PSGR Krishnammal College for Women

DEPARTMENT OF COMPUTER SCIENCE (PG)

CHOICE BASED CREDIT SYSTEM &

OUTCOME BASED EDUCATION SYLLABUS

MASTER OF SCIENCE (COMPUTER SCIENCE)

2020 – 2022 BATCH

M.Sc Computer Science

Programme Outcomes

After completion of the programme, the student will be able to

PO1 : Demonstrate broad knowledge in core areas of computer science, current and emerging technologies in IT

PO2: Apply higher degree of technical skills in problem solving and application development

PO3 : Gain analytical and managerial skills to enhance employment potential

PO4 : Acquire holistic development with strong emphasis on values and ethics

Programme Specific Outcomes

The students at the time of graduation will

PSO1: Identify and formulate complex problems to achieve solutions using concepts of algorithms, advanced networks, database management systems, artificial intelligence and machine learning

PSO2 : Design solutions for complex problems and design processes that meet the specific needs of the society.

PSO3 : Create and apply appropriate techniques, resources and tools including prediction and modeling to multifaceted activities

PSO4 : Apply programming and technical skills to solve real life complex problems and hence enhance employability

PSO5: Analyse research methods including interpretation of data and synthesis of the information to provide valid conclusions.

PSO6: Demonstrate skills as an individual and as a member or leader in diverse teams

PSO7: Recognize the need for life-long learning and pursue career as a researcher or software engineer.

PSO8: Apply ethical principles and contribute effectively to the welfare of the society

Curriculum and Scheme of Examination (2020 - 2021 Batch onwards)

Semester	Part	Subject Code	Title of Paper	Instruction hours/week	Contact hours	Tutorial hours	Duration of Examination	Examination Marks			Credits
								CA	ESE	Total	
I	III	MCS2001	Paper 1: Design and Analysis of Algorithms	4	56	4	3	40	60	100	4
I	III	MCS2002	Paper 2: Network Security	4	56	4	3	40	60	100	4
I	III	MCS2003	Paper 3: Modern Operating Systems	4	56	4	3	40	60	100	4
I	III	RWP2004	Paper 4: Web Programming	4	56	4	3	40	60	100	4
I	III	RAD2005	Paper 5: Advanced Database Management Systems	4	56	4	3	40	60	100	4
I	III	RAD20P1	Lab 1: ADBMS Lab	5	75	-	3	40	60	100	3
I	III	RWP20P2	Lab 2: Web Programming Lab	5	75	-	3	40	60	100	3
I	III		Online course	-	-	-	-	-	-	-	-
II	III	RPY2006	Paper 6: .Python Programming	4	56	4	3	40	60	100	4
II	III	MCS2007	Paper 7: J2EE Programming	4	56	4	3	40	60	100	4
II	III	RSP2008	Paper 8: Software Process Management	4	56	4	3	40	60	100	4
II	III		Elective – I	4	56	4	3	40	60	100	4
II	III	RPY20P3	Lab3: Python Programming Lab	5	75	-	3	40	60	100	3
II	III	MCS16P4	Lab4: J2EE Programming Lab	5	75	-	3	40	60	100	3
II	III	MTH19A5	Interdisciplinary Course: Statistical Techniques in Practice	4	60	-	3		100	100	4
II	III		Online course	-	-	-	-	-			-
III	III	MCS1909	Paper 9: Data Mining	4	56	4	3	40	60	100	4
III	III	MCS2010	Paper 10: Wireless Networks	4	56	4	3	40	60	100	4
III	III	MCS2012	Paper 11:Internet of Things	4	56	4	3	40	60	100	4
III	III		Elective – II	4	56	4	3	40	60	100	4
III	III	RRM19S1	Special Course: Research Methodology	4	60	-	3	-	100	100	4
III	III	MCS18P5	Lab 5: Data mining Lab	5	75	-	3	40	60	100	3

III	III	MCS20P6	Lab 6: Internet of Things Lab	5	75	-	3	40	60	100	3
III	IV	PGCE	Comprehensive Exam – Online	-	-	-	3	-	-	100	Grade
III		PGINST	Summer Internship	-	-	-	-	-	-	100	Grade
III	III		Job Oriented Course	-	-	-	-	-	-	-	-
IV	III	MCS16PW	Project Work and Viva-Voce	12		-	-	20	80	100	12
IV	III	MCS2014	Advanced Learner Course1 - Block Chain	-	-	-	3	25	75	100	5**
IV	III	RCY1915	Advanced Learner Course 2 - Cyber Security	-	-	-	3	25	75	100	5**

List of Electives

S. No	Course Code	Course Title
1	RI19E01	Internet Protocols
2	RA19E02	Artificial Intelligence
3	RC19E03 / MIT1910	Cloud Computing
4	RS19E06	Soft Computing
5	RB19E07 / MIT1909	Big Data Analytics
6	RI19E08	Information Retrieval
7	RV19E09	Virtual Reality

SUMMER INTERNSHIP

Students will undergo summer internship during the second semester holidays from first week of May to second week of June for a period of 4 weeks in a related organization approved by the staff co - ordinator / HOD. It will be evaluated during III semester for 100 marks and converted to equivalent grades as given below.

MARKS

Report : 50 Marks
Attendance : 10 Marks
Work Diary : 15 Marks
Viva Voce : 25 Marks
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100 Marks

Mark Range	Grade	Description
90 - 100	O	Outstanding
80 - 89	D+	Excellent
75 -79	D	Distinction
70 – 74	A+	Very Good
60 – 69	A	Good
50 – 59	B	Average
0 - 49	U	Reappear

PROJECT WORK AND VIVA VOCE

Students will undergo project work in the final semester for a period of 4 months (December to March) at any industry / institution approved by the staff co-ordinator and HOD. It will be evaluated for 100 marks comprising internal marks for 20 and external evaluation for 80 marks.

EVALUATION

Internal evaluation of the project will be carried out in stages as described below

I Review	- Selection of the field of study, Topic & Literature study	-	5 marks
II Review	-Research design & data collection	-	10 marks
III Review	-Analysis & conclusion, preparation of rough draft	-	5 marks
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	Total	**-**	**20 marks**

END SEMESTER EXAMINATION

Evaluation of the project	-	60 marks
Viva Voce	-	20 marks

Total	**-**	**80 marks**

Viva Voce will be conducted by a panel of external examiner and staff co-ordinator guiding the project.

Semester I

MCS2001	DESIGN AND ANALYSIS OF ALGORITHMS	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course covers the fundamental techniques for designing and analyzing algorithms, including asymptotic analysis, Trees, graphs, divide and conquer algorithms and recurrences. It also presents effective search methods, graph algorithms and randomized algorithms

Prerequisite

Data structures and algorithms

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand data structures and the concepts of algorithms for searching, sorting and dynamic programming	K2
CO2.	Understand the proofs of algorithms	K2
CO3.	Demonstrate a familiarity with major algorithms and data structures	K3
CO4.	Apply appropriate algorithms and data structures for various applications	K3
CO5.	Analyze the computational complexity of various algorithms	K4

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	S	M	M
CO4.	S	M	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Introduction: Algorithms – Analysis of algorithms – Best case and worst case complexities, Analysis of some algorithms using simple data structures, amortized time complexity. Binary search trees: Searching – Insertion and deletion of elements – Analysis

UNIT II **(12 Hrs)**

AVL trees: Definition – Height – searching – insertion and deletion of elements, AVL rotations – Analysis. Red black trees: Definition – searching – insertion and deletion of elements – algorithms and their time complexities. Splay trees: Definition – Steps in Splaying – Analysis

UNIT III **(11 Hrs)**

Multi-way search trees: Indexed Sequential Access – m-way search trees – B-Tree – searching, insertion and deletion - B^+ trees – Tries- Graphs: Definition – representations, Adjacency matrix,

packed adjacency list and linked adjacency list, – network representation – Graph search methods, Breadth first Search and Depth first Search

UNIT IV **(11 Hrs)**

Divide and conquer: The General Method – Examples – Finding the Maximum and Minimum - Merge sort - Quick sort - Binary Search. Greedy method: The General Method – Optimal Storage on Tapes – Knapsack Problem – Job Sequencing with Deadlines – Optimal Merge Patterns - Minimum cost spanning Trees – Single Source Shortest Path

UNIT V **(11 Hrs)**

Dynamic programming: The General Method – Multistage Graphs - All pairs shortest path problem – Travelling sales Person problem. Back tracking: The General Method – The Eight Queen Problem – Sum of Subset Problem – Graph Coloring – Hamiltonian Cycles

Text Book

Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran (2008). Fundamentals of Computer Algorithms, 2/e, Universities Press Private Limited, India

Reference Books

1. Ellis Horowitz and SartajSahni (2003). Fundamentals of Data Structures, Gurgaon: Galgotia Publication
2. Robert L Kruse(2008). Data Structures & Program Design, Prentice Hall, New Delhi
3. Tanenbaum A.M.(2008). Data Structures Using C, Prentice Hall of India, New Delhi

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers:

1.Mrs. V.Kalaimani
2.Mrs. S.Meera

MCS2002	NETWORK SECURITY	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course presents the principles of cryptography and Network Security. It also includes the classical and advanced encryption standards and techniques, message authentication codes, digital signatures, email security, IP security, web security, firewalls and Mobile Network Security.

Prerequisite

Computer Networks

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand cryptography and network security concepts and application	K2
CO2.	Apply security principle in system design	K3
CO3.	Analyze network security protocols	K4
CO4.	Detect network security threat	K5
CO5.	Design the code to implement a cryptographic algorithm	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	S	M	M
CO2.	S	S	M	S
CO3.	S	S	M	S
CO4.	S	S	S	S
CO5.	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Introduction: Security Trends - The OSI Security Architecture - Security Attacks - Security Services - A model for Internetwork Security. Classical Encryption Techniques: Symmetric Cipher Model - Substitution Techniques -Transposition Techniques - Steganography

UNIT II **(12 Hrs)**

Block Ciphers and the DES: Block cipher Principles - The DES - The Strength of DES - Differential and Linear Crypt Analysis. Advanced Encryption Standard: Evaluation Criteria for AES - The AES Cipher. Public key cryptography and RSA: Principles of Public – Key Cryptosystems – The RSA Algorithm

UNIT III **(11 Hrs)**

Key management Other Public – Key Cryptosystems: Diffie-Hellman Key exchange – Elliptic Curve Arithmetic - Elliptic Curve Cryptography. Message Authentication and Hash Functions: Authentication Requirements - Authentication Functions - Security of Hash Functions and MACs

UNIT IV **(11 Hrs)**

Digital Signatures and Authentication Protocols: Digital Signatures - Authentication Protocols - Digital Signature Standard. Authentication Applications: Kerberos - X.509 Authentication Service, Public-Key Infrastructure. Email Security: Pretty Good Privacy - S/MIME

UNIT V **(11 Hrs)**

IP Security: IP Security Overview - IP Security Architecture - Authentication Header - Encapsulating Security Payload. Web Security: Security Considerations - SSL and TLS-SET. System Security: Intruders - Intrusion Detection – Password Management. Malicious Software: Viruses and Related Threats. Firewalls: Design Principles - Trusted systems

Text Book

William Stallings (2007). Cryptography and Network Security - Principles and Practices, 4/e, New Delhi: Prentice Hall of India

Reference Books

1. AtulKahate (2006). Cryptography and Network Security, Tata McGraw Hill, New Delhi
2. Charles P Pfleeger, Shari Lawrence P Pfleeger (2006). Security in Computing, 3/e, New Delhi: Pearson education, New Delhi
3. BruiceSchneier (2008). Applied Cryptography – Principles, Algorithm and Source in C, 2/e, Wiley India Pvt. Ltd, New Delhi.
4. Niels Ferguson, Bruce Schneier, Tadayoshi Kohno (2010). Cryptography Engineering–Design Principles and Practical Applications, Wiley India Pvt. Ltd. New Delhi

Pedagogy: Lectures, Demonstrations, Case Studies

Course Designers:

1. Mrs. R. Kowsalya
2. Dr. N. Radha

MCS2003	MODERN OPERATING SYSTEMS	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course introduces the architecture of various modern operating systems. It also includes the techniques such as virtualization, scheduling, memory management and distributed system. The course provides case studies in Linux and Android.

Prerequisite

- Operating System
- Data Structure

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the architecture of distributed operating system.	K2
CO2.	Differentiate between centralized and distributed system.	K2
CO3.	Analyze the functions of operating system Linux and Android OS	K4
CO4.	Analyze effective virtualization techniques to be performed.	K4
CO5.	Evaluate the best methods to follow to execute a task in remote machines.	K5

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	M	M	S
CO2.	S	S	M	M
CO3.	S	M	M	S
CO4.	M	S	L	S
CO5.	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Distributed Systems – Network Hardware - Network Services and Protocols-Document Based Middleware – File system based middleware - Object based middleware- Co-ordination based middleware – Multi computers : User level Communication software – Remote Procedure call - Distributed shared memory – Multicomputer scheduling – Load Balancing

UNIT II **(11 Hrs)**

Virtualization and the cloud – History - Requirements for virtualization - Type 1 and Type 2 Hypervisors - Techniques for efficient virtualization - Memory Virtualization - I/O Virtualization - Virtual Appliances - Virtual Machines on Multicore CPUs – Clouds - Research on virtualization and the cloud

UNIT III **(12 Hrs)**

Security Environment: Threats – Attackers - Controlling Access to Resources - Protection Domains - Access control lists – Capabilities - Formal Models of Secure Systems - Multilevel security – Covert Channels - Authentication using a Physical object - Authentication using Biometrics – Defenses – Code signing – Jailing – Model based intrusion detection – encapsulating mobile code

UNIT IV **(11 Hrs)**

Case Study : Linux Overview – Processes in Linux : Process Management system calls in Linux – Implementation of processes and threads – Scheduling – Memory Management System calls- Paging – Input –output system calls - Linux file system: Fundamental concepts – File system calls in Linux

UNIT V **(11 Hrs)**

Case Study: Android - Android and Google - History of Android - Design Goals - Android Architecture - Linux Extensions – Dalvik - Binder IPC – Android Applications - Intents – Security - Process Model.

Text Book

1. Andrew S. Tanenbaum Herbert Bos (2015). Modern Operating Systems, 4/e, Pearson Education

Reference Books

1. Andrew S.Tanenbaum (2011). MaartenVan Steen, Distributed System – Principles and Paradigms, 2/e, Prentice Hall of India Pvt. Ltd.
2. Shubra Garg(2013). Fundamentals of Distributed Operating Systems, S.K. Kataria & Sons, 2013.
3. Yakup Paker et al (2012). Distributed Operating Systems: Theory and Practice, Springer.
4. S SKudate A P Kale et al(2012). Distributed Operating Systems, NiraliPrakashan.
5. Andrew S.Tanenbaum (2011). Distributed Operating System, 10/e, Pearson Education.

Pedagogy : Lectures, Demonstrations, Group Discussions

Course Designers:

1. Mrs. R. Kowsalya
2. Mrs. V. Pream Sudha

RWP2004	WEB PROGRAMMING	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course introduces the concepts of PHP, MySQL, HTML 5, CSS, JavaScript, jQuery and Angular. It provides concepts of creating dynamic web application using client and server-sidescripting languages.

Prerequisite

- Client/ Server Processing concepts, Fundamentals of Web applications
- Database Management System

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the concepts of dynamic web design	K2
CO2.	Apply the concepts of data driven web design using PHP with MySQL	K3
CO3.	Analyze the usage of SQL language, JavaScript, jQuery, PHP and CSS for real time applications	K4
CO4.	Design dynamic web application using server and client side	K5
CO5.	Create Web application using Angular framework	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	M	M	M
CO4.	S	S	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Introduction to CSS: Importing style sheet- CSS Rules – Style Types – CSS Selectors –Fonts and Typography – Managing Text styles – color- positioning elements – Box model and Layout – Advanced CSS and CSS3: Attribute Selectors – Box -sizing Property – CSS3 Backgrounds – Borders- Multicolumn Layout – Text effects

UNIT II (11 Hrs)

Accessing CSS from JavaScript - Revisiting the getElementById function – Accessing CSS properties from JavaScript – Inline Javascript – Adding NEW elements – Using Interrupts – Introduction to jQuery: selectors- Handling events – Event functions and Properties -Special effects – Manipulating the DOM – Dynamically Applying classes – Modifying Dimensions – DOM Traversal - Using jQuery without selectors

UNIT III **(12 Hrs)**

Introduction to Dynamic Web Content: HTTP and HTML- The Request /Response Procedure – Benefits of PHP. My SQL, Javascript, CSS and HTML5- Introduction to PHP- Expressions and Control Flow in PHP – PHP Functions and Objects- Arrays – File Handling

UNIT IV **(11 Hrs)**

Accessing MySQL using PHP – Form Handling – Cookies, Sessions, and Authentication – Exploring JavaScript - Functions – Objects – Arrays-JavaScript and PHP validation and Error Handling: Validating User Input with JavaScript–Using Ajax

UNIT V **(11 Hrs)**

Learning Angular: Jumping into typescript – Angular components - Expressions – Data binding – Advanced Angular: Events and Change detection – Implementing Angular services in Web applications.

Text Book

1. Robin Nixon (2017).Learning PHP, MySQL& JavaScript with jQuery, CSS &HTML5, (4/e) with jQuery, Thomson Press (India) Ltd., Delhi.

Reference Books

1. Brad Dayley, Brendan Dayley ,Caleb Dayley (2018), Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications (Developer's Library),(2/e), Pearson education
2. Ralph Moseley,M.T.Savaliya, (2013). Developing Web Applications,(2/e),Wiley India Pvt. Ltd., NewDelhi.
3. Nicholas C.Zakas(2012).Professional JavaScript for Web Developers(3/e),Wiley IndiaPvt. Ltd., New Delhi.

Pedagogy: Lectures**,** Demonstrations

Course Designers:

1. Dr. N. Radha
2. Mrs. M. Krithika Renuka

RAD2005	ADVANCED DATABASE MANAGEMENTSYSTEMS	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course presents the advanced concepts of Database Management Systems and various databases like parallel, distributed and object oriented database management systems. The course also introduces various advanced databases like Spatial and NoSQL databases.

Prerequisite

- DBMS Concepts
- SQL
- VB 6.0

Course Outcomes

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the concepts of parallel database, distributed database and object oriented database	K2
CO2.	Demonstrate various queries by applying RDBMS concepts	K3
CO3.	Analyze advanced databases like spatial and NoSQL databases for handling data	K4
CO4.	Design databases for real time applications	K5
CO5	Develop real time applications involving parallel, distributed object oriented and advanced databases	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	S	M	M
CO2.	S	S	M	M
CO3.	S	S	M	S
CO4.	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Parallel Database: Introduction - Architecture for Parallel Databases - Parallel Query Evaluation - Parallelizing Individual Operations - Parallel Query Optimization

UNIT II **(11 Hrs)**

Distributed Database - Distributed DBMS Architectures - Storing Data in a Distributed DBMS - Distributed Catalog Management - Distributed Query Processing - Updating Distributed Data - Distributed Transaction - Distributed Concurrency Control - Distributed Recovery

UNIT III **(11 Hrs)**

Object Database System :Motivating Example - Structured Data Types - Operations on Structured Data - Encapsulation and ADTs - Inheritance - Object, OIDs, and Reference Types - Database Design for ORDBMS - ORDBMS Implementation Challenges - OODBMS - Comparing RDBMS, OODBMS, and ORDBMS

UNIT IV **(11 Hrs)**

Data Warehousing And Decision Support: Introduction to Decision Support - OLAP: Multidimensional Data Model - Multidimensional Aggregation Queries - Implementation Techniques for OLAP - Data Warehousing - Data Warehouse Architecture - Data Warehouse Implementation - Views And Decision Support - View Materialization - Maintain Materialized Views - Data Mining : Introduction to Data Mining – Counting Co-occurrences – Mining for Rules - Clustering – Similarity Search over Sequences

UNIT V **(12 Hrs)**

Advanced Databases: Information retrieval: Introduction - Indexing for Text Search - Web Search Engines- Managing Text in a DBMS. Spatial data management: Types of Spatial Data and Queries- Applications Involving Spatial Data. NoSQL databases: Introduction - Column oriented stores – Key - value stores - Document databases. **Graph databases**: Introduction - Neo4J - Key concept and characteristics -Modeling data for Neo4j - Importing data into Neo4j

Reference Books

1. Raghu Ramakrishnan and Johannes Gehrke (2007). Database Management System, 3/e, McGraw Hill, Singapore.
2. G.K.Gupta (2011). Database Management systems, Tata McGraw Hill Private Limited.
3. Shashank Tiwari (2011). Professional NoSQL, John Wiley & Sons
4. Pranab Kumar Das Gupta, P. Radha Krishna (2013). Database Management System Oracle SQL and PL/SQL, PHI Learning Private Limited, New Delhi.
5. Rini Chakrabarti, Shilbhadra Dasgupta (2011). Advanced Database Management System, Wiley India, Private Ltd.
6. Abraham Silberschatz et.al (2011). Database System Concepts, 6/e, McGraw Hill, Singapore.
7. Tom White (2012). Hadoop : The Definitive Guide, Third Edition,O'Reilly Media

Pedagogy: Lectures, Demonstrations, Group Discussions

Course Designer:

1. Mrs. S. Meera
2. Mrs. V. Pream Sudha

RAD20P1	ADBMS LAB	Category	L	T	P	Credit
		III	-	-	75	3

Preamble

This course provides implementation of object oriented, parallel and partitioning concepts in RDBMS packages. This course also covers various queries in advanced databases like Neo4j and MongoDB

Prerequisite

- RDBMS
- SQL
- Oracle & MS-Access

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the concepts of integrity constraints with some example queries	K2
CO2.	Implementing object oriented, parallel and partitioning queries and queries in MongoDB	K3
CO3.	Analyze the concepts of different databases	K4
CO4.	Design simple applications using VB with MS-ACCESS, Oracle and SQL	K5
CO5.	Develop real time applications using advanced databases like Graph databases	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	S	M	M
CO4.	S	M	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercises to implement the concepts of null constraint, unique constraint, integrity constraints, check constraints.
- Exercises to implement parallel queries.
- Exercises to implement the concepts of partitioning queries.
- Exercises to implement object oriented concepts.
- Implement the various queries for CRUD operations in MongoDB and MapReduce.
- Implement the various queries for CRUD operations in Neo4j.
- Develop a simple application using ADODC with front-end as VB and MS-ACCESS as back - end.
- Develop a simple application using ADODC with front-end as VB and Oracle as back-end.
- Develop a simple application using ADODC with front-end as VB and SQL as back-end connectivity.

Pedagogy: Demonstrations

Course Designers

1. Mrs. S. Meera
2. Mrs.V. Pream Sudha

RWP20P2	WEB PROGRAMMING LAB	Category	L	T	P	Credit
		III	-	-	75	3

Preamble

This course provides exercises to create dynamic web application in both client and server side using CSS3, AJAX, Javascript, jQuery, PHP/ MySQL and Angular. It enables students to equip themselves as a full stack developer.

Prerequisite

- Essentials of Web application
- PHP / MYSQL
- Ajax, jQuery, CSS3, HTML5, Javascript, ngular

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the concepts of Client side /Server side web programming	K2
CO2.	Implement the form validation using jQuery	K3
CO3.	Analyze validation concepts using JavaScript	K4
CO4.	Design applications using connectivity with MySQL database	K5
CO5.	Develop dynamic web pages using PHP, HTML and MY SQL, CSS, jQuery, JavaScript, and Angular	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	S	S	M
CO2.	M	S	S	M
CO3.	M	S	S	M
CO4.	M	S	S	M
CO5.	M	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercise to pass information between web pages using GET and POST methods.
- Exercise to apply string functions to manipulate strings.
- Exercise to implement file operations.
- Exercise to implement the date and time functions.
- Exercise to create menus, styles, Animation using CSS.
- Exercise to validate the HTML form fields using Javascript.
- Exercise to using jQuery and CSS.
- Exercise to handle events and special effects using jQuery
- Exercise to implement explode and implode functions

- Exercise to create data base connectivity using PHP and MySQL
- Exercise using Angular

Pedagogy: Demonstrations

Course Designers:

1. Dr. N.Radha
2. Mrs. M. Krithika Renuka

Semester II

RPY2006	PYTHON PROGRAMMING	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course introduces the concepts of programming in Python. It provides knowledge in core python, advanced concepts like regular expressions, exception handling, multithreading, web programming and data base programming

Prerequisite

•Basic understanding of Open source software
•Database concepts

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the programming constructs of Python	K2
CO2.	Apply the concepts of Python in simple tasks	K3
CO3.	Develop real time applications using Python	K6
CO4.	Create advanced applications using multithreading and exception handling	K6
CO5.	Develop GUI programs for simple applications	K6

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	M	M
CO2	S	S	S	M
CO3	S	S	M	M
CO4	S	S	S	M
CO5	S	S	S	M

Syllabus

UNIT I (10 Hrs)

Introduction: What is Python? - Origins - Features - Getting started-Python Basics - Python Objects - Numbers – Sequences - Strings, Lists and Tuples: - Strings - **Strings and operators** - String only operators - Built-in functions - String - Built-in methods - Special features of strings

UNIT II (12 Hrs)

Lists - Operators – Built in functions - List Type built-in methods - Special features of Lists, Tuples - Operators and Built-in functions - **Special features of Tuples** – Mapping and setting Dictionaries – Operators - Built-in and factory functions - Mapping types-built-in methods - Dictionary keys.

UNIT III (11 Hrs)

Set types- Operators - Built-in function - Set type built-in methods - **Conditionals and loops**. Functions and functional programming – Modules - Objected oriented programming - Execution environment

UNIT IV **(11 Hrs)**

Regular expressions - Multithreaded programming – Files & I/O: **File objects** – Built in Functions – Methods – Built in Attributes – Standard files – Command line arguments – File System – File Execution – Storage Modules. GUI Programming

UNIT V **(12 Hrs)**

Web programming - database programming - **Exception Handling**: Exception - Exception Handling - Except clause - Try- Finally clause - User Defined Exceptions

Text Book

1. Wesley J. Chun (2010). Core Python programming, 2/e, Pearson education.

Reference Books

1. Mark Lutz (2010). Programming Python, 4/e, O'Reilly Media.
2. Mark Summerfield (2009), Programming in Python 3, Pearson Education.

Pedagogy: Lectures**,** Demonstrations, Case studies
Note: Flipped mode of learning topics are highlighted

Unit	Topic	Methodology	E-Resources
I	Strings and Operators	Small group problem solving	https://www.w3schools.com/python/ https://www.tutorialspoint.com/python/ https://www.geeksforgeeks.org/python-programming-examples https://realpython.com/start-here/ https://www.python.org/
II	Special features of Tuples	Discussion, Sequence of Questions	
III	Conditionals and loops	Students Generated Content, Packet of Problems	
IV	File Objects	Demonstration, Game on Subject(Quiz between teams)	
V	Exception Handling	Experiential Learning	

Course Designers:

1. Mrs. V.Santhanalakshmi
2. Mrs. V. Kalaimani

MCS2007	J2EE PROGRAMMING	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course presents concepts to design and develop web based and enterprise applications using J2EE. It also covers concepts such as JDBC, JSP, JNDI and Struts framework.

Prerequisite

- Java
- HTML

Course Outcomes

On completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the concepts of web designing using J2EE.	**K2**
CO2.	Understand the communication between application and database using JDBC API.	**K2**
CO3.	Apply JNDI concept to set up database connection pool.	**K3**
CO4.	Determine the importance of scripting language in making a web page interactive	**K3**
CO5.	Analyze effective techniques to be followed to create as Sruts application.	**K4**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	M	M	S
CO2.	M	S	M	S
CO3.	M	S	M	S
CO4.	S	S	M	S
CO5.	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Java 2 Enterprise Edition Overview: J2EE and J2SE – J2EE Multi-Tier Architecture: The Tier – J2EE Multi-Tier Architecture – Client Tier Implementation – Web Tier Implementation – Enterprise JavaBeans Tier Implementation – Enterprise Information Systems Tier Implementation. Java Servlets: Java Servlets and Common Gateway Interface Programming – A Simple Java Servlet – Anatomy of a Java Servlet – Reading data from a Client – Reading HTTP Request Headers –Sending Data to a Client and Writing the HTTP Response Header – Working with Cookies – Tracking Sessions.

UNIT II (12 Hrs)

JSP: Introduction to JSP –Working with JSP Basic and Implicit Objects: Exploring Scripting Tags – Exploring Implicit Objects – Exploring Directive Tags – Enhancing the JSP tags Support: Custom Tags – Empty Tags –Simple Tags – Understanding JSP Expression Language: Basic Syntax of using EL: Types of EL Expressions –Tag Attribute Types – Resolving EL Expressions –Expression Language Operators.

UNIT III (11 Hrs)

JDBC: Introducing JDBC – Exploring the JDBC Architecture – Working with JDBC APIs: Communicating with Databases by using JDBC APIs – Implementing JDBC statements and Result sets: Working with the Statement Interface – Working with the Prepared Statement Interface – Working with the Callable Statement Interface: Describing stored Procedures - Listing the benefits of working with a Stored Procedure – Using Callable Statement – Using Callable Statement with Parameters – Describing Advanced JDBC Concepts: SQL 99 Data Types.

UNIT IV (11 Hrs)

Java Naming and Directory Interface API: Naming and Directories – Java Naming and Directory Interface – Naming Operations – Web Services: SOAP – SOAP Basics – Java API for XML Messaging – Create, Send and Receive a Point to Point SOAP Message – Create and Send a SOAP Message Using a Messaging Provider – Creating a SOAP Attachment.

UNIT V (11 Hrs)

Struts Framework: Introduction to Struts – Two Development Models – Model View Architecture – Enterstruts – Basic Components of Struts – Building Simple Struts Application – Model Layer: Struts and the model - View Layer: Struts and view layer -The Controller Layer: Struts and controller layer.

Reference Books

1. Jim Keogh (2014), The Complete Reference J2EE, McGraw Hill Education (India) Private Limited, New Delhi, 36th reprint
2. Santosh Kumar (2014), JDBC Servlets and JSP, 1/e, Dream tech Press.
3. James Holmes (2007), Struts – The Complete Reference, Tata Mc-Graw Hill Publications.
4. James McGovern, Rahim Adaitia et.al, J2EE 1.4 Bible, Wiley India Publications, NewDelhi.
5. Kogent Learning Solutions Inc (2014), Java Server Programming, Dreamtech Press.

Pedagogy : Lectures, Demonstrations, Group Discussions

Course Designers:

1. Mrs.S. Gomathi
2. Mrs.V. Santanalakshmi

RSP2008	SOFTWARE PROCESS MANAGEMENT	Category	L	T	P	Credit
		III	56	4		4

Preamble

This course presents the concepts of software product life cycle models, Agile project management using Scrum and Lean. The course also introduces DevOps tools and technologies

Prerequisite

- Software Engineering

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand Agile Methodologies and Devops tools	K2
CO2.	Apply software process management concepts in real time applications	K3
CO3.	Differentiate various Agile Methodologies.	K4
CO4.	Compare the various software life cycle models	K5
CO5.	Devise a plan for delivering a quality product	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	S	S	M
CO2.	S	S	S	M
CO3.	S	S	S	M
CO4.	S	S	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (12 Hrs)

Foundations : Background – The Software Process Ecosystem – Historical Overview – Terminology and Basic Concepts . Software Process in the Software Product Life Cycle: Introduction – Basic Software Development Life Cycle Models – Methodology – Driven Cycle and Process Models – Detailed combined Software Life Cycle and Process Models

UNIT II (11 Hrs)

Agile : Introduction – Core Attitudes of Agile – Learning through Example. The need for Agile Methodologies – Principles of Agile Project Management – Introduction to Scrum – Scrum

Principles – Sprint Planning, Execution and Reviewing – Becoming a better Scrum Master - Introduction to kanban – The work in progress.

UNIT III (11 Hrs)

Scrum: Agile Principles and Values- Scrum: Development Teams – Scrum Master – Planning – Sprint Review – Sprint Retrospective. Three Scrum Artifacts – Sprint Cycle – Scrum Estimation – Scrum Planning and Roadmaps – The daily Scrum –Scrum case studies and findings.

UNIT IV (11 Hrs)

DevOps Concepts, Tools, and Technologies: Understanding the DevOps movement - The DevOps lifecycle - Tools and technologies: Code Repositories – GIT - Build Tools – Maven – Continuous Integration Tools – Jenkins – Configuration Management tools – Chef – Container Technology – Docker – Monitoring Tools. Installing and Configuring Docker.

UNIT V (11 Hrs)

Introduction to Lean : Lean Thinking Tools. Design Thinking, Lean and Agile : Introduction – Actionable Strategy – Act to Learn – Leading teams to win- Delivery : Devops and Continuous Delivery – Evolutionary Architecture and Emergent Design.

Reference Books

1. Ralf Kneuper (2018), Software Processes and Life Cycle Models , Springer. (Unit – I)
2. James Edge, Agile(2018) – An Essential Guide to Agile Project Management, The Kanban Process and Lean Thinking, CreateSpace Independent Publishing. (Unit – II & III)
3. Jonny Schneider(2017), Understanding Design thinking, Lean and Agile,O'Reilly Publishing. (Unit – IV)
4. Mitesh Soni(2016), Devops for Web Development, , Packt Publishing. (Unit – V)

Pedagogy: Lectures, Demonstrations, Case Studies

Course Designers:

1. Mrs. V. Santhana Lakshmi
2. Mrs. R. Vani

RPY20P3	PYTHON PROGRAMMING LAB	Category	L	T	P	Credit
		III	-	-	75	3

Preamble

This course introduces the concepts of programming in Python. It provides technical skill in core python, advanced concepts like regular expressions, exception handling, multithreading, web programming and data base programming.

Prerequisite

- C++ & Java
- SQL
- Oracle & MS-Access

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the basic concepts of python programming	K2
CO2.	Implementing the object oriented concepts to improve reusability.	K4
CO3.	Apply python concepts to develop applications that solves industrial problem.	K4
CO4.	Compare python programming language with other languages	K5
CO5.	Develop simple web application	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	S	S	M
CO2.	S	S	S	M
CO3.	S	S	S	M
CO4.	S	S	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

1. Exercises to implement File handling concept
2. Exercises to implement list
3. Exercises using Dictionary
4. Exercises to perform set operations
5. Exercises using object oriented concepts
6. Exercises to perform operations using Regular expression
7. Exercises using exceptional handling technique
8. Exercises using multithreading
9. Exercises to perform operations on Byte objects
10. Create an application using Python with database connectivity

Pedagogy: Demonstrations

Course Designers

1. Mrs.V.Kalaimani
2. Dr.Mrs.N.Radha

MCS16P4	J2EE PROGRAMMING LAB	Category	L	T	P	Credit
		III	-	-	75	3

Preamble

This course provides exercises to design and develop web based enterprise applications using J2EE. It also provides exercises to implement JSP, Servlet and Struts concepts to create an interactive application.

Prerequisite

- Java
- HTML

Course Outcomes

On completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the method of compiling and running a JSP program in Netbeans.	K2
CO2.	Implement database connectivity techniques to connect application with the database.	K3
CO3.	Apply struts tags to create a small application.	K3
CO4.	Apply exceptional handling techniques to develop an error free application.	K3
CO5.	Analyze the importance of web services in making a webpage interoperable.	K4

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	S	M	S
CO2.	M	S	M	S
CO3.	M	S	M	S
CO4.	M	S	M	S
CO5.	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

- Exercise to develop webpage to pass information between pages.
- Exercise to implement JDBC API to connect the application with the database.
- Exercise to design a website using form validation techniques.
- Exercise to implement arithmetic operations.
- Exercise to implement exception handling.
- Exercise to create an application using basic JSP tags.
- Exercise to develop a servlet application.
- Exercise to design a web application using struts.

Pedagogy: Demonstration**s**

Course Designers:

1.Mrs. V.Santhana Lakshmi
2. Mrs. V.Kalaimani

SEMESTER III

MCS1909	DATA MINING	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course presents the basic concepts of data mining and various data mining techniques like classification, clustering, association rule mining. The course also introduces various applications of data mining such as text mining, web mining, multimedia mining, image mining, spatial mining and data visualization.

Prerequisites

- Database Management Systems
- Probability and Statistics

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand basic concepts of data mining like classifications, clustering, association rule mining, prediction and related algorithms	K2
CO2	Apply data mining techniques to carry out simple data mining tasks	K3
CO3	Analyze data using data visualization with Tableau	K4
CO4	Design different data mining models for real world problems	K5
CO5	Develop predictive models using advanced Data Mining Techniques	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	M	M
CO2	S	S	M	M
CO3	S	S	S	M
CO4	S	S	S	M
CO5	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(10 Hrs)**

Introduction to data mining: Mining from database - Data mining functionalities – Mining patterns - Classification of data mining systems - Major issues in Data mining.

UNIT II **(12 Hrs)**

Data Preprocessing: Need for preprocessing – Data summarization – Data cleaning – Data integration - Data transformation – Data reduction – Data discretization. Association Rule Mining: Apriori algorithm.

UNIT III **(11Hrs)**

Classification - Decision trees - Naïve Bayes - K Nearest Neighbour - Support Vector Machine - Neural Networks- Deep Neural Networks- Evaluation of classification algorithms. Prediction – Regression, Evaluation of Prediction methods.

UNIT IV **(12 Hrs)**

Clustering: Cluster Analysis - Partitioning Methods: K-Means, K-Medoids - Hierarchical Methods – BIRCH, ROCK - Density based methods: DBSCAN, OPTICS - Evaluation of clustering algorithms.
Data Visualization: Foundations for building visualizations - Visualizing data -Working with Data in Tableau - Moving from Foundational to Advanced Visualizations.

UNIT V **(11 Hrs)**

Advanced Data Mining Techniques: Mining Data Streams - Mining Time Series Data - Mining Sequence Patterns in Biological Data - Graph Mining - Social Network Analysis – Spatial Data Mining - Multimedia Data Mining - Text Mining - Mining the World Wide Web - Data Mining Applications and Tools.

Text Book

1. Jaiwei Han, Micheline Kamber (2006). Data Mining-concepts and techniques, 2/e, Morgan Kaufmann Publishers, San Francisco

Reference Books

1. Joshua N.Milligan (2015). Learning Tableau, PACKT publishing
2. Mark A. Hall, Ian H. Witten, Eibe Frank (2011). Data Mining: Practical Machine Learning Tools and Techniques, 4/e, Morgan Kaufmann Publishers, San Francisco
3. David Hand, HeikkiMannila and Padhraic Smyth (2001). Principles of Data Mining, Prentice Hall of India, New Delhi
4. Arun K. Pujari (2001). Data Mining Techniques; Universities Press, Hyderabad
5. Soman KP (2005). Data mining from theory to practice, 2/e, PHI Learning Pvt. Ltd., New Delhi

Pedagogy

Lectures, Group Discussions, Case studies

Course Designers

1. Dr. M.S. Vijaya
2. Mrs.V.Santanalakshmi

MCS2010	WIRELESS NETWORKS	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course introduces the fundamentals of networking and principles of network operations. It also provides knowledge on various generations of cellular systems. It also covers topics such as satellite network, wide area network and personal area network.

Prerequisites

- Computer Networks
- TCP/IP

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of networking	K2
CO2	Understand the principles behind the networking operation	K2
CO3	Understand the principles behind the networking operation	K3
CO4	Classify different technologies followed in various generation of cellular networks	K3
CO5	Analyze different types of networks in wireless technology	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	M	S	M
CO3	S	S	M	M
CO4	S	M	S	M
CO5	S	S	S	M

S – Strong; M – Medium; L - Low

Syllabus

UNIT I **(11 Hrs)**

Introduction to Wireless Networks: Evolution of Wireless Networks – Challenges. Wireless Communications Principles and Fundamentals: The Electromagnetic Spectrum - Wireless Propagation Characteristics and Modelling - Analog and Digital Data transmission - Modulation Techniques for Wireless Systems - The Cellular Concept – Routers- Wireless Services. Principles of AIR-Interface Design - Characteristics of the Wireless Medium.

UNIT II **(11 Hrs)**

Generation of Cellular Systems: First Generation (1G) Cellular Systems - Second Generation (2G

Cellular Systems: Introduction – D-AMPS – CDMAone - GSM – IS-41 - Third Generation (3G) Cellular Systems: Introduction – 3G Spectrum Allocation – Service Classes and Application – Fourth Generation (4G) Systems.

5G Fundamentals and Architecture: Evolution of 5G, Need for 5G-5G RAN(Radio Access Networks)-Key features of 5G- Architecture: Key elements of 5G- 3GPP standards for 5G radio and core.

UNIT III **(11 Hrs)**

Principles of Wireless Network Operation: Network Planning – Wireless Network Operation - Satellite Networks: Introduction - Satellite Systems - VSAT Systems - Examples of Satellite based Mobile Telephony Systems - Satellite-based Internet Access.

UNIT IV **(12 Hrs)**

Fixed Wireless Access Systems: Wireless Local Loop versus Wired Access - Wireless Local Loop - Wireless Local Loop Subscriber Terminals (WLL) - Wireless Local Loop Interfaces to the PSTN, IEEE 802.16 Standards.Wireless Local Area Networks: Introduction - Wireless LAN Topologies - Wireless LAN Requirements - The Physical Layer - The Medium Access Control (MAC) Layer - Latest Developments. Wireless ATM: Introduction - Wireless ATM Architecture – HIPERLAN 2: An ATM Compatible WLAN.

UNIT V **(11 Hrs)**

Personal Area Networks: Introduction to PAN Technology and Applications, Commercial Alternatives: Bluetooth - Commercial Alternatives: HomeRF. Security Issues in Wireless Systems: The Need for Wireless Network Security - Attacks on Wireless Networks - Security Services - Wired Equivalent Privacy (WEP) Protocol - Mobile IP -Weaknesses in the WEP Scheme - Virtual Private Network (VPN). Simulation of Wireless Network Systems.

Text Book

P.Nicopolitidis, M.S. Obaidat, G.I Papadimitriou, A.S. Pomportsis (2003). Wireless Networks, New Delhi: John Wiley & Sons (ASIA)

Reference Books

1. William Stallings (2002). Wireless Communication and Networks, Pearson Education, Delhi,
2. KavehPahlavan, Prashant Krishnamurthy (2002), Principles of Wireless Networks - A Unified Approach; 2/e; New Delhi: Pearson Education.
3. Anwer AI-Dulaimi, Xianbin Wang and Chih-Lin I, "5G Networks: Fundamental Reqirements,Enabling Technologies, and Operations Management", Wiley- IEEE Press, USA, (2018).

Pedagogy:

Lectures, Group Discussions, Demonstrations, Simulation.

Course Designers

1. Dr.R.KrithikaRenuka
2. Mrs.R. Kowsalya

MCS2012	INTERNET OF THINGS	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course covers the basic concepts of IoT, IoT Protocols and design methodology. This coursealso introduces building IoT with Arduino forvarious real time applications.

Prerequisite

- Programming
- Networks

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand basic concepts of IoT	K2
CO2	Apply various sensors and protocols in real time applications	K3
CO3	Implement data acquisition using Arduino	K5
CO4	Create real time applications	K6
CO5	Create web application for handling data communication using IOT devices	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Introduction to IoT : Internet of Things – Physical Design of IoT– Logical Design of IoT: Blocks, Models - IoT Enabling Technologies : Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems. IoT Levels and Deployment Templates– Domain Specific IoTs.

UNIT II (12 Hrs)

Introduction to Arduino : Installing the Integrated Development Environment (IDE)- Setting up the Arduino Board- Structuring an Arduino Program- Simple Primitive Types- Floating-Point Numbers – Working with groups of values- Arduino String Functionality – C character Strings- Converting

Number to String – Structuring the Code into Function Block.

UNIT III **(11 Hrs)**

Serial Communication: Sending Debug Information From Arduino to your computer – Sending Formatted Text and Numeric data from arduino-Receiving Serial Data in Arduino – Sending and Receiving multiple text fields from arduino in a single message. Digital and Analog Input : Using Switch-Without external resistors-detecting the closing of switch- How long a switch is pressed-reading a Keypad, Analog values- Changing range of values- Displaying Voltage up to 5V.

UNIT IV **(11 Hrs)**

Inputs from Sensors : Detecting Movements, Light, Motion – Measuring Distance , Temperature-Detecting Vibration, Sound – Reading RFID tags. Visual Output: Connecting and Using LEDs-Adjusting the Brightness of an LED- Driving High-power LEDs-Adjusting the color of an LED. Physical Output : Controlling the position of a servo- Controlling one or Two Servo with a Potentiometer or sersor-Controlling the speed of continuous Rotation Seros.

UNIT V **(11 Hrs)**

Audio Outputs: Playing Tones, Simple Melody- Generating more than one simultaneously Tone-Generating Audio Tones and Fading LED's, Playing WAV File, Controlling MIDI. Using Display: Connecting and Using a Text LCD Display- Formatting Text – Turning the cursor and display On or Off- Scrolling Text- Displaying Special Symbols- Creating Custom Characters- Displaying Symbols Larger than a single character- Displaying Text on TV. Using Time and Dates : Creating Delays- Using millis to determine durati*on- Measuring duration Pulse-Using Arduino as Clock- Creating an alarm to periodically call a function –Using a Real time clock

Text Books

1. Arshdeep Bahaga, Vijay Madisetti (2014). "Internet of Things – A hands on approach", Universities Press
2. Michael Margolis(2011), "Arduino Cookbook" 2nd Edition, O'Reilly Media

Reference Books

1. Honbo Zhou(2012).The Internet of Things in the Cloud: A Middleware Perspective, New York: CRC Press.
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles (2011). Architecting the Internet of Things, Germany, Springer.
3. Olivier Hersent,Omar Elloumi and David Boswarthick (2012). The Internet of Things: Applications to the Smart Grid and Building Automation, UnitedStates: Wiley Publishing Inc

Pedagogy

Lectures**,** Demonstrations, Case studies

Course Designers

1. Mrs.V. Santhanalakshmi
2. Mrs.R. Kowsalya

RRM19S1	RESEARCH METHODOLOGY	Category	L	T	P	Credits
		III	60	-	-	4

Preamble

This course presents the concepts of research, types of research, research design, literature review and writing reports. It also covers various areas of computer science.

Prerequisite

This course is most appropriate for post graduate students who are interested in research but donot have prior research experience.

Course Outcomes

On successful completion of the course, the students will be able to

CONumber	CO Statement	Knowledge Level
CO1	Understand the concepts of research design, research process and various types of research	K2
CO2	Understand the different steps in writing report	K2
CO3	Implement the methods and techniques for experimental study	K3
CO4	Analyze the ethical issues in research	K4
CO5	Develop solutions for research problems in a responsible and ethical manner	K5

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	M	M	M
CO3	S	S	S	M
CO4	S	M	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(12 Hrs)**

Introduction: – Meaning of research – Objective of research – Motivation in research - Types of research – Research approaches – Significance of research – Research methods versus Methodology – Research and scientific method – Importance of knowing how research is done- Research process – Criteria of good research – Problems encountered by researchers in India. Defining the research problem: What is research problem? – Selecting the problem – Necessity of defining the problem

UNIT II **(12 Hrs)**

Reviewing the literature: Literature review in research – How to review the research? – Writing about the literature reviewed – Formulating a research problem. Research Design: Meaning of research design – Need for research design –Features of a good design – Important concepts relating to research design – Different research designs – Basic principles of experimental designs

UNIT III **(12 Hrs)**

Data Collection: Introduction – Experiments and Surveys - Collection of primary data –Collection of secondary data – Selection of appropriate method for data collection – Case study method. Data Preparation: Data Preparation Process – Some problems in preparation process – Missing values and outliers – Types of analysis – Statistics in research

UNIT IV **(12 Hrs)**

Processing and displaying Data: Data processing in quantitative studies – Data processing in qualitative studies – Displaying data. Interpretation and report writing: Meaning of interpretation – Technique of interpretation – Precaution in interpretation – Significance of report writing – Different steps in writing report – Layout of the research report – Types of reports – Oral Presentation – Mechanics of writing a research report – Precautions for writing research reports

UNIT V **(12 Hrs)**

Research Ethics and Responsible Conduct in Research: Brief history and analytical basis of research ethics, responsible conduct in research (Honesty in Science: Integrity, Authorship, Conflicts of Interest, Privacy and Confidentiality, Informed Consent, Risk/Benefit Assessment), The legal regulation of research ethics in India (From UGC, MHRD and other governing agencies), Regulatory requirements relevant to international research

Text Books

1. Kothari, Research Methodology - Methods and Techniques, 3/e Wiley Eastern Limited, 2013.

Reference Books

1. Ranjit Kumar, Research Methodology – A step- by-step guide for beginners, 3/e Pearson Education, 2011
2. R. Panneerselvam, Research Methodology, 4/e, Prentice Hall India Learning Private Limited, 2014.
3. Deepak Chawla and NeenaSondh, Research Methodology, Concepts and Cases, Vikas Publishing House Pvt. Ltd, 2011
4. On Being a Scientist, A Guide to Responsible Conduct in Research,Third Edition 2009
5. Mark Suckow, Bill Yates, Research Regulatory Compliance, eBook, ISBN: 9780124200654
6. Mark P.Aulisio, Robert M.Arnold, Role of the Ethics Committee: Helping To Address Value Conflicts or Uncertainties
7. https://www.glos.ac.uk/docs/download/Research/handbook-of-principles-and-procedures.pdf
8. Recent research ethics policy from Government of India.

Pedagogy:

Lectures, Demonstration, Case Studies

Course Designers

1. Mrs.S. Meera
2. Mrs. R.Vani

MCS18P5	DATA MINING LAB	Category	L	T	P	Credits
		III	-	-	75	3

Preamble

This course provides exercises to implement data mining techniques such as classification, clustering, association rule mining, regression using data mining tool like R, Python. This course also includes exercise to visualize the data using Tableau.

Prerequisite

- SQL, Oracle

Course Outcomes

On successful completion of the course, students will be able to

CONumber	CO Statement	KnowledgeLevel
CO1	Implement the association rule mining, classification, clustering, prediction algorithm and implement data visualization using Tableau.	K3
CO2	Apply data mining techniques to real world problem	K3
CO3	Analyze the performance of various classification, clustering and prediction algorithm	K4
CO4	Evaluate the features of data mining tools	K5
CO5	Build models using classification, clustering and prediction to solve real world problems using Python.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M
CO5	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercises to implement visualization techniques in R
- Exercises to implement correlation, linear regression in R

- Exercises to perform classification in R
- Exercises to perform clustering using Python
- Exercises to perform association rules using Python
- Exercises to perform text mining using Python
- Exercise to perform visualization using Tableau

Pedagogy:

Demonstrations

Course Designer

1. Mrs. V.Santanalakshmi
2. Dr.M.S.Vijaya

MCS20P6	INTERNET OF THINGS LAB	Category	L	T	P	Credits
		III	-	-	75	3

Preamble

This course introduces the concepts of programming in IoT. It also includes the practical exercises in building IoT using Simulators like NetSim, ANSYS, Matlab , eclipse, mbed and Cupcarbon

Prerequisite

- Java
- Python

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Apply the basic concepts of IoT	K3
CO2	Develop the applications of IoT	K4
CO3	Design a Portable IoT using Matlab	K6
CO4	Design a Portable IoT using Raspberry Pi	K6
CO5	Deploy simple application of IoT for Real time	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	S
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

1. Exercises on domain specific applications of IoT
2. Creating network based applications of IoT using Simulator
3. Exercises to implement the network communication aspects of IoT
4. Exercises on Sensor based application through embedded system platform.

Pedagogy

Demonstration

Course Designers

1. Dr. V. PreamSudha
2. Ms. R. Kowsalya

Job Oriented Course

Course Name: Cloud Architecting **Duration**: 40 hours

Objectives

This course introduces the students about AWS Cloud by understanding AWS services and how they fit into cloud-based solutions. It also explores various design patterns through the process of architecting optimal IT solution on AWS. It also provides opportunities for students to build a variety of infrastructures through a guided, hands-on approach.

Collaboration : ICTACT, Chennai.

Syllabus

Module 1: Welcome to AWS Academy Cloud Architecting

Module 2:Designing Your Environment

Module 3: Designing for High Availability I

Module 4: Designing for High Availability II

Module 5: Automating Your Infrastructure

Module 6:Decoupling Your Infrastructure

Module 7: Designing Web-Scale Media

Module 8:Well Architected Framework

Module 9: Well-Architected Pillar 1: Operational Excellence

Module 10: Well-Architected Pillar 2: Security

Module 11: Well-Architected Pillar 3: Reliability

Module 12: Well-Architected Pillar 4: Performance Efficiency

Module 13: Well-Architected Pillar 5: Cost Optimization

Module 14: Troubleshooting

Module 15: Design Patterns and Sample Architectures

MCS16PW	PROJECT WORK AND VIVA VOCE	Category	L	T	P	Credits
		III	-	-	-	12

Preamble

To build problem solving ability and technical skills through the application of theoretical concepts for modeling the real world problems using latest technologies

Prerequisites

- Software engineering
- Database management systems
- Programming languages
- Technologies

Outcomes

On successful completion of the project, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the problem identification, formulation and solution	K2
CO2	Apply Software Tools and techniques to solve complex problems	K3
CO3	Examine various technologies to implement the project solutions	K4
CO4	Evaluate algorithms/techniques used for problem solving	K5
CO5	Develop the knowledge, skills needed for professional software engineer	K6

Mapping with Programme Outcome

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	M
CO2	S	S	M	M
CO3	S	S	M	S
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Methodology

- Identify the problem
- Decide the platform to carry out the work
- Design and develop the solution
- Test and implement the application
- Document the work

MCS2014	ADVANCED LEARNER COURSE 1 – BLOCKCHAIN	Category	L	T	P	Credits
		III	-	-	-	5

Preamble

This course covers the technical principles of blockchain, cryptographic primitives used in blockchain, distributed system concepts, decentralization behind blockchain and the working of bitcoin. It also introduces the Ethereum platform and highlights the tools, use cases ofblockchain technology.

Prerequisite

- Distributed systems
- Cryptography
- Information security

Course Outcomes

On successful completion of the course, the student will be abe to

CO Number	CO statement	Knowledge Level
CO1	Understand the technical concepts of blockchain technology at sufficient depth to perform analysis	K2
CO2	Understand relevant legal and ethical issues of blockchain and their impact on policy and actions of organizations	K2
CO3	Apply various block chain concepts to analyze proposals, case studies and preliminary blockchain system design discussions	K3
CO4	Analyse the use of blockchain technology in systems and support decisions with relevant arguments	K4
CO5	Determine real world challenges that blockchain technologies may assist to solve	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	M	M	M
CO3	S	S	M	M
CO4	S	M	M	M
CO5	S	M	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction to Blockchain: Distributed systems - History of blockchain – Introduction to blockchain – Features -Applications -Tiers - Types of blockchain - Consensus in blockchain- Benefits and limitations

UNIT II

Decentralization : Decentralization using blockchain - Methods - Routes – Blockchain and full ecosystem decentralization – Smart contract – Decentralized applications – platforms for decentralization

UNIT III

Bitcoin : Bitcoin – Public, Private keys – Transaction life cycle – Transaction structure – Types of transaction - Blockchain – Structure of a block – Mining – Task of miners- Proof of work – Mining algorithm- Bitcoin network - Wallets-Payments

UNIT IV

Ethereum 101 : Introduction – Ethereumblockchain - Currency – Fork - Gas - Elements of Ethereumblockchain- EVM- Accounts- Transaction receipt - Block validation mechanism – Ether – Ethereum network

UNIT V

Emerging trends - Tools: Solidity- Metamask – Stratis– Embark. Use cases: Know Your customer (KYC) and Syndicated loan use case in Finance domain, Interest rate swapping in Banking, Re-insurance in Insurance, Auditing in Hotel reservation, Loyalty management system in retail domain, Order management system in Supply chain.

Text Book

1. Imran Bashir, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks,Packt Publishing, 2017 (Unit I to V)
2. DebajaniMohanty, Blockchain : From Concept to Execution, BPB Publications, 2018 (Unit V – Use cases)

Reference Books

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015

Course Designers

1. Dr. M.S.Vijaya
2. Dr. V.PreamSudha

RCY1915	ADVANCED LEARNER COURSE 2- CYBER SECURITY	Category	L	T	P	Credits
		III	-	-	-	5

Preamble

This course provides the classification of cyber crime, Botnets, attacks on the mobile devices, tools and methods used in cybercrime, laws of cybercrime and cyber forensic

Prerequisite

- Basic fundamental knowledge ofNetworking
- WebApplication
- MobileApplication
- Relational Database ManagementSystem

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of cybercrime	K2
CO2	Understand the fundamental principles of cyber forensic	K2
CO3	Apply methods of the cyber crime	K3
CO4	Analyze the technique used for cybercrime and forensics	K4
CO5	Create methodology to secure their data in the real world	K6

Mapping of Course Outcome with Programme Outcome

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	M
CO2	S	S	M	M
CO3	S	S	S	S
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction to Cybercrime: Introduction, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Newsgroup Spam/Crimes from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses , Software Piracy, Password Sniffing, Credit Card Frauds and Identity Theft. Cyber offenses: How Criminals Plan that attack, Categories of Cybercrime, How Criminals Plan the Attacks: Passive Attack, Active Attacks, Scanning/Scrutinizing gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector and Cloud Computing in Specific IoTs – IoT vsM2M.

UNIT II

Cybercrime- Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era and Laptops.

UNIT III

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft): Types of Identity Theft, Techniques of ID Theft, Identity Theft Countermeasures, How to Protect your Online Identity

UNIT IV

Cybercrimes and Cybersecurity: The Legal Perspectives Introduction, Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: IndianScenario.

UNIT V

Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail : RFC282, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing and Antiforensics.

Text Books

1. Nina Godbole, SunitBelapur, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Publications, April, 2013

Reference Books

1. James Graham, RicharHoward,Ryan Olson, “Cyber Security Essentials”, CRC Press, Tailor and Francis Group,2013

2. Robert Jones, “Internet Forensics: Using Digital Evidence to Solve Computer Crime”, O’Reilly Media, October,2005.

3. Chad Steel, “Windows Forensics: The field guide for conducting corporate computer investigations”, Wiley India Publications, December,2006.

Course Designers

1. Mrs.R.Kowsalya
2. Mrs.S.Meera

List of Electives

RI20E01	INTERNET PROTOCOLS	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course presents the concept of protocols in the TCP/IP suite (IP, UDP & TCP), Layering Concepts, and Routing Architectures. It also includes Internet Addressing, Mobile IP Addressing, Network Virtualization and Client Server model of interaction.

Prerequisite

- Computer Networks
- Basic Concept of Networking

Course Outcomes

On successful completion of the course, the students will be able to,

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of protocols in the TCP/IP suite, protocol Layering, Routing Architecture.	K2
CO2	Apply TCP/IP in the Mobiles.	K3
CO3	Analyze the relation between the various internet protocols.	K4
CO4	Evaluate the suitability of an internet protocol for supporting a given application type.	K5
CO5	Construct the alternate protocol.	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	M	M	S
CO2	S	M	M	S
CO3	S	S	S	S
CO4	S	S	S	S
CO5	S	S	S	S

S – Strong; M – Medium; L - Low

Syllabus

UNIT I **(11 Hrs)**

Introduction and Overview: The TCP/IP Internet – Internet services – History and Scope of the Internet –Internet Architecture Board - Transition to IPv6 - Relationship between IPv4 and IPv6 - IPv6 Migration, Overview of Underlying Network Technologies: Two Approaches to Network

Communication – WAN and LAN – Ethernet – Wi-Fi - ZigBee – OC and POS - Bridging – Congestion and Packet Loss, Internetworking Concept and Architectural Model: Application Level Interconnection – Network Level Interconnection – Internet Architecture – Interconnection of Multiple Networks with IP Routers, Protocol Layering: Reference Model - ISO 7 Layer - TCP/IP 5 Layer.

UNIT II **(11 Hrs)**

Internet Addressing:IPv4 - Classful Addressing Scheme - Subnet Addressing - Classless Addressing Scheme - Classless Addressing Example - IPv6 Addressing Scheme - Embedding IPv4 Addresses In IPv6 For Transition - Special Addresses - Weaknesses In Internet Addressing, Mapping Internet Addresses of Physical Addresses (ARP), Internet Protocol: Connectionless Datagram Delivery: Connectionless Delivery System Characteristics – IP Datagram – Datagram Encapsulation – Fragmentation – Reassembly.

UNIT III **(12 Hrs)**

Internet protocol: Forwarding IP Datagrams, Error and Control Messages: Internet Control Message Protocol - Error Reporting Vs. Error Correction - ICMP Message Delivery - ICMP Message Format – Example ICMP Message Types Used with IPv4 & IPv6, User Datagram Protocol, Reliable Stream Transport Service (TCP): Properties of the Reliable Delivery Service – Sliding Window Paradigm - Transmission Control Protocol - Layering, Ports, Connections, and Endpoints - Segment Format - Checksum Computation.

UNIT IV **(11 Hrs)**

Routing Architecture: Origin of Forwarding Tables - Forwarding With Partial Information - Internet Architecture and Cores – Distance Vector (Bellman-Ford) Routing – Link State (SPF) Routing, Routing Among Autonomous Systems : Scope Of A Routing Update Protocol - Autonomous System Concept - Exterior Gateway Protocols And Reachability – BGP, Routing Within an Autonomous System : Static Vs. Dynamic Interior Routes - Routing Information Protocol (RIP) - Open SPF Protocol (OSPF) - IS-IS Route Propagation Protocol.

UNIT V **(11 Hrs)**

Mobility And Mobile IP : Mobility, Addressing, and Routing - Mobility Via Host Address Change - Mobility Via Changes In Datagram Forwarding - Mobile IP Technology - Mobile IP Operation - Mobile IPv4 Addressing - IPv6 Mobility Support - Datagram Transmission, Reception, and Tunnelling - Assessment Of IP Mobility And Unsolved Problems , Network Virtualization: Virtual Private Networks (VPNs) - VPN tunnelling and IP-in-IP Encapsulation- VPN Addressing And Forwarding - Network Address Translation (NAT) - Example Of NAT Translation - Overlay Networks - Multiple Simultaneous Overlays, Client-Server Model of Interaction.

Text Book

Douglas E.Comer (2014), Internetworking with TCP/IP Vol I: Principles, Protocols and Architecture, 6/e, New Delhi, Pearson Publications.

Reference Books

1. BehrouzA.Forouzan (2006), TCP/IP protocol Suite Fourth Edition, Tata McGraw Hill, New Delhi.
2. Richard Stevens (2003), TCP/IP Illustrated Volume 2, Prentice Hall of India, New Delhi.
3. Julie C. Gaffin (2007) Internet Protocol 6, Nova Science Publisher Inc., Newyork.

Pedagogy

Lectures, Case Studies, Group Discussions.

Course Designers

1. Dr.M.Sasikala
2. Mrs. R. Kowsalya

RC19E03/ MIT1910	CLOUD COMPUTING	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course introduces the student to gain knowledge on various services of cloud computing. It also presents cloud computing collaborations and applications. It presents new concept of virtualization.

Prerequisite

- Computer Networks
- Web Technology

Course Outcomes

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the concepts of cloud Architecture and its services.	K2
CO2.	Classify different services providers and its services, tools.	K3
CO3.	Demonstrate various web based applications for collaborating everyone in the cloud computing.	K3
CO4.	Analyze the best service provider for cloud computing in terms of storage, services.	K4
CO5.	Assess various industrial platforms for the developments	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	S	M	M
CO4.	S	M	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Introduction: Benefits and Limitations - Cloud Architecture – Storage – Services –Service Providers - Types of Cloud Service Development – Services and Tools

UNIT II **(12 Hrs)**

Collaborating on Contact Management - Collaborating on Project Management- Collaborating on Word Processing, Spreadsheet, Presentations, Databases- Sharing Files and Photographs

UNIT III **(11 Hrs)**

Cloud Virtualization Technology –Virtualization Defined–Virtualization Benefits – Server Virtualization – Virtualization for x86 Architecture – Hypervisor Management Software – Logical Partitioning – VIO Server – Virtual Infrastructure Requirements

UNIT IV **(11 Hrs)**

Deep Dive: Cloud Virtualization –Introduction - Storage Virtualization–Storage Area Networks– Network Attached Storage – Cloud Server Virtualization – Virtualized Data Center

UNIT V **(11 Hrs)**

Industrial platforms and new developments - Amazon web services: Compute services - Storage services - Communication services - Additional services - **Google AppEngine:** Architecture and core concepts - Application life cycle - Cost model **Microsoft Azure:** Azure core concepts - SQL Azure - Windows Azure platform appliance

Reference Books

1. Michael Miller (2011). Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Pearson publication.
2. Dr. Kumar Saurabh (2011). Cloud Computing : Insights into New Era Infrastructure, Wiley India
3. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi (2013). Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann is an imprint of Elsevier
4. Rishabh Sharma (2014). Cloud Computing: Fundamentals, Industry Approach and Trends, wiley India edition.
5. Paul Mehner (2013). Cloud Computing with the windows Azure Platform, Microsoft Press US

Pedagogy: Lectures, Case Studies, Group Discussions

Course Designers

1. Mrs. S. Meera
2. Mrs. V. Kalaimani

RS19E06	SOFT COMPUTING	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course covers the concepts of neural networks and the role of neural networks in intelligent systems. It also presents fuzzy set theory, fuzzy logic, genetic algorithm, and hybrid system.

Prerequisite

Artificial Intelligence

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the concepts of soft computing and their applications	K2
CO2.	Summarize supervised and unsupervised learning in neural networks	K2
CO3.	Apply soft computing techniques for small applications	K3
CO4.	Analyze various soft computing techniques suitable for real time Applications	K4
CO5.	Evaluate the results of knowledge base system	K5

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	M	M	S
CO2.	S	M	M	S
CO3.	S	S	M	M
CO4.	S	M	S	S
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Neural Networks : Fundamentals of Neural Networks – Basic Concepts of Neural Networks – Model of an Artificial Neuron – Neural Network Architecture – Characteristics of Neural Network – Learning Methods – Taxonomy of Neural Network Architecture – Back Propagation Network – Architecture of Back Propagation Network – Back Propagation Learning

UNIT II **(12 Hrs)**

Neural Network Associative Memory: Auto Correlations – Hetero Correlations – Exponential BAM – Associative Memory for Real Coded Pattern Pairs – Adaptive Resonance Theory – Introduction – ART1 – ART 2 – Applications

UNIT III **(11 Hrs)**

Fuzzy Set Theory: Crisp Sets – Fuzzy Sets – Crisp Relations – Fuzzy Relations – Fuzzy Systems: Crisp Logic – Predicate Logic – Fuzzy Logic – Fuzzy Rule Based System – Defuzzification Method - Application

UNIT IV **(11 hrs)**

Genetic Algorithms: History – Basic Concepts – Creation of off Springs – Working Principle – Encoding – Fitness Function – Reproduction .Genetic Modeling – Inheritance Operators – Cross Over – Inversion and Deletion – Mutation Operator –Applications – Advances in Genetic Algorithm

UNIT V **(11Hrs)**

Hybrid System: Integration of Neural Network – Fuzzy Logic – Genetic Algorithm-Hybrid System – Neural Network – Fuzzy Logic – Genetic Algorithm Weight Determination – Application – Fuzzy Back Propagation Network – Language Recognition Type Fuzzy Members – Fuzzy Neuron – Fuzzy Back Propagation Architecture – Learning in Fuzzy Back Propagation – Applications – Knowledge Base Evaluation

Text Book

S.Rajasekaran and G.A.Vijayalakshmi Pai (2011).Neural Networks,Fuzzy Logic and Genetic Algorithms Synthesis and Application, Prentice Hall of India,Pvt. Ltd.

Reference Books

1. Vinoth Kumar and R. Saravana Kumar (2012). Neural Network and Fuzzy logic, S.K. Katria & Sons
2. Haykin Simon (2011).Neural Networks and Learning Machines, 3/e, Prentice Hall of India
3. Tang,Tan and Yi (2010).Neural Networks: Computational Models and Application, Springer Verlag Publications

Pedagogy: Lectures, Demonstrations, Group Discussions

Course Designers

1. Mrs.V.Kalaimani
2. Mrs. V. Pream Sudha

RB19E07/ MIT1909	BIG DATA ANALYTICS	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course gives an introduction tobig data tools, techniques, storage and Hadoop ecosystem. It also presents the concepts of MapReduce and data management in NoSQL and R programming

Prerequisite

- Database Management systems
- Data mining

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the characteristics of big data, tools, techniques, storage and Hadoop ecosystem	K2
CO2.	Understand data management concepts in NoSQL databases and R programming	K2
CO3.	Apply Mapreduce concepts to process big data	K3
CO4.	Analyze Hadoop components and their uses for big data processing	K4
CO5.	Design programs for big data applications using Hadoop components and R programming	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	S	M	M
CO4.	S	M	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Introduction –Big Data - Characteristics of Big Data- Structure of Big Data- Risk of Big Data- Exploring Big Data-Big Data Business model- Big Data Technologies-Web Data Overview – Web Data in Action.

UNIT II **(11 Hrs)**

Hadoop: Introduction–Comparison with other systems- History of Hadoop - Apache Hadoop and Hadoop Ecosystem - Mapreduce – introduction-Analyzing the data with Hadoop- -Hadoop Distributed File System- Design – concepts-Anatomy of a MapReduce Job Run – Classic – Mapreduce features- counters-sorting

UNIT III **(11 Hrs)**

Hadoop Components: Pig–Introduction–Comparison with databases-Pig Latin- Data processingoperators – Hive – Comparison with traditional databases-HiveQL - tables- Hbase - introduction-concepts - Hbase versus RDBMS

UNIT IV **(12 Hrs)**

NoSQL: Introduction to NoSQL- Key-value stores-Document databases-Graph databases Storage architecture: Working with column oriented databases- Document store internals- Understanding key value stores-Indexing in MongoDB

UNIT V **(11 Hrs)**

R Basics:- Introduction- Packages and Library – Data types – Basic operators – R objects- Vectors – Lists- Arrays – Matrix- Factors – Data frame- R file formats- Importing and exporting files – Data Visualization in R: Lattice package- Box plot- bar chart – scatter plot- GGplot2

Reference Books

1. Bill Franks (2012). Taming the Big Data Tidal wave, John Wiley & Sons
2. Tom White (2012). Hadoop : The Definitive Guide, Third Edition,O'Reilly Media
3. Shashank Tiwari (2011). Professional NoSQL, John Wiley & Sons
4. V. Bhuvaneswari (2016). Data Analytics with R, Bharathiar University.

Pedagogy: Lectures, Demonstrations, Group discussions

Course Designers:

1. Mrs.V. Preamsudha
2. Mrs.R.Kowsalya

RI19E08	INFORMATION RETRIEVAL	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course presents the concepts of document representation, document indexing, digital information storage, retrieval and distribution. It also introduces effective search strategies for IR systems, vector space model, text classification and evaluation methods of IR systems.

Prerequisite

- Database Management systems
- Data mining

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of document representation, document indexing, digital information storage, retrieval and distribution	K2
CO2	Summarize the advantages and disadvantages of different information-retrieval models	K2
CO3	Demonstrate document classification applying the concepts of vector spaces and classifiers	K3
CO4	Analyze the effective search strategies for IR systems	K4
CO5	Assess the result of an information retrieval system	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	S	M	M
CO4.	S	M	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11Hrs)**

Boolean retrieval: Information retrieval problem - Processing Boolean queries - Boolean model versus ranked retrieval. The term vocabulary and postings lists: Document delineation and character sequence decoding - Determining the vocabulary of terms - Faster postings list intersection via skip pointers - Positional postings and phrase queries

UNIT II **(12Hrs)**

Dictionaries and tolerant retrieval: Search structures for dictionaries - Wildcard queries - Spelling correction - Phonetic correction. Index construction: Hardware basics - Blocked sort-based indexing - Single-pass in-memory indexing - Distributed indexing - Dynamic indexing - Other types of indexes

UNIT III **(11Hrs)**

Scoring, term weighting and the vector space model: Parametric and zone indexes - Term frequency and weighting - The vector space model for scoring. Evaluation in information retrieval: Information retrieval system evaluation - Standard test collections - Evaluation of unranked retrieval sets - Evaluation of ranked retrieval results – Assessing relevance

UNIT IV **(11Hrs)**

XML retrieval: Basic XML concepts - A vector space model for XML retrieval - Evaluation of XML retrieval - Text-centric vs. data-centric XML retrieval. Text classification and Naive Bayes: The text classification problem - Naive Bayes text classification - Properties of Naive Bayes - Feature selection - Evaluation of text classification

UNIT V **(11Hrs)**

Vector space classification: Document representations and measures of relatedness in vector spaces – Rocchio classification - Flat clustering: Clustering in information retrieval - Evaluation of clustering - K-means – Web search basics - Web characteristics - Advertising as the economic model – Search user experience – Basic Page Rank

Text Book

Christopher D. Manning, Prabhakar Raghavan, Henrich Schutze (2008). Introduction to Information Retrieval, 1/e; New York: Cambridge University Press

Reference Books

1. Stefan Buttcher et.al (2012). Information Retrieval - Implementing and Evaluating, MIT Press
2. Dr Ricardo Baeza-Yates et.al (2011). Modern Information Retrieval: The Concepts and Technology, Addison Wesley
3. David A. Grossman and Ophir Frieder (2010). Information Retrieval,2/e, Universities Press

Pedagogy: Lectures, Demonstrations, Guest Lecture, Video Lectures

Course Designers

1. Mrs. V. Pream Sudha
2. Dr. M. S. Vijaya

RV19E09	VIRTUAL REALITY	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course provides the technology behind virtual reality and introduces input, output devices used for virtual reality. It also presents the techniques and applications used for augmented reality.

Prerequisite.

- Animation Techniques
- Image Processing

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Understand the basic concepts of virtual reality	K2
CO2.	Understand the fundamental principles of augmented reality.	K2
CO3.	Apply appropriate techniques and design augmented reality applications	K3
CO4.	Analyze the techniques required for virtual reality environments	K4
CO5.	Assess the methods and techniques appropriate for virtual reality applications	K5

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	M	M	M	M
CO3.	M	M	M	M
CO4.	S	M	M	M
CO5.	S	S	M	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Introduction: The Three Fs of Virtual Reality - A Short History of Early Virtual Reality – Early Commercial VR Technology - VR Becomes an Industry - The Five Classic Components of a VR System

UNIT II (12 Hrs)

Input Devices : Three – Dimensional Position trackers – Tracker Performance Parameters – Mechanical Trackers – Magnetic Trackers – Ultrasonic Trackers – Optical Trackers – Hybrid Inertial Trackers - Navigation and Manipulation Interfaces - Tracker-Based Navigation Manipulation Interfaces – Trackballs - Three-Dimensional Probes - Gesture Interfaces - The Pinch Glove - The 5DT Data Glove - The Didjiglove - The CyberGlove

UNIT III (11 Hrs)

Output Devices: Graphics Displays: The Human Visual System - Personal Graphics Displays - Large-Volume Displays - Sound Displays - The Human Auditory System - The Convolvotron – Speaker Based Three-Dimensional Sound - Haptic Feedback : The Human Haptic System - Tactile Feedback Interfaces - Force Feedback Interfaces

UNIT IV (11 Hrs)

Introduction to Augmented Reality - Definition – Examples – Displays - Visual perception - Requirements and characteristics – Tracking - Characteristics of tracking technology - Stationary tracking systems - Mobile sensors

UNIT V (11 Hrs)

Computer Vision for Augmented Reality - Natural feature tracking by detection – Simultaneous localization and mapping – Interaction - Output modalities – Input modalities – Tangible interfaces –Navigation

Text Book

1. Grigore C. Burdea, Philippe Coiffet (2010),Virtual Reality Technology, 2/e, Wiley Dream Tech India
2. Dieter Schmalstieg, Tobias Hollerer (2016), Augmented Reality : Principles and Practice, Pearson education Inc

Reference Books

1. Jonathan Linowes , Krystian Babilinski (2017), Augmented reality for developers, 1/ e, Packt Publishing
2. William R. Sherman, Alan B. Craig (2013), Understanding Virtual Reality: Interface, Application and Design, Morgan Kaufmann Publishers
3. Philippe Fuchs and Guillaume Moreau (2012),Virtual Reality: Concepts and Technologies, CRC Press
4. Ted Simpson (2011),Virtual Machines, Cengage Learning

Pedagogy: Lectures**,** Group Discussions, Demonstrations

Course Designers:

1. Mrs. V. Preamsudha
2. Mrs. R. Kowsalya

RA19E02	ARTIFICIAL INTELLIGENCE	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course introduces the concepts of Artificial Intelligence and the various methods of solving problems using Artificial Intelligence. It also provides insights onmachine learning techniques and its applications in Natural Language Processing

Prerequisite

- Probability and Statistics
- Discrete Structures

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	KnowledgeLevel
CO1	Understand the techniques of knowledge representation and problem solving in the field of artificial intelligence and machine learning	K2
CO2	Apply appropriate AI techniques for real time scenarios	K3
CO3	Analyze suitable Artificial Intelligence methods to solve a given problem	K4
CO4	Evaluate different machine learning algorithms for a given problem	K5
CO5	Design and develop models for predictive tasks in various domains	K6

Mapping of Course Outcome with Programme Outcome

COs	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	M	M	M	M
CO3.	M	M	M	M
CO4.	S	M	M	M
CO5.	S	S	M	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 hrs)**

Artificial Intelligence – Foundations - The State of Art. Intelligent Agents:Nature of Environment - Structure. Solving Problems by searching: Uninformed Search strategies -

Informed Search strategies -Planning and Acting in the real world: Time, Schedules and resources- Hierarchical planning - Planning and acting in nondeterministic domains

UNIT II **(12 hrs)**

Learning from examples: Forms of learning - Supervised Learning – Learning Decision trees - Evaluating and choosing the best hypothesis – The theory of learning – Regression and classification with linear models - Artificial Neural Networks - Non parametric models - Support vector machines - Ensemble learning. Reinforcement learning: Passive Reinforcement learning - Active Reinforcement learning - Generalization in Reinforcement learning – applications

UNIT III **(11 hrs)**

Deep learning: Learning algorithms – Capacity, Overfitting, Underfitting – Hyperparameters and validation sets - Estimators, Bias and variance - Deep Learning: Deep feed forward networks - Convolutional Networks- Sequence Modeling: Recurrent Neural Networks – Bidirectional RNNs – Long short term memory and Gated RNNs

UNIT IV **(11 hrs)**

Natural Language Processing: Language Models – Text classification – Information Retrieval - Information extraction. Natural Language for Communication: Phrase Structure - Syntactic Analysis - Machine translation - Speech Recognition

UNIT V **(11 hrs)**

Case Studies: AI in Retail (Alibaba, Walmart) - AI in Social Media Services (Facebook) - AI in Food industry (Coca -Cola, Dominos)- Home and workplace Automation with AI (Samsung) - AI in Entertainment (Netflix) – AI to detect Spambots(Twitter)- AI to build intelligent cars (BMW, Tesla) - AI in Healthcare (Infervision)

Text Book

Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Publishing, 2016, Third edition.

Reference Books

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2016.
2. Bernard Marr, Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems,Wiley Publications, 2019.

Pedagogy

Lectures, Group Discussions, Case studies

Course Designers

1. Dr.M.S.Vijaya
2. Mrs.V.PreamSudha

RC19E03	CLOUD COMPUTING	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course introduces the student to gain knowledge on various services of cloud computing. It also presents cloud computing collaborations and applications. It presents new concept of virtualization.

Prerequisite

- Computer Networks
- Web Technology

Course Outcomes

On successful completion of the course, the students will be able to,

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of cloud Architecture and its services.	K2
CO2	Classify different service providers and its services, tools.	K3
CO3	Demonstrate various web based applications for collaborating everyone in the cloud computing.	K3
CO4	Analyze the best service provider for cloud computing in terms of storage services.	K4
CO5	Assess various industrial platforms for the developments.	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	M	M	M
CO3	S	S	M	M
CO4	S	M	S	M
CO5	S	S	S	M

S – Strong; M – Medium; L – Low

Syllabus

UNIT I **(11 Hrs)**

Introduction: Benefits and Limitations – Cloud Architecture – Storage – Services – Providers – Types of Cloud Service Development – Services and Tools.

UNITII **(12 Hrs)**

Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing, Spreadsheet, Presentations, Databases – Sharing Files and Photographs.

UNIT III **(11 Hrs)**

Cloud Virtualization Technology – Virtualization Defined – Virtualization Benefits – Server Virtualization – Virtualization for x86 Architecture – Hypervisor Management Software – Logical Partitioning – VIO Server – Virtual Infrastructure Requirements.

UNIT IV **(11 Hrs)**

Deep Dive: Cloud Virtualization – Introduction – Storage Virtualization – Storage Area Networks – Network Attached Storage – Cloud Server Virtualization – Virtualized Data Center.

UNIT V **(11 Hrs)**

Industrial platforms and new developments – Amazon Web Services: Compute Services –Storage Services – Communication Services – Additional Services – Google App Engine -Architecture and core concepts – Application life Cycle –Cost Model - Microsoft Azure - Azure core concepts – SQL Azure – Windows Azure Platform Appliance.

Reference Books

1. Michael Miller (2011), Cloud Computing: Web-Based Applications that Change the Way You Work and Collaborate Online, Pearson publication.
2. Dr. Kumar Saurabh (2011), Cloud Computing : Insights into New Era Infrastructure, Wiley India.
3. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi (2013), Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann is an imprint of Elsevier
4. Rishabh Sharma (2014), Cloud Computing: Fundamentals, Industry Approach and Trends, WileyIndia Edition.
5. Paul Mehner(2013), Cloud Computing with the windows Azure Platform, Microsoft Press US.

Pedagogy

Lectures, Case Studies, Group Discussions.

Course Designers

1. Mrs. S. Meera
2. Mrs. V.Kalaimani

RS19E06	SOFT COMPUTING	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course covers the concepts of neural networks and the role of neural networks in intelligent systems. It also presents fuzzy set theory, fuzzy logic, genetic algorithm, and hybrid system.

Prerequisite

- Statistics
- Discrete Mathematics

Course Outcomes

On successful completion of the course, the students will be able to,

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of soft computing and their applications	K2
CO2	Summarize supervised and unsupervised learning in neural networks	K2
CO3	Apply soft computing techniques for small applications.	K3
CO4	Analyze various soft computing techniques suitable for real time applications.	K4
CO5	Evaluate the results of knowledge base system.	K5

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1	S	M	M	S
CO2	S	M	M	S
CO3	S	S	M	M
CO4	S	M	S	S
CO5	S	S	S	M

S – Strong; M – Medium; L - Low

Syllabus

UNIT I(11 Hrs)

Neural Networks : Fundamentals of Neural Networks – Basic Concepts of Neural Networks – Model of an Artificial Neuron – Neural Network Architecture – Characteristics of Neural Network – Learning Methods – Taxonomy of Neural Network Architecture – Back Propagation Network – Architecture of Back Propagation Network – Back Propagation Learning.

UNIT II (12 Hrs)

Neural Network Associative Memory: Auto Correlations – Hetero Correlations – Exponential BAM – Associative Memory for Real Coded pattern pairs – Adaptive Resonance Theory – Introduction – ART1 – ART2 – Applications.

UNIT III (11 Hrs)

Fuzzy set Theory: Crisp sets – Fuzzy Sets – Crisp Relations – Fuzzy Relations – Fuzzy Systems: Crisp logic – Predicate Logic – Fuzzy Logic – Fuzzy Rule Based System – DefuzzificationMethod – Applications.

UNIT IV (11 Hrs)

Genetic Algorithms: History – Basic Concepts – Creation of off Springs – Working Principle – Encoding – Fitness Function – Reproduction - Genetic Modeling – Inheritance Operators – Cross Over – Inversion and Deletion – Mutation Operator –Applications – Advances in Genetic Algorithm.

UNIT V (11 Hrs)

Hybrid System: Integration of Neural Network – Fuzzy Logic – Genetic Algorithm - Hybrid System – Neural Network – Fuzzy Logic – Genetic Algorithm - Weight Determination – Application – Fuzzy Back Propagation Network – Language Recognition Type Fuzzy Members – Fuzzy Neuron – Fuzzy Back Propagation Architecture – Learning in Fuzzy Back Propagation – Applications – Knowledge Base Evaluation

Text Book

S Rajasekaran and G A VijayalakshmiPai (2011), Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Application, Prentice Hall of India, Pvt. Ltd.

Reference Books

4. Vinoth Kumar and R. Saravana Kumar (2012), Neural Network and Fuzzy logic, S.K. Katria& Sons.
5. Haykin Simon (2011), Neural Networks and Learning Machines, 3/e, Prentice Hall of India.
6. Tang, Tan and Yi (2010), Neural Networks: Computational Models and Application, Springer Verlag Publications.

Pedagogy

Lectures, Demonstrations, Group Discussions.

Course Designers

1. Mrs. V. Kalaimani
2. Mrs. V. PreamSudha

RB19E07	BIG DATA ANALYTICS	Category	L	T	P	Credits
		III	56	4	-	4

Preamble

This course gives an introduction to big data tools, techniques, storage and Hadoop ecosystem. It also presents the concepts of Map reduce and data management in NoSQL and R programming.

Prerequisite

- Database Management Systems
- Data Mining

Course Outcomes

On successful completion of the course, the students will be able to,

CO Number	CO Statement	Knowledge Level
CO1	Understand the characteristics of big data, tools, techniques, storage and Hadoop ecosystem.	K2
CO2	Understand Data Management Concepts in NoSQL databases and R programming.	K2
CO3	Analyze MapReduce concepts to process big data.	K2
CO4	Analyze Hadoop components and their uses for Big Data Processing.	K4
CO5	Design programs for big data applications using Hadoop components and R programming.	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	M	M	M
CO3	S	S	M	M
CO4	S	M	S	M
CO5	S	S	S	M

S – Strong; M – Medium; L - Low

Syllabus

UNIT I **(11 Hrs)**

Introduction – Big Data – Characteristics of Big Data – Structure of Big Data – Risk of Big Data – Exploring Big Data – Big Data Business model – Big Data Technologies – Web Data overview – Web Data in Action.

UNIT II **(11 Hrs)**

Hadoop: Introduction – Comparison with other systems – History of Hadoop – Apache Hadoop and Hadoop Ecosystem – MapReduce – Introduction – Analyzing the data with Hadoop – HadoopDistributed File System – Design – Concepts – Anatomy of a MapReduce Job Run – Classic- MapReduce Features – Counters – Sorting.

UNIT III **(11 Hrs)**

Hadoop Components: Pig – Introduction – Comparison with Databases – Pig Latin – Data Processing Operators – Hive – Comparison with traditional databases – HiveQL – Tables – Hbase – Introduction – Concepts – Hbase versus RDBMS.

UNIT IV **(12 Hrs)**

NoSQL: Introduction to NoSQL- Key-value stores-Document Databases- Graph Databases Storage Architecture: Working with Column Oriented Databases- Document store internals- Understanding key value stores-Indexing in MongoDB.

UNIT V **(11 Hrs)**

R Basics: Introduction- Packages and Library – Data types – Basic operators – R objects- Vectors – Lists- Arrays – Matrix- Factors – Data Frame- R file formats- Importing and Exporting Files – Data Visualization in R: Lattice Package- Box plot- Bar Chart – Scatter plot- GGplot2.

Reference Books

5. Bill Franks (2012). Taming the Big Data Tidal wave, John Wiley & Sons
6. Tom White (2012). Hadoop : The Definitive Guide, Third Edition,O'Reilly Media
7. ShashankTiwari (2011). Professional NoSQL, John Wiley & Sons
8. V. Bhuvaneswari (2016). Data Analytics with R, Bharathiar University.

Pedagogy

Lectures, Demonstrations, Group Discussions.

Course Designers

1. Mrs. V. Preamsudha
2. Mrs. R. Kowsalya

RI19E08	INFORMATION RETRIEVAL	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course presents the concepts of document representation, document indexing, digital information storage, retrieval and distribution. It also introduces effective search strategies for IR systems, vector space model, text classification and evaluation methods of IR systems.

Prerequisite

- Database Management systems
- Data mining

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of document representation, document indexing, digital information storage, retrieval and distribution	K2
CO2	Summarize the advantages and disadvantages of different information-retrieval models	K2
CO3	Demonstrate document classification applying the concepts of vector spaces and classifiers	K3
CO4	Analyze the effective search strategies for IR systems	K4
CO5	Assess the result of an information retrieval system	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	S	M	M
CO4.	S	M	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11Hrs)**

Boolean retrieval: Information retrieval problem - Processing Boolean queries - Boolean model versus ranked retrieval. The term vocabulary and postings lists: Document delineation and character sequence decoding - Determining the vocabulary of terms - Faster postings list intersection via skip pointers - Positional postings and phrase queries.

UNIT II **(12Hrs)**

Dictionaries and tolerant retrieval: Search structures for dictionaries - Wildcard queries - Spelling correction - Phonetic correction. Index construction: Hardware basics - Blocked sort-based indexing - Single-pass in-memory indexing - Distributed indexing - Dynamic indexing - Other types of indexes.

UNIT III **(11Hrs)**

Scoring, term weighting and the vector space model: Parametric and zone indexes - Term frequency and weighting - The vector space model for scoring. Evaluation in information retrieval: Information retrieval system evaluation- Standard test collections -Evaluation of unranked retrieval sets - Evaluation of ranked retrieval results – Assessing relevance.

UNIT IV **(11Hrs)**

XML retrieval: Basic XML concepts -A vector space model for XML retrieval-Evaluation of XML retrieval - Text-centric vs. data-centric XML retrieval. Text classification and Naive Bayes: The text classification problem - Naive Bayes text classification - Properties of Naive Bayes - Feature selection - Evaluation of text classification.

UNIT V **(11Hrs)**

Vector space classification: Document representations and measures of relatedness in vector spaces – Rocchio classification - Flat clustering: Clustering in information retrieval - Evaluation of clustering - K-means – Web search basics - Web characteristics - Advertising as the economic model – Search user experience – Basic Page Rank.

Text Book

Christopher D. Manning, PrabhakarRaghavan, HenrichSchutze (2008). Introduction to Information Retrieval, 1/e; New York: Cambridge University Press

Reference Books

1. Stefan Buttcheret.al (2012). Information Retrieval - Implementing and Evaluating, MIT Press
2. Dr Ricardo Baeza-Yates et.al (2011). Modern Information Retrieval: The Concepts and Technology, Addison Wesley
3. David A. Grossman and OphirFrieder (2010). Information Retrieval,2/e, Universities Press

Pedagogy:

Lectures, Demonstrations, Guest Lecture, Video Lectures

Course Designers

1. Mrs. V. PreamSudha
2. Dr. M. S. Vijaya

RV20E09	VIRTUAL REALITY	Category	L	T	P	Credit
		III	56	4	-	4

Preamble

This course provides the technology behind virtual reality and introduces input, output devices used for virtual reality. It also presents the techniques and applications used for augmented reality.

Prerequisite

- Animation Techniques
- Image Processing

Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of virtual reality	K2
CO2	Understand the fundamental principles of augmented reality	K2
CO3	Apply appropriate techniques and design augmented reality applications	K3
CO4	Analyze the techniques required for virtual reality environments	K4
CO5	Assess the methods and techniques appropriate for virtual reality applications	K5

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	M	M	M	M
CO3.	M	M	M	M
CO4.	S	M	M	M
CO5.	S	M	M	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Introduction: The Three I's of Virtual Reality - A Short History of Early Virtual Reality – Early Commercial VR Technology - VR Becomes an Industry - The Five Classic Components of a VR System

UNIT II **(12 Hrs)**

Input Devices: Three – Dimensional Position trackers - Hybrid Inertial Trackers - Navigation and Manipulation Interfaces - Tracker-Based Navigation/Manipulation Interfaces – Three-Dimensional Probes - Gesture Interfaces - The Pinch Glove - The 5DT Data Glove - The Didjiglove - The CyberGlove

Output Devices: Graphics Displays: The Human Visual System -Personal Graphics Displays - Large-Volume Displays - Sound Displays - The Human Auditory System - The Convolvotron– Speaker Based Three-Dimensional Sound - Haptic Feedback: The Human Haptic System - Tactile Feedback Interfaces - Force Feedback Interfaces

UNIT III **(11 Hrs)**

Getting started with Unity and Playmaker: Downloading and Installing Unity – Buying and importing playmaker – Setting up your project. Unity's and Playmaker's User Interface: Interface overview and main menu – Hierarchy panel – Inspector panel – Project panel – Project panel – Views – Playmaker interface. Components and State Machines: Game objects, components and properties – Working with prefabs – Finite state machines, states and actions – Interaction between game objects

UNIT IV **(11 Hrs)**

Scripting and Custom Actions: Writing unity script – Overview of standard unity classes – Creating a playmaker action. Networking and Multiplayer: Understanding networking and multiplayer – Setting up photon unity networking – Making multiplayer

UNIT V **(11 Hrs)**

Introduction to Augmented Reality: Definition – Examples – Displays - Visual perception - Requirements and characteristics – Tracking - Characteristics of tracking technology- Stationary tracking systems - Mobile sensors. Computer Vision for Augmented Reality: Natural feature tracking by detection – Simultaneous localization and mapping – Interaction - Output modalities – Input modalities – Tangible interfaces –Navigation

Reference Books

1. Grigore C. Burdea, Philippe Coiffet (2010),Virtual Reality Technology, 2/e, Wiley Dream Tech India
2. Sergey Mohov (2013), Practical Game Design with Unity and Playmaker, Packt Publishing Ltd.
3. Dieter Schmalstieg, Tobias Hollerer (2016), Augmented Reality : Principles and Practice, Pearson education Inc

4. Jonathan Linowes , KrystianBabilinski (2017), Augmented reality for developers, 1/ e, Packt Publishing
5. William R. Sherman, Alan B. Craig (2013), Understanding Virtual Reality: Interface, Application and Design, Morgan Kaufmann Publishers

Pedagogy

Lectures**,** GroupDiscussions, Demonstrations

Course Designers

1. Dr.S.Meera
2. Dr.V. Preamsudha