

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
(Affiliated to Savitribai Phule Pune University, Pune)



Choice Based Credit System (CBCS)
Master of Science (M.Sc. Computer Science)

Syllabus of
M. Sc. Computer Science
Implemented from
Academic year 2021 -22

1. Prologue/ Introduction of the programme:

PREAMBLE: This syllabus is the extension of the existing syllabus which is currently being taught to M.Sc. (Computer Science) of Savitribai Phule Pune University for the last few years, but modified to be placed within the credit based system to be implemented from the academic year 2021-2022. However, there are few changes incorporated in the existing syllabus. It is believed that the proposed changes as part of the credit based system will bring a qualitative change in the way M.Sc. (Computer Science) is taught, which will offer a more enriched learning experience. It aims to provide technology-oriented students with the knowledge and ability to develop creative solutions, and better understand the effects of future developments of computer systems and technology on people and society. The syllabus is about developing skills to learn new technology, grasping the concepts and issues behind its use and the use of computers.

2. Programme outcomes (Pos):

- Unify the students to take up a career in the highly competitive IT industry with research and development skills acquired through minor and major projects.
- Equip students with comprehensive knowledge and understanding of advanced theoretical fundamentals in computer science as well as contemporary key research issues in specialized areas of computer science.
- Provide freedom to choose subjects of interest from the list of specialized courses and to allow the students to follow the career path they have dreamt of.
- Attain knowledge in the advanced areas of computer science especially Algorithms Design, Artificial Intelligence, Data Science and Information Security.

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Syllabus of
M. Sc. Computer Science
(Faculty of Science and Technology)
Semester – I

Sr. No.	Class	Course Code	Course Title	Credits
1.	M.Sc. Computer Science - I	MSC-CS 111 T	Paradigm of Programming Language	04
2.	M.Sc. Computer Science - I	MSC-CS112 T	Database Technologies	04
3.	M.Sc. Computer Science - I	MSC-CS 113 T	Design and Analysis of Algorithms	02
4.	M.Sc. Computer Science - I	MSC-CS114 P	Paradigm of Programming Language Practical	02
5.	M.Sc. Computer Science - I	MSC-CS 115 P	Database Technologies Practical	02
6.	M.Sc. Computer Science - I	MSC-CS116 P	Project	02
7.	M.Sc. Computer Science - I	MSC-CS 117 T(A)	Artificial Intelligence	02
8.	M.Sc. Computer Science - I	MSC-CS118 P(A)	Artificial Intelligence Practical	02
OR				
7	M.Sc. Computer Science - I	MSC- CS117 T(B)	Cloud Computing	02
8.	M.Sc. Computer Science - I	MSC-CS 118 P(B)	Cloud Computing Practical	02
9.	M.Sc. Computer Science - I	MSC-CS119 T	Research Methodology - I	02

Semester – II

Sr. No.	Class	Course Code	Course Title	Credits
10	M.Sc. Computer Science - I	MSC-CS 211 T	Advanced Operating System	04
11	M.Sc. Computer Science - I	MSC-CS212 T	Software Project Management	04
12	M.Sc. Computer Science - I	MSC-CS 213 T	Mobile Technologies	02
13	M.Sc. Computer Science - I	MSC-CS214 P	Advanced Operating System Practical	02
14	M.Sc. Computer Science - I	MSC-CS 215 P	Mobile Technologies Practical	02
15	M.Sc. Computer Science - I	MSC-CS216 P	Project	02
16	M.Sc. Computer Science - I	MSC-CS217 T(A)	Dot Net	02
17	M.Sc. Computer Science - I	MSC-CS218 P(A)	Dot Net Practical	02
OR				
16	M.Sc. Computer Science - I	MSC-CS 217 T(B)	Soft Computing	02
17	M.Sc. Computer Science - I	MSC-CS218 P(B)	Soft Computing Practical	02
18	M.Sc. Computer Science - I	MSC-CS 219 T	Research Methodology - II	02

Semester – III

Sr. No.	Class	Course Code	Course Title	Credits
19	M.Sc. Computer Science - II	MSC-CS311 T	Software Architecture and Design Patterns	04
20	M.Sc. Computer Science - II	MSC-CS 312 T	Machine Learning	04
21	M.Sc. Computer Science - II	MSC-CS313 T	Web Frameworks	02
22	M.Sc. Computer Science - II	MSC-CS 314 P	Software Architecture and Design Patterns Practical	02
23	M.Sc. Computer Science - II	MSC-CS315 P	Machine Learning Practical	02
24	M.Sc. Computer Science - II	MSC-CS 316 P	Project	02
25	M.Sc. Computer Science - II	MSC-CS317 T(A)	Big Data	02
26	M.Sc. Computer Science - II	MSC-CS 318 P(A)	Big Data Practical	02
OR				
25	M.Sc. Computer Science - II	MSC-CS 317 T(B)	Web Analytics	02
26	M.Sc. Computer Science - II	MSC-CS318 P(B)	Web Analytics Practical	02
27	M.Sc. Computer Science - II	MSC-CS 319 T	Cryptography & Cyber Forensics	02

Semester – IV

Sr. No.	Class	Course Code	Course Title	Credits
28	M.Sc. Computer Science - II	MSC-CS411 P	Industrial Training /Institutional Project	22

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2.	M.Sc. Computer Science - I	I	MSC-CS 112 T	Database Technologies	04
3.	M.Sc. Computer Science - I	I	MSC-CS 113 T	Design and Analysis of Algorithms	02
4.	M.Sc. Computer Science - I	I	MSC-CS 114 P	Paradigm of Programming Language Practical	02
5.	M.Sc. Computer Science - I	I	MSC-CS 115 P	Database Technologies Practical	02
6.	M.Sc. Computer Science - I	I	MSC-CS 116 P	Project	02
7.	M.Sc. Computer Science - I	I	MSC-CS 117 T(A)	Artificial Intelligence	02
8.	M.Sc. Computer Science - I	I	MSC-CS 118 P(A)	Artificial Intelligence Practical	02
OR					
7	M.Sc. Computer Science - I	I	MSC-CS117 T(B)	Cloud Computing	02
8.	M.Sc. Computer Science - I	I	MSC-CS 118 P(B)	Cloud Computing Practical	02
9.	M.Sc. Computer Science - I	I	MSC-CS 119 T	Research Methodology - I	02
10	M.Sc. Computer Science - I	II	MSC-CS 211 T	Advanced Operating System	04
11	M.Sc. Computer Science - I	II	MSC-CS 212 T	Software Project Management	04
12	M.Sc. Computer Science - I	II	MSC-CS 213 T	Mobile Technologies	02
13	M.Sc. Computer Science - I	II	MSC-CS 214 P	Advanced Operating System Practical	02

14	M.Sc. Computer Science - I	II	MSC-CS 215 P	Mobile Technologies Practical	02
15	M.Sc. Computer Science - I	II	MSC-CS 216 P	Project	02
16	M.Sc. Computer Science - I	II	MSC-CS 217 T(A)	Dot Net	02
17	M.Sc. Computer Science - I	II	MSC-CS 218 P(A)	Dot Net Practical	02
OR					
16	M.Sc. Computer Science - I	II	MSC-CS 217 T(B)	Soft Computing	02
17	M.Sc. Computer Science - I	II	MSC-CS 218 P(B)	Soft Computing Practical	02
18	M.Sc. Computer Science - I	II	MSC-CS 219 T	Research Methodology - II	02
19	M.Sc. Computer Science - II	III	MSC-CS 311 T	Software Architecture and Design Patterns	04
20	M.Sc. Computer Science - II	III	MSC-CS 312 T	Machine Learning	04
21	M.Sc. Computer Science - II	III	MSC-CS 313 T	Web Frameworks	02
22	M.Sc. Computer Science - II	III	MSC-CS 314 P	Software Architecture and Design Patterns Practical	02
23	M.Sc. Computer Science - II	III	MSC-CS 315 P	Machine Learning Practical	02
24	M.Sc. Computer Science - II	III	MSC-CS 316 P	Project	02
25	M.Sc. Computer Science - II	III	MSC-CS 317 T(A)	Big Data	02
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**Syllabus of M. Sc. Computer Science
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Semester –I	Paper -I
Course Code: MSC-CS 111T	Title of the Course: Paradigm of Programming Language
Credits: 04	Total Lectures: 60 Hrs

Course Outcomes (Cos)

To Prepare student to think about programming languages analytically:

- Separate syntax from semantics
- Compare programming language designs
- Understand their strengths and weaknesses
- Learn new languages more quickly
- Understand basic language implementation techniques

Unit	Course Contents	Allotted Hours
Unit I	Introduction 1.1 The Art of Language Design. 1.2 The Programming Language Spectrum. 1.3 Why Study Programming Languages? 1.4 Compilation and Interpretation. 1.5 Programming Environments.	(02)
Unit II	Names, Scopes, and Bindings 2.1 The Notion of Binding Time. 2.2 Object Lifetime and Storage Management. 2.3 Static Allocation, Stack-Based Allocation, Heap-Based Allocation, Garbage Collection Scope Rules. 2.4 Static Scoping, Nested Subroutines, Declaration Order, Dynamic Scoping The meaning of Names in a Scope. 2.5 Aliases, Overloading, Polymorphism and Related Concepts, the Binding of Referencing Environments. 2.6 Subroutine Closures, First-Class Values and Unlimited Extent, Object Closures Macro Expansion.	(05)

Unit III Control Flow (08)

- 3.1 Expression Evaluation, Precedence and Associativity, Assignments, Initialization, Ordering Within Expressions, Short-Circuit Evaluation.
- 3.2 Structured and Unstructured Flow, Structured Alternatives to goto..
- 3.3 Sequencing.
- 3.4 Selection - Short-Circuited Conditions, Case/Switch Statements Iteration.
- 3.5 Iteration - Enumeration-Controlled Loops, Combination Loops, Iterators, Logically Controlled Loops Recursion.
- 3.6 Recursion - Iteration and Recursion, Applicative- and Normal-Order Evaluation.

Unit IV Data Types (10)

- 4.1 Introduction.
- 4.2 Primitive Data Types.
- 4.3 Numeric Types: Integer, Floating point, Complex, Decimal, Boolean Types, Character Types.
- 4.4 Character String Types.
- 4.5 Design Issues, Strings and Their Operations, String Length Operations, Evaluation, Implementation of Character String Types.
- 4.6 User defined Ordinal Types Enumeration types, Designs Evaluation Subrange types, Ada's design Evaluation Implementation of user defined ordinal types
- 4.7 Array types
- 4.8 Design issues, Arrays and indices, Subscript bindings and array categories, Heterogeneous arrays, Array initialization, Array operations, Rectangular and Jagged arrays, Slices, Evaluation, Implementation of Array Types
- 4.9 Associative Arrays Structure and operations, Implementing associative arrays,
- 4.10 Record types
- 4.11 Definitions of records, Reference to record fields, Operations on records, Evaluation, Implementation of Record types
- 4.12 Union Types
- 4.13 Design issues, Discriminated versus Free unions, Evaluation, Implementation of Union types.
- 4.14 Pointer and Reference Types
- 4.15 Design issues, Pointer operations, Pointer problems, dangling pointers, Lost heap dynamic variables, Pointers in C and C++, Reference types, Evaluation
- 4.16 Implementation of pointer and reference types - Representation of pointers and references Solution to dangling pointer problem Heap management

Unit V	Subprograms and Implementing Subprograms	(10)
	5.1 Introduction	
	5.2 Fundamentals of Subprograms	
	5.3 Design Issues for subprograms	
	5.4 Local Referencing Environments	
	5.5 Parameter-Passing Methods	
	5.6 Parameters That Are	
	5.7 Subprograms	
	5.8 Overloaded Subprograms	
	5.9 Generic Subroutines, Generic Functions in C++, Generic Methods in Java	
	5.10 Design Issues for Functions User-Defined Overloaded Operators	
	5.11 Coroutines	
	5.12 Implementing Subprograms	
	5.13 The General Semantics of Calls and Returns	
	5.14 Implementing “Simple” Subprograms Implementing Subprograms with Stack Dynamic Local Variables	
	5.15 Nested Subprograms	
	5.16 Blocks	
	5.17 Implementing Dynamic Scoping	
Unit VI	Data Abstraction and Object Orientation	(08)
	6.1 Object-Oriented Programming	
	6.2 Encapsulation and Inheritance Modules, Classes, Nesting (Inner Classes), Type Extensions, Extending without Inheritance	
	6.3 Initialization and Finalization Choosing a Constructor, References and Values, Execution Order, Garbage Collection	
	6.4 Dynamic Method Binding	
	6.5 Virtual- and Non-Virtual Methods, Abstract Classes, Member Lookup, Polymorphism, Object Closures	
	6.6 Multiple Inheritance • Semantic Ambiguities, Replicated Inheritance,	
Unit VII	Concurrency	(07)
	7.1 Introduction: Multiprocessor Architecture Categories of concurrency, Motivations for studying concurrency	
	7.2 Introduction to Subprogram-level, concurrency Fundamental concepts, Language Design for concurrency, Design Issues	
	7.3 Semaphores - Introduction Cooperation synchronization, Competition Synchronization, Evaluation	
	7.4 Monitors - Introduction, Cooperation synchronization, Competition Synchronization, Evaluation,	
	7.5 Message Passing Introduction- The concept of	

Synchronous Message Passing
 7.6 Java Threads - The Thread class –Priorities,
 Competition Synchronization Cooperation
 Synchronization, Evaluation

Unit VIII Functional Programming in Scala (10)

8.1 Strings
 8.2 Numbers
 8.3 Control Structures
 8.4 Classes and Properties
 8.5 Methods
 8.6 Objects
 8.7 Functional Programming
 8.8 List, Array, Map, Set

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	Programming Language Pragmatics, 3e	Michel L. Scott	Kaufmann Publishers, An Imprint of Elsevier, USA
2	Concepts of Programming Languages, Eighth Edition	Robert W. Sebesta	Pearson Education
3	Scala Cookbook	Alvin Alexander	O'REILLY publication

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Semester –I	Paper –II
Course Code: MSC-CS 112 T	Title of the Course : Database Technologies
Credits: 04	Total Lectures: 60 Hrs

Course Outcomes (Cos):

- Provide an overview of the concept of NoSQL technology.
- Provide an insight to the different types of NoSQL databases
- Make the student capable of making a choice of what database technologies to use, based on their application needs.

Unit	Course Contents	AllottedHours
Unit I	Introduction to NOSQL (Core concepts) 1.1 Why NoSQL 1.2 Aggregate Data Models 1.3 Data modeling details 1.4 Distribution Models 1.5 Consistency 1.6 Version stamps 1.7 Map-Reduce	(20)
Unit II	Implementation with NOSQL databases 2.1 Key-Value Databases (Riak) 2.2 Document Databases (Mongodb) 2.3 Column-Family stores (Cassandra) 2.4 Graph databases (Neo4j)	(18)

Unit III	Schema Migrations	(8)
Unit IV	Polygot Persistence (Multi model types)	(8)
Unit V	Beyond NoSQL	(3)
Unit VI	Choosing your database	(3)

Suggested Readings:

Sr. No.	Title of the Book	Author/s
1	NoSQL Distilled	Pramod Sadalge, Martin Fowler
2	NoSQL for Dummies	A Willy Brand
3	http://nosql-database.org	

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Semester –I	Paper –III
Course Code: MSC-CS 113T	Title of the Course: Design and Analysis of Algorithms
Credits: 02	Total Lectures: 30 Hrs

Course Outcomes (Cos):

- To design the algorithms
- To select the appropriate algorithm by doing necessary analysis of algorithms
- To learn basic Algorithm Analysis techniques and understand the use of asymptotic notation
- Understand different design strategies
- Understand the use of data structures in improving algorithm performance

Unit	Course Contents	Allotted Hours
UNIT I	Basics of Algorithms	(09)
	1.1 Algorithm definition and characteristics	
	1.2 Space complexity	
	1.3 Time complexity, worst case-best case-average case	
	1.4 complexity, asymptotic notation	
	1.5 Recursive and non-recursive algorithms	
	1.6 Sorting algorithms (insertion sort, heapsort, bubble sort)	
	1.7 Sorting in linear time: counting sort, concept of bucket and radix sort	
	1.8 Searching algorithms: Linear, Binary	
UNIT II	Divide and conquer strategy	(04)
	2.1 General method, control abstraction	
	2.2 Binary search	
	2.3 Merge sort, Quick sort	
	2.4 Comparison between Traditional Method of Matrix Multiplication vs. Strassen's Matrix Multiplication	

UNIT III Dynamic Programming (07)

- 3.1 Principle of optimality
- 3.2 Matrix chain multiplication
- 3.3 0/1 Knapsack Problem
 - i) Merge & Purge
 - ii) Functional Method
- 3.4 Concept of Shortest Path
- 3.5 Single Source shortest path
 - i) Dijkstra's Algorithm
 - ii) Bellman Ford Algorithm
- 3.6 All pairs Shortest Path
- 3.7 Floyd- Warshall's Algorithm
- 3.8 Longest common subsequence,
- 3.9 String editing, Travelling Salesperson problem

UNIT IV Greedy Method (06)

- 4.1 Job sequencing with deadlines,
- 4.2 Minimum-cost spanning trees: Kruskal's and Prim's algorithm
- 4.3 Optimal storage on tapes
- 4.4 Optimal merge patterns
- 4.5 Huffman coding
- 4.6 Shortest Path: Dijkstra's algorithm

UNIT V Decrease and Conquer (04)

- 5.1 Definition of Graph Representation of Graph
- 5.2 5.2 By Constant - DFS and BFS
- 5.3 Topological sorting
- 5.4 Connected components and spanning trees 5.5 By Variable Size decrease Euclid's algorithm 5.6 Flow in graph
- 5.7 Articulation Point and Bridge edge

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	Computer algorithms	Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran	Galgotia Publication
2	T. Cormen, C. Leiserson, & R. Rivest	Algorithms	MIT Press
3	A. Aho, J. Hopcroft & J. Ullman	The Design and Analysis of Computer Algorithms	Addison Wesley
4	Donald Knuth	The Art of Computer Programming	Addison Wesley
5	Steven Skiena	The Algorithm Manual	Springer
6	Jungnickel	Graphs, Networks and Algorithms	Springer

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Semester –I	Paper -IV
Course Code: MSC-CS 114 P	Title of the Course: Paradigm of Programming Language Practical
Credits: 02	Total Lectures: 60 Hrs

Course Outcomes (Cos):

- Understand the features of SCALA language with different object- oriented features
- Acknowledge the functional programming with SCALA
- understand and write programs in the Scala programming language.

Course Contain

LIST OF SCALA PROGRAMS (PPL)

Control Structures

1. Write a program to calculate average of all numbers between n1 and n2(eg.100 to 300 Read values of n1 and n2 from user)
2. Write a program to calculate factorial of a number.
3. Write a program to read five random numbers and check that random numbers are perfect number or not.
4. Write a program to find second maximum number of four given numbers.
5. Write a program to calculate sum of prime numbers between 1 to 100
6. Write a program to read an integer from user and convert it to binary and octal using user defined functions.

Arrays

1. Write a program to find maximum and minimum of an array
2. Write a program to calculate transpose of a matrix.
3. Write a program to calculate determinant of a matrix,
4. Write a program to check if the matrix is upper triangular or not.
5. Write a program to sort the matrix using insertion sort.
6. Write a program for multiplication of two matrices (Validate number of rows and columns before multiplication and give appropriate message)

String

1. Write a program to count uppercase letters in a string and convert it to lowercase and display the new string.
2. Write a program to read a character from user and count the number of occurrences of that

character.

3. Write a program to read two strings. Remove the occurrence of second string in first string.
4. Create array of strings and read a string from user. Display all the elements of array containing given string.

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Semester –I	Paper -V
Course Code: MSC-CS 115 P	Title of the Course : Database Technologies Practical
Credits: 02	Total Lectures: 60 Hrs.

Course Outcomes (Cos):

Learn to design Schema using Advanced Queries and CRUD operations using MongoDB

- Use mongo DB Aggregation framework
- Learn about Neo4j, it's features, benefits, and use cases
- Understand how to manage data using the service

Database Technologies: MongoDB Practical Assignment 1

Create a database with the name 'Movie'.

1. A 'Film' is a collection of documents with the following fields:
 - a. Film Id
 - b. Title of the film
 - c. Year of release
 - d. Genre / Category (like adventure, action, sci-fi, romantic etc.) A film can belong to more than one genre
 - e. Actors (First name and Last name) A film can have more than one actor.
 - f. Director (First name and Last name) A film can have more than one director.
 - g. Release details (It consists of places of release, dates of release and rating of the film.)
 - h. An 'Actor' is a collection of documents with the following fields:
 - i. Actor Id
 - b. First name
 - c. Last Name
 - d. Address (Street, City, State, Country, Pin-code)
 - e. Contact Details (Email Id and PhoneNo)
 - f. Age of an actor.

Queries:

1. Insert at least 10 documents in the collection Film –
 - a. Insert at least one document with film belonging to two genres.
 - b. Insert at least one document with film that is released at more than one place and on two different dates.
 - c. Insert at least three documents with the films released in the same year.
 - d. Insert at least two documents with the films directed by one director.
 - e. Insert at least two documents with films those are acted by a pair 'Madhuri Dixit' and 'Shahrukh Khan'.

2. Insert at least 10 documents in the collection Actor. Make sure, you are inserting the names of actors who have acted in films, given in the 'Film' collection.
3. Display all the documents inserted in both the collections.
4. Add a value to the rating of the film whose title starts with 'T'.
5. Add an actor named " " in the 'Actor' collection. Also add the details of the film in 'Film' collection in which this actor has acted in.
6. Delete the film " ".
7. Delete an actor named " ".
8. Delete all actors from an 'Actor' collection who have age greater than " "
9. Update the actor's address where Actor Id is " ".
10. Update the genre of the film directed by ". M. Sc.[I] Computer Science"

Database Technologies: MongoDB Practical

Assignment 2

1. Create a database with name 'Company'.
2. An 'Employee' is a collection of documents with the following fields:
 - a. Employee ID
 - b. First Name
 - c. Last Name
 - d. Email
 - e. PhoneNo.
 - f. Address (House No, Street, City, State, Country, Pin-code)
 - g. Salary
 - h. Designation
 - i. Experience
 - j. Date of Joining
 - k. Birthdate
3. A 'Transaction' is a collection of documents with the following fields:
 - a. Transaction Id,
 - b. Transaction Date
 - c. Name (First Name of employee who processed the transaction)
 - d. Transaction Details (Item Id, Item Name, Quantity, Price)
 - e. Payment (Type of Payment (Debit/Credit/Cash), Total amount paid, Payment Successful)
 - f. Remark (Remark field can be empty.)

Queries:

1. Insert at least 5 documents in 'Employee' collection.
2. Insert multiple documents (at least 10) into the 'Transaction' collection by passing an array of documents to the db.collection.insert () method.
3. Display all the documents of both the collections in a formatted manner.
4. Update salary of all employees by giving an increment of Rs. 4000.
5. Update the remark for transaction id 201.
6. Update designation of an employee named " " from supervisor to manager.
7. Update designation of an employee having Employee Id as .
8. Change the address of an employee having Employee Id as .
9. Delete transaction made by " " employee on the given date.
10. Delete all the employees whose first name starts with 'K'.

Computer Science Database Technologies: MongoDB Practical Assignment 3

This assignment is based on 'Movie' database having collections 'Film' and 'Actor'. Prerequisite: Read MongoDB Aggregate framework before executing the following assignments. Note: It is expected that student should fill in the data relevant to the queries given in the assignment. The result set should not be empty.

1. Find the titles of all the films starting with the letter 'R' released during the
2. year 2009 and 2011.
3. Find the list of films acted by an actor " ".
4. Find all the films released in 90s.
5. Find all films belonging to "Adventure" and "Thriller" genre.
6. Find all the films having 'A' rating.
7. Arrange the film names in ascending order and release year should be in descending order.
8. Sort the actors in ascending order according to their age.
9. Find movies that are comedies or dramas and are released after 2013.
10. Show the latest 2 films acted by an actor " "
11. List the titles of films acted by actors " " and " ".
12. Retrieve films with an actor living in Spain.
13. Retrieve films with actor details.

Note: Similarly, additional queries can be executed based on these collections for practice.

Computer Science Database Technologies: MongoDB Practical Assignment 4

This assignment is based on 'Company' database having collections 'Employee' and 'Transaction'. Prerequisite: Read MongoDB Aggregate framework before executing the following assignments. Note: It is expected that student should fill in the data relevant to the queries given in the assignment. The result set should not be empty.

1. Find employees having designation as either 'manager' or 'floor supervisor'.
2. Find an employee whose name ends with " " and print the output in json format.
3. Display the name of an employee whose salary is greater than using a MongoDB cursor.
4. Sort the employees in the descending order of their designation.
5. Count the total number of employees in a collection.
6. Calculate the sum of total amount paid for all the transaction documents.
7. Calculate the sum of total amount paid for each payment type.
8. Find the transaction id of the latest transaction.
9. Find designation of employees who have made transaction of amount greater than Rs. 500.

10. Find the total quantity of a particular item sold using MapReduce.

Database Technologies Neo4j Practical

Assignment 1

Create the following databases as graph models. Visualize the models after creation, return properties of nodes, Return the nodes labels, Return the relationships with its properties. NB: You may assume and add more labels, relationships, properties to the graphs.

1. Create a library database, as given below.

There are individual books, readers, and authors that are present in the library data model. A minimal set of labels are as follows:

Book: This label includes all the books

Person: This label includes authors, translators, reviewers, Readers, Suppliers and so on.

Publisher: This label includes the publishers of books in the database

A set of basic relationships are as follows: PublishedBy: This relationship is used to specify that a book was published by a publisher.

Votes: This relationship describes the relation between a user and a book, for example, how a book was rated by a user. ReviewedBy :

This relationship is used to specify that a book was reviewed and remarked by a user. TranslatedBy: This relationship is used to specify

that a book was translated to a language by a user. IssuedBy: This

relationship is used to specify that a book was issued by a user.

ReturnedBy: This relationship is used to specify that a book was

returned by a user Every book has the following properties: Title: This is the title of the book in string format

Computer Science Tags: This is an array of string tags useful for searching through the database based on topic, arguments, geographic regions, languages, and so on Status: the book status , specifying whether its issued or in library. Condition: book condition, new or old

Cost : Cost of book Type: book is a Novel, Journal, suspense thriller etc.

2. Consider a Song database, with labels as Artists, Song

Recording company, Recording studio, song author etc.

Relationships can be as follows Artist → [Performs] → Song

→ [Written by] → Song_author. Song → [Recorded in] → Recording

Studio → [managed by] → recordingCompany Recording Company

→ [Finances] → Song You may add more labels and relationship and

their properties, as per assumptions.

3. Consider an Employee database, with a minimal set of labels as

follows Employee: denotes a person as an employee of the organization

Department: denotes the different departments, in which employees

work. Skillset: A list of skills acquired by an employee Projects: A list

of projects in which an employee works. A minimal set of relationships

can be as follows: Works_in : employee works in a department

Has_acquired: employee has acquired a skill Assigned_to : employee

assigned to a project Controlled_by: A project is controlled by a

department Project_manager : Employee is a project_manager of a

Project.

4. Consider a movie database, with nodes as Actors, Movies, Roles, Producer, Financier, Director. Assume appropriate relationships between the nodes, include properties for nodes and relationships. Create a Social network database, with labels as Person, Affiliations, Groups, Story, Timeline etc. Some of the relationships can be as follows: Person→[friend of]→Person→[affiliated to]→affiliations Person→[belongs to]→Groups, Person→[create]→Story→[refers to]→Person Person→[creates]→Timeline→[reference for]→Story, Timeline→[contains]→Messages

Computer Science Database Technologies: Neo4j Practical Assignment

2

Simple Queries.

1. Library Database:

- List all people, who have issued a book “.....”
- Count the number of people who have read “”
- Add a property “Number of books issued “ for Mr. Joshi and set its value as the count
- List the names of publishers from Pune city.

2. Song Database:

- List the names of songs written by “:.....”
- List the names of record companies who have financed for the song “”
- List the names of artist performing the song “.....”
- Name the songs recorded by the studio “”

3. Employee Database:

- List the names of employees in department “ ”
- List the projects along with their properties, controlled by department “.....”
- List the departments along with the count of employees in it
- List the skillset for an employee “”

4. Movie Database:

- Find all actors who have acted in a movie “ ”
- Find all reviewer pairs, one following the other and both reviewing the same movie, and return entire subgraphs.
- Find all actors that acted in a movie together after 2010 and return the actor names and movie node
- Find all movies produced by “”

5. Social Network Database:

- Find all friends of “John”, along with the year, since when John knows them.
- List out the affiliations of John.
- Find all friends of John, who are born in the same year as John
- List out the messages posted by John in his timeline, during the year 2015.

Computer Science Database Technologies: Neo4j**Assignment 3****Complex pattern Queries:****1. Library database**

- a) List all readers who have recommended either book “...” or “.....” or “.....”
- b) List the readers who haven't recommended any book
- c) List the authors who have written a book that has been read / issued by maximum number of readers.
- d) List the names of books recommended by “.....” And read by at least one reader
- e) List the names of books recommended by “.....” and read by maximum number of readers.
- f) List the names of publishers who haven't published any books written by authors from Pune and Mumbai.
- g) List the names of voracious readers in our library

2. Song Database:

- a) List the names of artists who have sung only songs written by “ ”
- b) List the names of artists who have sung the maximum number of songs recorded by “.....” studio
- c) List the names of songs financed by “.....”, and sung by “ ”

3. Employee Database:

- a) List the names of employees having the same skills as employee “ ”
 - b) List the projects controlled by a department “ ” and have employees of the same department working in it.
 - c) List the names of the projects belonging to departments managed by employee
- 4. Movie Database:**
- a) List the names of actors that paired in multiple movies together.
 - b) List all pairs of actor–movie subgraphs along with the roles played.
 - c) List all reviewers and the ones they are following directly or via another a third Reviewer.
 - d) List the names of movies that have the most number of reviews.

5. Social Network Database:

- a) List out the people, who have created maximum timeline messages.
- b) List all friends of John's friend, Tom
- c) List the people with maximum friends
- d) List the people who are part of more than 3 groups.

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**Syllabus of M. Sc. Computer Science
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Semester –I	Paper -VI
Course Code: MSC-CS 116 P	Title of the Course : Project
Credits: 02	Total Lectures: 60 Hrs

MSC-CS 116P :-Project

The Project can be platform, Language and technology independent. Project will be evaluated by project guide. Assessment will be done weekly in the respective batch. Evaluation will be on the basis of weekly progress of project work, progress report, oral, results and documentation and demonstration. You should fill your status of the project work on the progress report and get the Signature of project guide regularly. Progress report should sharply focus how much time you have spent on specific task. report should sharply focus how much time you have spent on specific task.

SN	From Date To Date	Details of Project work

Head,
Dept. of Computer Science

	<p>Project Guideline:</p> <p>Students should prepare design document using SE/UML techniques depends on your project • Project Report Contents should be as follows:</p> <ol style="list-style-type: none"> 1. College certificate 2. Acknowledgement 3. Problem Definition 4. Existing System and need for the new system 5. Scope of the work 6. Feasibility study (Including H/W & S/W setup requirements) 7. Requirement Analysis (including fact finding methods used) 8. E-R diagrams 9. Decision trees/Decision tables 10. Normalized Database Design & Data Dictionary. 11. Data flow Diagrams (if applicable) 12. Use-case Diagrams 13. Class Diagrams 14. Object Diagrams 15. Sequence Diagrams 16. Collaboration Diagram 17. Activity Diagram 18. State Chart (if applicable) 19. Component Diagram 20. Deployment Diagram (if applicable) 21. User interface design Menus Input Screens using sample data Reports, Graphs using sample data 22. Testing & Implementation plan (Should contain testing strategies, techniques used & implementation approach used.) 23. User manual 24. Drawbacks, Limitations & Proposed enhancement 25. Abbreviations used (if any) 26. Bibliography/Reference (Including book titles, authors name, editions, publications, etc.) <p>Project Related Assignments:</p> <p>Assignment 1</p> <p>Assignment 2</p> <p>Assignment 3</p> <p>Assignment 4</p>

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**Syllabus of M. Sc. Computer Science
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Semester –I	Paper -VI
Course Code: MSC-CS 117 T(A)	Title of the Course : Artificial Intelligence
Credits: 02	Total Lectures: 30 Hrs.

Course Outcomes (Cos):

- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning

Unit	Course Contents	Allotted Hours
Unit I	Introduction to Artificial Intelligence: Introduction and Intelligent systems, What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, Applications of AI, Early work in AI and related fields, AI problems and Techniques.	(01)
Unit II	Searching: Defining AI problems as a State Space Search: example, Search and Control Strategies, Problem Characteristics, Issues in Design of Search Programs, Production System. Blind Search Techniques: -BFS, DFS, DLS, Iterative Deepening, Search, Bidirectional Search, Uniform cost Search. Heuristic search techniques: -Generate and test, Hill Climbing, Best First search, Constraint Satisfaction, Mean-End Analysis, A*, AO*.	(05)
Unit III	Knowledge Representation: Representations and Mappings, Approaches to Knowledge	(09)

Representation, Knowledge representation method, Propositional Logic, Predicate logic, Representing Simple facts in Logic, Resolution, Forward and backward chaining. Knowledge Representation Structure- Weak Structures, Strong Structures. Semantic Networks, Frames, Conceptual Dependencies, Scripts Game Playing- Minimax Search Procedures, Adding alpha-beta cutoffs

Unit IV Introduction to AI with Python: (10)

Introduction to Python, why python with AI, Features of Python, Basics of Python, Python statements, Methods & Functions using python, Basic and advanced modules & Packages, Python Decorators and generators. Advanced Objects & Data structures.

Unit V Machine Learning: (05)

Why Machine learning, Types of Machine Learning: Supervised learning- Classification & Regression. Decision tree, Random Forest, KNN, Logistic algorithms. Unsupervised learning- Clustering & Association. K- means for clustering, Apriori algorithm. Support Vector Machine (SVM), Reinforcement learning.

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Author/s
1	Computational Intelligence	Eberhart	Elsevier Publication
2	Artificial Intelligence: A New Synthesis	Nilsson	Elsevier Publication
3	Artificial Intelligence with Python	Prateek Joshi	Packt Publishing Ltd
4	Reinforcement and Systematic Machine Learning for Decision Making,	Parag Kulkarni	Wiley-IEEE Press Edition
5	Artificial Intelligence	Saroj Kausik	Cengage Learning
6	Introduction to Machine Learning	Ethem Alpaydin	PHI 2nd Edition

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**Syllabus of M. Sc. Computer Science
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Semester –I	Paper -VIII
Course Code: MSC-CS 118 P(A)	Title of the Course: Artificial Intelligence Practical
Credits: 02	Total Lectures: 60 Hrs

Course Outcomes (Cos):

- learn various types of algorithms useful in Artificial Intelligence (AI).
- convey the ideas in AI research and programming language related to emerging technology.
- understand the numerous applications and huge possibilities in the field of AI that goes beyond the normal human imagination.

Sr.no	Course Contents :Artificial Intelligence PracticalAssignment
1.	Subject teacher should conduct first lab practical on basic programs using python for introducing and using python environment such as, a) Program to print multiplication table for given no. b) Program to check whether the given no is prime or not. c) Program to find factorial of the given no and similar programs.
2.	Write a program to implement List Operations (Nested list, Length, Concatenation, Membership, Iteration, Indexing and Slicing), ListMethods(Add, Append, Extend & Delete)
3.	Write a program to Illustrate Different Set Operations.
4.	Write a program to implement Simple Chatbot.
5.	Write a program to implement Breadth First Search Traversal.
6.	Write a program to implement Depth First Search Traversal.
7.	Write a program to implement Water Jug Problem.
8.	Write a program to implement K -Nearest Neighbor algorithm.
9.	Write a program to implement Regression algorithm.
10.	Write a program to implement Random Forest Algorithm.

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**Syllabus of M. Sc. Computer Science
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Semester –I	Paper -VIII
Course Code: MSC-CS 117 T(B)	Title of the Course : Cloud Computing
Credits: 02	Total Lectures: 30 Hrs

Course Objectives:

- To understand the principles and paradigm of Cloud Computing
- To appreciate the role of Virtualization Technologies
- Ability to design and deploy Cloud Infrastructure
- Understand cloud security issues and solutions

UNIT	Course Contents	Allocated Hours
Unit I	<p>Introduction to Cloud Computing Overview, Roots of Cloud Computing, Layers and Types of Cloud, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks. Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.</p>	(06)
Unit II	<p>Architecture, Services and Applications Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, SaaS Vs. PaaS, Using PaaS Application Frameworks, Software as a Service Cloud Deployment Models, Public vs Private Cloud, Cloud Solutions, Cloud ecosystem, Service management, Computing on demand, Identity as a Service, Compliance as a Service Future of cloud computing and Emerging trends.</p>	(06)

- Unit III Abstraction and Virtualization (05)**
 Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data Center Automation
- Unit IV Programming, Environments and Applications (06)**
 Features of Cloud and Grid Platforms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments, Understanding Core OpenStack Ecosystem. Applications: Moving application to cloud, Microsoft Cloud Services, Google Cloud Applications, Amazon Cloud Services, Cloud Applications (Social Networking, E-mail, Office Services, Google Apps, Customer Relationship Management).
- Unit V Security in The Cloud (07)**
 Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security. Autonomic Security Storage Area Networks, Disaster Recovery in Clouds.

Suggested Readings:

Sr. No.	Title of the Book	Authors	Publication
1	Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center	Brian J.S. Chee and Curtis Franklin	CRC Press, ISBN :9781439806128
2	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi	Mastering Cloud Computing: Foundations and Applications Programming	McGraw Hill, ISBN: 978 1259029950, 1259029956
3	Kai Hwang, Geoffrey C Fox, Jack G Dongarra	Distributed and Cloud Computing, From Parallel Processing to the Internet of Things	Morgan Kaufmann Publishers, 2012.

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**Syllabus of M. Sc. Computer Science
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Semester –I	Paper –VIII
Course Code: MSC-CS117 P(B)	Title of the Course : Cloud Computing Practical
Credits: 02	Total Lectures:60 Hrs.

Course Objectives:

- articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for cloud computing
- explain the core issues of cloud computing such as security, privacy, and interoperability.
- identify problems, and analyze, evaluate various cloud computing solutions according to the applications used.
- Create and deploy a cloud using google, Amazon, cloud platform.

Sr. No	Assignment
1.	Working and Implementation of Infrastructure as a service.
2.	Working and Implementation of Software as a service.
3.	Working and Implementation of Platform as a services.
4.	Practical Implementation of Storage as a Service.
5.	Working of Google drive to make spreadsheet and notes.
6.	Working and Implementation of identity management.
7.	Write a program for web feed.
8.	Execute the step to Demonstrate and implementation of cloud on single sign on.
9.	Practical Implementation of cloud security.
10.	Installing and Developing Application Using Google App Engine.
11.	Implement VMWareESXi Server
12.	Using OpenNebula to manage heterogeneous distributed data center Infrastructure.
13.	Implementation of Cloud Failure Cluster.
14.	Managing and working of cloud Xen server.
15.	Working with Aneka and demonstrate how to Managing cloud computing Resources .

16.	Installation and configuration of cloud Hadoop and demonstrate simple query.
17.	Create a sample mobile application using Amazon Web Service (AWS) account as a cloud service. Also provide database connectivity with implemented mobile application.

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Semester –I	Paper –IX
Course Code: MSC-CS 119 T	Title of the Course : Research Methodology-I
Credits: 02	Total Lectures: 30 Hrs.

Course Outcomes:

Upon completing this course, each student will be able to:

- demonstrate knowledge of research processes (reading, evaluating and developing)
- Prepare intellectual framework necessary to explore wide spectrum of research areas
- perform literature reviews.
- identify, explain, compare, and prepare the key elements of a research proposal/report.
- The qualitative as well as quantitative methods of research will help bridge the gap between theory and Practice.

Unit	Course Contents	Allotted Hours
Unit I	Purpose and Products of Research 6 lectures 1.1 Information Systems and Computing disciplines 1.2 Possible products and outcomes of research 1.3 Finding and choosing research topics 1.4 Evaluating the purpose and products of research	(10)
Unit II	Research Process 2.1 Model of research process 2.2 Evaluating the research process	(05)
Unit III	The Internet Research, Participants and Research Ethics 3.1 Internet research topics 3.2 Literature review on the Internet 3.3 The Internet and research strategies and methods 3.4 Internet research, the law and ethics 3.5 Rights of people directly involved 3.6 Responsibilities of an ethical Researcher 3.7 Design and creation projects and ethics 3.8 Evaluating research ethics	(10)

Unit IV Literature Review (05)

- 4.1 Purpose of literature review
- 4.2 Literature resources
- 4.3 The Internet and literature reviews
- 4.4 Conducting and evaluating literature review

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	Researching Information Systems and Computing	by Briony J. Oastes Sage	India Pvt. Ltd., New delhi ISBN 1-4129-0224-X (pbk)
2	Your research Project, A Step by step Guide for the first-time researcher	by Nicholas Walliman, Vistaar	A division of Sage Publications), New Delhi ISBN 81-7829- 540-7
3.	Research Methods	by William M K Trochim Co	

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Semester –II	Paper -I
Course Code: MSC-CS 211T	Title of the Course : Advanced Operating System
Credits: 04	Total Lectures: 60 Hrs

Course Outcomes:

- This course teaches Advanced Operating Systems Concepts using Unix/Linux.
- This course strikes a delicate balance between theory and practical applications. In fact, most Units start with the theory and then switch focus on how the concepts are implemented in a C program.
- This course describes the programming interface to the Unix/Linux system - the system call interface. It is intended for anyone writing C programs that run under Unix/Linux.
- This course provides an understanding of the functions of Operating Systems. It also provides an insight into functional modules of Operating Systems. It discusses the concepts underlying in the design and implementation of Operating Systems.

UNIT	Course Contents	Allotted Hours
Unit I	Introduction to UNIX/Linux Kernel	(06)
	1.1 System Structure, User Perspective, Assumptions about Hardware, Architecture of UNIX Operating System	
	1.2 Concepts of Linux Programming- Files and the File system, Processes, Users and Groups, Permissions, Signals, Inter process Communication	
Unit II	File and Directory I/O	(18)
	2.1 Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, inodes, structure of regular file, open, read, write, lseek, close, pipes, dup	
	2.2 open, create, file sharing, atomic operations, dup2, sync, fsync, and fdatasync, fcntl, /dev/fd, stat, fstat, lstat, file types, Set- User-ID and Set-Group-ID, file access permissions, ownership of new files and directories, access function, umask function, ch-mod and fchmod, sticky bit, chown, fchown, and lchown, file size, file truncation, file systems, link, unlink, remove, and rename functions, symbolic links, symlink and readlink functions, file times, utime, mkdir and rmdir, reading directories, chdir, fchdir, and getcwd, device special files	

Unit III Process Environment, Process Control and Process Relationships (18)

- 3.1 Process states and transitions, layout of system memory, the context of a process, saving the context of a process, sleep, process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, changing the size of the process, The Shell, Process Scheduling
- 3.2 Process termination, environment list, memory layout of a C program, shared libraries, environment variables, setjmp and longjmp, getrlimit and setrlimit, process identifiers, fork, vfork, exit, wait and waitpid, waitid, wait3 and wait4, race conditions, exec, changing user IDs and group IDs, system function, user identification, process times

Unit IV Memory Management (08)

- 4.1 The Process Address Space, Allocating Dynamic Memory, Managing Data Segment, Anonymous Memory Mappings, Advanced Memory Allocation, Debugging Memory Allocations, Stack-Based Allocations, Choosing a Memory Allocation Mechanism, Manipulating Memory, Locking Memory, Opportunistic Allocation
- 4.2 Swapping, Demand Paging

Unit V Signal Handling (10)

- 5.1 Signal concepts, signal function, unreliable signals, interrupted system calls, reentrant functions, SIGCLD semantics, reliable-signal technology, kill and raise, alarm and pause, signal sets, sigprocmask, sigpending, sigsetjmp and siglongjmp, sigsuspend, abort, system function revisited, sleep

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	The Design of the UNIX Operating System	Maurice J. Bach.	PHI
2	Advanced Programming in the UNIX Environment	Environment Richard Stevens	Addison-Wesley
3	Linux System Programming	Robert Love	O'Reilly

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**Syllabus of M. Sc. Computer Science
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Semester –II	Paper –II
Course Code: MSC-CS 212 T	Title of the Course : Software Project Management
Credits: 04	Total Lectures: 60 Hrs.

Course Outcomes:

- Software Metrics and Project Management covers skills that are required to ensure successful medium and large scale software projects.
- It examines Requirements Elicitation, Project Management, Verification & Validation and Management of Large Software Engineering Projects.
- Students learn to select and apply project management techniques for process modeling, planning, estimation, process metrics and risk management; perform software verification and validation using inspections, design and execution of system test cases.

Unit	Course Contents	Allotted Hours
Unit I	Introduction to Project Management	
	1.1 What is a Project?	(02)
	1.2 What is Project management?	
	1.3 Project phases and project life cycle	
	1.4 Organizational structure	
	1.5 Qualities of Project Manager	
	1.6 WBS	
Unit II	Project Management Components	
	2.1 Project Integration Management-Project plan development and execution.	(02)
	2.2 Change controls	
	2.3 CCB	
	2.4 Configuration management	
Unit III	Scope Management	
	3.1 Strategic planning • Scope planning, definition	(02)
	3.2 Verification and control	

Unit IV	Time management	(03)
	4.1 Activity planning	
	4.2 Schedule development and control	
	4.3 GANTT Chart	
Unit V	Cost Management	(03)
	5.1 Cost estimation and Control	
	5.2 COCOMO model	
	5.3 BASIC COCOMO NUMERICALS	
Unit VI	Quality Management	(02)
	6.1 Quality planning and assurance	
Unit VII	Human Resource Management	(02)
	7.1 Organizational planning	
	7.2 Staff acquisition	
Unit VIII	Communication Management	(02)
	8.1 Information distribution	
	8.2 Reporting	
Unit IX	Risk Management	(03)
	9.1 Risk identification	
	9.2 Quantification and control	
Unit X	Procurement Management	(03)
	10.1 Solicitation management and control	
	10.2 Contract administration	
Unit XI	Software Metrics	(10)
	11.1 The scope of software metrics	
	11.2 Size- oriented metrics	
	11.3 Function oriented	
	11.4 Software metrics data collection	
	11.5 Analyzing software data	
Unit XII	Software Metrics	(10)
	12.1 The scope of software metrics	
	12.2 Size- oriented metrics	
	12.3 Function oriented	
	12.4 Software metrics data collection	
	12.5 Analyzing software data	
Unit XIII	Planning a measurement program	(08)
	13.1 What is metrics plan?	
	13.2 Developing goals, questions and metrics	
	13.3 Where and When: Mapping measures to activities	
	13.4 How: Measurement tools	
	13.5 Who: Measurers , analyst, tools revision plan	
Unit XIV	Quality Standards	(08)
	14.1 CMM levels	
	14.2 KPA's	
	14.3 PSP/TSP	

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	Software Engineering Roger Pressman	Roger Pressman McGraw-Hill	Roger Pressman McGraw-Hill
2	Software Metrics for Project Management and process improvement	Robert B. Grady	Prentice hill

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**Syllabus of M. Sc. Computer Science
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Semester –II	Paper -III
Course Code: MSC-CS 213 T	Title of the Course : Mobile Technologies
Credits: 02	Total Lectures: 30 Hrs.

Course Outcomes:

- To impart basic understanding of the wireless communication systems.
- To expose students to various aspects of mobile and ad-hoc networks.
- Understand the issues relating to Wireless applications
- Understand the Mobile security

Unit	Course Contents	Allotted Hours
Unit I	Introduction to Mobile Computing 1.1 Introduction and need for Mobile computing 1.2 Mobility and portability 1.3 Mobile and Wireless devices 1.4 Mobile Applications 1.5 Mobile Operating system – IOS, Blackberry, Windows phone, Palm OS, Symbian OS, Phone Gap.	(06)
Unit II	Android Fundamentals 2.1 Introduction to Android - Overview and evolution of Android, Features of Android, Android architecture 2.2 Components of an Android Application, Manifest file 2.3 Android Activity 2.4 Service Lifecycle.	(06)
Unit III	Android UI Design 3.1 Basic UI Designing 3.2 Intent (in detail) 3.3 All components (e.g. Button, Slider, Image view, Toast) EventHandling 3.4 Adapters and Widgets 3.5 Menu.	(06)

- Unit IV** Android Thread and Notification **(08)**
- 4.1 Threads running on UI thread (runOnUiThread)
 - 4.2 Worker thread
 - 4.3 Handlers & Runnable
 - 4.4 AsyncTask (in detail)
 - 4.5 Broadcast Receivers
 - 4.6 Services and notifications
 - 4.7 Toast
 - 4.8 Alarms
- Unit V** Advanced Android Programming **(04)**
- 5.1 Content Providers – SQLite Programming
 - 5.2 JSON Parsing • Accessing Phone Service (Call, SMS, MMS)
 - 5.3 Location based services

• **Suggested Readings:**

Sr. No.	Title of the Book	Author/s	Publication
1	A Course in Machine Learning	Hal Daumé III	
2	IOS Apprentice	Matthijs Hollemans	
3	PhoneGap: Beginner's Guide G	Giorgio Natili, Purusothaman Ramanujam P	PACKT Publication
4	Beginning Android Application Development	Wei-Meng Lee Wile	

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**Syllabus of M. Sc. Computer Science
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Semester –II	Paper -IV
Course Code: MSC-CS 214 P	Title of the Course: Advanced Operating System Practical
Credits: 02	Total Lectures: 60 Hrs.

Course Outcomes:

- learn Advanced Operating Systems Concepts using Unix/Linux and Windows as representative examples.
- This course describes the programming interface to the Unix/Linux system - the system call interface.
- It concludes with an overview of Windows Threads Management, an understanding of the functions of Operating Systems. It also provides provide an insight into functional modules of Operating Systems.
- The concepts underlying in the design and implementation of Operating Systems.

Course Contents

Assignment:

1. To create 'n' children. When the children will terminate, display total cumulative time children spent in user and kernelmode.
2. To generate parent process to write unnamed pipe and willread from it.
3. To create a file with hole in it.
4. Takes multiple files as Command Line Arguments and printtheir inode number.
5. To handle the two-way communication between parent andchild using pipe.
6. Print the type of file where file name accepted throughCommand Line.
7. To demonstrate the use of atexit() function.
8. Open a file goes to sleep for 15 seconds before terminating.
9. To print the size of the file.
10. Read the current directory and display the name of thefiles, no of files in current directory.
11. Write a C program to implement the following unix/linuxcommand (use fork, pipe and exec system call) ls
-l | wc -l

12. Write a C program to display all the files from current directory which are created in particular month
13. Write a C program to display all the files from current directory whose size is greater than n Bytes Where n is accepted from user.
14. Write a C program to implement the following unix/linux command i. `ls -l > output.txt`
15. Write a C program which displays the information of a given file similar to given by the unix / linux command `ls -l`
16. Write a C program that behaves like a shell (command interpreter). It has its own prompt say "NewShell\$". Any normal shell command is executed from your shell by starting a child process to execute the system program corresponding to the command. It should additionally interpret the following command. i) count c - print number of characters in file ii) count w - print number of words in file iii) count l - print number of lines in file.
17. Write a C program that behaves like a shell (command interpreter). It has its own prompt say "NewShell\$". Any normal shell command is executed from your shell by starting a child process to execute the system program corresponding to the command. It should additionally interpret the following command. i) list f - print name of all files in directory ii) list n - print number of all entries iii) list i - print name and inode of all files
18. Write a C program that behaves like a shell (command interpreter). It has its own prompt say "NewShell\$". Any normal shell command is executed from your shell by starting a child process to execute the system program corresponding to the command. It should additionally interpret the following command. i) `typeline +10` - print first 10 lines of file ii) `typeline -20` - print last 20 lines of file iii) `typeline a` - print all lines of file
19. Write a C program that behaves like a shell (command interpreter). It has its own prompt say "NewShell\$". Any normal shell command is executed from your shell by starting a child process to execute the system program corresponding to the command. It should i) additionally interpret the following command. ii) search f - search first occurrence of pattern in filename iii) search c - count no. of occurrences of pattern in filename iv) search a - search all occurrences of pattern in filename
20. Write a C program which receives file names as commandline arguments and displays those filenames in ascending order according to their sizes. i) (e.g `$ a.out a.txt b.txt c.txt, ...`)
21. Write a C program which creates a child process which catches a signal `sighup`, `sigint` and `sigquit`. The Parent process sends a `sighup` or `sigint` signal after every 3 seconds, at the end of 30 seconds parent sends `sigquit` signal to child and child terminates by displaying message "My DADDY has Killed me!!!".
22. Write a C program to implement the following unix/linux command (use fork, pipe and exec system call). Your program should block the signal `Ctrl-C` and `Ctrl-\` signal during the execution. i. `ls -l | wc -l`
23. Write a C Program that demonstrates redirection of standard output to a file.

24. Write a program that illustrates how to execute two commands concurrently with a pipe.
25. Write a C program that illustrates suspending and resuming processes using signals.
26. Write a C program that illustrates inter-process communication using shared memory.

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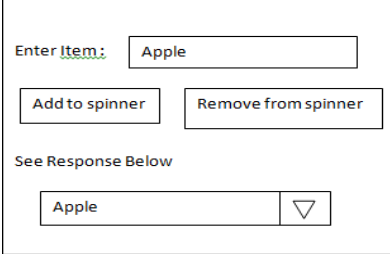
Semester –II	Paper -V
Course Code: MSC-CS 215 P	Title of the Course : Mobile Technology Practical
Credits: 02	Total Lectures: 60 Hrs.

Course Outcomes:

- Apply the fundamental design paradigms and technologies to mobile computing applications.
- Develop consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.
- Design effective mobile interfaces using human computer interaction principles.
- Appraise the quality and performance of mobile applications.
- Synthesize new knowledge in the area of mobile computing by using appropriate research methodologies and techniques.

Course Contents:

Sr. No.	Assignments
1	Java Android Program to demonstrate login form with validation. 
2	Java Android Program to demonstrate Registration form with validation.
3	Create the simple calculator shown below also perform appropriate operation 

4	Create an Android application which examine, that a phone number, which a user has entered is in the given format. * Area code should be one of the following: 040, 041, 050, 0400, 044 * There should 6- 8 numbers in telephone number (+ area code).
5	<p>By using Spinner, Buttons. Write a program to draw following GUI.</p> 
6	Create an Android application, which show to the user 5-10 quiz questions. All questions have 4 possible options and one right option exactly. Application counts and shows to the user how many right answers were right and shows the result to user.
7	Construct an app to display the image on date wise.
8	Construct image switcher using setFactory().
9	Construct a bank app to display different menu like windrow, deposit etc. into Emp and Dept table. 2) Accept Department name from User and delete
10	Create an Android application, where the user can enter player name and points in one view and display it in another view.
11	Create an Android application, the user can enter 10 students information and stored it in file and display student information in second view and also search the particular student information
12	Write an application to accept two numbers from the user, and displays them, but reject input if both numbers are greater than 10 and asks for two new numbers.
13	Create table Customer (id, name, address, phno). Create Application for Performing the following operation on the table. (using sqlite database) i) Insert New Customer Details. ii) Show All the Customer Details
14	Create an application that allows the user to enter a number in the textbox named 'getnum'. Check whether the number in the textbox 'getnum' is palindrome or not. Print the message accordingly in the label control named lbldisplay when the user clicks on the button 'check'.
15	Create Following Table: Emp (emp_no, emp_name, address, phone, salary) Dept (dept_no, dept_name, location) Emp-Dept is related with one-many relationship. Create application for performing the following Operation on the table 1) Add Records into Emp and Dept table. 2) Accept Department name from User and delete employee information which belongs to that department.

16	<p>Perform following numeric operation according to user selection of radio button</p> <div data-bbox="293 216 638 506" style="border: 1px solid black; background-color: #ffffcc; padding: 5px;"><p>Enter No : <input type="text" value="3"/></p><p><input checked="" type="radio"/> Odd or Even <input type="radio"/> Positive or Negative <input type="radio"/> Square <input type="radio"/> Factorial</p><p><input type="button" value="Click"/></p><p>Ans : <input type="text" value="No is Odd"/></p></div>
17	<p>Perform following string operation according to user selection of radio button.</p> <div data-bbox="293 569 602 827" style="border: 1px solid black; background-color: #ffffcc; padding: 5px;"><p>Enter String : <input type="text" value="hello"/></p><p><input checked="" type="radio"/> Uppercase <input type="radio"/> Lowercase <input type="radio"/> Right 5 Character <input type="radio"/> Left 5 Character</p><p><input type="button" value="Click"/></p><p>Output : <input type="text" value="HELLO"/></p></div>

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Semester –II	Paper -VI
Course Code: MSC-CS 216 P	Title of the Course : Project
Credits: 02	Total Lectures: 60 Hrs.

Course Contents:

Project:

The Project can be platform, Language and technology independent. Project will be evaluated by project guide. Assessment will be done weekly in the respective batch. Evaluation will be on the basis of weekly progress of project work, progress report, oral, results and documentation and demonstration. You should fill your status of the project work on the progress report and get the Signature of project guide regularly. Progress report should sharply focus how much time you have spent on specific task.

Project Progress Report

Roll No & Name of the student	
Title of the Project	
Project guide Name	

SN	From Date To Date	Details of Project work	Project guide sign (with date)

Head,
Dept. of Computer Science

Project Guideline:

• Students should prepare design document using SE/UML techniques depends on your project • Project Report Contents should be as follows :

1. College certificate
2. Acknowledgement

3. Problem Definition
4. Existing System and need for the new system
5. Scope of the work
6. Feasibility study (Including H/W & S/W setup requirements)
7. Requirement Analysis (including fact finding methods used)
8. E-R diagrams
9. Decision trees/Decision tables
10. Normalized Database Design & Data Dictionary.
11. Data flow Diagrams (if applicable)
12. Use-case Diagrams
13. Class Diagrams
14. Object Diagrams
15. Sequence Diagrams
16. Collaboration Diagram
17. Activity Diagram
18. State Chart (if applicable)
19. Component Diagram
20. Deployment Diagram (if applicable)
21. User interface design Menus Input Screens using sample data Reports, Graphs using sample data
22. Testing & Implementation plan (Should contain testing strategies, techniques used & implementation approach used.)
23. User manual
24. Drawbacks, Limitations & Proposed enhancement
25. Abbreviations used (if any)
26. Bibliography/Reference (Including book titles, authors name, editions, publications, etc)

Project Related Assignments:

Assignment 1

Assignment 2

Assignment 3

Assignment 4

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Semester –II	Paper -VII
Course Code: MSC-CS 217 T(A)	Title of the Course : DOT NET
Credits: 02	Total Lectures: 30 Hrs.

Course Outcomes:

- Students able to learn c# fundamentals
- Students develop web-sites using .NET framework
- Develop the console and GUI applications using C# .Net.

Course Contents:

Unit	Course Contents	Allotted Hours
Unit I	DOTNET Framework 1.1 Introduction to DOTNET 1.2 DOT NET class framework 1.3 Common Language Runtime Overview 1.4 Elements of .NET application 1.5 Memory Management 1.6 Garbage Collector : Faster Memory allocation, Optimizations 1.7 Common Language Integration 1.8 Common type system 1.9 Reflection API 1.10 User and Program Interface	(04)
Unit II	Introduction to C# 2.1 Language features 2.1.1 Variables and Expressions, type conversion 2.1.2 Flow Control 2.1.3 Functions, Delegates 2.1.4 Debugging and error handling, exception handling(System Defined and User Defined) 2.2 Object Oriented Concepts 2.2.1 Defining classes, class members, Interfaces, properties 2.2.2 Access modifiers, Implementation of class, interface and properties 2.2.3 Concept of hiding base class methods, Overriding	(04)

	2.2.4 Event Handling	
	2.3 Collections, Comparisons and Conversions	
	2.3.1 Defining and using collections,	
	2.3.2 Indexers, iterators	
	2.3.3 Type comparison, Value Comparison	
	2.3.4 Overloading Conversion operators, as operator	
	2.4 Generics	
	2.4.1 Using generics Defining Generics, generic Interfaces, Generic methods, Generic Delegate	
Unit III	Window Programming	(06)
	3.1 Window Controls	
	3.1.1 Common Controls	
	3.1.2 Container Controls	
	3.1.3 Menus and Toolbars	
	3.1.4 Printing	
	3.1.5 Dialogs	
	3.2 Deploying Window Application	
	3.2.1 Deployment Overview	
	3.2.2 Visual studio setup and Deployment project types	
	3.2.3 Microsoft windows installer architecture Building the project :Installation	
Unit IV	Data Access	(03)
	4.1 File System Data	
	4.2.XML	
	4.3 Databases and ADO.NET Data Binding	
Unit V	Web Programming	(03)
	5.1 Basic Web programming	
	5.2 Advanced Web programming	
	5.3 Web Services Deployment Web applications	
Unit VI	.NET Assemblies	(05)
	6.1 Components	
	6.2 .NET Assembly features	
	6.3 Structure of Assemble, Calling assemblies, private and shared assemblies	
Unit VII	Networking	(05)
	7.1 Networking overview	
	7.2 Networking programming options	
	7.2.1 Webclient	
	7.2.2 WebRequest and WebResponse	
	7.2.3 TcpListener &TcpClient	

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	Beginning Visual C#		Wrox Publication
2	Professional Visual C#		Wrox Publication
3	Beginning ASP.NET 3.5		Wrox Publication
4	Programming ASP.NET 3.5	Jesse Liberty, Dan Maharry, Dan Hurwitz	,O'Reilly

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Semester –II	Paper -VIII
Course Code: MSC-CS 218 P(A)	Title of the Course : Dot Net Practical
Credits: 02	Total Lectures: 60 Hrs.

Course Outcomes:

At the end of this Lab course students will be able to:

- Create user interactive web pages using ASP.Net.
- Create simple data binding applications using ADO.Net connectivity.
- Performing Database operations for Windows Form and web applications.

Course Contents

Assignment:

1. Program to display the addition, subtraction, multiplication and division of two number using console application.
2. Program to display the first 10 natural numbers and their sum using console application.
3. Program to display the addition using the windows application.
4. Write a program to convert input string from lower to upper and upper to lower case.
5. Write a program to simple calculator using windows application.
6. Write a program working with Page using ASP.Net.
7. Write a program working with forms using ASP.NET.
8. Write a program to connectivity with Oracle database.
9. Write a program to access data source through ADO.NET.
10. Write a program to manage the session.
11. Write a Program to perform validation operation.
12. Write a Program to display the phone no of an author using database.
13. Write a Program to display how data bind using dropdown list.
14. Write a Program to insert the data in to database using Execute-Non Query.
15. Write a Program to delete the data in to database using Execute non-query.
16. Write a Program to bind data using data grid.
17. Write a Program to bind data using Hyperlink column in data grid.
18. Write a Program to bind data using button column in data grid.
19. Write a Program create an own table and bind data using data grid.
20. Write a Program to bind data using template in data list.

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Semester –II	Paper –VII
Course Code: : MSC-CS 217 T(B)	Title of the Course : Soft Computing
Credits: 02	Total Lectures: 30 Hrs.

Course Outcomes:

- To introduce the ideas of soft computational techniques based on human experience.
- To generate an ability to design, analyze and perform experiments on real life problems using various Neural Learning Algorithms.
- To conceptualize fuzzy logic and its implementation for various real world applications.
- To apply the process of approximate reasoning using Neuro-Fuzzy Modeling.
- To provide the mathematical background to carry out optimization using genetic algorithms.

Unit	Course Contents	Allocated Hours
Unit I	Introduction to Soft Computing Neural Networks: Definition, Advantages, Applications, Scope. Fuzzy logic: Definition, Applications. Genetic Algorithms: Definition, Applications.	(02)
Unit II	Neural Network Fundamental Concept: Artificial Neural Network, Biological Neural Network, Brain vs. Computer-Comparison Between Biological Neuron and Artificial Neuron (Brain vs. Computer), Artificial Neurons, Neural Networks and Architectures: Neuron Abstraction, Neuron Single Functions, Mathematical Preliminaries, Neural Networks Defined, Architectures: Feedforward and Feedback, Salient Properties of Neural Networks Geometry of Binary Threshold Neurons and Their Networks: Pattern Recognition and Data Classification, Convex Sets, Convex Hulls and Linear Separability, Space of Boolean Functions, Binary Neurons are Pattern Dichotomizers, Non-linearly Separable Problems, Capacity of a Simple Threshold Logic Neuron, Revisiting the	(12)

XOR Problem, Multilayer Networks, How Many Hidden Nodes are Enough? Learning and Memory: An Anecdotal Introduction, Long Term Memory, The Behavioral Approach to Learning, The Molecular Problem of Memory, Learning Algorithms, Error Correction and Gradient Descent Rules, Learning Objective for TLNs, Pattern Space and Weight Space. Linear Severability, Hebb Network, Perceptron Network. α - Least Mean Square Learning, MSE Error Surface and Its Geometry, Steepest Descent Search with Exact Gradient Information, μ -LMS: Approximate Gradient Descent, Application of LMS TO Noise Cancellation.

Unit III Fuzzy Set Theory (10)

Brief Review of Conventional Set Theory, Introduction to Fuzzy Sets, Properties of Fuzzy Sets, Operations on Fuzzy Sets, Crisp Relation, Fuzzy Relation, Tolerance and equivalence relation, Fuzzy Tolerance and equivalence relation, Fuzzy Max-Min and Max-Product Composition, Membership Functions, Fuzzification, Defuzzification to crisp sets, λ -Cuts for fuzzy Relations, Fuzzy (Ruled-Based) system, Graphical technique of inference, Membership value assignment- Intuition, Inference. Fuzzy Classification -Classification by equivalence relation, Cluster analysis, cluster validity, c-Means clustering, Hard c-means, Fuzzy c- Means, Fuzzy Arithmetic, Fuzzy Extension Principle.

Unit IV Genetic Algorithms (06)

What are Genetic Algorithms? Why Genetic Algorithms? Biological Background: The Cell, Chromosomes, Genetics, Reproduction, Natural Selection, Traditional Optimization and Search Techniques, Simple GA, Terminologies and Operators in GA, Encoding, Selection, Crossover, Mutation, Search Termination, Constraints in GA, Problem solving using GA, Classification of GA.

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	Fuzzy Logic With Engineering Applications	Timothy Ross	Wiley Publication
2	Introduction to Soft Computing	Deepa & Shivanandan	Wiley Publication
3	Genetic Algorithms in Search, Optimization and Machine Learning	David E. Goldberg	Pearson Education
4	Fundamentals of Neural Networks – Architectures, Algorithms, And Applications	Laurene Fausett	Pearson Education
5	Neural Networks	Satish Kumar	Tata McGrawHill

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Semester –II	Paper –VIII
Course Code: : MSC-CS 218 P(B)	Title of the Course : Soft Computing Practical
Credits: 02	Total Lectures: 60 Hrs.

Course Outcomes:

At the end of the course the student should be able to

- Learn about soft computing techniques and their applications
- Analyze various neural network architectures
- Understand perceptron and counter propagation networks.

Implement the programs in C/C++/Java/MATLAB

Sr. No	Assignment
1.	Write a program to implement Fuzzy Operations Union Intersection Complement Algebraic sum Algebraic product Cartesian product.
2.	Write a program to implement De Morgans law.
3.	Write a program to implement Max-Min Composition and Max-Product Composition.
4.	Write a program to implement lambda cut.
5.	Write a program to implement Activation Function.
6.	Write a program to implement Perceptron Learning Rule.
7.	Write a program to implement Hebb's Rule.
8.	Write a program to implement Feed Forward Network.
9.	Write a program for building an Artificial Neural Network by implementing the Back propagation Algorithm and test the same using appropriate data sets.
10.	Write a program for solving linearly separable problem using Perceptron Model.
11.	Write a program to develop supervised learning algorithm.
12.	Write a program to study and analyze genetic life cycle.

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Semester –II	Paper –IX
Course Code: MSC-CS 219 T	Title of the Course : Research Methodology-II
Credits: 02	Total Lectures: 30 Hrs.

Course Outcomes:

Upon completing this course, each student will be able to:

- demonstrate knowledge of research processes (reading, evaluating and developing)
- Prepare intellectual framework necessary to explore wide spectrum of research areas
- perform literature reviews
- identify, explain, compare, and prepare the key elements of a research proposal/report
- The qualitative as well as quantitative methods of research will help bridge the gap between theory and practice

Unit	Course Contents	Allotted Hours
Unit I	Types of Research 1.1 Surveys 1.2 Design and Creation 1.3 Experiments 1.4 Case Studies 1.5 Action Research 1.6 Ethnography 1.7 Interviews 1.8 Observations 1.9 Questionnaires Documents	(08)
Unit II	Quantitative Data Analysis 2.1 Types of quantitative data 2.2 Data coding 2.3 Visual aids for quantitative data analysis 2.4 Using statistics for quantitative data analysis 2.5 Interpretation of data analysis results 2.6 Evaluating quantitative data analysis	(10)

Unit III	Qualitative Data Analysis	(07)
	3.1 Analyzing textual data 3.2 Analyzing non-textual qualitative data	
	3.3 Grounded theory	
	3.4 Computer aided qualitative analysis 3.5 Evaluating qualitative data analysis	
Unit IV	Experiential Learning	(05)
	4.1 Writing of research proposal and research report	
	4.2 Poster presentation and Conference paper presentation	

Suggested Readings:

Sr. No.	Title of the Book	Author/s	Publication
1	Researching Information Systems and Computing	by Briony J. Oastes Sage	India Pvt. Ltd., New delhi ISBN 1-4129-0224-X (pbk)
2	Your research Project, A Step by step Guide for the first-time researcher	by Nicholas Walliman, Vistaar	A division of Sage Publications), New Delhi ISBN 81-7829-540-7