



# **KALASALINGAM**

## **ACADEMY OF RESEARCH & EDUCATION**

### **(DEEMED TO BE UNIVERSITY)**

Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade



### **SCHOOL OF COMPUTING**

**Department of Computer Science and Information Technology**

## **M.Sc., (COMPUTER SCIENCE)**

## **CURRICULUM AND SYLLABUS**

### **(CBCS)**

**REGULATIONS 2018**



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## **SCHOOL OF COMPUTING**

### **Department of Computer Science and Information Technology**

#### **UNIVERSITY VISION**

To be a Centre of Excellence of International Repute in Education and Research.

#### **UNIVERSITY MISSION**

To Produce Technically Competent, Socially Committed Technocrats and Administrators through Quality Education and Research

#### **DEPARTMENT VISION**

To become a Center of excellence offering quality education and innovation in Computer Science and Information Technology.

#### **DEPARTMENT MISSION**

1. To prepare the students to excel in the field of Computer Science and IT industry
2. To prepare the students to pursue higher studies and develop sustainable innovative solutions for the society.



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## **SCHOOL OF COMPUTING**

### **Department of Computer Science and Information Technology**

#### **M.Sc (Computer Science)**

#### **Programme Educational Objectives (PEOs)**

- PEO1:** Graduates are prepared to apply broad knowledge of Computer Science and a focused understanding of their area of expertise.
- PEO2:** Graduates will be capable of pursuing professional careers or to take up research programmes
- PEO3:** Graduates are prepared to survive in rapidly changing technology and engage in life-long learning.

#### **Programme Outcomes (POs)**

- PO1 :** Ability to demonstrate hardware and software architectures of Computer Science
- PO2 :** Ability to design and conduct experiments to analyze and interpret data
- PO3 :** Ability to identify, formulate and solve computer related problems
- PO4 :** Ability to function on multidisciplinary teams
- PO5 :** Ability to communicate effectively—both orally and in writing
- PO6 :** Ability to understand about professional, ethical, security and social responsibilities.
- PO7 :** Ability to analyze the local and global impact of computing on individuals, organizations, and society.



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## SCHOOL OF COMPUTING

### Department of Computer Science and Information Technology

**M.Sc., (Computer Science)**  
(Those who joined 2018 onwards)

#### SCHEME OF INSTRUCTION

Course Code	Course Name	Course Type	L	T	P	C
MAT18R4011	Mathematical Foundations of Computer Science	T	4	1	0	4
MCS18R4001	Design and Analysis of Algorithms	TP	3	0	2	4
MCS18R4002	Advanced Database Management Systems	T	4	0	0	4
MCS18R4003	Artificial Intelligence	T	4	0	0	4
MCS18R40XX	Elective Paper-I	T	4	0	0	4
MCS18R4081	Advanced Database Management Systems Lab	L	0	0	4	2
MCS18R4083	Seminar and Comprehensive Viva	Viva	0	0	2	2
MCS18R4004	Digital Image Processing	TP	3	0	2	4
MCS18R4005	Object Oriented Analysis and Design	T	4	0	0	4
MCS18R4006	Software testing and Quality Assurance	TP	3	0	2	4
MCS18R40XX	Elective Paper	TP	3	0	2	4
MCS18R40XX	Elective Paper	T	4	0	0	4
MCS18R4082	Object Oriented Analysis and Design Lab	P	0	0	4	2
MCS18R4084	Seminar and Comprehensive Viva	Viva	0	0	2	2
MCS18R4061	Python Programming	P	1	1	2	2
MCS18R5001	Data Mining and Data Warehousing	T	4	0	0	4
MCS18R5002	Network Security	T	4	0	0	4
MCS18R5003	Web Programming	T	4	0	0	4
MCS18R5041	Research Methodology	T	3	0	0	2
MCS18R50XX	Elective Paper *	T	4	0	0	4
MCS18R5081	Web Programming Laboratory	L	0	0	6	2
MCS18R5061	Mobile Application using Android	L	1	1	2	2

	Programming					
MCS18R5082	Seminar and Comprehensive Viva	Viva	0	0	2	2
MCS18R50XX	Elective Paper *	T	4	0	0	4
MCS18R5098	Project and Viva Voce	Project	0	0	16	12

### ELECTIVES

Course. Code	Course Name	Course Type	L	T	P	C
<b>Group I</b>						
MCS18R4031	Distributed Computing	T	4	0	0	4
MCS18R4032	Cyber Forensics and Ethical Hacking	T	4	0	0	4
MCS18R4033	Software Project Management	T	4	0	0	4
MCS18R4034	Cloud Computing	T	4	0	0	4
MCS18R4035	Advanced Operating System	T	4	0	0	4
MCS18R4036	Advanced Computer Networks	T	4	0	0	4
MCS18R4037	Computer Graphics and Multimedia	T	4	0	0	4
<b>Group II</b>						
MAT18R4012	Operations Research	T	4	0	0	4
MCS18R4038	Soft Computing	TP	3	0	2	4
MCS18R4039	Social Network Analysis	T	4	0	0	4
MCS18R4040	Big Data Analytics	TP	3	0	2	4
MCS18R4041	Green Computing	T	4	0	0	4
MCS18R4042	Game programming	T	4	0	0	4
MCS18R4043	Adhoc and Sensor Networks	T	4	0	0	4
<b>Group III</b>						
MCS18R5031	Internet of Things	T	4	0	0	4
MCS18R5032	Biometrics	T	4	0	0	4
MCS18R5033	Wireless Communications	T	4	0	0	4
MCS18R5034	Machine Learning	T	4	0	0	4
MCS18R5035	Webmining	T	4	0	0	4

The students can be permitted to choose elective paper in any group in any but they can be permitted to choose only one elective in each group.

### Total Credits = 90

Courses	No. of Courses	No. of Credits
Core Courses	<b>10</b>	<b>40(10*4)</b>
Elective Courses	<b>5</b>	<b>20(5*4)</b>
Laboratory Courses	<b>3</b>	<b>6(3*2)</b>
Comprehensive Viva	<b>3</b>	<b>6(3*2)</b>
Research Methodology	<b>1</b>	<b>2</b>
Skill Development	<b>2</b>	<b>4(2*2)</b>

Courses		
Project Work	<b>1</b>	<b>12</b>
<b>Total Credits</b>		<b>90</b>

### Non-CGPA Courses

Sl. No.	Courses	Credit
1	NET/SET/JEST/GATE coaching classes*	1
	a) Pass in examination based on the coaching classes. Exam will be conducted by the department at the end of the third for coaching classes.	1
	b) Paper presentation in National/International Conferences/Seminars	1
	c) Participation in workshops (3 days)	1
	d) Participation in Guest Lecture (5 Nos.)	1
	e) Internship	1
	f) Foreign Language/National Language	1

\*80% attendance is compulsory in this category even if the student earns Non-CGPA credit as mentioned in the table.

The students should score minimum 2 credits for completing the Non-CGPA courses.

<b>MAT18R0411</b>	<b>MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **COURSE OBJECTIVE**

To introduce mathematical logic, combinatorial and counting techniques, Algebraic structures, Finite state system and grammar as Mathematical Foundation of computer Science so as to understand algorithms, computability and other theoretical aspects of Computer science.

### **COURSE OUTCOMES**

Upon completion of the course, the students should be able to

**CO1:** Understand the concepts of Permutations and Combinations

**CO2:** Study basics of Graph theory and they will be equipped with counting techniques to Solve combinatorial problems.

**CO3:** Discuss order relation and structures

**CO4:** Understand fundamental theorem on homomorphism

**CO5:** Study the concepts of finite state machines and monoids.

### **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	S	M					
<b>CO2</b>	S		M				L
<b>CO3</b>	M	S	S	S	M		M
<b>CO4</b>	S						
<b>CO5</b>	S	L					L

### **UNIT I**

Proposition and Logical Operation – Conditional Statements – Methods of Proof – Mathematical Induction – Mathematical Statements – Permutations – Combinations – Pigeonhole Principle.

### **UNIT II**

Graphs –Graph Models – Subgraphs and Quotient graphs - Representing graphs and graph isomorphism - Euler Paths and circuits - Hamiltonian Paths and Circuits – Trees – Minimal Spanning Trees.

### **UNIT III**

Partially Ordered Sets – Hasse Diagrams - Extremal Elements of Partially Ordered Sets – Lattices – Finite Boolean Algebras – Functions on Boolean Algebras – Circuits Design.

### **UNIT IV**

Properties of binary operations - Semi groups – Simple Problems - Isomorphism and Homomorphism – Fundamental homomorphism theorems - Groups.

## UNIT V

Languages – Representations of Special Grammars and Languages – Finite State Machines – Monoids, Machines and Languages – Machines and Regular Languages

### TEXT BOOKS:

1. Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, Discrete Mathematical Structures, PHI Learning Private Limited, New Delhi, 2010.

### REFERENCES:

1. Tremblay J.P and Manohar R, Discrete Mathematical Structures with Applications to Computer Science , Tata McGraw Hill Publication Co. Ltd, New Delhi, 2008.
2. Judith Gersting L , Mathematical Structures for Computer Sciences, W. H. Freeman and Company, New York, 6<sup>th</sup> Edition, 2007.
3. Kenneth Rosen H, Discrete and Combinatorial Mathematics, 7<sup>th</sup> Edition , Tata McGraw Hill Publication Co. Ltd, New Delhi, 2012.
4. Ralph Grimaldi P, Discrete and Combinatorial Mathematics, Pearson Education, 5<sup>th</sup> Edition, New Delhi, 2008

MCS18R4001	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	2	4

### COURSE OBJECTIVES

Basic Algorithm analysis techniques and understand the use of asymptotic notation and understand classical problem and solutions

### COURSE OUTCOMES:

At the end of the course the student able to

**CO1:** Analyze the pros and cons of applying the different design paradigms in different contexts.

**CO2:** Exposure to randomization as a tool for developing algorithms.

**CO3:** Relevance of analysis to the design of efficient computer algorithms.

**CO4:** Identify the computational issues and apply suitable algorithms to solve it effectively

**CO5:** Conceptualize and design efficient and effective algorithmic solutions for different real world problems.

### Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1		S			S		
CO2		S			S	M	
CO3			S		S		
CO4				M	S		L
CO5	S	S			S	L	

## UNIT -I INTRODUCTION



Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.

## **UNIT- II**

### **BRUTE FORCE AND DIVIDE-AND-CONQUER**

Brute Force - Closest-Pair and Convex-Hull Problems-Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication.

## **UNIT- III**

### **DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE**

Computing a Binomial Coefficient – Warshall's and Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm-Dijkstra's Algorithm-Huffman Trees.

## **UNIT -IV**

### **ITERATIVE IMPROVEMENT**

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs-The Stable marriage Problem.

## **UNIT -V**

### **COPING WITH THE LIMITATIONS OF ALGORITHM POWER**

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems--Coping with the Limitations - Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

### **List of programs**

1. Apply the Divide and Conquer technique to arrange a set of numbers using merge sort method.
2. Solve the knapsack problem using greedy method.
3. Construct a minimum spanning tree using greedy method.
4. Construct optimal binary search trees using dynamic programming method of problem solving.
5. Find the solution for traveling salesperson problem using dynamic programming approach.

### **TEXT BOOKS:**

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

### **REFERENCES:**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009.
4. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008

<b>MCS18R4002</b>	<b>ADVANCED DATABASE MANAGEMENT SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **COURSE OBJECTIVE**

To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram and understand the internal storage structures using different file and indexing techniques which will help in physical DB design.

### **COURSE OUTCOMES**

Upon completion of the course, the students should be able to

**CO1:** Acquire knowledge in fundamentals of Data Base Management System and Design, create tables in database through query.

**CO2:** Design data base and normalize data and Understand how query are being processed and executed.

**CO3:** Draw various data models for Data Base and Write queries mathematically.

**CO4:** Analyze and appraise different types of databases

**CO5:** To understand advanced distributed database systems.

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>		S			S		
<b>CO2</b>		S			S	M	
<b>CO3</b>			S		S		
<b>CO4</b>				M	S		L
<b>CO5</b>	S	S			S	L	

### **UNIT I DATABASE SYSTEMS**

Purpose of Database System – Views of data – Data Models – Database System Architecture – Database languages, Database users and administrators, Transaction management, Database system structure, Application architectures.

### **UNIT -II DATA MODELS**

Entity – Relationship Model – Basic concepts, Constraints, Keys, Design issues, ER diagram, Weak entity sets, Extended ER features, Design of an ER database schema, Reduction of an ER schema to tables - Relational model - Structure of relational databases – The relational algebra – Extended relational algebra operations, Modification of database, Tuple relational calculus, Domain relational calculus.

### **UNIT –III DATABASE DESIGN**

SQL fundamentals - Advanced SQL features –Embedded SQL– Dynamic SQL- Relational database design- Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form- Multivalued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

## **UNIT -IV IMPLEMENTATION TECHNIQUES**

File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Catalog Information for Cost Estimation- Query Optimization

## **UNIT -V**

### **TRANSACTION, CONCURRENCY CONTROL AND RECOVERY MANAGEMENT**

Transactions – Transaction concept, Transaction state, Implementation of atomicity and durability, Concurrent executions, Serializability, Recoverability, Implementation of isolation, Transaction definition in SQL, Testing for serializability - Concurrency control – Lock based protocols, Timestamp based protocols, Validation based protocols, Multiple granularity, Multiversion schemes, Deadlock handling, Insert and delete operations, Weak levels of consistency, Concurrency in index structures - Recovery system – Failure classification,

### **TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

### **REFERENCES:**

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fifth Edition , Pearson, 2008.
2. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, Tata McGraw Hill, 2010.
3. G.K.Gupta, ”Database Management Systems”, Tata McGraw Hill, 2011.

<b>MCS18R4003</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

## **COURSE OBJECTIVE**

The student should be made to study the concepts of Artificial Intelligence and learn the concepts of expert systems and machine learning.

## **COURSE OUTCOMES**

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

**CO1:** Identify problems that are amenable to solution by AI methods.

**CO2:** Identify appropriate AI methods to solve a given problem.

**CO3:** Formalise a given problem in the language/framework of different AI methods.

**CO4:** Implement basic AI algorithms.

**CO5:** Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>	M	S			S		
<b>CO2</b>		S			S	M	
<b>CO3</b>		S	S		S		
<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S			S	L	

**UNIT -I**

**INTRODUCTION TO AI AND PRODUCTION SYSTEMS**

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

**UNIT -II**

**REPRESENTATION OF KNOWLEDGE**

Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

**UNIT- III**

**KNOWLEDGE INFERENCE**

Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

**UNIT -IV**

**PLANNING AND MACHINE LEARNING**

Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning.

**UNIT- V**

**EXPERT SYSTEMS**

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

**TEXT BOOKS:**

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill- 2008. (Unit-1,2,4,5).

2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007. (Unit-III)

#### **REFERENCES:**

1. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.

2. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.

3. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.

<b>MCS18R4081</b>	<b>ADVANCED DATABASE MANAGEMENT SYSTEMS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

#### **COURSE OBJECTIVES**

This course aims to develop skills in SQL programming

#### **COURSE OUTCOMES**

**CO1:** Able to create databases using SQL

**CO2:** Have practical knowledge on the PL/SQL

**CO3:** Ability to use databases for building web applications.

#### **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	M	S			S		
<b>CO2</b>		S			S	M	
<b>CO3</b>		S	S		M		

1. Programs for Implementation of DDL commands of SQL with suitable examples
2. Programs for Implementation of DML commands of SQL with suitable examples
3. Programs for Implementation of different types of function with suitable examples
4. Programs for Implementation of different types of operators in SQL
5. Programs for Implementation of different types of Joins
6. Programs for implementation of functions using PL/SQL
7. Programs for implementation of cursors using PL/SQL.
8. Programs for implementation of triggers using PL/SQL.
9. Programs for implementation of packages using PL/SQL.
10. Programs for implementation of procedures using PL/SQL.
11. Develop a small project based on Database Design and Implementation of any one of following Systems:
  - i) Library information system
    - a. BSC CS&IT
    - b. MSC
  - ii) Inventory control system
    - a. Computer Lab
    - b. College Store
  - iii) Student information system
    - a. Academic
    - b. Finance

<b>MCS18R4004</b>	<b>DIGITAL IMAGE PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

## **COURSE OBJECTIVES**

This course is to make students learn fundamentals of image processing such as formation, restoration, segmentation, morphology.

## **COURSE OUTCOMES**

At the end of the course, the student able to

**CO1:** Understand the basic concepts in digital image processing

**CO2:** Analyze the histogram and filtering techniques for image enhancement.

**CO3:** Analyze the image Degradation/Restoration process.

**CO4:** Synthesize the various image compression and segmentation methods.

**CO5:** Apply the knowledge of representation and description of images.

### **Mapping of Course Outcome(s) with PO(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	M	S			S		
<b>CO2</b>		S			S	M	
<b>CO3</b>		S	S		S		
<b>CO4</b>		S		S	S		L
<b>CO5</b>	S	S			S	L	

## **UNIT- I**

### **DIGITAL IMAGE FUNDAMENTALS**

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models

## **UNIT- II**

### **IMAGE ENHANCEMENT**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters

## **UNIT- III**

### **IMAGE RESTORATION AND SEGMENTATION**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation

#### **UNIT- IV**

##### **WAVELETS AND IMAGE COMPRESSION**

Wavelets – Subband coding - Multiresolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards

#### **UNIT -V**

##### **IMAGE REPRESENTATION AND RECOGNITION**

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

#### **LIST OF PROGRAMS**

Use the following Matlab Commands to read and view an image.

- 1 Convert a color image into grayscale image using 'rgb2gray'.
- 2 Convert a grey image into binary Image.
- 3 Obtain the size of an image.
- 4 Find the usage of 'double' and 'uint8' commands.
- 5 Change the size of any image to specified value.

#### **TEXT BOOK:**

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.

#### **REFERENCES:**

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. William K Pratt, “Digital Image Processing”, John Willey, 2002.
4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.

<b>MCS18R4005</b>	<b>OBJECT ORIENTED ANALYSIS AND DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

#### **COURSE OBJECTIVE**

This course helps to understand theories, methods, and technologies applied for professional software development and explain its importance to discuss the concepts of software products and software processes

#### **COURSE OUTCOMES**



**CO1:** The students understands the process to be followed in the software development life cycle

**CO2:** Find practical solutions to the problems and define, formulate and analyze a problem

**CO3:** Solve specific problems alone or in teams and manage a project from beginning to end

**CO4:** Work independently as well as in teams

**CO5:** The ability to analyze, design, verify, validate, implement, apply, and maintain software systems and to manage the development of software systems

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
CO1	M	S			S		
CO2	S				S	M	
CO3	S		S		S		
CO4				M	S		L
CO5	S	S			S	L	

**UNIT -I**

**INTRODUCTION**

Basics – Object oriented philosophy, Object state, Behavior, Methods, Encapsulation and Information hiding, Associations, Aggregation, Meta classes, Identity, Dynamic binding - Object Oriented System development life cycle.

**UNIT- II**

**METHODOLOGY AND UML**

Methodology- Rumbaugh, Booch, Jacobson methodology, Patterns, Frameworks , Unified approach – Introduction to UML – UML diagrams , Class diagrams , Use case diagrams, Static and dynamic Models , Model organization , Extensibility.

**UNIT- III**

**OBJECT ORIENTED ANALYSIS**

Object analysis – Business object analysis, Use case driven approach, Use case model, Documentation – Classification – Identifying object relationship, Attributes, Methods, Super and Sub class, Object responsibility.

**UNIT- IV**

**OBJECT ORIENTED DESIGN**

OO design process – Design axioms and corollaries, Design classes, Class visibility, Refining attributes, Methods and protocols, Object storage and interoperability – Databases – Object relational systems – Designing interface objects – Macro and micro level processes, The purpose of a view layer interface.

## **UNIT -V**

### **SOFTWARE QUALITY**

Quality assurance - Testing Strategies, Object orientation testing, Test cases, Test plan, Debugging principles – Testing – Usability testing, Satisfaction testing.

### **TEXT BOOK**

1. Ali Bahrami, Object Oriented System Development, McGraw Hill International Edition, 2008.

### **REFERENCES**

1. Craig Larman, Applying UML and Patterns, 2<sup>nd</sup> Edition, Pearson Education, 2002.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison Wesley, 1999.

<b>MCS18R4006</b>	<b>SOFTWARE TESTING AND QUALITY ASSURANCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

### **COURSE OBJECTIVE**

This course aims to make the students to expose the criteria for test cases, learn the design of test cases., be familiar with test management and test automation techniques and Be exposed to test metrics and measurements.

### **COURSE OUTCOMES**

At the end of the course, the student able to

**CO1 :** To understand the fundamentals of testing theory and concepts

**CO2 :** To know the different types of testing and identify suitable tests to be carried out.

**CO3 :** To know the different categories of software testing.

**CO4 :** To develop the test plans and test cases are designed using automatic testing tools.

**CO5 :** To understand the software quality models.

### **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>
----------------	-----------

	1	2	3	4	5	6	7
<b>CO1</b>	M		S		S		
<b>CO2</b>			S			M	
<b>CO3</b>		S	S				
<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S			S	L	

## **UNIT- I**

### **BASIC CONCEPTS AND PRELIMINARIES**

Quality Revolution – Software Quality – Role of Testing – Verification and Validation – Failure, Error, Fault, and Defect – Notion of Software Reliability – Objectives of Testing – Concept of Complete Testing – Central Issue in Testing – Testing Activities – Test Levels – White-Box and Black-Box Testing – Test Planning and Design – Monitoring and Measuring Test Execution – Test Tools and Automation – Test Team Organization and Management.

## **UNIT- II**

### **TYPES OF TESTING**

UNIT TESTING : Concept of Unit Testing – Static Unit Testing – Defect Prevention – Dynamic Unit Testing – Mutation Testing – Debugging. DOMAIN TESTING : Domain Error – Testing for Domain Errors – Sources of Domains – Types of Domain Errors – ON and OFF Points. SYSTEM INTEGRATION TESTING : Concept of Integration Testing – Granularity of System Integration Testing – System Integration Techniques.

## **UNIT- III**

### **SYSTEM TEST CATEGORIES**

Taxonomy of System Tests – Basic Tests – Functionality Tests – Robustness Tests Interoperability Tests – Performance Tests – Scalability Tests – Stress Tests – Load and Stability Tests – Reliability Tests – Regression Tests – Documentation Tests – Regulatory Tests.

## **UNIT- IV**

### **SYSTEM TEST PLANNING AND AUTOMATION**

Structure of a System Test Plan – Introduction and Feature Description – Assumptions – Test Approach– Test Suite Structure – Test Environment – Test Execution Strategy  
System Test Automation – Evaluation and Selection of Test Automation Tools – Test Selection Guidelines for Automation – Characteristics of Automated Test Cases – Structure of an Automated Test Case – Test Automation Infrastructure.

## UNIT- V

### SOFTWARE QUALITY

Five Views of Software Quality – McCall’s Quality Factors and Criteria – ISO 9126 Quality Characteristics – ISO 9000:2000 Software Quality Standard. MATURITY MODELS : Basic Idea in Software Process – Capability Maturity Model – Test Process Improvement – Testing Maturity Model .

### LIST OF PROGRAMS:

1. Record and replay the test cases using calculator application.
2. Generate and run Test Scripts repeatedly for Regression Testing
3. Testing web application
4. Identify Business Scenario’s for Employee
5. Login Form Independent Test cases for Students University Result System

### TEXT BOOKS:

1. Kshirasagar Naik and Priyadarshi Tripathy. "Software testing and quality assurance: theory and practice". John Wiley & Sons, ISBN : 978-0-471-78911-6, 2011.
2. Srinivasan Desikan and Gopalaswamy Ramesh, “ Software Testing – Principles and Practices”, Pearson education, 2006.
3. Aditya P.Mathur, “Foundations of Software Testing”, Pearson Education,2008.

### REFERENCE BOOKS:

1. Boris Beizer, “Software Testing Techniques”, Second Edition,Dreamtech, 2003
2. Elfriede Dustin, “Effective Software Testing”, First Edition, Pearson Education, 2003.
3. Renu Rajani, Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, Tata McGraw Hill, 2004.

MCS18R4082	OBJECT ORIENTED DESIGN AND ANALYSIS LAB	L	T	P	C
		0	0	4	2

### COURSE OBJECTIVE

To Practice the notation for representing various UML diagrams and design problem by representing using UML diagrams

### COURSE OUTCOMES

**CO1:** Find solutions to the problems using object oriented approach

**CO2:** Represent using UML notation and interact with the customer to refine the UML diagrams

**CO3:** Create appropriate design pattern

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
CO1	M	S			S		
CO2		M			S	M	
CO3		S	S		M		

1. Introduction to UML Diagrams
2. Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include template showing description and steps of the Use Case for various scenarios.
3. Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships.
4. Draw sequence diagrams OR communication diagrams with advanced notation for your system to show objects and their message exchanges
5. Identify the business activities and develop an UML Activity diagram.
6. Identify the conceptual classes and develop a domain model with UML Class diagram.
7. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
8. Draw the State Chart diagram.
9. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation
10. Draw Component and Deployment diagrams.

Suggested domain for mini project

1. Expert system.
2. ATM system
3. Library management system
4. Course registration system.
5. Online ticket reservation system.
6. Payroll system.
7. Quiz system.
8. Real time scheduler.

MCS18R4061	PYTHON PROGRAMMING	L	T	P	C
		1	1	2	2

**COURSE OBJECTIVE**

This course introduces core programming basics including data types, control structures, algorithm development, and program design with functions via the Python programming language. The course discusses the fundamental principles of Object-Oriented Programming, as well as in-depth data and information processing techniques. Students will solve problems, explore real-world software development challenges, and create practical and contemporary applications.

## COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

CO1: Understand basic principles of computers.

CO2: Understand the decision structure and control structure.

CO3: Understand and implement functions to improve readability of programs.

CO4: Use Dictionaries, Lists and Tuples for organizing and processing data in Python programs.

CO5: Understand the object-oriented program design and the Graphical User Interface

### Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1		S			S		M
CO2			L		L		S
CO3		M			S	M	
CO4		L		S			M
CO5		S	S		M		

### UNIT I

Introduction to Python Programming: How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard,

### UNIT II

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

### UNIT III

Functions: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions, Generating Random Numbers, Writing Our Own Value-Returning Functions, The math Module, Storing Functions in Modules. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

### UNIT IV

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples. Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Dictionaries and Sets: Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

### UNIT V

Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, Working with Instances, Techniques for Designing Classes, Inheritance, Polymorphism. GUI

Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

### Text Book

1. Tony Gaddis, Starting Out With Python (3e), Pearson, 2015.

### References

1. Kenneth A. Lambert, Fundamentals of Python
2. Clinton W. Brownley, Foundations for Analytics with Python
3. James Payne, Beginning Python using Python 2.6 and Python 3
4. Charles Dierach, Introduction to Computer Science using Python
5. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3

MCS18R5001	DATA MINING AND DATA WAREHOUSING	L	T	P	C
		4	0	0	4

### COURSE OBJECTIVE

This course aims to introduce data warehouse principles and its working learn data mining concepts understand association rules mining. Discuss classification algorithms learn how data is grouped using clustering techniques.

### COURSE OUTCOMES:

At the end of the course, the student able to

**CO1:** Students should be able to understand why the data warehouse in addition to database systems.

**CO2:** Ability to solve real world problems in business and scientific information using data mining.

**CO3:** Ability to perform the preprocessing of data and apply mining techniques on it.

**CO4:** Ability to identify the association rules in large data sets.

**CO5:** Ability to identify the classification and clusters in large data sets and explore recent trends in data mining such as web mining, spatial-temporal mining

### Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1	M	S			S		
CO2		S				M	
CO3			S				

<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S			S	L	

## **UNIT -I**

### **DATA WAREHOUSING**

Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata.

## **UNIT- II**

### **BUSINESS ANALYSIS**

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

## **UNIT- III**

### **DATA MINING**

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

## **UNIT- IV**

### **ASSOCIATION RULE MINING AND CLASSIFICATION**

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods - Prediction

## **UNIT -V**

### **CLUSTERING AND APPLICATIONS AND TRENDS IN DATA MINING**

Cluster Analysis – Types of Data – Categorization of Major Clustering Methods - K- means – Partitioning Methods – Hierarchical Methods – Density Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

## **TEXT BOOKS:**



1. Alex Berson and Stephen J. Smith, “ Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

#### REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “ Introduction To Data Mining”, Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay “, Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “ Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, “Data Mining Methods and Models”, Wile-Interscience, 2006.

<b>MCS18R5002</b>	<b>NETWORK SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

#### COURSE OBJECTIVE

This course aims to get the understanding of malware analysis concepts and methodology and recognize the methodologies techniques for detecting host and network based intrusion.

#### COURSE OUTCOMES:

At the end of the course, the student able to

- CO1:** Understand the basic concepts of cryptography and encryption algorithms.  
**CO2:** Analyze the security features for a program and an web application.  
**CO3:** Analyze the security features for a network  
**CO4:** Synthesize the Security requirements for database systems  
**CO5:** Estimate the security models and its standards.

#### Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>	M	S			S		
<b>CO2</b>		S			S	M	
<b>CO3</b>		S	S		S		
<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S			S	L	

#### UNIT I

Types of Physical Medium-Topologies-Wireless Networking: Wireless Protocols. Data Link Layer: Layered Data Link Protocols-SLIP and PPP-MAC and ARP. Network Layer: Routing Risks-Addressing-Fragmentation-Security.

## **UNIT II**

Internet Protocol: IP Addressing-ICMP-Security options. Transport Layer: Common Protocols-Transport Layer Functions-Gateways. TCP: Connection Oriented Protocols-TCP Connections-UDP. Session Layer: Session State Machine-Session and Stacks. SSL: SSL Functionality-Certificates. SSH: SSH and Security-SSH Protocols. STMP: Email Goals-Common servers. HTTP: HTTP Goals-URL.

## **UNIT III**

Security: Importance-Threat Models-Concepts-Common Mitigation Methods. Network theory: Standards Bodies-Network Stacks-Multiple Stacks-Layers and Protocols-Common Tools. Cryptography: Securing Information-Necessary Elements-Authentication and Keys-Cryptography and Randomness-Hashes-Ciphers-Encryption-Steganography.

## **UNIT IV**

Data Encryption Techniques-Data Encryption Standards-Symmetric ciphers. Public key Cryptosystems-Key Management.

## **UNIT V**

Authentication-Digital Signatures-E-Mail Security-Web Security-Intrusion-Firewall.

### **TEXT BOOKS:**

1. Neal Krawetz, Introduction Network Security, India Edition, Thomson Delmar Learning. 2007
2. V.K.Pachghare, Cryptography and Information Security, PHI Learning Private Limited 2015 2<sup>nd</sup> Edition,

### **REFERENCE BOOK:**

1. William Stallings, Cryptography and Network Security, Prentice –Hall of India, 2008

<b>MCS18R5003</b>	<b>WEB PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

## **COURSE OBJECTIVE**

This course aims to make the students to developing modular application by using object oriented methodologies. Set up and configure programming environment for ASP.net programs, reate ASP.Net applications using standard .net controls and develop a data driven web application.

## **COURSE OUTCOMES**

At the end of the course, the student able to

**CO1 :** To understand the basic concepts of ASP.

**CO2 :** Design, Debug and Deploy web applications using ASP.NET.

**CO3 :** Use ASP.NET controls in web applications.

**CO4 :** To develop the projects using webforms in ASP.NET.

**CO5 :** Create database driven ASP.NET web applications and web services.

## **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	M		S		S		
<b>CO2</b>			S			M	
<b>CO3</b>		S	S				
<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S			S	L	

## **UNIT- I**

### **INTRODUCTION TO ACTIVE SERVER PAGES**

Introduction -What is ASP? - ASP Objects and Components - Basics of ASP - Variables in VBScript - Conditional Programming – Case Constructs - Looping Constructs.

## **UNIT- II**

### **ACTIVE SERVER PAGES AND HTTP**

The Response Object - Caching & ASP - The Request Object - Cookies and ASP - Creating Cookies - Retrieving Cookies - Including Files in ASP.

## **UNIT- III**

### **ASP.NET**

What is ASP.NET? Introduction - An Overview of ASP & ASP.NET - ADO & ADO.NET Objects - ASP.NET Programming Languages. Programming Basics: Basics of Programming - Program Flow - Effective Coding Techniques - Designing Applications – The ASP Server Object.

## **UNIT IV**

Web Forms & ASP.NET: Web forms. ASP.NET Configuration. Scope and State: ASP.NET and Configuration - ASP.NET and State - ASP Sessions- Session Object.

## **UNIT V**

ASP.NET Objects & Components: The Scripting Object Model - Active Server Components and Controls. ASP.NET & SQL Server: Using Databases in ASP.NET Applications - ActiveX Data Objects - The ADO.NET Object Model - Coding Structured Query Language (SQL).

## **TEXT BOOKS**

1. Jude D'Souza, Monica D'Souza, "Discover ASP 3.0", Tata McGraw-Hill, 2002. (UNIT I & II)
2. Dave Mercer, "ASP.NET A Beginner's Guide", Tata McGraw-Hill Edition, 2008. (UNIT III, IV & V)

## **REFERENCE BOOKS**

1. Matthew Mac Donald, "The Complete Reference ASP.NET", Tata McGraw-Hill Edition, 2009.
2. Vikas Gupta, ".Net Programming", 2007.
3. Kogent Solutins, "ASP.NET 3.5 Black Book", Dream Tech Press, 2009.
4. Chris Hart, John Kauffman, David Sussman, Chris Ullman, "Beginning ASP.NET 2.0 with C#", Dream Tech Press.

<b>MCS18R5041</b>	<b>RESEARCH METHODOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>2</b>

## **COURSE OBJECTIVE**

- To understand basic concepts of research and its methodologies
- To select and define appropriate research problem and parameters, conduct research in a more appropriate manner and write a research report and thesis

## **COURSE OUTCOMES**

At the end of the course, the students will be able to

**CO1** : understand basic concepts of research and its types

**CO2** : explain the steps in Laboratory and the Field Experiment

**CO3** : describe the different kind of data collection methods and data sources

**CO4** : understand the various data analysis methods and Application of Statistical (SPSS) Software Package in Research.

**CO5** : write a research report and thesis

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>				M	S		
<b>CO2</b>		L	M	M	L		
<b>CO3</b>			L	S	S		
<b>CO4</b>		L	M	M	S		L
<b>CO5</b>	S	S	M	M	S	L	

**UNIT- I**

**INTRODUCTION TO RESEARCH**

The features of scientific research –Building blocks of science in research –Concept of Applied and Basic research –Quantitative and Qualitative Research Techniques –Need for theoretical frame work –Hypothesis development –Hypothesis testing with quantitative data. Research design –Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

**UNIT- II**

**EXPERIMENTAL DESIGN**

Laboratory and the Field Experiment –Internal and External Validity –Factors affecting Internal validity. Measurement of variables –Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales –Validity testing of scales –Reliability concept in scales being developed –Stability Measures.

**UNIT- III**

**DATA COLLECTION METHODS**

Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design –Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data - Collection Methods and their utility. Sampling Techniques – Probabilistic and non-probabilistic samples.

**UNIT- IV**

**MULTIVARIATE STATISTICAL TECHNIQUES**

Data Analysis–Factor Analysis –Cluster Analysis –Discriminant Analysis –Multiple Regression and Correlation –Canonical Correlation –Application of Statistical (SPSS) Software Package in Research.

**UNIT -V**

**RESEARCH REPORT**

Purpose of the written report –Concept of audience –Basics of written reports. Integral parts of a report –Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report –

Experimental, Results and Discussion –Recommendations and Implementation section –  
Conclusions and Scope for future work.

## TEXT BOOKS

1. Donald R. Cooper and Ramela S. Schindler, Business Research Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2000
2. Uma Sekaran, Research Methods for Business, John Wiley and sons Inc., New York, 2000.

## REFERENCES

1. C.R. Kothari, Research Methodology, Wishva Prakashan, New Delhi, 2001.
2. Donald H. McBurney, Research Methods, Thomson Asia Pvt. Ltd. Singapore, 2002.
3. G.W. Ticehurst and A.J. Veal, Business Research Methods, Longman, 1999.
4. Ranjit Kumar, Research Methodology, Sage Publications, London, New Delhi, 1999.

MCS18R5081	WEB PROGRAMMING LABORATORY	L	T	P	C
		0	0	6	2

- 1) Write a console application that obtains four int values from the user and displays the product.
- 2) If you have two integers stored in variables var1 and var2, what Boolean test can you perform to see if one or the other (but not both) is greater than 10?
- 3) Write an application that includes the logic from Exercise 1, obtains two numbers from the user, and displays them, but rejects any input where both numbers are greater than 10 and asks for two new numbers.
- 4) Write a console application that places double quotation marks around each word in a string.
- 5) Write an application that receives the following information from a set of students:  
Student Id:  
Student Name:  
Course Name:  
Date of Birth:  
The application should also display the information of all the students once the data is Entered. Implement this using an Array of Structures.
- 6) Write a program to declare a class 'staff' having data members as name and post. accept this data for 5 staffs and display names of staff who are HOD.
- 7) Write a program to declare class 'Distance' have data members dist1, dist2, dist3. Initialize the two data members using constructor and store their addition in third data member using function and display addition.
- 8) Write a program to implement single inheritance from following figure. Accept and display data for one table.

- 9) Define a class 'salary' which will contain member variable Basic, TA, DA, HRA. Write a program using Constructor with default values for DA and HRA and calculate the salary of employee.
- 10) Write a program to accept a number from the user and throw an exception if the number is not an even number.
- 11) 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'.
- 12) Create an application which will ask the user to input his name and a message, display the two items concatenated in a label, and change the format of the label using radio buttons and check boxes for selection, the user can make the label text bold, underlined or italic and change its color. Include buttons to display the message in the label, clear the text boxes and label and exit.
- 13) List of employees is available in listbox. Write an application to add selected or all records from listbox (assume multi-line property of textbox is true).
- 14) "How is the book ASP.NET with c# by Vipul Prakashan?" Give the user three choices :  
i) Good ii) Satisfactory iii) Bad. Provide a VOTE button. After user votes, present the result in percentage using labels next to the choices.
- 15) Create a project that calculates the total of fat, carbohydrate and protein. Allow the user to enter into text boxes. The grams of fat, grams of carbohydrate and grams of protein. Each gram of fat is 9 calories and protein or carbohydrate is 4 calories. Display the total calories of the current food item in a label. Use other labels to display and accumulated some of calories and the count of items entered. The form food has 3 text boxes for the user to enter the grams for each category include label next to each text box indicating what the user is entering.
- 16) Design the same webpages for BMS, BAF, BscIT students and apply same background color for all the pages using CSS.
- 17) Programs using ASP.NET Server controls.  
Create the application that accepts name, password, age, email id, and user id. All the information entry is compulsory. Password should be reconfirmed. Age should be within 21 to 30. Email id should be valid. User id should have at least a capital letter and digit as well as length should be between 7 and 20 characters.
- 18) Programs using ASP.NET Server controls.  
Create a website for a bank and include types of navigation.
- 19) Database programs with ASP.NET and ADO.NET.  
Create a Web App to display all the Empname and Deptid of the employee from the database using SQL source control and bind it to GridView. Database fields are (DeptId, DeptName, EmpName, Salary).
- 20) Database programs with ASP.NET and ADO.NET  
Create a Login Module which adds Username and Password in the database. Username in the database should be a primary key.

<b>MCS18R5061</b>	<b>MOBILE APPLICATION USING ANDROID PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>

## **COURSE OBJECTIVE**

This course introduces mobile application development for the Android platform. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Students will learn skills for creating and deploying Android applications, with particular emphasis on software engineering topics including software architecture, software process, usability, and deployment.

## **COURSE OUTCOMES**

Upon successful completion of this course, the student will be able to:

**CO1:** To study about the android architecture and the tools for developing android applications.

**CO2:** To learn about the user interfaces used in android applications.

**CO3:** To learn about how to handle and share android data.

**CO4:** Understand the location based services.

**CO5:** To learn about how to develop an android services and to publish android application for use.

### **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	S	S			S	L	
<b>CO2</b>	M		S		S		
<b>CO3</b>		S	S				
<b>CO4</b>			S			M	
<b>CO5</b>		S		M	S		L

## **UNIT I**

Getting Started With Android Programming – What is Android ?, Android SDK installation and configuration, Anatomy of an Android application, Activities, Fragments and Intents- Understanding Activities, Linking Activities using intents, Fragments, Calling Built in applications using intents, Displaying Notifications.

## **UNIT II**

The Android User Interface- Understanding the components of a screen, Adapting to display orientation, Managing changes to screen orientation, Creating the user interface programmatically, Listening for UI notifications, Designing User Interface with Views- Using basic views, Using Picker Views, Understanding Specialized fragments,



### UNIT III

Data Persistence – Saving and Loading User Preferences, Persisting Data to Files, Creating and using Databases. Content Providers - Sharing Data in Android, Using a Content Provider, Creating Your Own Content Providers.

### UNIT IV

Messaging – SMS Messaging, Sending Email. Location-Based Services – Displaying Maps, Getting Location Data, Monitoring a Location.

### UNIT V

Networking – Consuming Webservices using HTTP, Consuming JSON Services, Sockets Programming, Developing Android Services – Creating Your Own Services, Establishing Communication between a service and an activity, Binding Activities to Services, Understanding Threading, Publishing Android Applications.

### TEXT BOOKS

1. Wei-Meng Lee, "Beginning Android 4 Application Development", Wrox publications, 2012

### REFERENCES

1. The Android Developer's Cookbook: Building Applications with the Android SDK James Steele, Nelson to Addison Wesley Publications 2010 First Edition.
2. Professional Android Application Development. Reto Meier, Wrox publications, 2009, Second Edition

### ELECTIVES

#### GROUP I

MCS18R4031	DISTRIBUTED COMPUTING	L	T	P	C
		4	0	0	4

#### **COURSE OBJECTIVE:**

The student should have learned the differences among: concurrent, networked, distributed, and mobile, resource allocation and deadlock detection and avoidance techniques, remote procedure calls, IPC mechanisms in distributed systems.

#### **COURSE OUTCOMES:**

At the end of the course, the student able to

**CO1:** Advanced network technologies, design and security issues for building, deploying and managing distributed computer systems.

**CO2:** Software engineering management and practice for distributed software development.

**CO3:** Internet technologies for web-enabled enterprise systems.

**CO4:** Advanced modeling techniques for building distributed computer systems.

**CO5:** Business, industrial and commercial context of building modern software systems

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>	M	S			S		
<b>CO2</b>		S			S	M	
<b>CO3</b>			S				
<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S				L	

**UNIT- I**

Introduction-Definition of a Distributed System- Goals- Connecting Users and Resources– Openness – Scalability – hardware Concepts: Multiprocessors – Homogeneous multicomputer systems – Heterogeneous Multicomputer Systems – Software Concepts: Distributed operating Systems - Network Operating Systems – Middleware-vThe Client-Server model: Client and Servers – Application layering – Client Server Architectures.

**UNIT- II**

Processes : Threads - clients – code migration: Approaches to code migration – Migration and Local Resources – Migration in Heterogeneous Systems – Software agents– Naming : naming Entities: names, identifiers and Addresses – Name resolution The implementation of a namespace – Locating Mobile entities: Naming versus Locating entities – Simple solutions – Removing unreferenced entities.

**UNIT- III**

Synchronization: clock Synchronization - Physical Clock – Synchronization algorithms – use of Synchronized clocks – logical clocks - Global State –Election algorithms - Mutual Exclusion – Distributed Transactions – consistency and Replication – Data Centric Consistency Models: Linearizability and Sequential Consistency – Weak Consistency – Distribution protocols: Replica placement – Update Propagation.

**UNIT -IV**

Fault Tolerance: Introduction to fault tolerance – Process resilience: design issues – Failure Masking and replication – Reliable Client-Server Communication: Point to Point Communication – RPC semantics in the presence of failures – Reliable group of Communication : basic Reliable – multicasting Schemes – Overview of CORBA – Overview of DCOM - Overview of NFS - Overview of WWW.

## UNIT - V

Linux Operating systems : Introduction –History of UNIX and Linux – System Features – Software Features – Differences between Linux and Other Operating System – hardware requirements - sources of Linux Information – Linux Startup and Setup : User accounts – Accessing the linux system – Unix Commands – Linux File Structure: Linux file types – File structures – managing Files - Managing Directories – File and Directory operation – File Management Operation: File and Directory permissions – Jobs – System Administration – Shells in Linux - Shell operations: Command Line – Standard Input/Output- Redirection – Pipes – Shell Scripts – Shell Variables - Arithmetic Shell Operations – Control Structures.

### TEXT BOOKS:

1. Andrew S.Tanenbaum and Marten Van Steen, Distributed Systems – Principles and Paradigms , PHI, 2004.
2. Richard Petersen , The Complete Reference – Linux , TMH, 1998.

### REFERENCE BOOKS:

1. Pradeep K.Sinha, Distributed Operating Systems , PHI, 2001.
2. George coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems – Concepts and Design , 3<sup>rd</sup> Edition, Pearson Education,2002.

MCS18R4032	CYBER FORENSICS AND ETHICAL HACKING	L	T	P	C
		4	0	0	4

## COURSE OBJECTIVES

The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security and Computer Forensics.

### COURSE OUTCOMES:

At the end of the course, the student able to

**CO1:** Understand the forensics fundamentals.

**CO2:** Understand the evidence capturing process.

**CO3:** Understand the preservation of digital evidence

**CO4:** Experience in basic concepts of hacking process.

**CO5:** Know the different types of hacking types like Windows hacking and Web Hacking.

### Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1	S	S				L	
CO2			M	S		L	
CO3	S			S	M		S
CO4	M	S			S		

<b>CO5</b>	<b>S</b>		<b>M</b>	<b>S</b>		<b>L</b>	
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#### **UNIT- I**

Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services

#### **UNIT- II**

Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

#### **UNIT- III**

Discover of Electronic Evidence –Identification of Data – Reconstructing Past Events – Networks

#### **UNIT -IV**

Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues –Tactics of Private Companies.

#### **UNIT -V**

Foundation for Ethical Hacking-Ethical Hacking in Motion-Hacking Network Hosts-Hacking Operating Systems-Hacking Applications.

#### **TEXT BOOKS:**

1. John R. Vacca, “Computer Forensics”, Firewall Media, 2004.
2. Kevin Beaver, “Hacking For Dummies”, John Wiley & Sons, 2012.

#### **REFERENCE BOOKS:**

1. Chad Steel, “Windows Forensics”, Wiley India, 2006.
2. Majid Yar, “Cybercrime and Society”, Sage Publications, 2006.
3. Robert M Slade, “Software Forensics”, Tata McGrawHill, 2004.

<b>MCS18R4033</b>	<b>SOFTWARE PROJECT MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

#### **COURSE OBJECTIVES**

Understand the fundamental principles of Software Project Management and will also have a good knowledge of responsibilities of project.

#### **COURSE OUTCOMES:**

At the end of the course, the student able to

- CO1:** Understand the overview of Software Project Characteristics and various concepts project management, project planning and project scheduling
- CO2:** Understand project life cycle, project cost and project quality management.
- CO3:** Understand the role and responsibilities of software engineers in various phases of software development.
- CO4:** Understand the foundations of software quality assurance and the development of appropriate quality assurance strategies

**CO5:** Understand the different techniques of software testing, reusability of software and software maintenance.

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>		S					L
<b>CO2</b>			M	S		L	
<b>CO3</b>			S	S	M		S
<b>CO4</b>					S		
<b>CO5</b>		S	M	S		L	S

**UNIT -I**

SPM: Introduction – Project planning – Project evaluation – Selection of an appropriate project approach.

**UNIT- II**

Software effort estimation – Activity planning – Risk Management – Resource allocation.

**UNIT -III**

Monitoring and control – Managing people and organizing teams – Small projects.

**UNIT- IV**

Software Quality: Introduction – Establishment – Software Quality Assurance Planning – Overview – Purpose and Scope – SQA management – Documentation – Standards, Practices, Conventions and Metrics.

**UNIT- V**

Reviews and Audits – Tests – Tools – Techniques and Methodologies – Training – Risk Management.

**TEXT BOOKS:**

1. BOB Hughes Mike Cotterell, Software Project Management, 2<sup>nd</sup> edn, McGraw Hill.
2. Mordechai Ben, Menachem Garry S. Marliss, Software Quality, Vikas, 1997.

**REFERENCE BOOKS:**

1. Futrell, Quality software Project management, Pearson Education India.
2. Royce, Software Project management, Pearson Education India.
3. Basics of Software Project Management , NIIT, Prentice-Hall of India
4. Drew Bire and Mike Harwood, Software Project Management from concept to Deployment , Wiley Dreamtech
5. Darrel Ince, An Introduction to Software Quality Assurance and its implementation .

<b>MCS18R4034</b>	<b>CLOUD COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**COURSE OBJECTIVE**

At the end of the course, the students must be aware of different cloud service providers and number and types of services they provide and advantages and concerns in adopting cloud computing services.

### **COURSE OUTCOMES:**

At the end of the course, the student able to

**CO1:** Understand security implications in cloud computing

**CO2:** Analyse the trade-offs inherent in Cloud Computing

**CO3:** Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.

**CO4:** Explain the core issues of cloud computing such as security, privacy, and interoperability

**CO5:** Identify problems, and explain, analyze, and evaluate various cloud computing solutions

### **Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>	M	S			S		
<b>CO2</b>						M	
<b>CO3</b>			S				
<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S			S	L	

### **UNIT- I**

Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture -IaaS – On-demand provisioning – Elasticity in cloud –Egs of IaaS providers - PaaS – Egs. Of PaaS providers - SaaS – Egs. Of SaaS providers – Public , Private and Hybrid clouds.

### **UNIT- II**

Basics of virtualization - Types of Virtualization -Implementation Levels of Virtualization - Virtualization Structures – Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices -Desktop virtualization – Server Virtualization.

### **UNIT- III**

Architectural Design of Compute andStorage Clouds – Layered Cloud Architecture Development – DesignChallenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

### **UNIT- IV**

Parallel and Distributed programming-Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop, Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open nebula, OpenStack.

### **UNIT- V**

Security Overview – Cloud Security-Challenges – Software-as-a-Service Security – Security Governance –Risk Management – Security Monitoring – Security Architecture Design –Data Security – Application Security – Virtual Machine Security.

#### TEXT BOOKS:

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things by Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.
2. Cloud Computing: Implementation, Management, and Security by John W.Rittinghouse and James F.Ransome : CRC Press 2010

#### REFERENCE BOOKS:

1. Cloud Computing, A Practical Approach by Toby Velte, Anthony Velte, Robert Elsenpeter: TMH, 2013
2. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice (O'Reilly)) by George Reese: O'Reilly
3. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
4. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, “Grid and Cloud Computing – A Business Perspective on Technology and Applications”,

MCS18R4035	ADVANCED OPERATING SYSTEMS	L	T	P	C
		4	0	0	4

#### COURSE OBJECTIVE:

The objective of the course is to provide basic knowledge of computer operating system structures and functioning

#### COURSE OUTCOMES:

At the end of the course, the student able to

**CO1:** Understand the concepts of Operating system, advantage and disadvantage of OS and Thread Management

**CO2:** Understand the concepts of Semaphores and Deadlocks

**CO3:** Understand the concepts of Memory Management techniques, Virtual Memory and , page replacement algorithms

**CO4:** Understand I/O Management and Disk Scheduling

**CO5:**Students will get the domain concepts of Protection & Security

#### Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1	M				M		S
CO2	S			L	S	M	
CO3		S	M		S	L	

<b>CO4</b>		M	S			S	
<b>CO5</b>	L	S		S			

### **UNIT- I**

Operating System Overview: Objectives and Functions - Processes: Process Description and Control – UNIX SVR4 Process Management – Threads and Multithreading – Symmetric Multiprocessing - Windows Thread Management - Solaris Thread and SMP Management - Linux Thread Management - Android Thread Management

### **UNIT- II**

Mutual Exclusion and Synchronization: Semaphores – Monitors - Message Passing – producer-consumer problem – readers writers problem - Principles of Deadlock – Deadlock prevention – Avoidance – Detection

### **UNIT -III**

Virtual Memory Management: Paging – segmentation - Operating System Software policies - Windows Memory Management - Android Memory Management - Uniprocessor Scheduling: Types of Scheduling - Scheduling Algorithms - Real-Time Scheduling

### **UNIT -IV**

I/O Management and Disk Scheduling: I/O Buffering - Disk Scheduling – RAID - File Management : File Organization and Access - Secondary Storage Management – File Allocation Methods – Free Space Management - Windows File System - Android File Management - Embedded Operating Systems: Characteristics – eCOS

### **UNIT -V**

Operating System Security: Basic concepts - Intruders and Malicious Software - viruses - Distributed Processing, Client/Server, and Clusters: Client/Server Computing - Distributed Message Passing - Remote Procedure Calls – Clusters - Windows Cluster Server – Sun Cluster

### **TEXT BOOKS**

1. Operating Systems-Internals and Design Principles, Williams Stallings, Pearson, 8th Edition, 2014.
2. Modern Operating Systems, Andrew S. Tanenbaum, Pearson,, 4th Edition, 2014.

### **REFERENCE BOOKS:**

1. Operating System Concepts, Abraham Silberschatz , Peter B. Galvin, Greg Gagne, John Wiley & Sons, 8th Edition, 2008.
2. Operating System Concepts and Design, Milankovic M., 2nd Edition, McGraw Hill, 1992
3. An Introduction to Operating Systems-Concepts and Practice, P.C.Bhatt Prentice Hall Of India, 2004
4. An Introduction to Operating Systems, H.M.Deitel 2nd Edition, Pearson Education, 2002



<b>MCS18R4036</b>	<b>ADVANCED COMPUTER NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

## **COURSE OBJECTIVES**

To study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues

## **COURSE OUTCOMES:**

At the end of the course, the student able to

**CO1:** Understand the concepts of Network Architecture and Reference models.

**CO2:** Understand Internetworking & devices, Routing techniques

**CO3:** Understand Frame Relay Services, ISDN services and ATM

**CO4:** Understand the concepts underlying IPv6 protocol, and their main characteristics and functionality.

**CO5:** Understand the concepts TCP/IP Application Protocols, FTP,TFTP and SNMP

## **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	M	S			S		
<b>CO2</b>						M	
<b>CO3</b>			S				
<b>CO4</b>		S		M	S		L
<b>CO5</b>	S	S			S	L	

## **UNIT- I**

Topology of Computer Network- Architecture of a Computer Network- Network Architecture Models- Partitioning of a system- Layered architecture of a Computer Network – Need for standardization of Network Architecture – Open System interconnection – Layered Architecture of the OSI Reference model – Functionality of the Layered architecture- Hierarchical Communication-Peer to Peer Communication- Service Interface- Data Transfer modes.

## **UNIT- II**

LAN Bridge-Transparent Bridges-Spanning Tree Algorithm- Source Routing Bridges-Route Discovery in Source Routing-Network Layer-Wide area Networks-Circuit Switching- Store and Forward Data Networks-Types of Packet switched Data Networks- Purpose of the Network Layer- Network Service.

## **UNIT - III**

X.25 Interface-X.25 Services-General Packet Format-Procedures for Switched Virtual Circuits-Addressing in X.25-Packet assembler and Disassembler-PAD operation-Frame Relay- Frame Relay Network Topology-Frame Relay Connection-Frame Relay Services- Frame format in Frame Relay-Basic operation of LAP-F-IP Encapsulation-Asynchronous Transfer Mode-UNI and NNI-ATM Virtual Channel connection- Virtual Path Connection-Layered Architecture in ATM-Physical Layer-ATM Layer-ATM Adaption Layer.

#### UNIT -IV

Internet Protocol- Internet Protocol (IP)-Hierarchical Addressing-Subnetting-Address Resolution Protocol-Internet Control Message Protocol (ICMP)-IPV6 Internet Protocol-Point to Point Protocol-Link Control Protocol-Quality of Service –Routing-Static Routing-Dynamic Routing-Distance Vector Routing Algorithm- Routing Information Protocol (RIP)-Link state Routing-Open Shortest Path First (OSPF) Routing Protocol.

#### UNIT- V

Transport Layer-Transmission Control Protocol (TCP)-TCP Ports and Connections-Format of TCP segment-TCP operation-Flow Control in TCP-Congestion Avoidance in TCP-Application Layer – TCP/IP Application Protocols-Domain Name System-Bootstrapping Protocol(BOOTP)-Dynamic Host Configuration Protocol (DHCP)-Trivial File Transfer Protocol(TFTP)- File Transfer Protocol(FTP)- Electronic Mail-Simple Network Management Protocol(SNMP).

#### TEXT BOOK

1. Data Communications and Computer Networks-Prakash C.Gupta, PHI Learning Private Limited 2006

#### REFERENCE

1. Computer Network-Tanenbaum-PHI Learning Edition 2012
2. Data Communication and Networking –Forouzan, Tata McGraw Hill Edition 2011

MCS18R4037	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
		4	0	0	4

#### COURSE OBJECTIVE:

To develop skills and knowledge about computer graphics and multimedia and to understand 2D, 3D transformations and about multimedia Authoring tools.

#### COURSE OUTCOMES:

At the end of the course, the student able to

**CO1:** Understand the concepts of Graphics display devices

**CO2:** Understand the concepts of different types of graphics drawing algorithms

**CO3:** Understand the concepts of 2D Geometrical Transformations and clipping

**CO4:** Understand the concepts of Viewing, Curves and surfaces

**CO5:** Understand multimedia skills and able to develop interactive animations using multimedia tools

#### Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1		S				L	
CO2					S		
CO3	L	S	M			L	
CO4							S
CO5		S	M			L	M

## **UNIT- I**

Overview of Graphics System – Video display devices – Raster Scan Systems - Random Scan Systems - Graphics Monitors and Workstations - Input devices - Graphics software – Points and Lines –Line Attributes - Line Drawing Algorithms – Loading the frame buffer – Line function.

## **UNIT- II**

Circle Generating algorithms – Ellipse generating Algorithms –Curve Attributes - Curve Functions – Pixel Addressing and Object Geometry – Filled area primitives – Fill Area functions – Color and gray scale levels – area fill attributes – character attributes – bundled attributes.

## **UNIT -III**

Two dimensional geometric transformations – basic transformations – matrix representations and homogenous coordinates – composite transformations – other transformations – two dimensional viewing - Viewing pipeline – Window to viewport coordinate transformation – Clipping operations - Line clipping - polygon clipping – curve clipping – text clipping.

## **UNIT- IV**

Three dimensional Geometric and modeling transformations – translation – rotation – scaling – other transformations – composite transformations – three dimensional viewing – viewing pipeline-viewing coordinates – projections – clipping – Visible surface detection methods – back face detection – depth buffer method – Scan Line method – depth sorting method – Octree methods – Ray casting method.

## **UNIT -V**

What is multimedia – Where to use multimedia – Multimedia Skills – Basic Software Tools – Multimedia Authoring Tools.

## **TEXT BOOKS**

1. Donald Hearn, M. Pauline Baker – Computer Graphics C Version – Pearson Education, 2009.
2. Tay Vaughan , Multimedia Making It Work – Tata McGraw Hill , Seventh Edition ,2008.

## **REFERENCE BOOKS:**

1. Foley, Vandom, Feiner and Huges, “Computer Graphics: Principles and Practice”, 2<sup>nd</sup> Edition, Pearson Education, 2003
2. Andleigh, P. K and Kiran Thakrar, “Multimedia Systems and Design”, PHI, 2003.
3. Judith Jeffcoate, “Multimedia in practice: Technology and Applications”, PHI, 1998.

## **GROUP II**

MAT18R4012	OPERATIONS RESEARCH	L	T	P	C
		4	0	0	4

## **COURSE OBJECTIVES**

This course aims to introduce students to use quantitative methods and techniques for effective decisions-making, model formulation, applications that are used in solving business decision problems and apply operations research to solve linear programming problem transportation problems, assignment problems, dynamic programming & Queuing theory.

## **COURSE OUTCOMES**

**CO1:** Able to solve linear programming problems using graphical method and simplex method

**CO2:** Able to build and solve Transportation Models and Assignment Models.

**CO3:** Able to solve problems in Network models

**CO4:** Able to solve dynamic programming problem

**CO5:** Able to design and solve problems using queuing models

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>			L		S		
<b>CO2</b>			S	M	S		L
<b>CO3</b>			S	M	S		L
<b>CO4</b>			S	M	S		L
<b>CO5</b>				M	S		

**UNIT I - LINEAR PROGRAMMING PROBLEMS**

Graphical solution of linear programming problems - LP solution space in equation form - Simplex method - Artificial starting solution.

**UNIT II - TRANSPORTATION AND ASSIGNMENT PROBLEMS**

Introduction to transportation and assignment problems - The transportation algorithm - The Assignment model.

**UNIT III - NETWORK MODELS**

Minimal spanning tree algorithm - Shortest route problem - Maximal flow model.

**UNIT IV - DYNAMIC PROGRAMMING**

Elements of the dynamic programming model - Optimality principle - Examples of dynamic programming models and their solutions

**UNIT V - QUEUING THEORY**

Single and multiple server Markovian queuing models – Steady state system size probabilities – Little's formula – Customer impatience – Priority queues – M/G/1 queuing system – P - K formula.

**TEXT BOOK**

1. Taha, H.A., Operations Research: An Introduction, 8<sup>th</sup> Edition, Pearson Education, 2011.

## REFERENCES

1. Natarajan, A.M., Balasubramani, P., Tamilarasi, A., Operations Research, Pearson Education, Asia, 4<sup>th</sup> edition, 2009.
2. Prem Kumar Gupta, Hira, D.S., Operations Research, 3<sup>rd</sup> Edition, Sultan Chand and Company Ltd, New Delhi, 11<sup>th</sup> edition, 2007.

MCS18R4038	SOFT COMPUTING	L	T	P	C
		3	0	2	4

## COURSE OBJECTIVE:

- To learn the various soft computing frame works
- To be familiar with design of various neural networks, be exposed to fuzzy logic
- To learn genetic programming.

## COURSE OUTCOMES:

At the end of the course, the student will be able to

**CO1:** Understand the fundamentals of fuzzy logic and genetic algorithms.

**CO2:** Describe the concept of supervised and unsupervised learning networks

**CO3:** Apply fuzzy arithmetic, fuzzy measures, fuzzy rules, fuzzy decision making.

**CO4:** Explain the concept and applications of Genetic Algorithms

**CO5:** Apply Hybrid Soft Computing Techniques in Various Problems

## Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1	L		M		S		
CO2	L		M		S		
CO3		S	S	M	M		L
CO4	L		M		S		
CO5		S	S	M	M		L

## UNIT -I INTRODUCTION

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models – important technologies – applications. Fuzzy logic: Introduction – crisp sets- fuzzy sets – crisp relations and fuzzy relations, Genetic algorithm- Introduction – biological background – traditional optimization and search techniques

## UNIT II NEURAL NETWORKS

McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks–unsupervised learning networks: Kohonen self organizing feature maps

### **UNIT- III FUZZY LOGIC**

Membership functions: features, fuzzification, methods of membership value assignments- Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules- decomposition of rules, aggregation of fuzzy rules, overview of fuzzy expert system-fuzzy decision making.

### **UNIT -IV GENETIC ALGORITHM**

Genetic algorithm and search space – general genetic algorithm – operators – Generational cycle – stopping condition – constraints – classification – genetic programming – multilevel optimization – real life problem- applications of GA

### **UNIT -V HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS**

Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems- Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

1. To perform Union, Intersection and Complement operations.
2. To implement De-Morgan's Law.
3. To plot various membership functions.
4. To implement FIS Editor. Use Fuzzy toolbox to model tip value that is given after a dinner based on quality and service.
5. To implement FIS Editor.
6. Generate ANDNOT function using McCulloch-Pitts neural net.

### **TEXT BOOKS:**

1. J.S.R.Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI / Pearson Education 2004.

2. S.N.Sivanandam and S.N.Deepa, “Principles of Soft Computing”, Wiley India Pvt Ltd, 2011.

## REFERENCES:

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications”, Prentice-Hall of India Pvt. Ltd., 2006.
2. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.
3. David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning” Pearson Education India, 2013.

MCS18R4039	SOCIAL NETWORK ANALYSIS	L	T	P	C
		4	0	0	4

## COURSE OBJECTIVE:

- To understand the concept of semantic web, human behavior in social web
- To learn knowledge representation using ontology

## COURSE OUTCOMES:

At the end of the course, the student will be able to

**CO1:** Understand the fundamentals of Semantic Web and related applications.

**CO2:** Describe the concept of Modeling, Aggregating and Knowledge Representation

**CO3:** Explain the detecting communities and tools for detecting communities in social networks.

**CO4:** Understand the concept of predicting human behavior for social communities

**CO5:** Learn visualization of social networks and Applications of Social Networks

## Mapping of Course Outcome(s):

CO / PO	PO						
	1	2	3	4	5	6	7
CO1	S	L			L		
CO2			S	M	S		
CO3					S		
CO4				L	M		
CO5			L		M		S

## UNIT- I INTRODUCTION

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

## UNIT- II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships.

### **UNIT -III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS**

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks.

### **UNIT- IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation.

### **UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS**

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks

#### **TEXT BOOKS:**

1. Peter Mika, “Social Networks and the Semantic Web”, , First Edition, Springer 2007.
2. Borko Furht, “Handbook of Social Network Technologies and Applications”, 1st Edition, Springer, 2010.

#### **REFERENCES:**

1. Guandong Xu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, First Edition Springer, 2011.
2. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009.

<b>MCS18R4040</b>	<b>BIG DATA ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
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### **COURSE OBJECTIVE:**

- To understand the Big Data Platform and its Use cases
- To provide HDFS Concepts and Interfacing with HDFS
- To understand Map Reduce Jobs and apply analytics on Structured, Unstructured Data.

### **COURSE OUTCOMES:**

At the end of the course, the student will be able to

**CO1:** Identify Big Data and its Business Implications and List the components of Hadoop and Hadoop EcoSystem

**CO2:** Access and Process Data on Distributed File System

**CO3:** Manage Job Execution in Hadoop Environment using Map-Reduce Function

**CO4:** Develop Big Data Solutions using Hadoop Eco System

**CO5:** Apply Machine Learning Techniques using R

### **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	S	L	L				
<b>CO2</b>		S	S	M	L		S
<b>CO3</b>		S	S	M	L		L
<b>CO4</b>	L	S	S	M	L		
<b>CO5</b>	L	S	S	M	L		S

## **UNIT -I INTRODUCTION TO BIG DATA AND HADOOP**

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy

## **UNIT- II HADOOP DISTRIBUTED FILE SYSTEM)**

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Avro and File - Based Data structures.

## **UNIT- III MAP REDUCE**

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

## **UNIT -IV HADOOP ECO SYSTEM**

**Pig** :Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

**Hive** :Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

**Hbase** : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.

**Big SQL** : Introduction

## **UNIT V DATA ANALYTICS WITH R**

Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

### **LIST OF PROGRAMS**

1. (i)Perform setting up and Installing Hadoop in its two operating modes:
  - Pseudo distributed,
  - Fully distributed.(ii) Use web based tools to monitor your Hadoop setup.
2. (i) Implement the following file management tasks in Hadoop:
  - Adding files and directories
  - Retrieving files
  - Deleting filesii) Benchmark and stress test an Apache Hadoop cluster
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
  - Find the number of occurrence of each word appearing in the input file(s)
  - Performing a MapReduce Job for word search count (look for specific keywords in a file)
4. Stop word elimination problem:
  - Input:
    - A large textual file containing one sentence per line
    - A small file containing a set of stop words (One stop word per line)
  - Output:
    - A textual file containing the same sentences of the large input file without the words appearing in the small file.
5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
  - Find average, max and min temperature for each year in NCDC data set?
  - Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

### **TEXT BOOKS**

1. Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

## REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R
4. Enterprise and Oracle R Connector for Hadoop", McGraw -Hill/Osborne Media (2013), Oracle press.
5. Anand Rajaraman and Jeffrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.

<b>MCS18R4041</b>	<b>GREEN COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

## COURSE OBJECTIVE:

To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment, skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user, and to understand how to minimize equipment disposal requirements

## COURSE OUTCOMES:

At the end of the course, the student will be able to

**CO1:** Understand the fundamentals of Green Computing

**CO2:** Describe the Green Business Process Management and Green Enterprise Architecture

**CO3:** Explain the Best ways for Green PC and Virtualizing of IT systems

**CO4:** Understand Green Compliance and Emergent Carbon Issues

**CO5:** Applying Green IT Strategies and Applications to different domains

## Mapping of Course Outcome(s):

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	M		L		L		L
<b>CO2</b>	M				M		
<b>CO3</b>				S	M		
<b>CO4</b>	M			L	M		
<b>CO5</b>		S	S	M			S

## UNIT I FUNDAMENTALS

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon footprint, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics, Applications

## **UNIT II GREEN ASSETS AND MODELING**

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development.

## **UNIT III GRID FRAMEWORK**

Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

## **UNIT IV GREEN COMPLIANCE**

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

## **UNIT V CASE STUDIES**

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and retail Sector.

### **TEXT BOOKS:**

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.

### **REFERENCES:**

1. Alin Gales, Michael Schaefer, Mike Ebbbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.
3. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”, Lulu.com, 2008.

<b>MCS18R4042</b>	<b>GAME PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **COURSE OBJECTIVE:**

- To acquire knowledge to build game applications

### **COURSE OUTCOMES:**

At the end of the course, the student will be able to

**CO1:** Apply 3D Transformations, 3D Modeling and Rendering techniques.

CO2: Describe the Game engine architecture, Game loop and real-time simulation  
 CO3: Write Game Programming for User Interface management and Game event management  
 CO4: Understand Gaming Platforms and Frameworks  
 CO5: Develop 2D and 3D interactive games using DirectX or Python

**Mapping of Course Outcome(s):**

CO / PO	PO						
	1	2	3	4	5	6	7
<b>CO1</b>	L	M		S			
<b>CO2</b>			S	M			
<b>CO3</b>		S	S	M			L
<b>CO4</b>	L				L		
<b>CO5</b>		S	S	M			L

**UNIT I 3D GRAPHICS FOR GAME PROGRAMMING**

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Scene Graphs.

**UNIT II GAME ENGINE DESIGN**

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

**UNIT III GAME PROGRAMMING**

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

**UNIT IV GAMING PLATFORMS AND FRAMEWORKS**

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - DX Studio

**UNIT V GAME DEVELOPMENT**

Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single and multi Player games.

**TEXT BOOKS:**

1. Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.
3. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” 2nd Editions, Morgan Kaufmann, 2006.

**REFERENCES:**

1. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2nd Edition Prentice Hall / New Riders, 2009.
2. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3rd Edition, Course Technology PTR, 2011.

<b>MCS18R4043</b>	<b>ADHOC AND SENSOR NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **COURSE OBJECTIVE:**

- To facilitate the understanding of Infrastructure less networks and their importance in the future directions for wireless communications

### **COURSE OUTCOMES:**

At the end of the course, the student will be able to

- CO1:** Acquire the Fundamental knowledge of Wireless Communication Technology.  
**CO2:** Describe the Issues in designing a MAC Protocol and Classification of MAC Protocols  
**CO3:** Explain the Issues in designing a routing protocol and Classification of Transport Layer solutions.  
**CO4:** Explain the single node architecture and WSN Network architecture  
**CO5:** Understand the Issues in WSN routing and QOS in WSN

### **Mapping of Course Outcome(s):**

<b>CO / PO</b>	<b>PO</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>CO1</b>	S						S
<b>CO2</b>	S						
<b>CO3</b>			L	M			
<b>CO4</b>			L				S
<b>CO5</b>							M

### **UNIT -I INTRODUCTION**

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks and wireless sensor networks- concepts and architectures. Applications of Ad Hoc and Sensor networks.

### **UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS**

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

### **UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS**

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

### **UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS**

single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

### **UNIT V WSN ROUTING, LOCALIZATION & QOS**

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization,- QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

#### **TEXT BOOKS:**

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

#### **REFERENCES:**

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks:Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication,2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”,Wiley, 2005

### **GROUP III**

MCS18R5031	INTERNET OF THINGS	L	T	P	C
		4	0	0	4

#### **COURSE OBJECTIVES:**

The main objective of this course is to understand the technology behind Internet of Things. Students get familiar with the design principles of connected devices. Students can know about business models and ethics in Internet of Things. Students will be exploring the interconnection and integration of the physical world and the cyber space. They can also able to design &develop IOT Devices.

#### **COURSE OUTCOMES:**

Upon the completion of this course, the students will be able to

**CO1:** Design a portable IoT using Arduino/Equivalent boards and relevant protocols

**CO2:** Develop web services to access/control IoT devices.

**CO3:** Analyze the various components of IoT

**CO4:** Analyze applications of IoT in real time scenario.

**CO5:** Deploy an IoT application and connect to the cloud

Mapping of COs with POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S		
CO2	S	S	S	S	S		
CO3						S	M
CO4						S	
CO5					S	S	S

### **UNIT- I FUNDAMENTALS OF IOT**

Introduction-Characteristics - Physical design - Protocols-Logical design - Enabling technologies - IoT levels-Domain specific IoTs - IoT vs M2M

### **UNIT- II IOT DESIGN METHODOLOGY**

IoT systems management - IoT design methodology-Specifications - Integration and Application Development

### **UNIT- III IOT COMPONENTS**

Sensors and activators - Communication modules - Zigbee-RFID-Wi-Fi-Power sources.

### **UNIT -IV BUILDING IOT WITH HARDWARE PLATFORMS**

Platform - Arduino/Intel Galileo/Raspberry Pi- Physical device - Interfaces - Programming - APIs/Packages - Web services.

### **UNIT -VCASE STUDIES AND ADVANCED TOPICS**

Various Real time applications of IoT-Connecting IoT to cloud-Cloud storage for IoT-Data Analytics for IoT- Software & Management Tools for IoT.

### **TEXT BOOKS**

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

### **REFERENCES**

1. Manoel Carlos Ramon, —Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers||, Apress, 2014.
2. Marco Schwartz, —Internet of Things with the Arduino Yun||, Packt Publishing, 2014

<b>MCS18R5032</b>	<b>BIOMETRICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>



## **COURSE OBJECTIVE**

The main objective of this course is to understand the basics of Biometrics and its functionalities. Students can learn the role of biometric in the organization, get expose to the concept of IRIS and sensors

## **COURSE OUTCOMES:**

Upon the completion of this course, the students will be able to

**CO1:** Identify the various Biometric technologies.

**CO2:** Design of biometric recognition for the organization

**CO3:** Develop simple applications for privacy.

**CO4:** Understand the need of biometric in the society

**CO5:** Develop applications with biometric security

## **Mapping of COs with POs**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	L	S	M				
CO2	S	S			S		
CO3	L	S	M				
CO4	L				M		S
CO5	L	S	M		M		

## **UNIT I INTRODUCTION**

Person Recognition – Biometric systems –Biometric functionalities: verification, identification – Biometric systems errors - The design cycle of biometric systems – Applications of Biometric systems – Security and privacy issues.

## **UNIT II FINGER PRINT AND FACIAL RECOGNITION**

**FINGERPRINT :** Introduction – Friction ridge pattern- finger print acquisition :sensing techniques ,image quality –Feature Extraction –matching –indexing. **FACE RECOGNITION:** Introduction –Image acquisition: 2D sensors ,3D sensors- Face detection- Feature extraction - matching.

## **UNIT III IRIS AND OTHER TRAITS**

Design of an IRIS recognition system-IRIS segmentation- normalization – encoding and matching- IRIS quality –performance evaluation –other traits- ear detection –ear recognition –gait feature extraction and matching –challenges- hand geometry –soft biometrics.

## **UNIT IV BEHAVIORAL BIOMETRICS**

Introduction –Features- classification of behavioral biometrics –properties of behavioral biometrics – signature –keystroke dynamics –voice- merits –demerits –applications- error sources-types –open issues –future trends

## **UNIT V APPLICATIONS AND TRENDS**

Application areas: surveillance applications- personal applications –design and deployment -user system interaction-operational processes – architecture –application development –design validation-disaster recovery plan-maintenance-privacy concerns.

## **TEXT BOOK**

1. James wayman, Anil k. Jain, Arun A. Ross, Karthik Nandakumar, —Introduction to Biometrics, Springer, 2011.
2. John Vacca "Biometrics Technologies and Verification Systems" Elsevier 2007

## **REFERENCES**

1. James Wayman, Anil Jain, David M. Altoni, Dasio Maio (Eds) "Biometrics Systems Technology", Design and Performance Evaluation. Springer 2005.
2. Khalid saeed with Marcin Adamski, Tapalina Bhattasali, Mohammed K. Nammous, Piotr panasiuk, mariusz Rybnik and soharab H. Sgaikh, —New Directions in Behavioral Biometrics, CRC Press 2017.
3. Paul Reid "Biometrics For Network Security "Person Education 2004

<b>MCS18R5033</b>	<b>WIRELESS COMMUNICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

## **COURSE OBJECTIVE**

The main objective of this course is to introduce the concepts and techniques associated with Wireless Cellular communication systems and to get familiarize with state of art standards used in wireless cellular systems.

## **COURSE OUTCOMES**

- CO1** : Understand the radio propagation mechanism and path loss modeling.  
**CO2** : Compare CDMA, TDMA and TDMA approach.  
**CO3** : Understand the cellular network operation.  
**CO4** : Analyze the various wireless standards like GSM, CDMA.  
**CO5** : Describe about IEEE802.11, HIPERLAN and Bluetooth.

## Mapping of COs with POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	L	S	M				
CO2	S	S			S		
CO3	L	S	M				
CO4	L				M		S
CO5	L	S	M		M		

### UNIT I WIRELESS MEDIUM

Air Interface Design – Radio propagation mechanism – Pathloss modeling and Signal Coverage –Effect of Multipath and Doppler – Channel Measurement and Modelling – Simulation of Radio Channel.

### UNIT II WIRELESS MEDIUM ACCESS

Fixed Assignment Access for Voice Networks – Random Access for Data Networks – Integration of Voice and Data Traffic.

### UNIT III WIRELESS NETWORK OPERATION

Wireless Network Topologies – Cellular Topology – Cell fundamentals – Signal to Interference Ratio – Capacity Expansion – Mobility Management – Resources and Power Management – Security in Wireless Networks.

### UNIT IV WIRELESS WAN

GSM and TDMA Technology – Mobile Environment – Communication in the Infrastructure – CDMA Technology – IS95 – IMT2000 – Mobile Data Networks – CDPD Networks – GPRS – Mobile Application Protocol.

### UNIT V WIRELESS LANS AND HIPERLANS

Introduction to wireless LANs – IEEE 802.11 – WPAN IEEE 802.15 –Mobile AdHoc Networks(MANET)- Principle and operation - Wireless Home Networking – Concepts of Bluetooth Technology – Wireless Geo-location.

### TEXT BOOK

1.Kaveth Pahlavan, K.Prasanth Krishnamurthy, —Principles of Wireless Networks, Pearson Education Asia, 2002

### REFERENCE BOOKS

- 1.William Stallings, —Wireless Communications and Networks, Second Edition Prentice Hall, India 2007
2. Leon Garcia, Widjaja, —Communication Networks, Tata McGraw Hill, New Delhi, 2000.
3. Jon W Mark , Weihua Zhuang, Wireless communication and Networking, Prentice Hall India 2003

<b>MCS18R5034</b>	<b>MACHINE LEARNING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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### **COURSE OBJECTIVES :**

The main objective of this course is to understand the concepts of machine learning ,theoretical and practical aspects of Probabilistic Graphical Models. Students get knowledge about the concepts and algorithms of reinforcement learning and computational learning theory

### **COURSE OUTCOMES**

**CO1** : Distinguish between, supervised, unsupervised and semi-supervised learning

**CO2** : Apply the appropriate machine learning strategy for any given problem

**CO3** : Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem

**CO4** : Design systems that uses the appropriate graph models of machine learning

**CO5** : Modify existing machine learning algorithms to improve classification efficiency

### **Mapping of COs with POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S		
CO2	S	S	S	S	S		
CO3						S	M
CO4						S	
CO5					S	S	S

### **UNIT I INTRODUCTION**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

### **UNIT II LINEAR MODELS**

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

### **UNIT III TREE AND PROBABILISTIC MODELS**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms –

#### **UNIT IV DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS**

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

#### **UNIT V GRAPHICAL MODELS**

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

#### **TEXT BOOK**

1. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)ll, Third Edition, MIT Press, 2014

#### **REFERENCES:**

1. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionalsll, First Edition, Wiley, 2014
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
4. Tom M Mitchell, —Machine Learningll, First Edition, McGraw Hill Education, 2013

<b>MCS18R5035</b>	<b>WEB MINING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

#### **COURSE OBJECTIVES :**

The main objective of this course is to introduce students to the basic concepts and techniques of Information Retrieval, Web Search, Data Mining, and Machine Learning for extracting knowledge from the web. Students can develop skills of using recent data mining software for solving practical problems of Web Mining.

#### **COURSE OUTCOMES**

- CO1:** Identify the different components of a web page that can be used for mining  
**CO2:** Apply machine learning concepts to web content mining  
**CO3:** Design a system to collect information available on the web to build recommender systems  
**CO4:** Analyze social media data using appropriate data/web mining techniques  
**CO5:** Develop a simple search engine using available open source tools

### Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1		S	S	S	S		
CO2	S		S	S	S		
CO3						S	M
CO4						S	
CO5					S		S

### UNIT I INTRODUCTION

Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing –Web Search – Meta-Search – Web Spamming

### UNIT II WEB CONTENT MINING

Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text classification – Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering – Hierarchical Clustering –Partially Supervised Learning – Markov Models -

### UNIT III WEB LINK MINING

Web Link Mining – Hyperlink based Ranking – Introduction of Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search – Enhanced Techniques for Page Ranking - Community Discovery

### UNIT IV STRUCTURED DATA EXTRACTION

Structured Data Extraction: Wrapper Generation – Preliminaries- Wrapper Induction- Instance-Based Wrapper Learning -- Automatic Wrapper Generation: Problems - String Matching and Tree Matching

### UNIT V WEB USAGE MINING

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm – Binning - Discovery and Analysis of Web Usage Patterns

### TEXT BOOK

1. Bing Liu, —Web Data Mining, Exploring Hyperlinks, Contents and Usage Data, Springer, Second Edition, 2011.

2. Guandong Xu ,Yanchun Zhang, Lin Li, —Web Mining and Social Networking: Techniques and Applications, Springer, First Edition.2010.

**REFERENCES:**

1. Zdravko Markov, Daniel T. Larose, —Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage, John Wiley & Sons, Inc., 2007.
2. Soumen Chakrabarti, —Mining the Web: Discovering Knowledge from Hypertext Data, Morgan Kaufmann Edition, 2003.