting a form to a Database: checking configuration, connecting to a database, selecting a database, creating a table, inserting records, altering, updating, and deleting a table. Regular Expressions in PHP – preg_match(), preg_match_all() – File Handling – reading from a file, writing to a file – Exception Handling in PHP – Cookies and Session in PHP.

*Self-studyandquestionsforexaminationsmaybetakenfromtheself-studyportionsalso.

Teaching Methods:

Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning

Text Book:

1. Deitel and Deitel "Internet and World wide web" Pearson International,4thEdition.

Reference Books:

1. Adam Rizvi, Click Start Internet Basics: The Internet Basics, Written for Beginners, Click start publishing, UK, 2011.
2. Jon Duckett,"Beginning Web Programming with HTML, XHTML, and CSS", Wiley publishers, 2008.
3. Ivan Bayross and Sharanam Shah, "MySQL 5 for Professionals", Shroff Publishers and Distributors, Third Edition, 2005.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	M	S	L
CO2	H	S	S	H	M
CO3	M	S	S	S	H
CO4	M	H	H	S	S
CO4	M	M	H	H	M

S – Strong **H – High** **M – Medium** **L – Low**

Sub.Code:23PCS307

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper	**Core Paper7: Big Data Analytics**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**6**	**90**	**4**

Course Objectives

1. To introduce the basic concepts of big data.
2. To face the challenges of big data.
3. To teach students in applying skills and tools to manage and analyze big data.

Course Outcomes (CO)		
K1 to K5	CO1	Understand the concept and challenges of big data.
	CO2	Collect, manage, store, store, query and analyse various forms of big data.
	CO3	Gain hands-on experience on large-scale analytics tools to solve some open big data problems.
	CO4	Understand the big data tools like Hadoop, Hbase, NoSQL and Neo4J
	CO5	Exposure to modeling a Graph Database.

Syllabus	
UNIT I	**(18 Hours)**
What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies - open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.	
UNIT II	**(18 Hours)**
History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort– Task execution - Map Reduce Types and Formats- Map Reduce Features.	
UNIT III	**(18 Hours)**
Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.	
UNIT IV	**(18 Hours)**
Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships– schemaless databases – materialized views – distribution models -	

peer- peer replication –consistency – relaxing consistency – version stamps – partitioning and combining – composing map-reduce calculations -Document based Database *– MongoDB- Introduction- Data Model- Working with data- Replication &Sharding- Development.

UNIT V **(18 Hours)**

Graph databases Neo4J- Key concept and characteristics-Modelling data for neo4j- Importing data into neo4j-Visualizations neo4j-Cypher Query Language-Data visualization- Creating Visual analytics with Tableau-Connecting your data-Creating Calculation-Using maps-Dashboard-Stories.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning

Text Book:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition ,O'Reilly Media Inc., 2012.

Reference Books:

1. Rik Van Bruggen, "Learning Neo4j" Packt Publishing, 2014.
2. Daniel G. Murray, "Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software" 2nd Edition,Wiley Publications, 2016.
3. EelcoPlugge, David Hows, Peter Membrey, Tim Hawkins "The Defininetive Guide to Mongodb",Apress, 2015.
4. Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" Pearsons Education, 2014.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	H	S	H	S
CO2	M	H	S	M	S
CO3	M	S	S	M	S
CO4	M	M	S	M	S
CO4	H	H	M	S	H

S – Strong **H – High** **M – Medium** **L – Low**

Sub.Code:23PCS3CP

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Practical 5 – Web Technologies Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**6**	**90**	**4**

Course Objectives

1. The course educates the advanced concepts in web designing with Open Source tools.
2. To demonstrate the development of web application and its validation.
3. To inculcate the significance of Server Scripts and simulating applications with backends.

Course Outcomes (CO)		
K1 to K5	CO1	Posses better presentation and manipulating skills for developing a dynamic web page.
	CO2	Validating the essentials in an application using JavaScript.
	CO3	Capable to develop Web application with Server script.
	CO4	Performs better Data manipulation for web application using PHP- Mysql suite.
	CO5	Develop Web applications to solve day today problems using PHP and My SQL.

LIST OF PRACTICAL PROBLEMS

1. Designing Websites with HTML and CSS.
2. Developing applications with JavaScript.
3. Validations with PHP.
4. File Handling in PHP.
5. Develop applications with PHP and MySQL

Teaching Methods:

Program Demonstration, assignment, Discussion and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical – 25, Observation-10, Attendance – 5].

ESE: Two Questions will be given for each student. (3Hours/60marks)Record: 10 Marks

Algorithm, Coding and execution – 50 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Execution & viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	H	M	S	S	H
CO3	H	S	S	H	M
CO4	H	S	S	H	S
CO5	H	H	M	H	S

S – Strong **H – High** **M – Medium** **L – Low**

Sub.Code:23PCS3CQ

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Practical 6 – Big Data Analytics Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**6**	**90**	**4**

Course Objectives

1. To setup and install Hadoop, Pig Latin and Hive in different operating modes.
2. To Develop Map Reduce to solve problems.
3. To implement Pig Latin and Hive for Problem Solving.

Course Outcomes (CO)		
K1 to K5	CO1	Exposure to setup and install Hadoop, Pig Latin and Hive
	CO2	Apply Map Reduce to Solve different problems
	CO3	Exposure to Solve Problems using Pig Latin
	CO4	Execution of simple programs using Hive
	CO5	Develop queries using HiveQL

LIST OF PRACTICAL PROBLEMS

1. Setting and installing Hadoop, Pig Latin and Hive in different operating modes.
2. Developing Map Reduce to solve problems
3. Solving problems using Pig Latin.
4. Problem Solving using Hive.

Teaching Methods:

Program Demonstration, assignment, Discussion and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical – 25, Observation-10, Attendance – 5].

ESE: Two Questions will be given for each student. (3Hours/60 marks)Record: 10 Marks

Algorithm, Coding and execution – 50 Marks

Particulars	**Program1 (Marks)**	**Program2 (Marks)**
Algorithm	5	5
Program Coding	15	15
Execution & viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	M
CO2	S	H	S	H	H
CO3	S	H	S	H	H
CO4	S	S	S	H	S
CO5	S	H	M	H	S

S – Strong **H – High** **M – Medium** **L – Low**

SYLLABUS

Second Year

(Semester – IV)

Sub.Code:23PCS408

Programme Code:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Paper8 - Internet of Things**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**4**	**60**	**4**

Course Objectives

1. To understand Smart Objects and IoT Architectures
2. To learn about various IOT - related protocols
3. To develop IoT infrastructure for popular applications

Course Outcomes (CO)		
K1 to K5	CO1	Students will get the knowledge of IoT
	CO2	Understand the IoT Protocols & IoT Access Technologies
	CO3	Describe Design & Development of IoT
	CO4	Know IoT supporting services
	CO5	Develop IoT prototypes for solving real time issues.

Syllabus	
UNIT I	**(12 Hours)**
Fundamentals of IoT: Evolution of Internet of Things -Enabling Technologies–IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -–Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.	
UNIT II	**(12 Hours)**
IoT Protocols: IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN –Network Layer: IP versions – Optimizing IP forIoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Layer Protocols: CoAP and MQTT.	
UNIT III	**(12 Hours)**
Design And Development: Design Methodology - Embedded computing logic- Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - introduction.	
UNIT IV	**(12 Hours)**
Data Analytics and Supporting Services : Structured Vs Unstructured Data and Data in Motion Vs Data in Rest –Role of Machine Learning – No SQL Databases – Hadoop Ecosystem –	

Python Web Application Framework	
UNIT V	**(12 Hours)**
Case Studies/Industrial Applications: Cisco IoT system - IBM Watson IoT platform –Manufacturing - Home Automation, smart cities, Smart, Agriculture, * Smart Parking Architecture and Smart Traffic Control.	
*Self-study and questions for examinations may be taken from the self-study portions also.	
Teaching Methods:	
Chalk and Talk/ Smart Class Room/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning	
Text Book:	
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017. 2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things –Key applications and Protocols, Wiley, 2012.	
Reference Books:	
1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things –A hands-on approach, Universities Press, 2015. 2. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'ReillyMedia,2011.	

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	H
CO2	S	S	M	H	M
CO3	S	S	H	H	M
CO4	S	S	H	H	H
CO4	S	M	H	M	H

S – Strong **H – High** **M – Medium** **L – Low**

Sub.Code:23PCS409

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Paper 9 - Advanced Computing**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**4**

Course Objectives

1. To Inculcate the basics of Grid Computing Architecture and Framework
2. To provide exposure to Cluster Computing Middle wares
3. To understand the concepts of Cloud Computing and its Applications

Course Outcomes (CO)		
K1 to K5	CO1	Obtain a foundation for Grid Computing Concepts and Architecture
	CO2	Exposure to various toolkits used in Grid
	CO3	Proficient in single system image
	CO4	Apply Cloud in various Real-time Applications
	CO5	Apply Cloud in various Real-time Applications

Syllabus

UNIT I	**(15 Hours)**

Grid Computing: Grid Computing -The data Centre, the Grid and the distributed/High performance computing –Cluster computing and Grid computing – Meta computing– Scientific, business and E-Governance Grids, web services and Grid computing. Technologies and architecture for Grid computing. World wide Grid Computing Activities, Organizations and projects. Web services and the Service oriented Architecture (SOA).

UNIT II	**(15 Hours)**

Grid Computing Architecture : OGSA for Resource distribution – Stateful web services in OGSA –Web services Resource Framework(WSRF) – Resource approach tostateful services-WSRF specification – Globus Toolkit. Grid Resource Management system - Grid Security Requirements – *Data management challenges.

UNIT III	**(15 Hours)**

Cluster Computing : Approaches to parallel computing –How to achieve low cost parallel computing through clusters – Definition and architecture of a cluster – Cluster Middleware : An Introduction –Levels and layers of single system Image(SSI) –Cluster middleware design objectives –Resource Management and scheduling –Cluster programming environment and tools. Process Scheduling - Load sharing and Load balancing.

UNIT IV	**(15 Hours)**

Understanding Cloud Computing: Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services.

UNIT V	**(15 Hours)**

Developing Cloud Services: Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service –Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds.Cloud Computing for the family - Cloud Computing for the Community - Cloud Computing for the Corporation.
*Self-studyandquestionsforexaminationsmaybetakenfromtheself-studyportionsalso.
Teaching Methods:
Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning
Text Book:
1. C.S.R Prabhu, Grid and Cluster computing, Prentice Hall of India, 2008. (Units I, II & III) 2. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que, 2008. (Units IV & V)
Reference Books:
1. Ian Foster, Carl Kesselman, The Grid 2: Blueprint for a New Computing Infrastructure, Elsevier Series, 2004.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	S
CO2	S	H	S	H	S
CO3	S	S	S	H	S
CO4	S	S	S	S	S
CO4	S	H	S	S	S

S – Strong **H – High** **M – Medium** **L – Low**

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Core Practical 7 – Internet of Things Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**4**

Course Objectives

1. To understand IoT techniques.
2. To introduce IoT Application using IDEs
3. To know how to implement IoT.

Course Outcomes (CO)		
K1 to K5	CO1	Effective use of IoT.
	CO2	Ability to use different IDEs for IoT implementation.
	CO3	Student can able to implement IoT Applications.
	CO4	Student can able to embed IoT Applications.
	CO5	Develop IoT application to send sensor data to Cloud

LIST OF PRACTICAL PROBLEMS

1. Automated electrical product
2. A Smart hose hold monitoring system
3. A smart agriculture monitoring system
4. Sensors (Temperature& Humidity etc.)

Teaching Methods:

Demonstration, simulation, assignment and Discussion.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical – 25, Observation-10, Attendance – 5].

ESE: Two Questions will be given for each student. (3Hours/60marks)Record: 10 Marks

Algorithm, Coding and execution – 50 Marks

Particulars	**Program1 (Marks)**	**Program2 (Marks)**
Algorithm	5	5
Program Coding	15	15
Execution & viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	H	M
CO2	H	M	H	H	M
CO3	M	M	M	H	H
CO4	H	M	H	H	M
CO5	H	H	M	M	M

S – Strong **H – High** **M – Medium** **L – Low**

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Project and Viva-Voce**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**12**	**180**	**6**

Course Objectives

1. To develop real time applications.
2. To implement the concepts of Software Project Management.
3. To teach students in applying skills and tools to manage and develop a solution.

Course Outcomes (CO)		
K1 to K5	CO1	Understand the concept and challenges of market.
	CO2	Collect, manage, plan and develop a real time application.
	CO3	Gain hands-on experience on different project models.
	CO4	Helps to understand the complexity and maintaining quality.
	CO5	Helps to understand the complexity and maintaining quality.

MARK DISTRIBUTION

CIA: Total marks– 20 [Review– 15, Regularity– 5]

ESE: Total marks– 80[ProjectReport60, Viva-Voce–20]

***BothInternalandExternalExaminershallevaluateProjectandViva-Vocejointly.**

Mapping

PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	H	M	H	M
CO2	H	M	S	S	H
CO3	H	S	S	H	M
CO4	H	S	S	H	S
CO5	H	S	S	S	H

S – Strong **H – High** **M – Medium** **L – Low**

MAJORELECTIVEPAPERS

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Major Elective Papers: Network Security and Cryptography**		
Batch **2023-2024**	Hours/Week **5**	Total Hours **75**	Credits **5**

Course Objectives

1. To familiarize basic concepts of cryptography and algorithms.
2. To know about various security issues.
3. To understand the process of implementing the cryptographic algorithms.

Course Outcomes (CO)		
K1 to K5	CO1	Understanding fundamental concepts of network security.
	CO2	Knowing how the encryption and decryption are done.
	CO3	Familiarize various kinds of viruses and related threats.
	CO4	Implementing various cryptography algorithms.
	CO5	Exposure to various Encryption standards

Syllabus	
UNIT I	**(15 Hours)**
Introduction: The OSI Security Architecture-Security Attacks-Security Services- Security Mechanisms-A model for network security. Classical Encryption Techniques: Symmetric Cipher Model-Substitution technique-Transposition Technique-Rotor Machines-Steganography.	
UNIT II	**(15 Hours)**
Block Ciphers and the data Encryption Standard: Block Cipher Principles-The Data Encryption Standard-Block Cipher Design Principles. Advanced Encryption Standard: Evaluation Criteria for AES-The AES Cipher.Public Key Encryption and Hash Functions: Introduction to Number theory-Public Key Cryptography and RSA-Key Management.	
UNIT III	**(15 Hours)**
Message Authentication and Hash Functions: Authentication Requirements-Authentication Functions-Authentication Codes-Hash Functions-Security of Hash Functions and MACs.Hash and MAC Algorithms: Secure Hash algorithm-Whirlpool-HMAC-CMAC.Digital Signatures-Authentication protocols-Digital Signature Standard.	
UNIT IV	**(15 Hours)**
Network Security Applications: Authentication Applications-Electronic Mail Security*- IP Security-Web Security.	
UNIT V	**(15 Hours)**
Intruders-Intrusion Detection-Password Management-Viruses and Related Threats-Virus Counter measures-Firewall Design Principles-Trusted Systems.	

*Self-study and questions for examinations may be taken from the self-study portions also.
Teaching Methods:
Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning
Text Book:
1. S.William Stallings "Cryptography and Network Security Principles and Practices", Fourth Edition, PHI Publications, 2011.
Reference Books:
1. AtulKahate, "Cryptography and Network Security", Third Edition, TMH, 2005. 2. Haribhaskar, "Cryptography and Network Security", Sam Publishers, First Edition, 2008.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	H	S
CO2	H	S	H	H	H
CO3	H	S	H	H	H
CO4	H	S	H	M	H
CO4	S	S	M	M	H

S – Strong **H – High** **M – Medium** **L – Low**

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Major Elective Papers- Quantum Computing**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**5**	**75**	**5**

Course Objectives

1. To understand the building blocks of a Quantum Computer
2. To understand the principles, Quantum information and Limitation of quantum operations.
3. To understand the Quantum error and its correction.

Course Outcomes (CO)		
K1 to K5	CO1	Understand the fundamental concepts of Quantum Computing and Computations.
	CO2	Understand the concepts Quantum Computers.
	CO3	Understand the concepts of Informations of Quantum Computing
	CO4	Understand the concepts of Quantum Noise and Operations
	CO5	Exposure to error correction and fault tolerant Quantum computation

Syllabus	
UNIT I	**(15 Hours)**
FUNDAMENTAL CONCEPTS : Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.	
UNIT II	**(15 Hours)**
QUANTUM COMPUTATION : Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates*, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems- Quantum Search for an unstructured database.	
UNIT III	**(15 Hours)**
QUANTUM COMPUTERS: Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer– Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.	
UNIT IV	**(15 Hours)**
QUANTUM INFORMATIONS : Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.	
UNIT V	**(15 Hours)**
QUANTUM ERROR CORRECTION : Introduction, Shor code, Theory of Quantum Error – Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.	

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning

Text Book:

1. Micheal A. Nielsen and Issac L. Chiang, ―Quantum Computation and Quantum Information, Cambridge University Press, Fint South Asian Edition, 2002
2. Vinod Chandra. Bennett C.H., Bernstein E., Brassard G., Vazirani U., The Strengths and Weaknesses of Quantum Computation. SIAM Journal on Computing.

Reference Books:

1. Nayak, Chetan; Simon, Steven; Stern, Ady; Das Sarma, Sankar, ―NonabelianAnyons and Quantum Computation, 2008.
2. Clarke, John, Wilhelm, Frank, ―Superconducting quantum bits, 2008
3. William M Kaminsky, ―Scalable Superconducting Architecture for Adiabatic Quantum Computation, 2004.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	H	S	S
CO2	M	H	H	S	H
CO3	H	S	S	M	S
CO4	H	M	H	S	H
CO4	H	M	H	H	H

S – Strong **H – High** **M – Medium** **L – Low**

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Major Elective Papers: Artificial Intelligence and Machine Learning**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**6**	**90**	**5**

Course Objectives

1. To familiarize AI problems and AI techniques.
2. To learn various search techniques and knowledge representations.
3. To inculcate expert system concepts and applying them to solve the problems.

Course Outcomes (CO)		
K1 to K5	CO1	Understanding basic concepts Artificial Intelligence, AI problems and its techniques.
	CO2	Analyze state space search, problem characteristics and knowledge representations.
	CO3	Students can able to differentiate between different types of learning.
	CO4	Students can solve the problem by acquiring knowledge of supervised and unsupervised learning.
	CO5	Analyze and understand difference between various types of Machine Learning algorithms

Syllabus	
UNIT I	**(18 Hours)**
Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.	
UNIT II	**(18 Hours)**
Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations* - Frame Problem.	
UNIT III	**(18 Hours)**
Using Predicate logic: Representing simple facts in logic - Representing Instance and Is a relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge - Logic programming - Forward Vs Backward reasoning - Matching - Control knowledge	
UNIT IV	**(18 Hours)**
Learning: Types of learning - Machine learning - Intelligent agents. Clustering: k- means clustering - fuzzy clustering - hierarchical clustering - cluster similarity - case studies. Reinforcement learning: Markov decision problem - Q-learning - temporal difference learning - case studies.	
UNIT V	**(18 Hours)**
Artificial neural nets: ANN basics - ANN learning process-types of networks - perceptron. Supervised learning: support vector machines – inductive logic programming - case based	

reasoning - nearest neighborhood - fuzzy network- case studies. Unsupervised learning: Expectation maximization - self organizing maps - adaptive resonance theory - case studies.
*Self-studyandquestionsforexaminationsmaybetakenfromtheself-studyportionsalso.
Teaching Methods:
Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning
Text Book:
1. Elaine Rich and Kevin Knight," Artificial Intelligence", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 2002. 2. Vinod Chandra. S.S. and AnandHareendran. S, "Artificial Intelligence and Machine Learning", PHI Learning Private Limited, 2014.
Reference Books:
1. 1. Richard E .Neapolitan and Xia Jiang,"Artificial Intelligence with an Introduction to Machine Learning",2nd Edition ,CRC Press,2018.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	H	S
CO2	H	M	S	M	S
CO3	H	M	M	M	H
CO4	M	M	M	M	H
CO4	S	M	M	M	S

S – Strong **H – High** **M – Medium** **L – Low**

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Major Elective Papers- Digital Image Processing**		
Batch **2023-2024**	Hours/Week **5**	Total Hours **75**	Credits **5**

Course Objectives

1. To be exposed with the basic concepts of image processing.
2. To understand image enhancement techniques through filtering techniques.
3. To understand color models.
4. To be exposed with image segmentation and compression techniques.

Course Outcomes (CO)		
K1 to K5	CO1	Understanding about the fundamental of digital image processing
	CO2	Knowing about image enhancements and various filtering mechanisms
	CO3	Familiarizing the concepts of transformation, restoration and color models
	CO4	Analyze image compression.
	CO5	Implementing the concepts of image segmentation and compression

Syllabus	
UNIT I	**(15 Hours)**
Digital Image Processing: The origins of Digital Image Processing-Example that use digital image processing-Fundamental Steps in Digital Image Processing-Components of an Image Processing System. Digital Image Fundamentals: Elements of Visual Perception-Light and the Electromagnetic Spectrum-Image Sensing and acquisition.	
UNIT II	**(15 Hours)**
Digital Image Fundamentals: Image Sampling and quantization-Basic relationship between Pixels-Linear and Non-Linear operations-Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations –Histogram processing-Basics of Spatial filtering.	
UNIT III	**(15 Hours)**
Image Restoration: Noise models-Restoration in the Presence of Noise Only Spatial Filtering-Color Image Processing: Color Fundamentals-Color Models-Pseudocolor Image Processing-Color Transformations*-Color Segmentation.	
UNIT IV	**(15 Hours)**
Image Compression: Fundamentals-Image Compression Models-Elements Of Information Theory-Error-Free compression-Lossy Compression.	
UNIT V	**(15 Hours)**
Image Segmentation: Detection Of Discontinuities-Edge Linking And Boundary Detection-Thresholding: Foundation-The Role of Illumination-Basic global Threshholding- Region-Based Segmentation.	
*Self-study and questions for examinations may be taken from the self-study portions also.	
Teaching Methods:	
Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped	

Class/peerLearning/Experiential Learning/Blended Learning
Text Book:
1. Rafael C.Gonazalez, Richard E. Woods, "Digital Image Processing",2nd Edition. Pearson Education
Reference Books:
1. B.Chanda, D.DuttaMajumder, "Digital Image Processing and Analysis", PHI,2003. 2. Nick Efford ,"Digital Image Processing a Practical Introducing using Java", Pearson Education. 3. John R. Jenson, "Introductory Digital Image Processing", Pearson, Fourth Edition 2017 4. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing ",Pearson, Third edition 2016.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	L
CO2	S	M	S	H	H
CO3	S	M	S	H	H
CO4	S	S	S	S	S
CO4	S	S	H	S	S

S – Strong **H – High** **M – Medium** **L – Low**

NON-MAJOR ELECTIVE PAPERS

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Non-Major Elective Papers- Information Security**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**4**	**60**	**4**

Course Objectives

1. The course is intended to preach the common goals of security.
2. To educate the Legal issues of Information Security and its cons.
3. To inculcate the Security Technologies and its methods of implementation.

Course Outcomes (CO)		
K1 to K5	CO1	Understanding the fundamental and history of Information Security, its legal and professional issues.
	CO2	Aware of Intrusion Detection tools and Biometric controls in
	CO3	market.
	CO4	Capable to handle sensitive real time security technologies and establishing VPNs
	CO5	Students are able to implement information security projects and its technical aspects.

Syllabus	
UNIT I	**(12 Hours)**
Introduction to Information Security: Introduction-The history of information security- what is security? - Components of an information system-The security systems development life cycle. The need for security: Threats-Attacks.	
UNIT II	**(12 Hours)**
Legal, Ethical and professional issues in Information Security: Introduction-Law and ethics in information security- International Laws and Legal Bodies- Ethics and information security. Risk Management: An overview of risk management-Risk identification-Risk assessment-Risk Control strategies*.	
UNIT III	**(12 Hours)**
Security Technology: Firewalls and VPNs: Introduction-Access control-Firewalls- Protecting remote connections.	
UNIT IV	**(12 Hours)**
Security Technology: Intrusion detection and prevention systems, Other security tools: Intrusion detection and prevention systems-Honeypots, Honeynets and padded cell systems-Scanning and analysis tools-Biometric access controls.	
UNIT V	**(12 Hours)**
Implementing Information Security: Introduction-Information Security project management-Technical aspects of implementation– non-technical aspects of implementation. Information Security*. Maintenance: Security management maintenance models: The Security maintenance models-monitoring the external environment.	
*Self-study and questions for examinations may be taken from the self-study portions also.	

Teaching Methods:
Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning
Text Book:
1. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security ", Fifth Edition, Cengage Learning Publications, 2014.
Reference Books:
1. Mark Rhodes-Ousley,"Information Security The Complete Reference", Second Edition McGraw Hill Professional, 2013. 2. John Vacca,"Managing Information Security", Second Edition, Syngress Imprint, 2013. 3. Nayak, Umesha, Rao, UmeshHodeghatta,," The InfoSec Handbook an Introduction to Information Security", Apress Publisher, First Edition, 2014.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	L	M	H
CO2	M	S	M	H	H
CO3	L	S	S	H	H
CO4	M	H	H	S	H
CO4	S	M	L	M	H

S – Strong **H – High** **M – Medium** **L – Low**

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Non-Major Elective Papers- Management Information Systems**		
Batch **2023-2024**	Hours/Week **4**	Total Hours **60**	Credits **4**

Course Objectives

1. Students will identify the core concepts of Management Information Systems
2. To examine the concepts of business and information.
3. To design and implement the manufacturing sector.

Course Outcomes (CO)		
K1 to K5	CO1	Student will learn the principles and fundamentals of business management
	CO2	Demonstrate knowledge of the Information concepts
	CO3	Student will able to configure and develop a Management Information Systems
	CO4	Analyses the various streams of manufacturing sector
	CO5	Students would have the knowledge about, Development and implementation of the MIS technology

Syllabus	
UNIT I	**(12 Hours)**
Management's information systems: role and importance of management-process of management -organization and theory -strategic management of business.	
UNIT II	**(12 Hours)**
Concepts –methods-tools and the name of the procedures -behavioral concepts in decision making: information–Information concepts-information: a quality product- classification of the information-methods of data and information collection -Value of the information -general model of a human as an information preprocessor -organization and information.	
UNIT III	**(12 Hours)**
Development of MIS-Development of long range plans of MIS -ascertaining the class of information-determining the information requirement-Development and implementation of the MIS -management of quality in the MIS -organization for Development of the MIS -choice of information technology –nature of it decision-strategic decision-configuration design–evaluation.	
UNIT IV	**(12 Hours)**
Applications in manufacturing sector -personnel management –financial management –production management - *materials management – marketing management-decision support systems-concept and philosophy, DSS: deterministic systems -knowledge based expert systems (KBES).	
UNIT V	**(12 Hours)**
InfoTech infrastructure-technology of information systems-database and client server architecture-data in data warehouse-architecture of data ware houses Self-Study: data in data warehouse.	
*Self-study and questions for examinations may be taken from the self-study portions also.	

Teaching Methods:
Chalk and Talk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning
Text Book:
1. W.s Jawadekar, "Management Information Systems", Tata McGraw Hill Publishers, 2002.
Reference Books:
1. G.Murdick, James R.Clagett, "Information Systems for Modern Management", Robert third edition prentice hall of India. 2. Amitabh Jain ,NaveenaBajaj,"Management Information System", 1st edition, 2002 3. Aman Jindal, "Management information system", 1st edition, 2003.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	H	S	S
CO2	M	H	H	S	H
CO3	H	S	S	M	S
CO4	H	M	H	S	H
CO4	L	M	H	H	H

S – Strong **H – High** **M – Medium** **L – Low**

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**Non-Major Elective Papers- Business Intelligence**		
Batch **2023-2024**	Hours/Week **4**	Total Hours **60**	Credits **4**

Course Objectives

1. To be exposed with the basic rudiments of business intelligence system
2. To understand the modeling aspects behind Business Intelligence
3. To understand business intelligence life cycle and the techniques used
4. To be exposed with different data analysis tools and technique.

Course Outcomes (CO)		
K1 to K5	CO1	Understanding fundamental concepts within Business Intelligence,
	CO2	Knowing how decision analysis and decision processes are carried Out in businesses
	CO3	Familiarize concepts, theories and methods within data warehousing
	CO4	Implementing the relationship of data warehouses to production and Operational systems,
	CO5	Incorporate Data analysis framework for optimal performance

Syllabus	
UNIT I	**(12 Hours)**
INTRODUCTION: Business Intelligence: definition, concept and need for Business Intelligence, Case studies BI Basics: Data, information and knowledge, Role of Mathematical models.	
UNIT II	**(12 Hours)**
ANALYTICS STRATEGY: Business Analytics at the strategic level: Strategy and BA, Link between strategy and Business Analytics, BA supporting strategy at functional level, dialogue between strategy and BA functions, information as strategic resource.	
UNIT III	**(12 Hours)**
Business Analytics at Analytical level: Statistical data mining, descriptive Statistical methods, lists, reports, automated reports, hypothesis driven methods, data mining with target variables, cluster analysis, Discriminate analysis, logistic regression, principal component analysis.	
UNIT IV	**(12 Hours)**
XML: Introduction XML: An Eagle's Eye view of XML – XML Definition-List of an XML DATA WAREHOUSING: Business Analytics at Data Warehouse Level, Designing physical database, Deploying and supporting DW/BI system.	
UNIT V	**(12 Hours)**
BUSINESS INTELLIGENCE: Business Intelligence Architectures: Cycle of Business Intelligence Analysis, Development of Business Intelligence System, spread sheets, concept of dashboard, CLAP, SQA, decision engineering. BI Tools: Concept of dashboard. BI Applications in different domains-CRM, HR, Production. .	

*Self-studyandquestionsforexaminationsmaybetakenfromtheself-studyportionsalso.
Teaching Methods:
ChalkandTalk/ Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class/peerLearning/Experiential Learning/Blended Learning
Text Book:
1. Turban, Sharda,Decision Support and Business Intelligence Systems, Delen,Pearson, 9th Edition, 2014.
Reference Books:
1. Olivia Parr Rud, "Business Intelligence Success Factors Tools for aligning your business in the global economy",John Wiley and Sons, 2009 2. Steve Williams and Nancy Williams, "The Profit impact of Business Intelligence, Morgan Kauffman Publishers! " Elsevier, 2007 3. Gert H.N. Laursen, JesperThorlund, "Business Analytics for Managers: Taking Business Intelligence beyond reporting", Wiley and SAS Business Series. 2010.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	H	S
CO2	H	S	H	H	H
CO3	H	S	H	H	H
CO4	H	S	H	M	H
CO4	S	M	H	H	S

S – Strong **H – High** **M – Medium** **L – Low**

Extra Departmental Course

ProgrammeCode:**09**	**M.Sc. Computer Science**		
Title of the Paper:	**EDC Paper - Internet and Web Designing Lab**		
Batch	Hours/Week	Total Hours	Credits
2023-2024	**2**	**30**	**2**

Course Objectives

1. To educate the benefits of the Internet.
2. To promote web designing skills using html tags.
3. Students can understand usage of CSS in web designing.

Course Outcomes (CO)		
K1 to K5	CO1	Understand the concepts of Internet and Internet Addresses and DNS.
	CO2	To enhance the usage of E-Mail.
	CO3	Understand how to create a website with HTML tags like table tag, frame tag and
	CO4	Can apply their knowledge to create dynamic website using html and CSS
	CO5	Can apply their knowledge to create dynamic website using html and CSS.

LIST OF PRACTICAL PROBLEMS

1. Design a web page for a company using HTML formatting tags.
2. Design a web page for your department using Images.
3. Design a personal web page with hyperlink.
4. Design a web page for advertising a product using animation effect
5. Design a web page using ordered and unordered list.
6. Design a web page using tables.
7. Design a web page using forms.
8. Design a web page using frameset tag.
9. Design a web page using position and background concept in CSS
10. Design a web page, which shows your bio-data using CSS.

Teaching Methods:

Program Demonstration, assignment, Discussion and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical – 25, Observation-10, Attendance – 5].

ESE: Two Questions will be given for each student. (3Hours/ 60 marks)Record: 10 Marks

Algorithm, Coding and execution – 50 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Execution & viva voce	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	M	H	H	M
CO2	H	M	M	M	M
CO3	M	H	M	M	H
CO4	M	M	H	M	M
CO5	H	S	H	H	S

S – Strong **H – High** **M – Medium** **L – Low**

ADVANCEDLEARNERSCOURSE(ALC)

Sub.Code:23PCS0D1

ALC1: PROGRAMMING IN C#

Course Objectives

1. To understand the basic elements of C#.
2. To provide exposure to Program Structure and Inheritance.
3. To understand File systems and its operations.

Syllabus
UNIT I
Basic Elements of C #: .Net frame work – C # language – Features – Character set – Lexical elements - Escape sequence – Identifiers – Keywords – Concepts of data – Operators – Punctuators – Primitive data types – Preprocessing Directives.
UNIT II
C# Program Structure: Program Structure – Methods – Instance – new operator – Member access – Invoking a method – Parameter Types - Constructor – Destructor – Default Constructor – this reference – Access Modifiers – Static members – Formatted method – Header of main method – Enumeration operators types – type conversion – Merging of String - is operator – Checked & unchecked operator.
UNIT III
Statements: Classification – Expression – Control Flow – Block – Declaration – Empty – Exception – Lock – Labeled – Checked & unchecked. Arrays: Regular & Jagged Arrays – Two & Three dimensional arrays – Local Arrays - Features of arrays – System Arrays – Passing array as a parameter – Application of arrays – Recursive methods – Structure – Nested Structures.
UNIT IV
Inheritance: Introduction – Types - .Net building blocks – Name Hiding – Virtual and override methods – Dynamic binding – Abstract method & class – Advantages. Interface and Operator overloading: Interface – Declaration of Interface – Polymorphism of Interface – Operator overloading – method overloading – Collection Interfaces – Variable method Interfaces list.
UNIT V
File Operations and Multithreading: Stream – File management – File operations – Multitasking – Multi threading – Operation of threads - Secondary threads – Synchronization. .
Text Book:
1. S.ThamaraiSelvi, R.Murugesan, "A Text Book on C# A systematic approach to Object Oriented Programming", Pearson Education, 2003.
Reference Books:
1. E Balagurusamy "Programming in C#", Fourth Edition, McGraw Hill Education, 2017.

Sub.Code:23PCS0D2

ALC 2: J2EE

Course Objectives

1. To understand the basics of J2EE.
2. To provide exposure to Java Servlets, Beans and Remote Method Invocation.
3. To learn the concepts of Web Services.

Syllabus	
UNIT I	
J2EE and J2SE - The Birth of J2EE - Databases - The Maturing of Java - Java Beans and Java Message Service - Why J2EE? J2EE Multi-Tier Architecture - J2EE Best Practices - J2EE Design Patterns and Frameworks.	
UNIT II	
J2EE FOUNDATION - Java servlets - Java Server Pages.	
UNIT III	
Enterprise JavaBeans - JavaMail API - Java Interface Definition Language and CORBA.	
UNIT IV	
Inheritance: Introduction – Types - .Net building blocks – Name Hiding – Virtual and override Java Remote Method Invocation - Java Message Service – Security - Java Naming and Directory Interface API.	
UNIT V	
WEB SERVICES - SOAP - Universal Description, Discovery, and Integration (UDDI) - Electronic Business XML - The Java API for XML Registries (JAXR) - Web Services Description Language (WSDL)..	
Text Book:	
1. James Keogh, "J2EE - The complete Reference", Mc-Graw Hill, 2002.	
Reference Books:	
2. Stephanie Bodoff, Eric Armstrong, Jennifer Ball, Debbie Bode Carson, Ian Evans, Dale Green Kim, Haase Eric Jendrock, " The J2EE Tutorial", Second Edition, Pearson Education, 2004.	