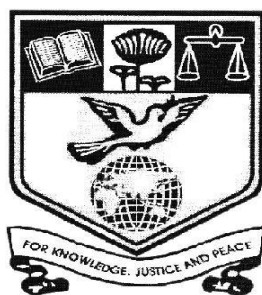Curriculum Framework and Syllabus for

Master of Science (M.Sc) in Computer Science Programme

For the students admitted from the academic year 2019-2020

(BASED ON CHOICE BASED CREDIT SYSTEM (CBCS))

2019-2020

Board of Studies Meeting was held on 21.9.2018 and approved by academic council on 10.04.2019

POST GRADUATE AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

NEHRU MEMORIAL COLLEGE

[Nationally Accredited with 'A' Grade by NAAC]
An autonomous College affiliated to Bharathidasan University
Puthanampatti—621 007

M.Sc. Computer Science

VISION

Contribute to the society through excellence in scientific technology and make use of knowledge based education, potential of computer science with deep passion for knowledge, culture and values.

MISSION

- To achieve distinguished academic positions in computer science through innovative teaching and learning process.

- To motivate students for acquiring necessary skills to face the challenges of the IT industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The Post Graduates of MSc Program will be able to

PEO1: Use the competence in the analysis of computer problems and finding solutions of those problems

PEO2: Utilizing the domain knowledge to help the society in the transformation process of digital world

PEO3: Applying their acquired knowledge and skills towards professional achievements in their carrier

PROGRAMME OUTCOME (PO)

At the end of the MSc programme the students will be able to

PO1: Scientific Knowledge

Apply the knowledge of computing fundamentals, principles of mathematical logic and domain knowledge to solve complex problems.

PO2: Problem Analysis

Identify, formulate and analyze complex problems using appropriate methods and finding solutions to problems.

PO3: Conduct investigations of complex problems

Design and develop algorithms by providing solutions to complex problems.

PO4: Modern tool usage

Ability to improve divulging knowledge in various domains and to solve real life problem using various advanced software tools.

PO5: Individual and team work:

Function effectively as an individual and as a leader in diverse domain.

PO6: Lifelong learning

Recognize the need for an independent and lifelong learning in the technological change.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Apply knowledge of computing to develop quality program for real life problems

PSO2: Empower the use of software development tools and modern computing platforms.

PSO3: Ability to design dynamic website using open source technologies.

PSO4: Apply appropriate techniques and strategies to develop solutions to complex problems.

PROGRAM STRUCTURE

- **Program Duration** : 2 Years

- **System Followed** : Semester

- **Medium of Instruction** : English

- **Credit System :**

    Total number of credits: 90

- **Eligibility criteria for admission to the program:**

    B.Sc (Computer Science)

- **Mandatory attendance to appear for examination:**

    Attendance: 75%

S.NO	CATEGORY OF COURSES	CREDITS	% OF CREDITS TO TOTAL CREDITS
1	Basic Science	5	5.6
2	Core Courses	43	47.7
3	Core Practicals	12	13.3
4	Elective Courses	16	17.8
4	Open Elective Course	4	4.4
5	Project	10	11.1
	Total	**90**	**100**

PROGRAM CORE, ELECTIVE, OPEN ELECTIVE AND PRATICAL COURSES

SEMESTER	NUMBER OF CORE COURSES	CREDITS	NUMBER OF ELECTIVE COURSES	CREDITS	NUMBER OF OPEN ELECTIVE COURSES	CREDITS	NUMBEROF PRACTICALS /PROJECTS	CREDITS
1	4	20					1	4
2	3	12	1	4	1	4	1	4
3	4	16	1	4			1	4
4			2	8			1	10
	11	48	4	16	1	4	4	22

Total Credits: 90

AVERAGE PERCENTAGE OF THE COURSES HAVING FOCUS ON SKILLS, EMPLOYABILITY, KNOWLEDGE

Courses	Employability	Skill based	Knowledge based	
CC-I Graph and Automata Theory			Y	
CC-II Design and Analysis of Algorithm			Y	
CC-III Data Base System	Y			
CC-IV Open Source Technologies	Y			
CC-V Open Source Technologies Lab	Y			
CC-VI Programming in Java and J2EE	Y			
CC-VII Soft Computing			Y	
CC-VIII Datamining and Data Warehousing			Y	
CC-IX Lab-II-Java And J2EE Lab	Y			
CC-X AI and Machine Learning		Y		
CC-XI Principles of Compiler Design			Y	
CC-XII-Internet of Things		Y		
CC-XIII Rapid Application Development using Python		Y		
CC-XIV Lab-III-Machine Learning		Y		
CEC-I- Digital Image Processing			Y	
OEC – Functional Programming using Haskell	Y			
CEC-II- Cloud Computing			Y	
CEC-III-Big Data Analytics			Y	
CEC-IV- Software Project Management			Y	
Total	6	4	9	
Percentage	32	21	47	100

INTERNAL AND EXTERNAL ASSESSMENT

Theory

Internal: 25marks

Marks Distribution**:**

Seminar	= 5 Marks
Assignment	= 5 Marks
CIA Test I	= 7.5 Marks
CIA Test II	= 7.5 Marks
Total	= 25 Marks

External: 75 marks

Question Paper Pattern for Internal and External Assessment:

Section A: 10 Questions x 2 Marks = 20 Marks

(Two Questions from each unit)

Section B: 5 Questions x 5 Marks = 25 Marks

(Internal Choice and one question from each unit)

Section C: 3 Questions x 10 Marks = 30 Marks

(Answer any three out of 5 questions and one question from each unit)

Practical
Internal: 40 marks

Marks Distribution**:**

Test1	= 15 Marks
Test2	=15 Marks
Observation	=10 Marks
Total	= 40 Marks

External: 60 marks

Marks Distribution**:**

Practical	= 50 Marks
Record	= 10 Marks
Total	= 60 Marks

Project: 100 marks

Marks Distribution**:**

Internal (2 reviews)	**:** 25 Marks
Report Evaluation	**:** 30 Marks
Viva Voce	**:** 20 Marks
Total	**:** 75 Marks

NEHRU MEMORIAL COLLEGE [AUTONOMOUS]

MASTER OF SCIENCE[COMPUTER SCIENCE] FROM 2019-2020

CODE	TITLE	HRS	CREDIT	CIA	EE	TOTAL
SEMESTER - I						
CC-I	Graph and Automata Theory	6	5	25	75	100
CC-II	Design and Analysis of Algorithms	6	5	25	75	100
CC-III	Advanced Data Base System	6	5	25	75	100
CC-IV	Open Source Technologies	6	5	25	75	100
CC-V	Lab - I – Open Source Technologies	6	4	40	60	100
SEMESTER - II						
CC-VI	Programming in JAVA and J2EE	4	4	25	75	100
CC-VII	Soft Computing	5	4	25	75	100
CC-VIII	Data Mining and Data Ware Housing	5	4	25	75	100
CC-IX	Lab-II- Java & J2EE	6	4	40	60	100
CEC-I	Principles of Wireless and Mobile Network					
	Digital Image Processing	6	4	25	75	100
	Advanced Operating System					
OEC	R Programming					
	Web Technology	4	4	25	75	100
	Functional Programming using Haskell					
SEMESTER – III						
CC-X	AI and Machine Learning	5	4	25	75	100
CC-XI	Principles of Compiler Design	5	4	25	75	100
CC-XII	Internet of Things	4	4	25	75	100
CC-XIII	Rapid Application Development Using Python	4	4	25	75	100
CC-XIV	Lab - III –Machine Learning	6	4	40	60	100
CEC-II	Cloud Computing					
	Service Oriented Architecture	6	4	25	75	100
	Graphics and Human Computer Interaction					

SEMESTER - IV						
	Big Data Analytics					
CEC-III	Network Security	6	4	25	75	100
	Web Application Architecture					
	Software Project Management					
CEC-IV	Software Forensics	6	4	25	75	100
	Software Testing					
CC-XV	PROJECT	18	10	25	75	100
	TOTAL	120	90			2000

Course Code & Title	CC-I GRAPH AND AUTOMATA THEORY		
MSc	Semester : I	Credits : 5	Hrs: 6
Cognitive Level	**K1 –** Remember **K2 –** Understand **K4 –** Analyze		
Learning Objectives	**This Course aims to** ▪ understand basic concepts of graph theory. ▪ know the applications of graphs in other disciplines. ▪ learn the basics of automata theory and understand finite state automata, regular expressions ▪ learn Context free grammars and various normal forms ▪ impart knowledge in push down automata.		

UNIT – I

Graph Path and Circuits: Introduction- Applications of Graphs- Finite and Infinite Graphs- Incidents and Degree- Isolated vertex, pendant vertex and null graph. Paths and Circuits isomorphism Sub Graphs- Walks, Path and Circuits- Connected & Disconnected Graphs, Euler's graphs-Operations on Graphs- Hamiltonian Paths & Circuits.   **(18 hrs)**

UNIT – II

Trees and Fundamental Circuit, Matrix Representation of Graph- Trees and fundamental circuits- Properties of Trees Distance and Centers in a Tree- Rooted Binary Trees, Spanning trees, Matrix representation of Graphs- Incidence Matrix- Sub Matrix of A9G- Circuit Matrix- Fundamental matrix- Adjacency Matrix.   **(18 hrs)**

UNIT – III

Introduction: Strings, alphabets and languages – Graphs and Trees- Inductive proofs – Set notation – Relations. Finite Automata and regular expressions: Finite State Systems- Basic definitions - Non-Deterministic Finite Automata - Finite Automata with epsilon moves-Regular Expressions   Applications of Finite Automata.   **(20 hrs)**

UNIT – IV

Context Free Grammars: Motivation and Introduction - Context- Free Grammars – Derivation-Trees – Simplification of Context free grammar - Chomsky Normal Form - Greibach Normal Form.   **(18 hrs)**

UNIT – V

        The Pumping Lemma for CFL's – Closure properties of CFL's. Push Down Automata: Definitions – Pushdown automata and context free languages.   **(16 hrs)**

Books for study:

1. Narsing Deo, "*Graph Theory with applications to Engineering and Computer Science",* Proentice- Hall of India Limited, New Delhi, 2016.

2. John E.Hopcroft& Jeffery D.Ullman, "*Introduction to Automata Theory, languages and Computation*", Narosa Publishing House, New Delhi, 1997, ISBN 81-85015-96-1.

Books for Reference:

1. F. Harary, "*Graph Theory*". Addison- Wesley, Reading Mass., 1990

2. Motwani R and J .D. Ullman, "*Introduction to Automata Theory, Languages and Computation*", Pearson Education Asia, 2nd Edition.

3. Peter linz, "*An Introduction to formal language and automata*", Fifth edition, Narosa publication**.**

Web Reference:

1. www.edutechlearners.com

2. www.britannica.com

3. www.sanfountry.com

Course Outcomes:

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

CO1: understand different types of graphs with applications. **K2**

CO2: know strong background of graph theory which has diverse applications in many areas of computer science, engineering, etc., **K2**

CO3: mastering in regular languages and finite automata, push down automata **K1**

CO4: mastering in context free languages. **K1**

CO5: think analytically and develop the problem solving skills in theory of computer science **K4**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	W	S	M	S	S	N	N	S
CO2	S	S	W	S	M	S	S	N	N	S
CO3	S	S	W	S	M	S	S	N	N	S
CO4	S	S	W	S	M	S	S	N	N	S
CO5	S	S	M	S	M	S	S	N	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Mrs.P.Nirmala
Verified by	Dr.S.Murugan

Course Code & Title	CC-II DESIGN AND ANALYSIS OF ALGORITHMS		
MSc	**Semester : I**	**Credits : 5**	**Hrs: 6**
Cognitive Level	K1 – Remember K3 – Apply K4 –Analyze		
Learning Objectives	**This Course aims to** ▪ know the fundamentals of algorithms. ▪ study the different algorithm design techniques. ▪ conversant greedy functionalities. ▪ Learn operations of dynamic programming ▪ apply different algorithm techniques to solve the problems.		

UNIT-I

Introduction - Basic steps in the complete development of an algorithm-Top-down structured programming and program correctness –structured programming- The knight's tour problem.

(18hrs)

UNIT-II

Algorithm-Definition-Algorithm specifications-Recursive algorithm-Performance analysis-Divide and conquer method-Binary Search-Finding maximum and minimum-Merge sort-Quick sort. **(20hrs)**

UNIT-III

Greedy method-Knapsak problem-Minimum cost spanning trees-Prim's algorithm-Kruskal's algorithm-Single-Source shortest paths. **(16hrs)**

UNIT -IV

Dynamic programming-All-Pairs shortest paths-Optimal binary search tree. Depth-first-search-Breadth first search-Connected components. **(19hrs)**

UNIT –V

Backtracking- 8 -queens problem-Sum of subsets problem-Branch and Bound-Travelling sales man problem. **(17hrs)**

Books for Study:

1. S.E Good man, S.T.Hedetimini. "*Introduction to the Design and analysis of algorithms*" Tata McGraw-Hill Edition-2002.(Unit –I)
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran. "*Fundamentals of computer algorithms*" Universities press (India) Ltd-2014. Second edition (Unit II, III, IV and V)

Reference Book:

1. A.V. Aho, J.D.Ullman and J.E.Hospcraft."*The Design and Analysis of algorithms*". Pearson edition.

Course Outcomes:

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

CO1: define the various steps in algorithm.	**K1**
CO2: apply various techniques to real life problem.	**K3**
CO3: analyze complexity of the algorithm.	**K4**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	S	S	N	S	S	S	N	S
CO2	S	S	M	S	N	S	S	M	N	S
CO3	S	S	S	M	N	S	S	S	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.S.Murugan
Verified by	Dr.K.Mani

Course Code & Title	CC-III DATABASE SYSTEMS		
MSc	Semester : I	Credits : 5	Hrs: 6
Cognitive Level	**K2 –** Understand **K6–** Create		
Learning Objectives	**This Course aims to** ▪ understand various data models. ▪ design ER diagram. ▪ develop and refine the conceptual data models, entities, attributes. ▪ apply normalization techniques. ▪ learn database system architecture.		

UNIT - I

Introduction**:** Data base system verses file system – View of data – Data Models –   Database Languages – Database users and Administrators – Database system structure. Entity: Basic concepts – Constraints – Keys – Design Issues – ER Diagram – Weak entity Relationship Model: Sets – Design of an ER Database schema – Reduction of an ER schema to tables. Relational Model**:** Structure – Relational Algebra – Extended Relational Algebra – Algebraic operations – Modification**.**   **(15 hrs)**

UNIT- II

SQL: Structure of SQL -Set operations – Aggregate functions – Null values – Nested sub queries – Views – Complex queries – Joined Relations – Embedded SQL - Dynamic SQL – QBE – Domain Constraints – Referential Integrity – Assertions – Triggers   **(10 hrs)**

UNIT - III

Database Design: Relational – First normal form – Functional dependencies – Decomposition – Boyce-codd normal form – Third Normal Form – Fourth normal form - More normal form.
                                                                                                                    (10 hrs)

UNIT - IV

Transactions concepts**:** Transaction state – concurrent execution – serializability – recoverability – testing for serializability. Concurrent control**:** Lock based protocols – timestamp based protocols – validation based protocols – Deadlock Handling.   **(15 hrs)**

UNIT - V

Data base system architecture**:** Centralized and client server architecture – server   system architecture – parallel systems – Distributed systems - Network types.Distributed database: Distributed data storage - distributed transactions – commit   protocols – distributed query processing.   **(10 hrs)**

Books for Study:

1. Henry F.Korth and Abraham Silberschatz, *"Database System concepts"*, 4th Edition, McGraw Hill publication, 2002,(unit I,II,IV,V) ISBN: 0-07-120413-X.
2. C.J.Date, *" An Introduction to Database system"*,7thedition, Addison Wesley publication,year2002,(Chapter10.2,10.3,11.3,11.3,11.5,12.2,12.3,12.4,12.7)ISBN:81-7808-231-4

Books for Reference:

1. Bepin C.Desai, *"An Introduction to Data base system"*, Galogotia publications Private limited.
2. Ivan Bayross, "SQL *and PL/SQL"*, BPB Publications, New Delhi.

Web Reference:

1. https://en.wikibooks.org/wiki/Introduction_to_Computer...Systems/Database
2. https://www.c-sharpcorner.com/UploadFile/.../types-of-database-management-systems/

Course Outcomes:

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

CO1:	understand the fundamentals of database system.	**K2**
CO2:	design and create tables in database and develop queries.	**K6**
CO3:	design a database based on a data models using normalization.	**K6**
CO4:	understand the transaction concepts	**K2**
CO5:	explain database system architecture, distributed database	**K2**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	S	M	N	M	S	M	N	S
CO2	S	S	S	M	N	S	S	S	W	S
CO3	S	S	M	M	N	M	S	M	W	M
CO4	S	S	M	M	N	S	S	M	W	S
CO5	S	S	M	S	N	S	S	S	W	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.D.Jayachitra
Verified by	Mrs.V.Priya

Course Code & Title	CC-IV OPEN SOURCE TECHNOLOGIES		
MSc	**Semester : I**	**Credits : 5**	**Hrs: 6**
Cognitive Level	**K3** – Apply **K6** – Create		
Learning Objectives	**This Course aims to** ▪ knowledge in fundamental commands of Unix and Linux ▪ develop shell scripts ▪ develop perl scripts ▪ introduce advanced concept of PHP ▪ work with various open source tools MySQL,PHP,etc		

UNIT- I

Introduction to UNIX/LINUX operating system: History of UNIX- salient features of UNIX – UNIX architecture-LINUX and GNU-basic LINUX commands: man,date,cal,echo,printf,bc,script,bc,passd,uniq-Introduction to text editor-vi.

File System: types of files-file system hierarchy-file directories-file related commands: pwd,cd,mkdir,rmdir-path names-ls command-handling ordinary files:cat,cp,rm,mv more,less,file,od,wc,emp,comm,diff-basic attributes.   **(20 hrs)**

UNIT-II

Shell Programming: different types shells and their functions-introduction to shell script-shell variable-shell keywords-positional parameters-command line arguments-control structures: if-then-fi, if-then-elif-fi, nested if, case-esac, while, until and for loop.Process basics: ps command-mechanism of process creation- internal and external commands. Filters: simple filter:pr, head, tail, cut, paste, find sort and tr-filters using regular expression:grep and egrep.System Administrations: root-administrator privileges-user management-startup and shutdown-disk usage-device files-back up files:tar, cpio   **(18 hrs)**

UNIT-III

Perl Overview: Perl Components   – Perl Parsing Rules: The Execution Process – Syntax and Parsing Rules – Perl Coding Styles - Perl Variables and Data: Basic Naming Rules – Scalar Variables – Literals – Arrays – Hashes – Lists. Control Structures: Code Blocks – Conditional Statements - Loops.   **(18 hrs)**

UNIT-IV:

Class and Object: Introduction to OOPS- Declaring a class- Objects - new keyword- constructor and DestructorAccess method and properties using $this variable -public ,private, protected properties and methods-Static properties and method-Class constant-Inheritance & code reusability-Polymorphism-Parent & self :keyword Instance of operator Abstract method and class Interface Final-Exception Handling-Understanding Exception Handling(Try, catch, throw)

(20 hrs)

UNIT V:

$affected_rows-auotocommit-begin_transaction-change_user-character_set_name-close-commit-$connect_error - costructdebug- dump_debug _ info-$error-$error_list-field_count-get_charset-$client_info - $client_version - get_connection_stats-$host_info-protocal_version-$server_info-$server_version -getwarnings - $info-init-$insert_id-kill-more_results-multi_query-next_result-referesh-release_savepoint-rollback-savepoint-select_db.

(14 hrs)

Book for Study:

1. Sumitabha Das,"***UNIX concepts and applications"***, Tata McGraw Hill, Fourth edition, 2009.[Chapters 1,2,3,4,5,6,7,8,9,10.1-10.6,14,15.1-15.3,17]

2. Yashavant Kanetkar, "***UNIX shell programming"*** BPB publications, 1996 [chapters 9,10,11]

3. Martin C Brown, "The Complete Reference – Perl", Tata McGraw Hill Publishing Company Limited, New Delhi. Second Edition (For Unit III)

Book for Reference:

1. Neil Matthew Richard Stones, "***Beginning LINUX"*** ,Wiley Dreamtech", 4th edition, 2014.

Web Reference:

1. http://php.net/manual/en/mysqli.close.php

2. https://www.w3schools.com/php/func_mysqli_affected_rows.asp

Course Outcomes:

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

CO1:	develop applications in different platforms.	**K6**
CO2:	create interactive web pages using Perl and PHP.	**K6**
CO3:	develop simple web applications.	**K6**
CO4:	select suitable platform for real life problem.	**K4**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	S	N	S	S	M	S	M
CO2	S	M	S	S	N	M	M	S	S	S
CO3	M	W	S	S	N	M	S	W	S	M
CO4	S	S	M	S	N	S	S	M	S	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.D.Jayachitra
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-V LAB-I- OPEN SOURCE TECHNOLOGIES		
MSc	Semester : I	Credits : 4	Hrs: 6
Cognitive Level	K2 – Understand K6 – Create		
Learning Objectives	This Course aims to ▪ familiar with Unix Commands, shell scripts ▪ design dynamic web pages.		

CYCLE – I

- Basic UNIX commands
- Filters in UNIX

Simple Shell scripts using

- Control Structure
- Loops
- File and directory permissions
- Pattern matching

CYCLE –II

UI Design

UI Design with PHP & MySQL

Interactive pages using WAMP

Course Outcomes:

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

CO1: understand UNIX commands.		**K2**
CO2: create interactive web pages.		**K6**
CO3: develop simple applications in PHP and MySQL.		**K6**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	W	S	N	S	S	S	S	S
CO2	S	S	W	S	N	S	S	M	S	M
CO3	S	S	W	S	N	S	S	S	S	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Mrs.K.PonvelAzhaguLakshmi
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-VI PROGRAMMING IN JAVA AND J2EE		
MSc	**Semester : II**	**Credits : 4**	**Hrs:4**
Cognitive Level	**K 1 –** Remember **K 6 –** Create		
Learning Objectives	**This Course aims to** ▪ develop basic socket programming and TCP/IP protocols ▪ understand distributed environment and its architecture ▪ apply the concepts of RMI to develop distributed applications ▪ create web based distributed applications using Java Servlets ▪ design web based distributed applications using Java Server Pages		

UNIT I

Networking Basics - Socket Programming - Proxy server - TCP/IP Sockets - Net address-datagrams. **(12 hrs)**

UNIT – II

Distributed Hardware Architecture: Evolution of Personal Computer – PC to PC Communication – Local Area Network – File Server Architecture – Client-Server Architecture – Database Server Architecture – Corporate Network – Intranet – Wide Area Network – Internet.Distributed Software Architecture: Mainframe – File Server - Client-Server Architecture:Single–two tier–three tier–N-tier Architecture–Distributed Application. **(13 hrs)**

UNIT – III

Distributed Computing using RMI: Introduction - RMI Architecture – Developing Applications with RMI –RMI with Database Connectivity.
Java Servlets: Servlet Life Cycle – Generic and HTTP Servlet – Servlet with Database Connectivity- Session Tracking: Hidden Form Fields – URL Rewriting – The Cookie Class – The   Session Tracking class. **(11 hrs)**

UNIT – IV

Java Server Pages: JSP Basic Concepts – JSP Elements – Expressions – Scriplets – Request and Response Objects – JSP with Database Connectivity - Session Tracking: Hidden Form Fields – URL Rewriting – The Cookie Class – The Session Tracking class. **(14 hrs)**

J2EE Platform: J2EE Architecture – Containers – J2EE Technologies: Component – Service – Communication Technologies – Developing J2EE Application. EJB Architecture and Design: Introduction to EJB – The EJB Container and its Services – Working with EJB – Session Bean and Business Logic – Entity Bean and Persistence. **(10 hrs)**

Books for Study:

1. Herbert Schildt,"***The Complete Reference Java***",Tata McGraw Hill Publishing Company Limited, 9th Edition, 2014,ISBN: 9780070636774

2. Ivan Bayross, " ***Web Enabled Commercial Applications Development using Java 2***", Edition 2000, BPB Publications,,ISBN 10: 8176563560 ISBN 13: 9788176563567

3. Jason Hunter with William Crawford, "***Java Servlet Programming***", Shroff Publishers & Distributors Pvt. Ltd, ISBN 1-56592-391-XE

4. Phil Hanna, "***JSP 2.0 The Complete Reference***", Tata McGraw Hill Publishing Company Limited, ISBN-10: 0072224371; ISBN-13: 978-0072224375.

5. James Holmes, ***"Strut: The Complete Reference",*** Second Edition, Tata McGraw Hill Publishing Company Limited, *ISBN*: 9780070658455.

6. Subrahmanyam Allamaraju, "***Professional Java Server Programming – J2EE Edition Volume 1",*** Shroff Publishers & Distributors Pvt. Ltd, *ISBN* 0-13-015592-6.

Reference Book:

1. Parsian, "***Java Metadata, MYSQL and Oracle Recipes: A Problem-Solution Approach"***, Apress Publicaton, 2006.

Web Reference:

1. http://Docs.oracle.com/javase/tutorials/java/index.html
2. http://javabeginnerstutorial.com/core-java
3. http://www.w3schools.in/java-tutorial/
4. http://www.j2eebrain.com
5. http://www.tutorialspoint.com

Course Outcomes:

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

CO1: design socket programming and TCP/IP protocol **K6**

CO2: identify distributed hardware and software architecture and distributed environment **K1**

CO3: identify RMI architecture and Java Servlets, apply the same to develop applications **K1**

CO4: develop real time web based applications using JSP **K6**

CO5: build applications in J2EE server using Java Servlets and Java Server Pages **K6**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	S	N	S	S	S	S	S
CO2	S	S	S	M	N	S	S	M	S	S
CO3	S	M	S	S	N	S	S	M	M	S
CO4	S	S	S	M	N	S	S	M	S	S
CO5	S	S	S	S	N	S	S	W	M	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.K.Sridevi
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-VII SOFT COMPUTING		
MSc	Semester : II	Credits : 4	Hrs:5
Cognitive Level	**K1** – Apply **K6** – Create		
Learning Objectives	**This Course aims to** ▪ impart knowledge in Fuzzy Set Theory ▪ learn Optimization, ▪ impart knowledge in Neural Networks ▪ understand Nero Fuzzy Modeling ▪ understand the application of Computational Intelligence		

UNIT- I
Fuzzy Set Theory:

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set – Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems– Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

(15hrs)

UNIT- II
Optimization:

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search. **(15 hrs)**

UNIT -III
Neural Networks:
Supervised Learning Neural Networks – Perceptrons – AdalineBackpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning. **(15 hrs)**

UNIT- IV
Neuro Fuzzy Modeling:

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum **(15 hrs)**

UNIT -V
Application of Computational Intelligence:

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction. **(15 hrs)**

Book for Study:

1. J.S.R. Jang, C.T. Sun and E. Mizutani, *"Neuro Fuzzy and Soft Computing"*, PHI, Pearson Education, 2004.

Reference Books:

1. Timothy J. Ross, "*Fuzzy Logic with Engineering Application,* "McGraw Hill, 1977.
2. Davis E. Goldberg, "Genetic *Algorithms Search, Optimization and Machine Learning",* Addision Wesley, 1989.
3. S. Rajasekaran and G.A.V. Pai, "*Neural Networks, Fuzzy Logic and Genetic Algorithms"*, PHI, 2003. Emereo PTV Limited, July 2008.
4. Ahmar, Abbas, "*Grid Computing - A Practical Guide to technology and Applications"*, Charles River media, 2003.

Course Outcomes:

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

CO1: apply fuzzy set theory to real life problem		**K3**
CO2: develop Neural Networks and Nero Fuzzy Model		**K6**
CO3: apply Computational Intelligence		**K3**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	M	N	S	S	S	N	S
CO2	S	W	S	W	N	S	M	M	N	S
CO3	S	S	M	M	N	S	S	S	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.S.Murugan
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-VIII DATA MINING & DATA WARE HOUSING		
MSc	**Semester : II**	**Credits : 4**	**Hrs:5**
Cognitive Level	**K1 –** Remember **K2 –** Understand **K3 –** Apply **K4 –** Analyze		
Learning Objectives	**This Course aims to** ▪ introduce the basic concepts of data mining and preprocessing techniques ▪ imbibe the knowledge on Association Rule Mining ▪ elaborate the importance of classification and prediction technique through various methods ▪ introduce the concepts and importance of basic clustering techniques ▪ introduce the concepts of warehousing, architecture and multidimensional data model		

UNIT – I

DATA MINING & DATA PREPROCESSING**:** Introduction to KDD process – Knowledge Discovery from Databases - Data Preprocessing: An Overview – Data Cleaning – Data Integration – Data Reduction –Data Transformation and Data Discretization.   **(10 hrs)**
Self Study : Data Discretization.

UNIT – II

ASSOCIATION RULE MINING: Mining Frequent Patterns: Basic concepts **-** Frequent Itemset Mining Methods: Apriori Algorithm: Finding Frequent Itemsets using Candidate Generation- Generating Association Rules from Frequent Itemsets- A Pattern-Growth Approach for Mining Frequent Itemset.   **(15 hrs)**

UNIT – III

CLASSIFICATION: Basic Concepts - Decision Tree Induction -Bayes Classification Methods- Rule-based Classification - Model Evaluation and Selection- Techniques to improve Classification Accuracy.   **(15 hrs)**
Self Study: Techniques to improve Classification Accuracy.

UNIT – IV

CLUSTERING: Cluster Analysis - Partitioning Methods: k-means and k-medoids – Hierarchical methods: Agglomerative and Divisive Hierarchical Clustering: BIRCH – Density-

Based Methods: DBSCAN – Grid-Based Methods: STING - Evaluation of Clustering.
Self Study: Evaluation of Clustering. **(15 hrs)**

UNIT – V

DATA WAREHOUSE: Data Warehousing - Operational Database Systems vs. Data Warehouses - Data Warehouse Multitier Architecture - Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse - Multidimensional Data Model: Data Cube, Stars, Snowflakes, and Fact Constellations – Online Analytical Processing: Introduction - OLAP Operations**.** **(20 hrs)**

Book for Study:

1. Jiawei Han and MichelineKamber, "***Data Mining Concepts and Techniques"*** , Third Edition, Elsevier, Reprinted 2011.

Books for Reference:

1. K.P. Soman, ShyamDiwakar and V. Ajay, *"Insight into Data mining Theory and Practice"*, Easter Economy Edition, Prentice Hall of India, 20012.
2. G. K. Gupta, *"Introduction to Data Mining with Case Studies"*, Easter Economy edition, Prentice Hall of In*d*ia, 2012.
3. A Pang-Ning Tan, Michael Steinbach and Vipin Kumar, *"Introduction to Data Mining",* Pearson Education, 2017

Web Reference:
1. https://www.tutorialspoint.com/data_mining/
2. https://www.hackerearth.com/blog/machine-learning/beginners-tutorial-apriori-algorithm-data-mining-r-implementation/
3. https://t4tutorials.com/apriori-algorithm-in-data-mining-with-examples/
4. https://data-flair.training/blogs/classification-algorithms/
5. https://www.youtube.com/watch?v=9v4Wnz27c20
6. https://www.youtube.com/watch?v=E24Wxj7UmaA
7. https://www.slideshare.net/2cdude/data-warehousing-3292359

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

CO1:	preprocess the data using various preprocessing techniques	**K1**
CO2:	generate association rules using Apriori and FP-growth algorithms	**K6**
CO3:	predict the class label of a given tuple using the classification techniques	**K3**
CO4:	group the data using the basic clustering techniques	**K4**
CO5:	summarize the concepts of warehouse, its architecture and multidimensional data models	**K2**

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Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	S	S	N	S	S	S	N	S
CO2	S	S	W	S	N	S	S	M	N	S
CO3	M	S	M	S	N	S	S	S	N	S
CO4	M	S	W	S	N	S	S	M	N	S
CO5	S	S	M	S	N	S	S	S	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Miss.P.Kalpana
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-IX LAB II- JAVA & J2EE		
MSc	**Semester : II**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K 3** – Apply **K 4** – Analyze **K 6** – Create		
Learning Objectives	**This Course aims to** ▪ develop network programs using TCP/IP and UDP ▪ develop distributed applications using RMI ▪ create web based distributed applications using Java Servlets ▪ design web based distributed applications using Java Server Page		

Socket Programming

      i. Communication between server and client using TCP/IP

      ii. Communication between server and client using UDP

Distributed applications using RMI

      i. Simple RMI application

      ii. RMI application with a server and more than one clients

      iii. RMI application with Database Connectivity

Implementing Servlet

      I.Simple Servlet

      ii.Servlet with JDBC

      iii.Servlet Session Tracking

Implementing Java Server Pages(JSP)

      i. Simple JSP

      ii.JSP with JDBC

      iii JSP with Session Tracking

Enterprise Java Beans

      i. Session Bean

      ii. Entity Bean

Course Outcomes:

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

CO1: write code on socket programming using TCP/IP and UDP	**K3**
CO2: design various real time applications using RMI	**K4**
CO3: develop various real time web based distributed applications using Java servlets,JSP	**K6**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	S	N	S	S	S	S	S
CO2	S	M	S	S	N	S	S	M	M	S
CO3	S	S	M	S	N	S	S	M	S	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.K.Sridevi
Verified by	Dr.K.Mani

Course Code & Title	CEC-I PRINCIPLES OF WIRELESS AND MOBILE NETWORK		
MSc	Semester : II	Credits : 4	Hrs:6
Cognitive Level	**K2 –** Understand **K3 –** Apply **K4–** Analyze		
Learning Objectives	**This Course aims to** • comprehend the basic concepts of Personal Communication services (PCS) principle and fundamentals. • introduce the Operations Mobility Management and handoff management. • conversant with Broadband and Adhoc networks functionalities. • acquire the knowledge in design of the Wireless WANS. • cognize the Wireless Geolocation System		

UNIT- I

Network Planning: Introduction – wireless network Topologies – Cellular Topology – Cell Fundamentals – Signal-to-Interference Radio Calculation-Network Planning for CDMA Systems. **(18 hrs)**

UNIT- II

Wireless Network Operation: Introduction – Mobility Management – Radio Resources and Power Management – Security in Wireless Networks **(18 hrs)**

UNIT- III

Wireless WANS: what is GSM – Mechanisms to Support a Mobile Environment – Communication in Infrastructure – CDMA – IMT-2000 – GPRS and Higher Data rates – short Message service in GSM – Mobile Application Protocols **(15 hrs)**

UNIT- IV

Local Broadband and Adhoc networks: IEEE 802.11 – PHY layer – MAC Sublayer -Wireless ATM – HIPERLAN – HYPERLAN-2 - IEEE 802.15 WPAN–HomeRF–Bluetooth–Interference between Bluetooth and 802.11**. (20 hrs)**

UNIT- V

Wireless Geolocation System: What is wireless Geolocation – Wireless geolocation System Architecture – Technologies for Wireless Geolocation – Geolocation standards for E-911 Services – Performance Measures for geolocation Systems. **(19 hrs)**

Book for Study:
1. Kaveh Palavan, Prashant Krishnamoorthy , *Principles of Wireless Networks*, Eastern Economy Edition,2002,ISBN- 81-203-2380-7 (Chapter 5,6,7,8,9,11,12,13,14 only),ISBN: 978-0-470-69708-5

Books for Reference:

1. Jochen Schiller, *Mobile Communications*, Second Edition, Pearson Education, Ltd., 2010 ISBN81-**2.** 297-0350-5.

2. T.S. Rappaport, *Wireless Communications: Principles and Practice* , Second Edition, Prentice Hall, 2002,ISBN: 9780130422323 .

Web Reference:

1. www.ccs.neu.edu/home/rraj/Courses/G250/S05/Lectures/BluetoothMobileIP.ppt

2. www.chu.edu.tw/~lhyen/wc/gsm.pdf

3. www.hit.bme.hu/~mihaly/mobil.hir/gsmbase.pdf

4. http://www.cs.fsu.edu/~zzhang/CIS5930_Spring_2009_files/OSMR_chest_snd.py

Course Outcomes:

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

CO1: understand the basic concepts of Personal Communication   Services (PCS) by wireless network fundamentals and topology. **K2**

CO2: exposed to the required Operations Mobility Management and handoff management for various wireless management and radio resources and security. **K3** **K4**

CO3: design of the wireless WAN for GSM ,GPRS and CDMA. **K4**

CO4: conversant with Broadband and Adhoc networks functionalities by IEEE wireless projects. **K4**

CO5: apply cognize the Wireless Geolocation System by E-911 **K3**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	S	S	N	S	S	S	S	S
CO2	S	S	S	S	N	S	S	M	M	S
CO3	S	S	M	S	N	S	S	S	S	S
CO4	S	S	W	S	N	S	S	M	M	S
CO5	S	S	M	S	N	S	S	S	S	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Mrs.V.Priya
Verified by	Dr.K.Mani

Course Code & Title	CEC-I DIGITAL IMAGE PROCESSING		
MSc	Semester : II	Credits : 4	Hrs:6
Cognitive Level	**K 2 –** Understand **K 3 –** Apply **K 4 –** Analyze		
Learning Objectives	**This Course aims to** ▪ learn the fundamentals of digital image. ▪ understand the basics of image enhancement. ▪ imbibe the knowledge on image restoration. ▪ introduce the concepts of image compression. ▪ impart the knowledge in segmentation.		

UNIT -I

Digital Image Fundamentals:

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels color models. **(20 hrs)**

UNIT- II

Intensity Transformation and Spatial Filtering:

Background-Basic intensity transformation functions – Histogram processing – Fundamentals of Spatial Filtering– Smoothing and Sharpening; Spatial Filtering – Frequency Domain: Preliminary concepts-DPI of one variable-Extension to function of two variable-Basics of filtering – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. **(15 hrs)**

UNIT- III

Image Restoration:

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Color Image Processing-Color models-Pseudo Color Image Processing-Basics of Full Color Image Processing-Color Transformation **(18 hrs)**

UNIT- IV

Wavelets and Image Compression:

Wavelets – Background- Multire solution expansions –Wavelet Transforms in one dimension-The fast Wavelet Transform-Image Compression-Fundamentals- Basic Compression Methods – Digital Image water making. **(18 hrs)**

Image Segmentation:

 Fundamentals – Point, Line, and Edge detection – Thresholding –Region – Based segmentation – Segmentation using Morphological Watersheds – The use of Motion in segmentation.

(19 hrs)

Book for Study:

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

Books for Reference:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "***Digital Image Processing Using MATLAB",*** Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. "***Fundamentals of Digital Image Processing***", PHI Learning Pvt. Ltd., 2011.
3. Willliam K Pratt, "***Digital Image Processing"***, John Willey, 2002

Course Outcomes:

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

CO1: describe digital image fundamentals and image enhancement	**K2**	
CO2: apply knowledge on image restoration	**K3**	
CO3: use image compression techniques to real life models	**K4**	
CO4: apply knowledge on image segmentation	**K3**	

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	S	M	M	N	S
CO2	S	M	S	S	N	S	M	S	N	S
CO3	M	W	S	M	N	S	S	M	N	S
CO4	M	M	S	S	N	S	M	S	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.S.Murugan
Verified by	Dr.K.Mani

Course Code & Title	CEC-I ADVANCED OPERATING SYSTEM			
MSc	Semester : II		Credits : 4	Hrs:6
Cognitive Level	K1 – Remember K2 – Understand K3 – Apply			
Learning Objectives	**This Course aims to** ▪ fundamentals of operating systems, process description and control. ▪ gain knowledge on concurrency ,mutual exclusion and deadlock ▪ introduce the memory management techniques and scheduling. ▪ understand the concepts of I/O management ▪ gain knowledge of distributed processing			

UNIT- I

Operating Systems Overview: Operating Systems objectives and functions– The evolution of OS – Process Description and Control: Process states – process description – process control.**(18 hrs)**

UNIT- II

Concurrency: Mutual Exclusion and Synchronization: Principles of concurrency – Mutual Exclusion: Software support – Hardware support – Semaphores – Monitors – Message Passing – Reader/Writer problem. Deadlock and Starvation: Principles of deadlock – Deadlock prevention – avoidance – detection – Dining Philosophers problem. **(20 hrs)**

UNIT- III

Memory Management: Requirements – Memory partitioning – Paging – Segmentation – Virtual Memory: Hardware and Control structures – OS software – Scheduling: Types of scheduling – Scheduling algorithms**. (17 hrs)**

UNIT- IV

I/O Management and Disk Scheduling: I/O devices – Organization of I/O function – OS design issues – I/O buffering – Disk scheduling – Disk cache – File Management: Overview- File organization – directories – sharing – Record blocking – Secondary storage management.

(12 hrs)

UNIT- V

Distributed Processing, Client/Server & Clusters: Client/Server computing – Distributed message passing – Embedded OS: Embedded systems- Characteristics of embedded OS – iOS and Android: Apple iOS developers – iOS architecture and SDK framework. **(13 hrs)**

Books for Study:

1. William Stallings, "*Operating Systems, Internals & Design Principles",* 8ᵗʰ Edition, Prentice Hall, 2010

2. Neil Smyth, "*iPhone iOS 4 Development Essentials – Xcode*", 4ᵗʰ Edition, Payload Media, 2011.

Reference Books:

1. Mukesh Singhal and Niranjan G. Shivaratri, "*Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems*",   Tata McGraw-Hill, 2001.,ISBN 007057572X, 9780070575721.

2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "*Operating System Concepts*", 9th Edition, John Wiley & Sons, 2004.

Web Reference:

1. www.geeksforgeeks.org
2. www.tutorialspoint.com
3. www.studytonight.com
4. www.ebookfrenzy.com/pdf_previews/iPhoneiOS6EssentialsPreview.pdf

Course Outcomes:

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

CO1: identify the services provided by operating systems	**K1**
CO2: solve problems involving process description and control.	**K2**
CO3: resolve Mutual exclusion, Deadlock detection	**K2**
CO4: apply the memory management techniques	**K3**
CO5: manage I/O devices, disk scheduling and file sharing.	**K1**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	M	M	N	S
CO2	S	M	S	M	N	S	M	S	N	S
CO3	M	W	S	M	N	M	S	M	N	S
CO4	W	S	M	S	N	W	S	M	N	S
CO5	M	S	M	S	N	S	S	S	N	M

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.K.Sridevi
Verified by	Ms.P.Kalpana

Course Code & Title	OEC-I R PROGRAMMING			
MSc	**Semester : II**		**Credits : 4**	**Hrs:4**
Cognitive Level	**K1**-Remember **K3 -**Apply			
Learning Objectives	**This Course aims to** ■ Familiarize the R environment and its fundamentals ■ introduce the concept of objects and descriptive statistics ■ Inculcate knowledge in data distribution ■ Provide data analysis using graphical tools ■ Provide understanding for regression concepts			

UNIT- I

Introduction to R: getting the Hang of R - Running a R Script - Finding your way with R - Command Packages - Becoming Familiar with R: some simple math - Reading and Getting data into R - viewing named objects - types of data items - the structure of data items - Examining data structure - working with history commands - saving your work in R   **(12 hrs)**

UNIT - II

Working with objects: Manipulating objects - viewing objects within objects - constructing data objects - forms of data objects: Testing and converting. Data: Descriptive Statistics and tabulation- Summary commands - Summarizing samples- summary tables.   **(13 hrs)**

UNIT - III

Data: Distribution - Looking at the distribution of data - Simple Hypothesis testing : Using the student's t-test - The Wilcoxon U-test - Paired t- and U-tests - Correlation and Covariance - Test for association.   **(11 hrs)**

UNIT -IV

Introduction to graphical analysis: Box whiskers plots - scatter plots - pairs plots - line charts - pie charts – clevel and dot charts- bar charts - copy graphics to other applications   **(14 hrs)**

More about graphics: Adding elements to existing plots - Matrix plot - Multiple plots in one window - Exporting graphs- Regression: Simple Linear regression - Multiple Regression.**(10 hrs)**

Text Book:

1. Mark Gardener, "***Beginning R The statistical programming language*** ", John Wiley & Sons Inc, 2012, ISBN:978-1-118-16430-3

Reference Books:

1. Norman Matloff, "***The art of R programming***", William Pollock , 2011, ISBN-10: 1-59327-384-3
2. Roger D. Peng, "***R Programming for Data Science***", Leanpub, 2015

Course Outcomes:

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

CO1: use R for statistical programming, computation, graphics, and modeling   **K3**

CO2: use R programming for research and scientific applications   **K3**

CO3: apply statistical tests for various research problems using R.   **K3**

CO4: identify and fit some basic types of statistical models   **K1**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	M	M	W	S
CO2	M	M	S	W	N	M	M	S	W	S
CO3	M	W	S	M	N	M	S	M	W	S
CO4	S	S	M	S	N	W	S	M	W	S
CO5	S	S	M	M	N	M	S	S	W	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Ms.P.Kalpana
Verified by	Dr.K.Mani

Course Code & Title	OEC-I WEB TECHNOLOGY		
MSc	Semester : II	Credits : 4	Hrs:4
Cognitive Level	**K1**– Understand **K3** – Apply **K6 --** Create		
Learning Objectives	**This Course aims to** ▪ introduce the concepts of web browsers and network related protocols ▪ understand the basic HTML tags ▪ design the frameset and forms using various HTML tags. ▪ introduce java script ▪ study AMP technologies		

UNIT-I

Web Medium: Core web technologies – Web browsers – Markup Languages – Style Sheet technologies –client side, server side – network and related protocols – Introduction to static, dynamic and active web pages. **(13 hrs)**

UNIT-II

Introduction to HTML – History – Structure of HTML Document – Basic Tags – Images – List – Ordered List and Unordered List –Table Handling. **(12 hrs)**

UNIT-III

Frameset Definition – Nested frameset – Introduction to Forms – Actions attribute – Method Attribute – ENC type attribute – Prop down List ,Check boxes , Radio Buttons ,Text field ,Text area, Password and Hidden files, Submit and Reset button–Designing sample forms**. (14 hrs)**

UNIT-IV

Client Side Scripting: Overview of Java Script – languages constructs – classes and objects – properties and methods – events – functions and parameters – event handling. **(11 hrs)**

UNIT-V

Introduction to AMP: Introduction to the integrated usage of Apache, MySQL, PHP technologies for designing a web page - Overview of PHP – Structure and syntax – Using PHP and MySQL – Creating interactive web page using AMP technologies. **(10 hrs)**

Books for Study:

1. Thomas A Powell, "*Web Design – The Complete Reference*", Tata McGraw- Hill, Second Edition, 2010, ISBN: 0072224429
2. Achyut S Godbole, Atul Kahate, "*Web Technologies – TCP/IP to Internet Application Architectures*",TataMcGraw-Hill,2003.,ISBN: 9780070472983.

3. Michael K Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer,   Jeremy Stolz, Jason Gerner, " **Beginning PHP, Apache , MySQL Web Development"**, Wiley dreamtech press, 2016 edition, ISBN 978-0-7645-5744-6 .

4. Andi Gutmans, Stig Saether Bakken, Derick Rathens, "**PHP 5 Power Programming"**, Prentice Hall, 2005.,C.Xavier, "**World Wide Web Design with HTML**", Tata McGraw-Hill, 2004.,, ISBN: 0-07-041186-7

Books for Reference:

1. Cristian Darie, Bogdan Brinzarea, Filip Cherecheş-Toşa, Mihai Bucica, "**Building Responsive Web Applications PHP**", Packet Publishing

Web Reference:

1. https://www.w3schools.com/php/
2. https://www.tutorialspoint.com/

Course Outcomes:

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

CO1: identify web browsers and network protocols	**K1**
CO2: design a web pages using HTML tags	**K3**
CO3: create a dynamic webpage using PHP and MySQL	**K6**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	S	S	M	S	S
CO2	M	S	S	M	N	S	M	S	S	S
CO3	S	W	S	M	N	S	S	M	S	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared By	Dr.D.Jayachitra
Verified By	Ms.P.Kalpana

Course Code & Title	OEC- FUNCTIONAL PROGRAMMING USING HASKELL			
MSc	**Semester : II**	**Credits : 4**	**Hrs:4**	
Cognitive Level	**K2 –** Remember **K3 –** Apply **K4 –** Analyze **K6–** Create			
Learning Objectives	**This Course aims to** ▪ learn the syntax and semantics of the Haskell programming language ▪ learn business logic and data analysis, fast prototyping and enhancing ▪ study existing software environments. ▪ understand file processing. ▪ acquire the knowledge on various file operation and pattern matching.			

UNIT I

Getting Started – Lists – Stringsand Characters –Type System – Function Application – Writing Simple functions – Understanding evaluations – Defining new Data types – Algebric data types – Pattern matching.   **(14 hrs)**

UNIT – II

Functional Programming – Infix functions – Working with Lists – Think about loops – Lamda functions – Writing aLibrary – Working with JSON data- Anatomy of Haskell module – Pointing JSON Data.   **(13 hrs)**

UNIT –III

Using Type Classes – Built in Type Class – Type Classesat work – I/O – Classic I/O –Working with files – Lazy I/O – I/O Monad – Buffering.   **(12 hrs)**

UNIT – IV

File processing – Regular Expressions – Pattern matching – Writing Lazy Function – I/O case study – Find – Naïve finding system – Predicates.   **(11 hrs)**

UNIT – V

Data Structures – Association Lists – maps – Monads – Monad type class using new monad – State Monad.   **(10 hrs)**

Book for Study:

1. O'Reilly,*"Real World Haskell",* First edition, released in Nov 2008.

Books for Reference:

1. Graham Hutton,*"Programming in Haskell",* Second Edition, Kindle Edition,ISBN-13: 978-1316626221 ISBN-10: 1316626229
2. Simon Thompson.*"The Craft of Functional Programming",* Third Edition.

Web Reference:

1. https://www.tutorialspoint.com/haskell

2. https://www.haskell.org.

Course Outcomes:

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

CO1:	understand the simple functions	K2
CO2:	develop functional programming in integrated deployment	K6
CO3:	write haskell program using various built in functions	K6
CO4:	apply various concept in pattern matching	K3
CO5:	analyze concept of data structure	K4

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	M	M	W	S
CO2	M	M	S	W	N	M	M	S	W	S
CO3	M	W	S	M	N	M	S	M	W	S
CO4	S	S	M	S	N	W	S	M	W	S
CO5	S	S	M	M	N	M	S	S	W	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.M.Muralidharan
Verified by	Dr.S.Murugan

Course Code & Title	**CC-X -AI AND MACHINE LEARNING**		
MSc	**Semester : III**	**Credits : 4**	**Hrs:5**
Cognitive Level	**K1 –** Remember **K2 –** Understand		
Learning Objectives	**This Course aims to** ▪ study the concepts of Artificial Intelligence ▪ impart knowledge representation ▪ understand the basics of machine learning ▪ describe Neural Networks and Genetic Algorithms ▪ illustrate Bayseian and Computational learning		

UNIT - I

Introduction to AI and Production Systems: Introduction to AI-Problem formulation, Problem Definition –Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics- Specialized production system-Problem solving methods – Problem graphs, Matching, Indexing and Heuristic functions –Hill Climbing –Depth first and Breath first, Constraints satisfaction – Related algorithms, Measure of performance and analysis of search algorithms. **(15 hrs)**

UNIT-II

Representation of knowledge: Game playing- Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic- Structured representation of knowledge. **(10 hrs)**

UNIT –III

Introduction : Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. **(15 hrs)**

UNIT – IV

Neural Networks And Genetic Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evalution and Learning. **(15 hrs)**

UNIT -V

Bayesian and Computational Learning : Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network –EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model. **(20hrs)**

Book for Study:

1. Kevin Night and Elaine Rich, Nair B " *Artificial Intelligence(SIE)"*, Mc Graw Hill-2008(Unit I,II)
2. Tom M. Mitchell, "**Machine Learning**", First Edition, McGraw Hill Education (India) Private Limited, (1 May 2013) ISBN-10: 1259096955 , ISBN-13: 978-1259096952

Books for Reference:

1. Ethem Alpaydin, *"Introduction to Machine Learning (Adaptive Computation and Machine Learning)",* The MIT Press 2004
2. T. Hastie, R. Tibshirani, J. H. Friedman, "*The Elements of Statistical Learning",* Springer; 1 edition, 2001
3. Deepak Khemani" *Artificial Intelligence",* Tata Mc Graw Hill-2013

Web Reference:

1. https://www.cs.ubbcluj.ro/~gabis/ml/ml-books/McGrawHill%20-20Machine%20Learning%20-Tom%20Mitchell.pdf
2. https://www.python-course.eu/machine_learning.php

Course Outcomes:

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

CO1: solve the real life problems using AI techniques. K1

CO2: identify appropriate AI methods to develop knowledge based solution. K2

CO3: identify problems, through the concept of learning methods. K1

CO4: apply various neural networks algorithms to real life problems. K2

CO5: apply genetic algorithms for research problems. K1

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	M	N	S	M	M	N	M
CO2	M	S	S	M	N	M	M	S	N	S
CO3	S	W	S	M	N	M	S	M	N	M
CO4	S	S	M	S	N	W	S	M	N	S
CO5	S	M	M	M	N	S	S	S	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.M.Muralidharan
Verified by	Dr.K.Sridevi

Course Code & Title	CC-XI PRINCIPLES OF COMPILER DESIGN		
MSc	Semester : III	Credits : 4	Hrs:5
Cognitive Level	K1 – Remember K2 – Understand K5 – Evaluate K6 – Create		
Learning Objectives	This Course aims to ▪ classify various translators and its functions ▪ summarize various phases of a compiler ▪ develop thorough knowledge in Parsers ▪ organize syntax based translations ▪ generate the optimized object code		

UNIT–I

Introduction to compilers – compilers and translators – assembly language – macros – structure of compiler **– compiler writing tools** – bootstrapping. Lexical analysis – role of lexical analyzer – regular expression – finite automata – implementation of lexical analyzer – context free grammars – derivation and parse trees.   **Self Study:Compiler Writing tools, implementation of simple lexical analyser in C**   **(15 hrs)**

UNIT-II:

Parsers – shift reduce parsing – operator precedence parsing – top down parsing – predictive parsers – simple precedence parser – LR parsers – constructing SLR parsing tables – constructing canonical LR parsing table – constructing LALR parsing tables – using ambiguous grammars.   **(15 hrs)**

Unit–III:
Syntax directed translation schemes – implementation of syntax directed translation schemes – intermediate code– postfix notation – parse trees and syntax trees – three address code, uadruples and tuples – translation of assignment statements – Boolean expression – postfix translation.
                                                                                                                            (15 hrs)
UNIT–IV

Symbol table – the contents of a symbol table – data structures for symbol tables –representing scope information – Errors – lexical phase errors – syntactic phase errors– Semantic errors
                                                                                                                            (15 hrs)

UNIT–V

Code optimization – principle sources of optimization – loop optimization – machine dependent optimization – DAG representation in basic blocks. Code generation –problems in code generation – a simple code generator – register allocations and assignment – Code generation from DAG's – Peep hole optimization.   **(15 hrs)**

Book for Study:

1. A.V.Aho and J D Ullman, "***The Principles of Compiler Design***" ,Narosa Publishing House, 1998, ISBN: 81-85015-61-9.(Chapters: 1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 15)

Books for Reference:

1. Alfred Aho, Ravi Sethi, Jeffy D. Ullman, "***Compilers – Principles, Techniques and Tools***", Pearson Education Asia, 2002
2. Dick Grune, Kes van Reeuwijk, Henri E.bal, Ceriel J H Jacobs, Koen Langendoen, ***"Modern Compiler Design",*** Second edition

Web Reference:

1. www.nptel.ac.in/courses/106108052/
2. www.nptel.ac.in/downloads
3. www.tutorialspoint.com/compiler_design/
4. www.geeksforgeeks.org/compiler-design-tutorials

Course Outcomes:

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

CO1:	understand various types of translators and its functions	**K1**
CO2:	identify phases of compiler	**K2**
CO3:	design lexical analyzer and identify the similarities and differences among different parsing techniques	**K6**
CO4:	formulate the different representation of intermediate code	**K6**
CO5:	evaluate the optimized code to generate code.	**K5**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	M	M	N	M
CO2	M	M	S	M	N	M	M	S	N	S
CO3	M	W	S	M	N	M	S	M	N	M
CO4	W	S	M	S	N	W	S	M	N	S
CO5	S	S	S	S	N	N	M	S	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.K.Sridevi
Verified by	Mrs.K.PonvelAzhagu Lakshmi

Course Code & Title	**CC-XII IOT-INTERNET OF THINGS**		
MSc	**Semester : III**	**Credits : 4**	**Hrs:4**
Cognitive Level	**K4** – Analyze **K6** – Create		

Learning Objectives	**This Course aims to**
	  ▪ understand the fundamentals of Internet of Things
	  ▪ provide a Complete Knowledge about the Internet of Things
	  ▪ provide Scalable Integration Framework for Heterogeneous Smart Objects.
	  ▪ understand Federated Cloud Service Management
	  ▪ apply the concept of Internet of Things in the real world scenario		

UNIT- I

Introduction - Putting the Internet of Things forward to the Next Level - Internet of Things Strategic Research and Innovation Agenda : Internet of Things Vision - Internet of Things Strategic Research and Innovation Directions - IoT Smart X Applications. **(13 hrs)**

UNIT- II

Internet of Things and Related Future Internet Technologies - Network and Communications - Processes - Data Management - Security, Privacy and Trust - Device Level Energy Issues - IoT Related Standardization - IoT Protocols Convergence. **(12 hrs)**

UNIT- III

Scalable Integration Framework for Hetrogeneous Smart Objects, Applications and Services : IPV6 Potential - IoT6 - IPV6 vsIoT - Adapting IPV6 to IoT Requirements - IoT6 Architecture - DigCovery - IoT6 Integration with the Cloud and EPICS – Enabling Hetrogeneous Integration - IoT6 Smart Office Use Case - Scalability Perceptive. **(14 hrs)**

UNIT- IV

Insignts on Federated Cloud Service Management and the IoT : Federated Cloud Service Management - Federated Management Service Life Cycle - Self Management Life Cycle - Self Organising Cloud Architecture - Horizontal Platform. **(11 hrs)**

UNIT- V:
Internet of Things Applications :OpenIoT - iCORE - Compose. **(10 hrs)**

Book for Study:

1. Vidiu Vermesan and Peter Friess, "***Internet of Things - From Research Innovation to Market Deployment"*** River Publishers, 2014.

Book for Reference:

1. McEwen and Hakim Cassimally, John Wiley and Sons "***Designing the Internet of Things"*** Ltd, 2014.

Web Reference:

1. https://www.tutorialspoint.com/internet_of_things/
2. https://www.codeproject.com/Learn/IoT/

Course Outcomes:

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

CO1: design a portable IoT using Arduino equivalent boards and relevant protocols	**K6**
CO2: develop web services to access/control IoT devices	**K6**
CO3: deploy an IoT application and connect to the cloud	**K6**
CO4: analyze applications of IoT in real time applications.	**K4**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	S	N	W	S	M	N	S
CO2	S	M	S	W	N	M	M	S	N	S
CO3	S	W	S	S	N	M	S	M	N	S
CO4	S	S	M	S	N	W	S	M	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.K.Sridevi
Verified by	Dr.S.Murugan

Course Code & Title	CC-XIII-RAPID APPLICATION DEVELOPMENT USING PYTHON			
MSc	Semester : III		Credits : 4	Hrs:4
Cognitive Level	K1– Remember K3– Apply K6 – Create			
Learning Objectives	**This Course aims to** ▪ introduce the basic concepts of Python ▪ gain knowledge on sequencing structures ▪ understand the concepts of files and exceptions ▪ analyze OOP's concepts ▪ classify NumPy module and its functionalities			

UNIT-I

Using python: Installing python- The python Interpreter – Interactive mode – IDLE programming environment – Basics of Python Language: comment – variables Strings and String literals - Getting input and Displaying output (input, raw_input& print)- Operators and Expressions – Control Flow Statements: Decision structures and loop control structures. **(12 hrs)**

UNIT-II

Data Structures: List, Tuples, Dictionaries, Set and Strings – Functions – Modules   **(13 hrs)**

UNIT-III

File Handling – Errors and Exception Handling – Python Standard Library**.**   **(11 hrs)**

UNIT-IV

Regular Expression - Object Oriented Programming: Objects and Classes – Inheritance .

(14 hrs)

UNIT-V

NumPy: NumPy on windows- Beginning with NumPy fundamentals- Getting Familiar with commonly used functions – correlation- polynomials- working with matrices and ufuncs – NumPy modules.   **(10 hrs)**

Books for Study:

1. Tony Gaddis, "*Starting out with python*", 2nd edition, Addison Wesley, Pearson
2. Michael Dawson, "*Python programming for the absolute beginner*", Premier press, 2003
3. Ivan Idris, *"NumPy Beginner's Guide",* Third Edition,Packet Publishing, 2015

Books for Reference:

1. Guido van Rossum, *" Python Tutorial – Release 2.3.3"* 2003, Python Software Foundation Ltd.
2. Jennifer Campbill, Paul Gries, Jason Montojo and Greg Wilson, "*Practical programing, An Introduction to computer science using Python*",2011

Web Reference:

1. https://github.com/beginners_python_cheat_sheet_pcc_all.pdf
2. https://docs.python.org
3. www.tutorialspoint.com

Course Outcomes:

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

CO1: install of python and its fundamentals	K1
CO2: apply various data structures	K3
CO3: compile the functions of files and exceptions	K6
CO4: develop OOP based programs	K6
CO5: using NumPy functions for developing applications	K6

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	M	M	W	S
CO2	M	M	S	M	N	M	M	S	W	S
CO3	M	W	S	M	N	M	S	M	W	S
CO4	W	S	M	S	N	W	S	M	W	S
CO5	M	S	M	M	M	S	M	S	W	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Mrs.K.PonvelAzhagu Lakshmi
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-XIV-Lab- III -Machine Learning			
MSc	**Semester : III**		**Credits : 4**	**Hrs:6**
Cognitive Level	**K2 – Understand** **K5 –Evaluate**			
Learning Objectives	**This Course aims to** - make use of datasets in implementing machine learning algorithms. - implementing machine learning concepts using python.			

Implement and demonstrate the following algorithms using appropriate datasets

1. Decision Tree

2. Naive Bayesian Classification

3. k-Means

4. k-Nearest Neighbor Classifiers

5. Genetic Algorithm

Course Outcomes:

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

CO1:	solve the real life problems using machine learning algorithms	K2
CO2:	apply machine learning algorithms to datasets in different domains	K2
CO3:	classify the datasets as training data and test data	K5

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	S	S	M	S	S
CO2	M	S	S	M	N	S	M	S	S	S
CO3	S	W	S	M	N	S	S	M	S	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.M.Muralidharan
Verified by	Dr.K.Sridevi

Course Code & Title	CC-II CLOUD COMPUTING			
MSc	Semester : III		Credits : 4	Hrs:6
Cognitive Level	K1 – Remember K3 – Apply			
Learning Objectives	This Course aims to ▪ recognise various types of clouds service and deployment models ▪ acquire knowledge in cloud computing architecture ▪ analyze basic cloud collaborating applications ▪ identify advanced cloud collaborating applications ▪ learn Cloud security and its importance to real time applications			

UNIT- I :

Introduction to Cloud Computing: Roots of Cloud Computing - Layers and Types of Cloud – Features of a cloud-Infrastructure Management-Cloud Services-Challenges and Risks. Migrating into a Cloud: Approaches –Seven Step Model. Introduction-Broad Integration as a Service-Integration Methodologies- SaaS. **(18 hrs)**

UNIT- II:

The Anatomy of Cloud Infrastructure- Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- RVWS Design – Cluster as a Service: The Logical Design – Cloud Storage : from LANs TO WANs- Technologies for Data Security in Cloud Computing . **(18 hrs)**

UNIT -III:

Collaborating on Project Management: Understanding Project Management - Exploring Project Management Applications - Collaborating on Word Processing: How Web-Based Word Processing Works - Exploring Web-Based Word Processors - Collaborating on Spreadsheets: How Web-Based Spreadsheets Work - Exploring Web-Based Spreadsheets - Collaborating on Databases: Understanding Database Management - Exploring Web-Based Databases - Collaborating on Presentations: Preparing Presentations Online - Evaluating Web-Based Presentation Applications. **(19 hrs)**

UNIT- IV

Storing and Sharing Files and other online contents: Understanding Cloud Storage - Evaluating Online File-Storage and Sharing Services - Exploring Online Bookmarking Services— Sharing Digital Photographs: Exploring Online Photo- Editing Applications - Exploring Photo-Sharing Communities - Controlling it all with web based Desktops: Understanding Web-Based Desktops - Evaluating Web Based Desktops - Collaborating via web based Communication Tools: Evaluating Web Mail Services - Evaluating Instant Messaging Services - Evaluating Web Conferencing Tools. **(17 hrs)**

UNIT- V

Grid and Cloud- HPC in the Cloud: Performance related Issues –Data Security in the Cloud- The Current State of Data Security in the Cloud- Homo Sapiens and Digital Information- Risk- Identity- The Cloud, Digital Identity and Data Security – Content Level Security: Pros and Cons- Legal Issues in Cloud Computing–Data Privacy and Security Issues-Cloud Contracting models.

(18hrs)

Books for Study:

1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski. *"Cloud Computing Principles and Paradigms"* 2015 .(UNIT I, II, V), ISBN: 978-0-470-88799-8

2. Michael Miller*" Cloud Computing: Web Based Applications that change the way You work and collaborate online*, Pearson Education, 2009 edition.(UNIT III,IV) ISBN: 9788131725337

Book for Reference:

1. George Reese" *Cloud Application Architectures"* Shroff/O'Reilly,2009,ISBN: 8184047142

Web Reference:

1. http://chettinadtech.ac.in/storage/13-01-21/13-01-21-08-33-12-1373-mahendra.pdf

Course Outcomes:

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

CO1: apply the various types of clouds service and deployment models	**K3**
CO2: describe cloud computing architecture	**K1**
CO3: identify the basic cloud collaborating applications	**K1**
CO4: apply cloud security to real time applications	**K3**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	M	N	S	S	M	N	S
CO2	S	M	S	W	N	S	M	S	N	S
CO3	S	M	S	M	N	S	S	M	N	S
CO4	S	S	M	S	N	S	S	M	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.D.Jayachitra
Verified by	Mrs.V.Priya

Course Code & Title	CEC-II SERVICE ORIENTED ARCHITECTURE		
MSc	**Semester : III**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K2 –** Understand **K3 –** Apply **K4 –** Analyze		
Learning Objectives	**This Course aims to** ▪ study the concepts of software architecture and service oriented architecture ▪ learn the benefits of SOA. ▪ know related technologies and implementation basics of SOA ▪ obtain the knowledge of web services security and its related technologies. ▪ cover the policies for transactions processing and the usage of SOA in mobiles.		

UNIT-I

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – Perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models   **(15 hrs)**

UNIT-II

Service-oriented Analysis and Design – Design of Activity, Data, Client and Business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – Stakeholder objectives – Benefits of SOA – Cost Savings   **(18 hrs)**

UNIT-III

SOA implementation and Governance – Strategy – SOA development – SOA governance – trends in SOA – Event-driven architecture – Software s a service – SOA technologies – Proof-of-concept – Process orchestration – SOA best practices   **(18 hrs)**

UNIT-IV

Meta data management – XML security – XML signature – XML Encryption – SAML – XACML – XKMS – WS-Security – Security in web service framework – advanced messaging   **(20 hrs)**

UNIT-V

Transaction processing – Paradigm – Protocols and Coordination – Transaction specifications –

Books for Study:

1. Shankar Kambhampaly, "*Service –Oriented Architecture of Enterprise Applications",* Wiley India Pvt Ltd, 2008.
2. Eric Newcomer, Greg Lomow, "*Understanding SOA with Web Services*", Pearson Education.
3. Mark O' Neill, et al., "*Web Services Security*", Tata McGraw-Hill Edition, 2003

Web Reference:

1. http://snsce.snscourseware.org/notes.php?cw=CW_5869ea2881d33
2. http://studentsfocus.com/it6801-soa-notes-service-oriented-architecture-lecture-handwritten-notes-cse-7th-sem-anna-university/
3. http://www.professionalcipher.com/2017/07/service-oriented-architecture-soa-notes.html

Course Outcomes:

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

CO1: understand the software architecture, enterprise wide SOA, SOA patterns and SOA programming models.	**K2**
CO2: critique the benefits of SOA	**K2**
CO3: implement the SOA.	**K3**
CO4: demonstrate the meta data management and web services security.	**K3**
CO5: analyze the transaction processing and web services security.	**K4**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	M	M	N	S
CO2	M	M	S	M	N	M	M	S	N	S
CO3	M	W	S	M	N	M	S	M	N	S
CO4	W	S	M	S	N	W	S	M	N	S
CO5	S	M	S	M	S	M	S	S	N	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Mrs.K.Saraswathi
Verified by	Mrs.K.PonvelAzhagu Lakshmi

Course Code & Title	**CEC-II GRAPHICS AND HUMAN COMPUTER INTERACTION**		
MSc	**Semester : III**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K1 –** Remember **K2 –** Understand **K6 –** Create		
Learning Objectives	**This Course aims to** ▪ study the graphics techniques and algorithms. ▪ develop their creativity using Output Primitives. ▪ learn the computer animation. ▪ know the design technologies for individual persons with disabilities. ▪ learn the guidelines for user interface.		

UNIT-I

Output Primitives: Introduction - Line - Curve and Ellipse Drawing Algorithms –Attributes – Two-Dimensional Geometric Transformations. **(15 hrs)**

UNIT-II

Two-Dimensional Clipping and Viewing-Three-Dimensional Concepts – Three Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations. **(18 hrs)**

UNIT-III

Three-Dimensional Viewing–Color models and Color Applications–Computer Animation. Self-study: Color models and Color Applications, computer animation. **(18 hrs)**

UNIT IV

The interaction: Introduction - Models of interaction - Frameworks and HCI - Ergonomics - Interaction Styles - Elements of WIMP interface - Interactivity – The Context of the interaction - Paradigm: Introduction - Paradigms for interaction. **(20 hrs)**

UNIT V

Interaction Design basics: Introduction - what is design? - User focus - Scenarios - Navigation design - Screen design and layout - Interaction and prototyping - HCI in the software process: Introduction - The software lifecycle - Usability engineering - Interactive design and prototyping - Design rationale. **(19 hrs)**

Books for Study:

1. Donald Hearn and M.Pauline Baker, "*Computer Graphics C Version*", Pearson Education, 2013.(UNIT I : Chapters 1 to 6; UNIT 2: Chapter 9 – 12, 15, 16), ISBN 0-13-530924-7.
2. Alan Dix, "*Human-computer Interaction*", Pearson Education - 2008.,ISBN:013046109.

Book for Reference:

1. Foley, Vandam, Feiner, Huges, " *Computer Graphics: Principles &Practice*",Pearson Education, second edition 2011, ISBN-13: 978-0321399526 ISBN-10: 0321399528

Course Outcomes:

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

CO1: design effective dialog for HCI.	**K6**
CO2: design effective HCI for individual persons with disabilities.	**K6**
CO3: assess the importance of user feedback.	**K2**
CO4: explain the HCI implications for designing Web sites.	**K1**
CO5: develop meaningful user interface.	**K6**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	M	S	M	N	S	S	M	W	S
CO2	M	M	S	M	N	M	M	S	W	S
CO3	M	W	S	M	N	M	S	M	W	S
CO4	W	S	S	S	N	S	S	M	W	S
CO5	S	M	S	M	N	S	S	S	W	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Mrs.K.Deepa
Verified by	Mrs.K.PonvelAzhagu Lakshmi

Course Code & Title	CEC-III Big Data Analytics		
MSc	**Semester : IV**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K 2 –** Understand **K 3 –** Apply **K 4 –** Analyze **K 6 –** Create		
Learning Objectives	**This Course aims to** - illustrate the evolution and foundations of Big data - classify the methods of streams - learn Hadoop, map reduce and its environment - justify features and working of map reduces. - build Hadoop cluster and extend the framework of Big Data analytics		

UNIT- I

The Fundamentals of Big Data: The Evolution of Data Management-Understanding the Waves of Managing Data-Defining Big Data-Big Data Management Architecture-Traditional and advanced analytics. **Big Data Types:** Defining Structured Data-Defining Unstructured Data. **Technology Foundations of Bigdata:** Big data Stack (technology Components) – Big data Analytics- Big data Applications. **Virtualization and Distributed Computing:** Understanding the basics of virtualization- importance of virtualization to Big Data**.**   **(18 hrs)**

UNIT -II

Mining Data Streams : Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window. **Self Study: Real time Analytics Platform (RTAP) Applications**.   **(20 hrs)**

UNIT- III

Hadoop: History of Hadoop- Components of Hadoop –Map Reduce: Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- The Hadoop Distributed File System :Design of HDFS-HDFS Concepts-The command Line Interface- Java interfaces**.   Self Study: Installation of Hadoop** , **Hadoop eco system tools**   **(16 hrs)**

UNIT- IV

Map Reduce:Developing Map Reduce application: Setting up the development environment-Writing a unit test with MRTUnit- Running Locally on Test Data. How Map Reduce Works: Anatomy of a Map Reduce Job run-Shuffle and Sort – Map Reduce Types and Formats- Map Reduce Features: Counters-Sorting-Joins.   **Self Study: Developing MR programs and execution**   **(21 hrs)**

UNIT -V

Hadoop Environment: Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security - Administering Hadoop: HDFS - Monitoring-Maintenance.
FRAMEWORKS: Pig: Installing and Running Pig- Data processing operators in Pig – Hive: Installing Hive- Hive services –Hive Client- HiveQL – Querying Data in Hive. **Self Study: Basics of Pig & Hive** (15 hrs)

Books for Study:

1. Judith Hurwitz, Alan Nugent, Dr.Fern Halper and Marcia Kaufman,"**Big data for dummies"**, John Wiley & Sons, Inc 2017.ISBN: 978-1-118-50422-2. UNIT I: Chapters 1,2,4 & 5
2. AnandRajaraman and Jeffrey David Ullman, "*Mining of Massive Datasets*", Cambridge University Press, 2012.UNIT-II:Chapter 4(4.1-4.7)
3. Tom White "*Hadoop: The Definitive Guide*" Fourth Edition, O'reilly Media, 2015.**UNIT III**: Chapter I,II, III **UNIT IV**:VI,VII, VIII, IX **UNIT V**: Chapters 10,11,16&17

Books for Reference:

1. Michael Berthold, David J. Hand, "*Intelligent Data Analysis*", Springer, 2007.
2. Alan Gates, *"Programming Pig"*, O'reilly Media, Second Edition 2018
3. Jason Ruthberglen,Dean Wampler & Edward Capriolo,*"Programming Hive"*, O'reilly Media, Fifth Edition 2018

Web Reference:

1. https://youtu.be/TG48mumSlaw: Flajolet Martin Algorithm
2. https://youtu.be/JZDNBfnYwe4: AMS algorithm
3. https://pig.apache.rg/docs/latest/start.html
4. Hadoop.adache.org

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

CO1: analyze evolution and technologies requirement of big data	**K4**
CO2: predict mining data from data sets	**K3**
CO3: outline Components of Hadoop and Mapreduce functions and its environment	**K3**
CO4: explain different working principles of Mapreduce	**K2**
CO5: formulate Hadoop cluster and select appropriate tool	**K6**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	S	M	N	W	M	M	N	S
CO2	M	M	S	S	N	M	M	S	N	S
CO3	M	W	S	M	N	M	S	M	N	S
CO4	W	S	M	S	N	W	S	M	N	S
CO5	S	S	M	M	S	M	S	M	N	M

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Mrs.K.PonvelAzhagu Lakshmi
Verified by	Dr.M.Muralidharan

Course Code & Title	CEC-III Network Security		
MSc	**Semester : IV**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K 1 –** Remember **K 2 –** Understand		
Learning Objectives	**This Course aims to** ▪ provide network security concepts and major issues ▪ understand basics of Cryptography and Network Security. ▪ impart network security applications ▪ understand various protocols for network security to protect against the threats in the networks. ▪ learn authentication and kerberos		

UNIT -I

Introduction: Network Security Overview: Defining Trust – Weakness and Vulnerability – Responsibilities for network security. Understanding Vulnerability- The need for Security: Risk and Vulnerability – TCP / IP Suite weakness- Buffer overflows – Spoofing Techniques. Understanding Defenses: Digital IDs – Intrusion Detection System – PC Card based solutions – Physical Security. **(16 hrs)**

UNIT - II

Applications & System Securtiy: Network Security Applications : Transport Level Security - Wireless Network Security - Electronic mail security - IP security. System Security : Intruders - Malicious Software . **(18 hrs)**

UNIT - III

Cryptography : Concepts and Techniques - Symmetric key algorithms and AES – Asymmetric key algorithms, Digital Signatures and RSA – Digital Certificates and Public key Infrastructure (PKI). **(20 hrs)**

UNIT - IV

Internet Security Protocols: Introduction – Basic concepts – SSL – TLS – SHTTP – TSP – SET – SSL Vs SET – 3D Secure Protocol – Electronic Money – Email Security – WAP security – Security in GSM – Security in 3G. **(18 hrs)**

UNIT - V

Authentication and Kerberos : Introduction – Authentication Basics – Passwords – Authentication Tools – Certificate based authentication – Biometric Authentication – Kerberos – KDC –Firewalls and Virtual Private Network : Firewalls – IP Security – VPN. **(18 hrs)**

Books for Study:

1. Gert DeLaet, Gert Schauwers, "*Network Security Fundamentals"* Published Sep 8, 2005 by Cisco Press.

2. William Stallings "*Network Security Essentials Applications and Standards* ",4th Edition - Published by Prentice Hall.

3. Atul Kahate *,"Cryptography and Network Security"* Published by Tata McGraw Hill

Book for Reference:

1. Bruce Schneier, "*Applied Cryptography Protocols, Algorithms*", John Wiley &Sons Inc 2005,Second Edition,

2. Richard E.Smith *"Internet Cryptography"* ,Addison –Wasley Professional Aug 2014.

3. Behrouz A. Forouzan, *"Cryptography and Network Security*", Tata McGraw-Hill Publishing Company Limited.2007

4. William Stallings *"Cryptography and Network Security"*, Pearson Prentice Hall, Third Edition, 2009

Web Reference:

1. http://www.williamstallings.com/Security2e.html

2. PDF : http://index- of.es/Hack/Network%20Security%20Essentials %204th %20 Edition pdf

Course Outcomes:

After studying this course, Students should be able to:

CO1: identify major issues in network security	**K1**
CO2: identify and classify different types of attacks	**K1**
CO3: explain vulnerability, threats and attack	**K2**
CO4: compare symmetric and asymmetric encryption systems and their vulnerability to attack.	**K2**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	S	N	W	M	M	N	S
CO2	S	S	S	M	N	M	M	S	N	S
CO3	M	S	S	M	N	M	S	M	N	S
CO4	S	S	M	S	N	W	S	M	N	S

S-Strongly Correlating   M-Moderately Correlating

W-Weakly Correlating   N-No Correlation

Prepared by	Mr.C.Yogaraj
Verified by	Mrs.V.Priya

Course Code & Title	CEC-III WEB APPLICATION ARCHITECTURE		
MSc	**Semester : IV**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K1 –** Remember **K3 –** Apply **K6 –** Create		
Learning Objectives	**This Course aims to** ■ acquire knowledge in web application architecture. ■ introduce a bird side view of Rails and Ruby ■ provide the idea to develop dynamic database driven web sites using HTML, CSS. ■ enrich the web application with the help of Client side scripting languages. ■ introduce Ajax		

UNIT -I

Introduction to Web Application – Application Architectures – Design Patterns – Development environment **(18 hrs)**

UNIT- II

Rails overview – First Rails App – Version Control – Git on rails – Relational Databases – Databases in rails – The active record design pattern **(20 hrs)**

UNIT- III

Ruby: Classes and Inheritance – Objects and variables - Strings, Regular Expressions and Symbols - Expressions and Control Structures - Collections, Blocks and Iterators **(16 hrs)**

UNIT- IV

Middleware Technologies- HTTP introduction – MVC Design Pattern – Rails controllers – Request and Response handling **(21 hrs)**

UNIT- V:

Presentation and User Interface: HTML structure-tags-forms – Dynamic content – CSS – introduction to javascript –Introduction to jQuery – introduction to Ajax. **(15 hrs)**

Books for Study:

1. David Flanagan & Yukihiro Matsumoto, "*The Ruby Programming Language*", O'Reilly.,ISBN-13: 978-0596516178 ISBN-10: 0596516177.

Books for Reference:

1. Michel Hartl, "***Rubyon on Rails Tutorial (Learn Web Developmet with Rails***", Addison-Wesley Professional,, ISBN-978-0134077703

Web Reference:

1. http://railstutorial.org
2. http://guides.rubyonrails.org

Course Outcomes:

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

CO1: analyze the architecture of web applications	**K3**
CO2: design web pages using HTML and CSS	**K6**
CO3: identify appropriate programming languages to develop the application logic in both client and server.	**K1**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	S	M	S	S
CO2	M	M	S	S	N	M	M	S	S	S
CO3	M	W	S	M	N	M	S	M	M	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.S.Murugan
Verified by	Dr.K.Mani

Course Code & Title	CEC-IV SOFTWARE PROJECT MANAGEMENT			
MSc	Semester : IV	Credits : 4		Hrs:6
Cognitive Level	K 1 – Remember K 2 – Understand K 5 – Evaluate			
Learning Objectives	This Course aims to - study the importance and evolution of software project management - understand the framework and software architecture - study the importance and evolution of software project management - know the process planning and process automation - learn risk management concepts			

UNIT-I

Software Management Renaissance: Conventional Software Management – Evolution of Software Economics - Improving Software Economics - The Old Way and the New. **(18 hrs)**

UNIT-II

A Software Management Project Management Process Framework: Life-Cycle Phases - Artifacts of the Process - Model-Based Software Architectures - Work Flows of the Process - Check Points of the Process. **(18 hrs)**

UNIT-III

Software Management Disciplines: Iterative Process Planning – Project Organizations and Responsibilities - Process Automation. **(16 hrs)**

UNIT-IV

Software Management Disciplines: Project Control and Process Instrumentation - Tailoring the Process. **(17 hrs)**

UNIT-V

Risk Management: Introduction - Risk - Categories of risk - A framework for dealing with risk - Risk Identification - Risk assessment - Risk planning - Risk management - Evaluating risks to schedule - Applying the PERT technique - Monte Carlo simulation - Critical chain concepts.

(19 hrs)

Books for Study:

1. Walker Royce, *"Software Project Management"*, Pearson Education.,ISBN:0-201-309580.
2. Bob Hughes & Mike Cotterell, "*Software project Management*", McGraw Hill Publications, ISBN-13 978-0-07—712279-9.Fourth edition-2008
3. Joel Henry, "*Software Project Management"*, Pearson education, ISBN9780321223425.
4. Roger S. Pressman, "*Software Engineering"*, TMH Publications, ISBN-13: 978-0078022128. ISBN-10:0078022126, Fourth edition,1998

Web Reference:

1. https://www.cornerstoneondemand.com/online-reference-guide-project-management

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

CO1: explain conventional software project management and software economica	**K2**
CO2: evaluate project management framework	**K5**
CO3: describe process planning, project organization and process automation	**K1**
CO4: identify various risk management policies	**K1**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	M	M	M	N	W	M	M	N	S
CO2	M	M	S	M	N	M	M	S	N	S
CO3	M	W	S	M	N	M	S	M	N	S
CO4	W	S	M	S	N	W	S	M	N	S

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W-Weakly Correlating   N-No Correlation

Prepared by	Dr.S.Murugan
Verified by	Dr.M.Muralidharan

Course Code & Title	CEC-IV SOFTWARE FORENSICS		
MSc	**Semester : IV**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K1**– Remember **K3** – Apply **K4** – Analyze		
Learning Objectives	**This Course aims to** ▪ study the fundamentals of software forensics. ▪ learn types of computer forensics ▪ learn about data recovery methods. ▪ provide electronic evidence. ▪ identify the threats in computer forensics.		

UNIT- I

Ethical Hacking - Foundation for Ethical Hacking-Ethical Hacking in Motion-Hacking Network Hosts-Hacking Operating Systems-Hacking Applications.   **(20 hrs)**

UNIT- II

Types of Computer Forensics - Computer   Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services.   **(16 hrs)**

UNIT -III

Data Recovery - Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.   **(21 hrs)**

UNIT- IV

Electronic Evidence - Discover of Electronic Evidence –Identification of Data – Reconstructing Past Events – Networks.   **(15 hrs)**

UNIT- V

Threats - Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues –Tactics of Private Companies.   **(18 hrs)**

Books for Study:

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

Reference Books:

1. Chad Steel, *"Windows Forensics",* Wiley India, 2006.

2. Majid Yar, *"Cybercrime and Society",* Sage Publications, 2006.
3. Robert M Slade, *"Software Forensics"*, Tata McGrawHill, 2004.

Web Reference:
1. https://www.tutorialspoint.com/forensics

Course Outcomes:

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

CO1: identify hackers and normal users.	**K1**
CO2: apply the principles of computer forensics for security	**K3**
CO3: manage threats and the tactics	**K4**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	S	N	S	S	M	N	S
CO2	S	S	W	S	N	S	S	S	N	S
CO3	S	S	S	S	N	S	S	M	N	S

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Prepared by	Dr.S.Murugan
Verified by	Dr.D.Jayachitra

Course Code & Title	CEC-IV SOFTWARE TESTING		
MSc	**Semester : IV**	**Credits : 4**	**Hrs:6**
Cognitive Level	**K2 –** Understand **K6 –** Create		

Learning Objectives	This Course aims to
	  ▪ introduce the basic concepts of testing and its types
	  ▪ study the software testing process and its methodology.
	  ▪ Learn integration testing and its types
	  ▪ Learn regression testing and its types
	  ▪ acquire knowledge in architecture for automation		

UNIT-I

Principles of Testing: Context of Testing in Producing Software – Principles of Testing – Dijkstra's Doctrine – A Test in Time –Test the Tests First- The Pesticide Paradox –The Ends of Pendulum – Men in Black – Automation Syndrome. **Software Development Le Cycle Models** Phases of Software Project – Quality, Quality Assurance and Quality Control – Testing, Verification and Validation – Process model to Represent Different Phases –Life   cycle models –Comparison of Various Life Cycle Models. (Chapters 1,2)   **(18 hrs)**

UNIT-II

White Box Testing: Classification of White Box Testing – Static testing – Static Testing by Humans – Methods of Static Testing - Static Analysis Tools – Code Review Checklist - Structural Testing – Unit/Code testing – Code Coverage Testing – Code Complexity Testing – Challenges in White Box Testing. **Black Box Testing** Need for Black Box Testing – Techniques for Effective Black box testing - Requirements Based Testing – Positive and Negative Testing – Boundary Value Analysis – Decision Tables – Equivalence Partioning – State Based or Graph Based Testing – Compatibility Testing – User Documentation Testing – Domain Testing. (Chapters 3,4)   **(18 hrs)**

UNIT-III

Integration Testing: Integration Testing - Integration Testing as a Type of Testing – Top- Down Integration – Bottom-Up Integration – Bi-directional Integration – System Integration – Choosing Integration Method – Integration Testing as a Phase of Testing – Scenario Testing – Defect Bash . **System And Acceptance Testing** System Testing Overview – Need for System Testing - Functional Versus Non-functional System Testing –Design/ Architecture Verification – Business Vertical Testing- Deployment Testing – Beta Testing – Certification, Standards and Testing for Compliance – Non Functional Testing – Setting up the Configuration – Scalability Testing – Reliability testing – Stress Testing – Interoperability Testing – Acceptance Testing –

Acceptance Criteria – Selecting Test Cases for Acceptance Testing – Executing Acceptance Tests. (Chapters 5,6)   **(19 hrs)**

UNIT-IV

Performance Testing: Introduction – Factors governing Performance Testing – Methodology for Performance Testing – Collecting Requirements – Writing Test Cases – Automating Performance Test Cases – Executing Performance Test Cases – Analyzing the Performance Test Results – Performance Tuning – Performance Benchmarking – Capacity Planning – Tools for Performance Testing. **Regression Testing** Need for Regression Testing - Types of Regression Testing – Regression Testing Phase- Method for Conducting Regression Testing- Performing an Initial Smoke or Sanity Test – Understanding the criteria for selecting the test cases – Classifying Test Cases – Methodology for Selecting the Test Cases – Resetting the Test Cases for Regression Testing – Results of Regression Testing – Best practices in Regression Testing. (Chapters 7,8)   **(20 hrs)**

UNIT-V

S/W Test Automation: Introduction – Terms Used in Automation -Skills Needed for Automation- Scope of Automation- Design and Architecture for Automation-Generic Requirements for Test Tool/Framework-Process Model for Automation –Selecting a Test Tool- Criteria for Selecting a Test Tool –Steps for Tool Selection and Deployment-Automation for Extreme Programming Model- Challenges in Automation. (Chapter 16)   **(15 hrs)**

Book for Study:

1. Srinivasan Desikan and Gopalswamy Ramesh, "*Software Testing: Principles and Practices",* Pearson Education Publication,ISBN:9788177581218.

Books for Reference:

1. Ron Patton, "*Software Testing*", 2nd Edition, Pearson education , 2004, ISBN: 0672327988; ISBN-13: 978067232798

2. Ren Rajani, Pradeep Oak, "*Software testing – effective methods tools, techniques*" TMH, 2004,ISBN 9780070583528.

Course Outcomes:

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

CO1: describe the testing process and its methodology   **K2**
CO2: identify and apply the various types of testing in real time problem   **K2**
CO3: design test cases   **K5**
CO4: design architecture for automation using tools.   **K5**

Mapping of Cos with PSOs & Pos:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	S	S	N	W	S	S	W	S
CO2	S	S	S	S	N	M	S	S	W	S
CO3	S	S	M	S	N	M	S	S	W	M
CO4	S	M	W	S	N	W	S	S	W	S

S-Strongly Correlating   M-Moderately Correlating
W-Weakly Correlating   N-No Correlation

Prepared by	Dr.D.Jayachitra
Verified by	Mrs.V.Priya