SRI RAMAKRISHNA COLLEGE OF ARTS AND SCIENCE

(An Autonomous Institution)

Nava India, Avinashi Road, Coimbatore

Scheme of Examination

(For the students admitted during the academic year 2020 - 2021 and onwards)

Under

Choice Based Credit System (CBCS)

&Learning Outcomes-Based Curriculum Framework (LOCF)

POSTGRADUATE PROGRAMMES

(Except MBA)

Programme:MSc(Computer Science)   **Branch: PG – CS**

Course Code	Study Components and Course Title	CIA	Comprehensive Exam Online	Comprehensive Exam Descriptive Theory	Comprehensive Exam Total	Total	Credit
I SEMESTER							
20MCS101	CORE I –Cyber Security	40	10	50	60	100	4
20MCS102	CORE II –Data Structures and Algorithms with lab	40	-	-	60	100	5
20MCS103	CORE III – Advanced RDBMS with lab	40	-	-	60	100	5
20MCS104	CORE – IV - Advanced Operating Systems	40	10	50	60	100	4
20MCSE01/20MCSE02/20MCSE03	**DS Elective –I**	40	10	50	60	100	4
II SEMESTER							
20MCSC01	CORE – V - AI & Expert Systems	40	10	50	60	100	4
20MITC01	CORE – VI - Advanced Software Engineering	40	10	50	60	100	4
20MCSC02	CORE – VII - Data Analytics and Open	40	-	-	60	100	5

	Source Tools Lab						
20MITC02	CORE – VII – Network Security	40	10	50	60	100	4
20MCSC03	CORE – IX- Robotic Process Automation Design and Development with Lab	40	-	-	60	100	5
20MCSE04 /20MCSE05/ 20MCSE06	**DS Elective – II**	40	10	50	60	100	4
	MACE/ACE				100	100@	2$
	Mandatory Non-CGPA **(Summer Project-1 /Internship/Teaching Assignment)**	100				100	1$
	Mandatory Non-CGPA Co/Extra CC/VE Literature Survey	100				100	1$
	Mini Project(will announce summer project)	-	-	-	-	-	-
III SEMESTER							
20MITC03	CORE – X Cloud Computing	40	10	50	60	100	4
20MCSM301	CORE – XI Online MOOC Course: SWAYAM	40	10	50	60	100	4
20MCSC04	CORE – XII Machine Learning and Python Lab	40	10	50	60	100	5
	IDC / **Generic Elective** – Self-Study paper - Business Intelligence	-	-	-	-	100	4
20MCSE07/ 20MCSE08/ 20MCSE09	**DSElective –III**	40	10	50	60	100	4
	Mandatory Non-CGPA	100				100	2$

	SEC / MACE @						
20MCS301	CORE – XIV - Mini Project(Summer)	80	-	-	20	100	3
	IV SEMESTER						
20MITC04	CORE – XV- Software Testing & Quality Assurance	40	10	50	60	100	4
	DS Elective –IV (Self-Study-Research) Spoken Tutorial	40	10	50	60	100	4
20MCS401	Internship / Capstone Project	120			80	200	10

$ Extra credit courses

@ Comprehensive Examinations only.

**** Not included in Total Marks and CGPA Calculation.**

@@ MOOC Course-Minimum of 30 Hours from recognizedMOOC portal like SWAYAM, Coursera, etc. Assessment with Score/Credit and Certificate is mandatory.

Abstract of
Scheme of Examination

(For the students admitted during the academic year 2020 - 2021 and onwards)

Subject	Papers	Credit	Total credits	marks	Total marks
Core (including Project work & Viva voce)			70		1800
DS Elective	4	4	16	100	300
IDC / **Generic Elective**	1	4	4	100	100
Mandatory Non-CGPA **AEC / MACE**	1	2	2#	100	100#
Mandatory Non-CGPA **SEC / MACE**	1	2	2#	100	100#
Mandatory Non-CGPA **(Summer Project-1)**	1	1	1#	100	100#
Mandatory Non-CGPA **(Co/Extra Curricular/VE)**	1	1	1#	100	100#
Total			90 + (6 Extra Credits)		2200 + (400#)

Note:
- **Two core courses are mandatory in MOOC Portal**
- **Minimum 20 and Maximum 24 Credit/Semester**

List of Elective Papers/ DSE (Can choose any one of the paper as electives)		
	Course Code	Title
ElectivesTrack -1 (SLET/NET)- / **DSE-I**	20MCSE01	Research Methodology
	20MCSE02	Digital Marketing
	20MCSE03	Theory of Computation and Compilers
ElectivesTrack -2 (Research)/ **DSE-II**	20MCSE04	Programming Languages and Computer Graphics
	20MCSE05	Business Intelligence
	20MITE01	Block chain Technology
	20MITE02	Data Communication and Computer Networks
ElectivesTrack -3 (Entrepreneurship & Innovation) /	20MCSE06	Information Retrieval
	20MCSE07	Argument Reality and Virtual Reality

DSE-III	20MITE03	Bioinformatics
	20MITE04	Internet of Things

Syllabus Coordinator
(Dr Hemalatha M)

BOS-Chairman/Chairperson
(Dr Maria Priscilla G)

Academic Council – Member Secretary

Outline of Learning Outcomes-Based Curriculum Framework (LOCF)

1. Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. Elective Course: Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure tosome other discipline/subject/domain or nurtures the candidate's proficiency/skill iscalled an Elective Course.

2.1 Discipline Specific Elective (DSE) Course: Elective courses may be offered by the**main discipline/subject of study** is referred to as Discipline Specific Elective. TheInstitute may also offer discipline related Elective courses ofinterdisciplinary nature (to be offered by main discipline/subject of study).

2.2 Dissertation/Project: An elective course designed to acquire special/advancedknowledge, such as supplement study/support study to a project work, and acandidate studies such a course on his own with an advisory support by ateacher/faculty member is called dissertation/project.

2.3 Generic Elective (GE) Course: An elective course chosen generally from an**unrelated discipline/subject**, with an intention to seek exposure is called a GenericElective.

P.S.: A core course offered in a discipline/subject may be treated as an elective byother discipline/subject and vice versa and such electives may also be referred to asGeneric Elective.

3. Ability Enhancement Courses (AEC): The Ability Enhancement (AE) Courses may beof two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; i. Environmental Science and ii. English/MIL Communication.

These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

3.1 Ability Enhancement Compulsory Courses (AECC): Environmental Science, EnglishCommunication/ Media and Information Literacy (MIL) Communication.

3.2 Skill Enhancement Courses (SEC): These courses may be chosen from a pool ofcourses designed to provide value-based and/or skill-based knowledge.

Introducing Research Component in Under-Graduate Courses

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A Project/Dissertationwork would be of 6 credits. A Project/Dissertation work may be given in lieu of a disciplinespecific elective paper.

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SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCS101	CYBER SECURITY	DSC	30	5	40	5	A

This course aims at facilitating the students to understand the various security issues, solution and its operations. The course helps the students to understand the competetive advantages of Cyber Security

DEPARTMENT OFFERINGPREAMBLE / COURSE OBJECTIVE

MSc Computer

PREREQUISTE

Higher Secondary Level –Set Theory, Logic Theory

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Able to know the concepts of security and applications of various fields of computer security	Remember
CO2	Apply criminal justice methods to cyber security and computer Vulnerabilities	Understand
CO3	Plan, implement, and evaluate various testing and ethical hacking of networks of computer systems	Apply
CO4	Analyze, and mitigate threats web security	Apply
CO5	Apply critical thinking skills to risk analysis of computer systems.	Apply

SYLLABUS

UNIT 1 : INTRODUCTION OF CYBER SECURITY: 11L HOURS

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:-Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.

UNIT 2: CYBER SECURITY VULNERABILITIES AND SAFEGUARDS   11L HOURS

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT 3: WEB SECURITY   11L HOURS

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

UNIT 4: INTRUSION DETECTION AND PREVENTION   11L HOURS

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

UNIT 5: CRYPTOGRAPHY AND NETWORK SECURITY   11L HOURS

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

TEXT BOOKS

A. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGrawHill, 2006.
B. Peter Stephenson, "Investigating Computer Crime: A Handbook for Corporate Investigations",Sept 1999.

REFERENCE BOOKS

A.Skoudis. E., Perlman. R. Counter Hack: A Step-by-Step Guide to Computer Attacks and Effective Defenses.Prentice Hall Professional Technical Reference. 2001.
B.William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.
C.Joseph M Kizza, "Computer Network Security", Springer Verlag, 2005
D.Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004

WEB RESOURCES

A. https://analyticsindiamag.com/top-10-free-resources-to-learn-cybersecurity/

B. https://thycotic.com/resources/wileys-dummies-cybersecurity
nw/?utm_expid=.SZu1hR9SR7q4dw6O3YQRUA.1&utm_referrer=https%3A%2F%2Fwww.google.com%2F

C. https://www.simplilearn.com/introduction-to-cyber-security-course?referrer=search&tag=cyber%20security

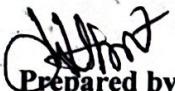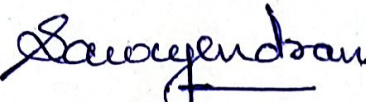## MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	M	S	S	-	-	-	-
CO2	S	S	M	M	L	-	-	-	-
CO3	S	M	M	S	L	-	-	-	-
CO4	S	L	M	S	L	-	-	-	-
CO5	S	M	S	M	L	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr.M.Hemalatha
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr.V Krishna Priya
BOS Chairman

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCS102	Data Structures and Algorithms with Lab	DSC	30	5	40	5	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to understand the various data structures, their organization and operations. The course helps the students to assess the applicability of different data structures and associated algorithms to real world problems.

DEPARTMENT OFFERING

MSc Computer
Science

PREREQUISTE

Higher Secondary Level –Set Theory, Logic Theory

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Refresh and implement abstract data types for linear data structures	Remember
CO2	Classify the different nonlinear data structures to problem solutions.	Understand
CO3	Analyze the sorting and searching techniques	Apply
CO4	Apply different design techniques	Apply
CO5	Apply the graph algorithms for finding shortest paths.	Apply

SYLLABUS

UNIT I INTRODUCTION AND BASIC DATA STRUCTURES   6 L+8P HOURS

Introduction - Basic Terminology; – Problem solving techniques and examples-Abstract Data Type (ADT)-The list ADT Arrays- Stacks and Queues: Implementation and Application, Circular Queues-Linked List-Types of list-Applications of List

1. Implementation of Linear Data Structures
   —Stack, Queue, Circular Queue using Array and Linked List
2. Implement Applications of Linear data structures-Solve real time problems

UNIT II ADVANCED DATA STRUCTURES   6L+8P HOURS

Trees: Preliminaries-Binary Tree- Tree traversals-Binary search Trees-Threaded Trees -AVL Trees-B Trees.–Implementation and Applications
   3. Implementation of Tree Operations - Binary Search Tree Operations,
   4. Implementation of BST Applications
      - Tree Traversal
      - Find the depth of the node

UNIT III SORTING AND SEARCHING   6L+8P HOURS

Searching: Overview-Types of Searching- Hashing - General idea-Hash functions Separate Chaining-Open Addressing-Rehashing-Extendible Hashing.Sorting: Overview- Internal Sorting methods-External Sorting methods-Sorting by Diminishing Increment- Heap Sort- Heaps Maintaining the Heap Property-Building a Heap- Heap sort Algorithm-Quick sort Description-Performance of quick sort-Analysis of Quick Sort.
   5. Implementation of Sorting Methods: Internal Sorting and External Sorting.
   6. Implementation of Searching Techniques
   *Compare the time and memory consumption for each method.

UNIT IV ALGORITHM DESIGN TECHNIQUES   6L+8P HOURS

The role of algorithms in computing-Getting Started-Growth of functions. Divide and conquer dynamic programming-Greedy Algorithm – Backtracking.
   7. Implementation of greedy algorithm
   8. Implementation of backtracking algorithm.

UNIT V GRAPH ALGORITHMS6L+8P HOURS

Elementary Graph Algorithms-Graph Traversal-BFS and DFS -Minimum Spanning Trees-Single-source shortest paths-All pairs shortest paths.
   9. Implemention of graph operations –Insertion, Deletion,updation.
   10. Implementation of graph algorithms-
      -Graph Traversals
      -Shortest path Algorithms
      -Minimum Spanning Tree Algorithms

TEXT BOOKS

A. G.A.V.PAI., "Data Structures and Algorithms-Concepts,Techniques and Applications",- TataMcGraw-HillPublishing Company,NewDelhi,6th reprint 2011.

REFERENCE BOOKS

A. Ellis Horrowitz et al.,"Fundamentals of Data Structures in C", Silicon press, Second edition, 2017.
B. Thomas.HCoremen, CharlessS.Leiserson, "Introduction to Algorithms",PHI,MIT Press,Third Edition,2009.
C. Jean Paul Tremblay, Sorenson; An Introduction to Data Structures with Applications,

Tata McGrawHill, 2nd Edition (2016).

A. file:///C:/Users/ADLAB/Downloads/Fundamentals%20Of%20Data%20Structures%20%20Ellis%20Horowitz%20_%20Sartaj%20Sahni.pdf

B. https://www.slideshare.net/nirajju/fundamentals-of-data-structures-7794245

C. http://apachetechnology.in/ati/www/KC/dw/Horowitz%20Sahni%20-%20Data%20Structure.pdf

MAPPING WITH PROGRAM OUTCOMES

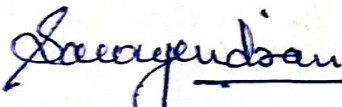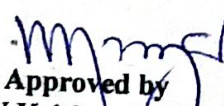| COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	S	S	M	L	-	-	-	-
CO2	S	L	S	M	M	-	-	-	-
CO3	S	S	S	M	M	-	-	-	-
CO4	S	S	S	M	M	-	-	-	-
CO5	S	S	S	M	M	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr.A.Jeyalakshmi
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr.V Krishna Priya
BOS Chairman

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCS103	Advanced RDBMS with lab	DSC	30	5	40	5	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to understand the various kinds of Database and operations. The course helps the students to emphasis on how to organize, maintain and retrieve - efficiently, and effectively

DEPARTMENT OFFERING

MSc Computer
Science

PREREQUISTE

Higher Secondary Level – Basic of Database

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	To learn the fundamentals of database in centralized environments	Remember
CO2	To study SQL and relational database design	Understand
CO3	To provide a strong formal foundation in database concepts, technology and practice.	Apply
CO4	To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures	Apply
CO5	Understand how mongo DB works with its various functions	Apply

SYLLABUS

UNIT I INTRODUCTION TO RELATIONAL DATABASES   **6 L+8P HOURS**

Database-System Applications – Purpose of Database systems – view of Data – Database languages – Relational Design – Database Design – Data Storage and Querying – Transaction Management – Database Architecture- Database Users and Administrators - Structure of Relational Databases- Database schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations.
Overview of SQL Query language – SQL data Definition – Basic structure of SQL queries – Set Operations – Null values – Aggregate Functions – Nested Subqueries – Modification of the Database

1. Implementation of queries using DDL and DML commands.
2. Implementation of different types of functions

UNIT II ADVANCED SQL
8L+8P HOURS

Join Expressions – views – Transactions – Integrity Constraints – Sql Data Types and Schemas
Authorization– Functions and procedures– Triggers – OLAP –
Relational Algebra – The tuple Relational Calculus – The Domain Relational Calculus

3. Write a Database trigger with insert/update/delete statements
4. Implement the concept of Views, Functions, Triggers in Databases

UNIT III DATABASE DESIGN
8L+8P HOURS

Overview of Design Process – The Entity-Relationship model – constraints – removing redundancy
attributes in entity sets – Entity-Relationship Diagrams – Reduction of relational schemas – Extended E-R
Features.

5. Database design using E-R model using any open source

UNIT IV NORMALIZATION
8L+8P HOURS

Features of Good Relational Designs – Atomic Domains and First Normal form – Decomposition
using functional dependencies – Functional dependency theory – Algorithms for Decomposition –
Decomposition using Multivalued Dependencies – Database Design Process– Application Design
and Development – Application Program and user Interfaces – Web Fundamentals – Servlets and
JSP – Application Architectures

6. Implementation of Database Navigation process using Java
7. Concept based on Normalization checking in database

UNIT V MONGO DATABASES
8L+8P HOURS

Mongo DB – Overview- Advantages – Mongo DB Environment – MongoDB Data
Modeling – Normalized Data model – Mongo DB Create Databases – use command – The
drop database method – The create collection() method- The drop method () – Mongo DB
Datatypes – Insert document – Query document – Update Document – Delete Document
– Sort records – Indexing – Create index() method – the aggregate method() - sharding
method- backup method in mongo DB

8. Design and Implement any 5 query using MongoDB
9. Implement aggregation and indexing with suitable example using MongoDB.
10. Create collection names in MongoDB

TEXT BOOKS

A. Database system concepts ,Abraham Silberschatz Henry F.korth,S.Sudarshan, 6 Edition, Tata
McGraw Hill Education 2013
B. MongoDB –The Definitive Guide, Second Edition ,KristinaOreilly Publication,2013(unit 5)

REFERENCE BOOKS

A. Ellis Horowitz et al,"Fundamentals of Data Structures in C", Silicon press, Second edition, 2017.

WEB RESOURCES

A. https://www.coursera.org/courses?query=relational%20database

B. https://www.tutorialspoint.com/mongodb/mongodb_overview.htm

C. https://swayam.gov.in/nd1_noc19_cs46/
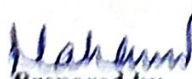
MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	L	M	M				
CO2	S	S	L	L	M				
CO3	S	M	S	L	L				
CO4	S	M	S	L	L				
CO5	S	M	S	L	L				

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr.S.B.Mahalakshmi
Course Co-ordinator

Verified by
Dr.Anna Sara Vijendran
Dean- School of Computing

Approved by
Dr.V Krishna Priya
BOS Chairman

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCS104	ADVANCED OPERATING SYSTEMS	DSC	50	5	-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to understand IPC problems and File caching schemes and to Gain knowledge in Distributed OS and Unix OS, also to be familiar with Linux operating system

DEPARTMENT OFFERING

MSc Computer
Science

PREREQUISITE

Higher Secondary Level – Basic of Computer Systems and Hardware Operating sytems

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	To Know about the Operating System Various Basic Concept	Remember
CO2	Develop solutions for problems using Inter Process Communication concepts	Understand
CO3	Apply the RPC mechanism in File System	Apply
CO4	To Know about the Linux Operating System	Understand
CO5	Demonstrate usage of process control in UNIX	Apply

SYLLABUS

UNIT I OPERATING SYSTEM   11 HOURS

Introduction – Evolution of Operating systems – Serial, Simple Batch, Mutiprogrammed Batch, Timesharing, Distributed and Real time operating systems – Computer Hardware review – Interrupts - Operating System Concepts – Processes – Model – Creation - Termination – Process Hierarchy – Process States – Implementation of Processes – Threads – Thread Usage – Implementation of Threads in User Space and Kernel space – Multi threading

UNIT II   INTER PROCESS COMMUNICATION   **11 HOURS**

Inter Process Communication – Race condition – Critical Region – Mutual Exclusion – Sleep and wakeup – Semaphores – Mutexes – Message Passing. Classical IPC Problems : The Dining Philosophers Problem – The Readers and Writers Problem – The Sleeping Barber Problem – Producer Consumer problem.

UNIT III   DISTRIBUTED OPERATING SYSTEM   **11 HOURS**

Distributed Operating System Concepts & Design - Fundamentals -Remote Procedure Calls - The RPC Model - Transparency of RPC - Implementing RPC mechanism - Stub Generation - RPC Messages - Server Management - Parameter-Passing Semantics - Call Semantics - communication Protocol for RPCs.- Distributed File System: Introduction - Desirable Features - File Models - File - Accessing Models - File Sharing Semantics - File Caching Schemes - File Replication.

UNIT IV   LINUX   **11 HOURS**

LINUX : Architecture of Unix Operating System – Introduction to system concepts – kernel data structures – Internal representation of Files – Inodes – Algorithms for allocation and Releasing inode - Structure of a Regular file – Directories – Super block – Algorithm for assigning new Inode and freeing Inode - Allocation of Disk blocks - Process states and transition – Layout of system memory - The context of a Process.

UNIT V PROCESS CONTROL IN UNIX   **11 HOURS**

Process Control in Unix – Algorithm for Fork system call – Algorithm for Exit – Algorithm for Wait – Algorithm for Exec – Uses of Exec – Algorithm for Booting the Unix system – Algorithm for Init process - Process scheduling algorithm – Example of Process scheduling in Unix. Example C programs by using fork, exec, wait, exit system calls.

TEXT BOOKS

1. Andrew S.Tanenbaum,"Modern Operating Systems", PHI/Pearson Education Asia, Second Edition, 2001

REFERENCE BOOKS

1. Pradeep K. Sinha, "Distributed operating systems concepts and design" ,Prentice - Hall of India, 2002
2. Maurice J. Bach, "The Design of the Unix Operating System", Prentice-Hall of India, 1998.
3. William Stallings, "Operating Systems", Prentice Hall of India, Second Edition, 2000

WEB RESOURCES

A. https://www.udacity.com/course/advanced-operating-systems--ud189

B. https://www.researchgate.net/publication/299535414 Illustrated Notes for Advanced Operating Systems

C. https://www.researchgate.net/publication/299535414 Illustrated Notes for Advanced Operating Systems

MAPPING WITH PROGRAM OUTCOMES
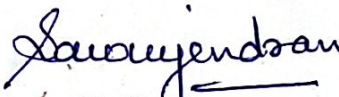
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	S	L	L	M	-	-	-	-
CO2	S	S	M	M	L	-	-	-	-
CO3	S	M	S	L	M	-	-	-	-
CO4	S	S	S	M	M	-	-	-	-
CO5	M	S	M	S	L	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr.A.Jeyalakshmi
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr.V Krishna Priya
BOS Chairman

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSE101	RESEARCH METHODOLOGY	DSC	50	5	-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to impart education in the foundational methods and techniques of Research methods and report writing .The course helps the students gain familiarity with a phenomenon or to achieve new insights into research in computer science

DEPARTMENT OFFERING

MSc Computer Science

PREREQUISTE

Higher Secondary Level –Set Theory, Logic Theory

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Develop various kinds of research, objectives of doing research, research process, research designs and sampling.	Remember
CO2	Have basic knowledge on qualitative research techniques	Understand
CO3	Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis	Understand
CO4	Implement data analysis-and hypothesis testing procedures	Apply
CO5	Gain knowledge in IPR,Copyrights and citations	Apply

SYLLABUS

UNIT I OVER VIEW OF RESEARCH METHODOLOGY   11 HOURS

Meaning of Research, Characteristics and Types of Research Process. Formulation of Research objectives, Formulation of Hypotheses, Types of Hypotheses, Methods of testing Hypotheses - Research plan and its components, Methods of Research (Survey, Observation, Case study, experimental, historical and comparative methods) Concept of Sampling Design, types and Steps in Sample Design.

UNIT II DATA COLLECTION, PROCESSING AND ITS ANALYSIS   11 HOURS

Methods of Primary data collection.Collection of data through questionnaires, Schedule.Collection of Secondary data.Processing Operations, Elements of Analysis.Use of library, research books, monograph, periodicals, abstract, documents, review of relevant literature.

Elements in research methodology: Identification and formation of researchproblem (Hypothesis). Research design: CRD (Completely Randomized Design), RBD (Randomized Block Design), and LSD (Latin Square Design). Scientific database: Science Direct and DOAJ (Direct *Open Access Journals*)

UNIT III   FUNCTIONS OF SEVERAL VARIABLES   11 HOURS

Scientific body in research: Ethical, legal, social and scientific issues in research. A brief idea about the funding agencies such as DST (Department of Science and Technology), DBT (*Department of Biotechnology*), ICMR (Indian Council of Medical Research), CSIR (Council of Scientific & Industrial Research) and UGC (*University Grants Commission*). Role of IPR (Intellectual Property Rights) in Research and Development.

Measurement and scaling Technique: Measurement in research, Measurement Scales, Error sources. Test of sound measurement. Technique of developing measurement tools.Meaning of Scaling and its bases of classification, Scaling techniques.

UNIT IV INTERPRETATION AND REPORT WRITING   11 HOURS

Writing of Research Proposal, Report and Research Paper: Meaning and types, Stages in preparation, Characteristics, Structure, Documentation: Footnotes and Bibliography - Editing the final draft-Evaluating the final draft- Checklist for a good proposal/report/research paper, online submission and e-submission. Basic knowledge of organizing conferences, symposia, workshop, exhibition etc.

UNIT V APPLICATION OF RESULTS AND ETHICS   11 HOURS

Environmental impacts - Ethical issues - ethical committees - Commercialization – Copy right – royalty - Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability

TEXT BOOKS

1. Research Methodology-CRKothari.
2. Research Methodology- C.H. Chaudhary, RBSA Publication.
3. Research Methodology- G.R. Basotia and K.K.Sharma.
4. Statistics By T.R Jain & S C Aggarwal, VK (India) Enterprises, Darya Ganj (New Delhi)

REFERENCE BOOKS

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A

Process of Inquiry, Allyn and Bacon.

2. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.
3. Coley, S.M. and Scheinberg, C. A., 1990, "Proposal Writing", Sage Publications.
4. Day, R.A., 1992.How to Write and Publish a Scientific Paper, Cambridge University Press.
5. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
6. Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, Prentice Hall.

WEB RESOURCES

A. http://edutechwiki.unige.ch/en/Research_methodology_resources

B. https://lecturenotes.in/m/21513-research-methodology-

C. https://www.easybiologyclass.com/research-methodology-free-lecture-notes-online-tutorials-ppts-mcqs/
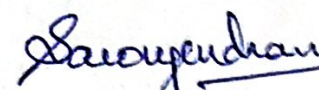
MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	POS	PO9
CO1	S	M	S	M	M	-	-	-	-
CO2	S	S	M	M	M	-	-	-	-
CO3	S	S	M	M	M	-	-	-	-
CO4	S	S	L	M	M	-	-	-	-
CO5	S	S	M	M	M	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr.M.Hemalatha
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr.V Krishna Priya
BOS Chairman

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSE102	DIGITAL MARKETING	DSC	80	8	-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to inculcate the skills of digital marketing among students and to build conceptual foundation of Digital Marketing. Also to develop the students' skills to plan, implement and monitor digital marketing campaigns in Globalized Environment

DEPARTMENT OFFERING

MSc

ComputerScience

PREREQUISTE

Higher Secondary Level – Basic of systems

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successaful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Gain Knowledge in Digital Marketingtechnologies	Remember
CO2	Explore about search engine optimization and its techniques	Apply
CO3	Have adequate knowledge in various marketing campaigns	Understand
CO4	Analyze campaigns and preparing reports	Understand
CO5	Apply marketing strategies through online	Apply

SYLLABUS

UNIT I DIGITAL MARKETING   11 HOURS

Introduction to Digital Marketing and its Significance -Traditional Marketing Vs Digital Marketing - Digital Marketing Process-Website Planning and Development : Types of websites - Website Planning and Development - Keywords-Understanding Domain and Webhosting - Building Website/Blog using CMS WordPress- Using WordPress Plug-ins

UNIT II SEARCH ENGINE OPTIMIZATION
11 HOURS

Introduction to Search Engine Optimization -Keyword P lanner Tools - On Page SEO Techniques-Indexing and Key Word Placement - On Page SEO Techniques - Content Optimization - On Page SEO : Yoast SEO Plug-in - Off –Page SEO Techniques

UNIT III EMAIL MARKETING
11 HOURS

Email Marketing- Introduction and Significance - Designing e-mail marketing campaigns using Mail Chimp- Building E-mail List and Signup Forms - Email Marketing Strategy and Monitoring - Email –Automization - Pay Per Click Advertising: Introduction- Pay Per Click Advertising: Google Adword - Types of Bidding strategies

UNIT IV MONITORING VIDEO CAMPAIGNS
11 HOURS

Designing and Monitoring search campaigns - Designing and Monitoring Display campaigns - Designing and Monitoring Video campaigns - Designing and Monitoring Universal App Campaigns - Google Analytics : Introduction and Significance - Google Analytics Interface and Setup - Understanding Goals and Conversions- Monitoring Traffic Behavior and preparing Reports - Social Media Marketing : Introduction and Significance

UNIT V FACEBOOK MARKETING
11 HOURS

Facebook Marketing : Introduction Types of Various Ad Formats - Setting up Facebook Advertising Account - Understanding Facebook Audience and its Types - Designing Facebook Advertising Campaigns - Working with Facebook Pixel - Twitter Marketing: Basics - Designing Twitter Advertising Campaigns - Introduction to LinkedIn Marketing - Developing digital marketing strategy in Integration form

TEXT BOOKS

1. Digital Marketing by Seema Gupta Hill ,First edition -2017

2. Swayam online – Digital Marketing   by Dr. Tejinderpal Singh

REFERENCE BOOKS

1. Understanding Digital marketing - Marketing Strategies for Engaging the Digital Generation, Damian Ryan 4th edition 2019

2. Marketing 4.0 – Moving from traditional to digital ,Philip Kotler, first edition, 2019

WEB RESOURCES

A. https://www.classcentral.com/course/swayam-digital-marketing-14006

B. https://www.hubspot.com/digital-marketing

C. https://d20vrrgs8k4bvw.cloudfront.net/documents/en-US/DMND+Syllabus+(2).pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	M	M	L	M	S	-	-	-	-
CO2	S	M	S	M	S	-	-	-	-
CO3	S	M	L	S	S	-	-	-	-
CO4	S	M	S	S	M	-	-	-	-
CO5	S	M	L	S	M	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr.S B Mahalakshmi
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr.V Krishna Priya
BOS Chairman

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSE103	THEORY OF COMPUTATION	DSC	50	5	-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to Familiarize the theory of computation in the concept of context free language, to identify the Runtime Storage organization and make use of Code Optimization in computer science

DEPARTMENT OFFERING

MSc Computer
Science

PREREQUISTE

Higher Secondary Level –Set Theory, Logic Theory

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Able to know Theory of Computation and Language Models	Remember
CO2	Analyse the context free and turning machines	Understand
CO3	Classifying complexity of the problems	Understand
CO4	Analyze the run time storage organization	Apply
CO5	Apply the code optimization approaches	Apply

SYLLABUS

UNIT I THEORY OF COMPUTATION   10 HOURS

Theory of Computation: Formal Language, Non-Computational Problems, Diagonal Argument, Russels's Paradox.
Regular Language Models: Deterministic Finite Automaton (DFA), Non-Deterministic Finite Automaton (NDFA), Equivalence of DFA and NDFA, Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, Non-Regular Languages, Lexical Analysis.

UNIT II   CONTEXT FREE LANGUAGE

12 HOURS

Context Free Language: Pushdown Automaton (PDA), Non-Deterministic Pushdown Automaton (NPDA), Context Free Grammar, Chomsky Normal Form, Greibach Normal Form, Ambiguity, Parse Tree Representation of Derivation Trees, Equivalence of PDA's and Context Free Grammars; Properties of Context Free Language.

Turing Machines (TM): Standard Turing Machine and its Variations; Universal Turing Machines, Models of Computation and Church-Turing Thesis; Recursive and Recursively-Enumerable Languages; Context-Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages, Construction of TM for Simple Problems

UNIT III   COMPUTATIONAL COMPLEXITY

11 HOURS

Unsolvable Problem, Halting Problem, Post Correspondence Problem, Unsolvable Problems for Context-Free Languages, Measuring and Classifying Complexity, Tractable and Intractable Problems.
Syntax Analysis: Associativity, Precedence, Grammar Transformations, Top Down Parsing, Recursive Descent Predictive Parsing, LL(1) Parsing, Bottom up Parsing, LR Parser, LALR(1) Parser .

UNIT IV   RUNTIME STORAGE ORGANIZATION

11 HOURS

Semantic Analysis: Attribute Grammar, Syntax Directed Definitions, Inherited and Synthesized Attributes; Dependency Graph, Evaluation Order, S-attributed and L-attributed Definitions; Type-Checking.

Run Time System: Storage Organization, Activation Tree, Activation Record, Stack Allocation of Activation Records, Parameter Passing Mechanisms, Symbol Table.

UNIT V INTERMEDIATE CODE GENERATION

11 HOURS

Intermediate Code Generation: Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls.
Code Generation and Code Optimization: Control-flow, Data-flow Analysis, Local Optimization, Global Optimization, Loop Optimization, Peep-Hole Optimization, Instruction Scheduling.

TEXT BOOKS

1. Michael Sipser, "Introduction to the Theory of Computation", Third Edition, New Delhi, 2012.

REFERENCE BOOKS

1. Anil Maheshwari & Michiel Smid , "Introduction to Theory of Computation", Carleton University, Ottawa,Canada,2019.

WEB RESOURCES

A. https://g.co/kgs/ucauHW

B. http://www.vssut.ac.in/lecture_notes/lecture1428551440.pdf

C. http://people.math.sc.edu/mlevet/Lecture_Notes.pdf
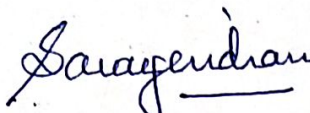
MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	S	M	S	S	-	-	-	-
CO2	S	M	S	L	L	-	-	-	-
CO3	M	S	M	L	L	-	-	-	-
CO4	S	L	S	M	M	-	-	-	-
CO5	S	S	S	M	L	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr.A.Jeyalakshmi
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr.V Krishna Priya
BOS Chairman

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSC01	AI & EXPERT SYSTEMS	DSC	55		-	4	A

This course aims at facilitating the students to understand about the basic theory of problem solving paradigms and search strategies in artificial intelligence. planning, learning, decision making process Familiar in ANN and deep learning concept

DEPARTMENT OFFERING

MScComputerScience

PREREQUISTE

Higher Secondary Level – Basic of systems

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Develop solutions for problems using various Artificial Intelligence concepts	Remember
CO2	To understand about the basic theory of problem solving paradigms and search strategies	Understand
CO3	Design applications using PROLOG for making inferences	Analyze
CO4	Demonstrate usage of planning and decision making.	Apply
CO5	Apply the concepts of learning using Tensor Flow and any other programming language	Apply

SYLLABUS

UNIT–I INTRODUCTION AND PROBLEM SOLVING   11 Hours

Definitions of AI - Intelligent Agents. Problem solving by searching: Problem-solving agents- example problems – Search for solutions Uninformed search strategies – Informed search strategies – Heuristic functions

UNIT–II LOGIC   11 Hours

Logical agents: Knowledge-based agents – The Wumpus world. Logic – Propositional logic: A very simple logic-Propositional theorem proving.First order logic: Representation – Syntax and semantics of first order logic – Using first order logic-PROLOG basicsInference in first order logic: Propositional versus first order inference–Unification and lifting – Forward chaining – Backward chaining – Resolution.

UNIT–III PLANNING AND DECISION MAKING   11 Hours

Classical Planning: Definition – Algorithms for planning as state-space search-Planning graphs – Other classical planning approaches.Making simple Decisions-Combining beliefs and desires under Uncertainty-Utility theory-Utility functions-Multi attribute utility functions-Decision networks- The value of information-Decision theoretic expert systems.

UNIT–IV LEARNING   11 Hours

Quantifying uncertainty: Acting under uncertainty - Probability basics – Bayes' Rule and its use. Probabilistic reasoning: Representing knowledge in uncertain domain-The semantics of Bayesian networks. Forms of learning - Supervised learning - Learning decision trees. Reinforcement Learning: Passive Learning – Active Learning – Learning an Action-Value function using Q Learning

UNIT–V ANN AND DEEP LEARNING   11 Hours

Introduction to artificial neural networks, Perceptron's, Multi-layer feed forward network, Application of ANN - Deep feed forward networks – Convolution Neural networks – Applications-Use of Tensor flow.

TEXT BOOKS

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India,2015.
2. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, "Artificial Intelligence", Tata McGraw Hill, Third Edition ,2009
3. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd.,2000

REFERENCE BOOKS

1. George F. Luger, "Artificial Intelligence-Structures and Strategies For Complex Problem Solving", Pearson Education / PHI,2002
2. David L. Poole, Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press,2010.
3. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning"A,An MIT PressBook, 2016.
4. Li Deng , Dong Yu, "Deep Learning: Methods and Applications", Now Publishers,2014.

WEB RESOURCES

1. http://aima.cs.berkeley.edu

2. http://www-formal.stanford.edu/jmc/whatisai/
3. http://nptel.ac.in/courses/106106126/4
4. https://www.coursera.org/specializations/deep-learning#courses
5. https://www.deeplearningbook.org/
6. https://medium.freecodecamp.org/an-introduction-to-q-learning-reinforcement-learning-14ac0b4493cc

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	L		
CO2	S	S	L	M	M
CO3	S	S	L	M	M
CO4	S	S	L	M	M
CO5	S	S	L	M	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr Kavitha P
Course Co-ordinator

Verified by
Dr Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr Maria Priscilla G
BOS Chairman

Academic Council – Member Secretary

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSC02	DATA ANALYTICS AND OPEN SOURCE TOOLS LAB	DSC	30	5	40	5	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to understand the fundamental algorithms and techniques used in Data Analytics. The statistical foundations will be covered first, followed by various machine learning and data mining algorithms

DEPARTMENT OFFERING

MScComputerScience

PREREQUISTE

Basic of Computer Systems and Open Source Softwares

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Deploy the Data Analytics Lifecycle to address big data analytics projects	Remember
CO2	Develop solutions for several key technologies used in manipulating, storing, and analyzing big data.	Understand
CO3	Analyze data by utilizing various statistical and data mining approaches	Analyze
CO4	Apply regression and classification models for data analysis	Apply
CO5	Demonstrate usage of algorithms using R Programming	Apply

SYLLABUS

UNIT I INTRODUCTION TO DATA ANALYTICS   6L+8PHOURS

Big Data Overview-Data Structures- Analyst Perspective on Data Repositories - State of the Practice in Analytics- Business Intelligence versus Data Science-Current

Analytical Architecture- Drivers of Big Data- Data Analytics Lifecycle Overview-Key Roles for a Successful Analytics Project -Background and Overview of Data Analytics Lifecycle - Phase 1: Discovery - Phase 2: Data Preparation - Phase 3: Model Planning - Phase 4: Model Building - Phase 5: Communicate Results -Phase 6: Operationalize.

1. Analyse Various Data Repository for Analysis
2. Arithmatics and Logic operators in R

UNIT II DATA OBJECTS IN R   6L+8P HOURS

Introduction and preliminaries – Vectors assignment and vector arithmetic – Index vectors - Objects, their modes and attributes - Ordered and unordered factors - Arrays - Matrices – Lists – Data Frames – Reading data from files - Grouping, loops and conditional execution – Functions

3. Vectors, Arrays and Matrices
4. Simple and Advanced Functions inR

UNIT IIISTATISTICAL MODEL, GRAPHICS AND PACKAGESIN R   6L+8P HOURS

Linear models - Analysis of variance and model comparison - Generalized linear models - Nonlinear least squares and maximum likelihood models - non standard models - Graphical procedures: High-level plotting commands - The plot() function Displaying multivariate data - Display graphics - Graphics parameters list - Graphical elements-Packages - Standard packages - Contributed packages and CRAN –Namespaces

5.Data frames andLists
6.Implement importing data into R and Exporting data fromR

UNIT IV REGRESSION AND CLASSIFICATION   6L+8P HOURS

Linear Regression - Logistic Regression - Reasons to Choose and Cautions - Additional Regression Models - Decision Trees - Naive Bayes - Diagnostics of Classifiers - Additional Classification Methods

7. Implement Linear and logisticRegression
8. Implement SVM / Decision tree classificationtechniques

UNIT V CLUSTERING AND ASSOCIATION RULES   6L+8P HOURS

Overview of Clustering - K-means - Use Cases Overview of the Method - Determining the Number of Clusters – Diagnostics - Additional Algorithms- Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - The Groceries Dataset - Frequent Itemset Generation - Rule Generation and Visualization

9. Implement clusteringtechniques

10 Visualize data using any plottingframework and Implement an application that stores big data inR

TEXT BOOKS

1. V. Bhuvaneswari, T. Devi, (2016). Big Data Analytics: A Practitioner's Approach, Bharathiar University

2. V. Bhuvaneswari (2016). Data Analytics with R, Bharathiar University..

REFERENCE BOOKS

1. Nina Zumal, John Mount , Practical Data science in R, Managing Publication Company,2014
2. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. W.N Venables, D.M Smith and the R Core Team, An Introduction to R, Notes on R: A programming environment for Data Analysis and Graphics Version 3.4.4,2018.
4. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, ,O„Reilly Media, 2013.
5. Roger D. Peng, "R Programming for Data Science" Lean Publishing, 2014 .

WEB RESOURCES

1. https://campus.datacamp.com/courses/

2. https://www.tutorialspoint.com/data_analytics_using_r_programming/index.asp

3. https://www.tutorialspoint.com/data_analytics_using_r_programming/index.asp

4. https://www.youtube.com/watch?v=I4NRCN9DPTID

5. https://www.tutorialspoint.com/data_analytics_using_r_programming/index.asp

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	L	S	L	M
CO2	S	S	M	S	L
CO3	S	M	S	M	L
CO4	S	S	S	M	M
CO5	M	S	M	S	L

S- Strong; M-Medium; L-Low

Follows the pattern of Internal and External assessment.
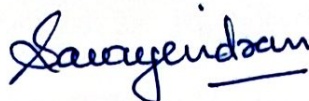
CIA Caluculation : Total Marks : 40
 Continues Internal Assessment as per theory evaluation.
CE Calculation : Total Marks :60
Comprehensive Examination as per semester practical evaluation

Prepared by
Dr Hemalatha M
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr Maria Priscilla G
BOS Chairman

Academic Council – Member Secretary

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSC03	Robotic Process Automation Design and Development with Lab	DSC	30	5	40	5	A

PREAMBLE / COURSE OBJECTIVE

This course offers comprehensive knowledge and professional-level skills focused on developing and deploying software robots. The course is intended for students and individuals who want to design and develop robots for process automation.

DEPARTMENT OFFERING

MSc Computer Science

PREREQUISTE

To understand and complete the course successfully the student must have basic programming skills

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Able to know the basics of Robotic Process Automation	Understand
CO2	Use the various functionalities and features of UiPath Studio.	Apply
CO3	Identify processes which can be automated	Analyze
CO4	Develop and deploy attended and unattended robots independently	Apply
CO5	Know and apply business best practices in RPA projects.	Apply

SYLLABUS

UNIT I   PROGRAMMING REVIEW   **7 L+8P HOURS**

Basic Programming concept review: knowledge of data and data structures- Software development guidelines- Learn about scripting languages, macros and their applications introduction of Variables and files.**Programming**

fundamentals from an RPA perspective-RPA and its development-List the programming constructs used in RPA projects Differentiate between the types of robots used in RPA- Identify the business processes that can be automated

1. Download/install UiPath and its browser extensions.
2. "Swap two variables" : Using only two variables in UIPATH Studio.

UNIT II FOUNDATIONAL RPA CONCEPTS   7L+8P HOURS

Applying RPA- Explain the concept of Center of Excellence and its role in the success of an RPA project. - Apply the RPA project methodology, by differentiating it from Software Development Lifecycle.

RPA deployments: business and management considerations- Identify the stages of implementing RPA and plan the RPA journey. - Position RPA as a technology in the future enterprise ecosystem.

3. Generate the following:(i) Odd Numbers Series (ii) Even Numbers Series (iii) Prime Numbers Series
4. Display "Hello" by using Sequence and Flowchart activities through: (i) Message Box activity (ii) Write Line activity

UNIT III   UIPATH - INTRODUCTION & BASICS   7L+8P HOURS

UIPATH Studio Introduction-Basics of workflow-Types of workflows-Sequences-Flowchart-State machines-Variables-Managing Variables-variables panel-Types of variables-Generic value variable-text variables-true or false variable-Number variable-array variables-date and time variables-Data table variable-**UIPATH arguments**-Managing arguments-The arguments panel-using arguments.

5. Implement the arithmetic operations using variables and produce output.
6. Implement sequences for true or false variable, Date and Time variables.

UNIT IV Control flow and data manipulation Techniques   7L+8P HOURS

Control Flow Techniques: About control flow-control flow activities-Assign activity-Delay Activity-Do-While Activity-If activity-For each activity-switch activity-break activity.

Data Manipulation Techniques: concept of Data Manipulation- its business needs and the issues it resolves- Define variables and data structures according to the business needs formulated- Apply the main commands and operations of data manipulation.- Apply data manipulation methods suitable to RPA to different types of data structures and variables

7. Implement to find the largest of three numbers.

8. Implement to arrange a list of number

UNIT V UIPATH RECORDING UI ELEMENTS   7L+8P HOURS

Uipath Recording: Basics- Automatic Recording-Types of Recording-Basic Recording-Examples of Basic Recording-Desktop Recording-Examples of Desktop recording-Web Recording-Examples of Web recording.

UI Elements: Basics-UI Activities Properties-Input method-Examples of input methods-Screen scraping methods-Example of using output or screen scraping methods.

1. Implement a simple arithmetic calculator operation using basic recording.
2. Implement a simple screen scraping operation.

TEXT BOOKS

1.Alok Mani Tripathi, "Learning Robotic Process Automation",kindle Edition, Packt Publishing,2018.
2.Vaibhav Jain, "Crisper Learning: for UiPath", Independently published ,2018

REFERENCE BOOKS

1. NICE RPA team ,Steve Kaelble, "Robotic Process Automation",NICE Special Edition, Nice Publication, John Wiley & Sons, Ltd., 2018.

WEB RESOURCES

1.https://www.tutorialspoint.com/uipath/index.htm

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	L
CO2	M	M	S	M	M
CO3	S	S	S	M	M
CO4	S	L	S	M	M
CO5	S	S	S	M	M

S- Strong; M-Medium; L-Low

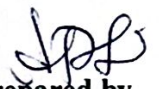## ASSESSMENT PATTERN (if deviation from common pattern)

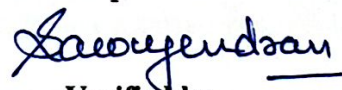*Follows the pattern of Internal and External assessment.*
CIA Caluculation : Total Marks : 40
 Continues Internal Assessment as per theory evaluation.
CE Calculation : Total Marks :60
Comprehensive Examination as per semester practical evaluation

Prepared by	Verified by	Approved by
Dr Jeyalakshmi A	Dr.Anna Saro Vijendran	Dr Maria Priscilla G
Course Co-ordinator	Dean- School of Computing	BOS Chairman

Academic Council – Member Secretary

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSE04	Programming Languages and Computer Graphics	DSE	55		-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to understand Programming Languages and Computer Graphics to analyze the web page design scripting languages

DEPARTMENT OFFERING

MScComputerScience

PREREQUISTE

Higher Secondary Level – Basic of systems

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	To analyze the strengths and weaknesses of programming languages for effective and efficient program development	Remember
CO2	To inculcate the principles underlying the programming languages enabling to learn new programming and scripting languages	Understand
CO3	To grasp different programming paradigms	Understand
CO4	Develop scientific and strategic approach to solve complex problems Computer in the domain of Computer Graphics	Analyze
CO5	To use the programming paradigms effectively in computer graphics	Apply

SYLLABUS

UNIT–I PROGRAMMING LANGUAGE   11 HOURS

: Basic Concepts-Object Oriented Programming: Class, Object, Instantiation, Inheritance, Encapsulation, Abstract Class, Polymorphism-Programming In C++: Tokens, Identifiers, Variables And Constants- Data Types, Operators- Control Statements- Functions Parameter Passing, Virtual Functions- Class And Objects-

Constructors And Destructors- Overloading- Inheritance- Templates-Java-Basic Concepts-Interface-Packages- Multithread Programming

UNIT–II HTML and DHTML
11 HOURS

HTML- Introduction, Structure of HTML Document: Text Basics, Images and Multimedia, Links and webs, Document Layout, Cascading Style Sheet- HTML 4 style sheet features, Creating Forms, Frames and Tables.

DHTML: Combining HTML, CSS and Javascript, events and buttons, controlling your browser.

UNIT–III XML and JAVA Script
11 HOURS

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT

Java Script : Client side scripting, What is Java script, How to develop Java script, simple Javascript, variables, functions, conditions, loops and repetition charts

UNIT–IV Computer Graphics
11 HOURS

: Video-Display Devices, Raster-Scan and Random-Scan Systems; Graphics Monitors, Input Devices, Points and Lines; Line Drawing Algorithms, Mid-Point Circle and Ellipse Algorithms; Scan Line Polygon Fill Algorithm, Boundary-Fill and Flood Fill.

UNIT–V 2-D Geometrical Transforms and Viewing
11 HOURS

Translation, Scaling, Rotation, Reflection and Shear Transformations; Matrix Representations and Homogeneous Coordinates; Composite Transforms, Transformations Between Coordinate Systems, Viewing Pipeline, Viewing Coordinate Reference Frame, Window to View-Port Coordinate Transformation, Viewing Functions, Line and Polygon Clipping Algorithms

TEXT BOOKS

1. Herbert Schildt,"Java™ : The Complete Reference", Seventh Edition.2017
2. Steve Marschner, Peter Shirley," Fundamentals of Computer Graphics, A K Peters/CRC Press20154th Edition, ISBN: 9781482229417

REFERENCE BOOKS

1. Randy Connolly ," Fundamentals of Web Development 1/e,pearson publishers,2016
2. Kogent Learning Solutions Inc.," Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Black Book" Kindle Edition

WEB RESOURCES

1.http://aima.cs.berkeley.edu

2.http://www-formal.stanford.edu/jmc/whatisai/
3.http://nptel.ac.in/courses/106106126/4
4.https://www.coursera.org/specializations/deep-learning#courses
5.https://www.deeplearningbook.org/
6.https://medium.freecodecamp.org/an-introduction-to-q-7.learning-reinforcement-learning- 14ac0b4493cc

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	L		M
CO2	S	S	S	M	M
CO3	M	S	L	M	S
CO4	S	M	M	S	M
CO5	S	S	L	M	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
D Hemalatha M
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr Maria Pricilla G
BOS Chairman

Academic Council – Member Secretary

SEMESTER II

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MCSE05	Business Intelligence	DSE	55		-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating how to design and build a Business Intelligence solutionand how to design and build a Data Warehouse . To gain knowledge on various design the data warehouse in order to develop an effective BI plan.

DEPARTMENT OFFERING

MScComputerScience

PREREQUISTE

Higher Secondary Level – Basic of systems

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	1. Acquire knowledge about the tools and techniques for solving big data analytics.	Understand
CO2	2. Analyze regression and classification models for data Analysis	Analyze
CO3	3. Apply various functions and methods of R programming to large datasets	Apply
CO4	4. Apply various of Python programming for Data Analytics	Apply
CO5	5. Analyze and applying the big data flow for the actual projects	Analyze

SYLLABUS

UNIT I INTRODUCTION TO BUSINESS INTELLIGENCE   11 HOURS

An Overview of Business Intelligence, Analytics, and Decision Support-Changing Business Environments and Computerized Decision Support, A Framework for Business Intelligence (BI), Intelligence Creation, Use, and BI Governance, Transaction

Processing Versus Analytic Processing, Successful Bl Implementation, Analytics Overview, Brief Introduction to Big Data Analytics

UNIT II BUSINESS REPORTING   11 HOURS

Business Reporting, Visual Analytics, and Business Performance Management-Business Reporting Definitions and Concepts, Data and Information Visualization, Different Types of Charts and Graphs, The Emergence of Data Visualization and Visual Analytics, Performance Dashboards, Business Performance Management, Performance Measurement

UNIT III –DATAMINING   11 HOURS

Data Mining- Data Mining Concepts and Applications, Data Mining Applications, Data Mining Process, Data Mining Methods, Data Mining Software Tools, Data Mining Privacy Issues, Myths, and Blunders, Text and Web Analytics, Text Analytics and Text Mining Overview- Natural Language Processing, Text Mining Applications, Text Mining Proces, Sentiment Analysis, Web Mining Overview, Search Engines, Web Usage Mining (Web Analytics), Social Analytics

UNIT IV DATA ANALYTICS   11 HOURS

Big Data and Analytics, Definition of Big Data- Fundamentals of Big Data Analytics, Big Data Technologies, Data Scientist, Big Data and Data Warehousing, Big Data Vendors, Big Data And Stream Analytics, Applications of Stream Analytics.

UNIT V BUSINESS ANALYTICS   11 HOURS

Business Analytics: Emerging Trends and Future Impact- Location-Based Analytics for Organizations, Analytics Applications for Consumers, The Web 2.0 Revolution and Online Social Networking, Cloud Computing and Bl, Impacts of Analytics In Organizations, Issues of Legality, Privacy, and Ethics, An Overview of the Analytics Ecosystem.

TEXT BOOKS

1. EMC2 Education Services, "Data Science Big Data Analytics- Discovering, Analyzing, Visualizing and Presenting Data" Wiley Publishing, Inc.,2015.
2. W.N Venables, D.M Smith and the R Core Team, An Introduction to R, Notes on R: Aprogramming environment for Data Analysis and Graphics Version3.4.4(2018-03-15).

REFERENCE BOOKS

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics:
2. Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013.
3. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, , O„Reilly Media,2013.
4. V. Bhuvaneswari, T. Devi, (2016). Big Data Analytics: A Practitioner's Approach, Bharathiar University

2. V. Bhuvaneswari (2016). Data Analytics with R, Bharathiar University
3. Chris Eaton, Dirk deroos et al.(2012). Understanding Big data, McGraw Hill 3. Min Chen (2014). Big Data : Related Technologies, Challenges and Future Prospects, Springer 4. Judith Hurwitz (2013). Big Data for Dummies, John Wiley & Sons
4. Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, "A Beginner's Guide to R" Springer, 2009
5. Roger D. Peng, "R Programming for Data Science" Lean Publishing, 2014 3. R Data camp – Online Course Contents - https://campus.datacamp.com/courses/

WEB RESOURCES

7. http://aima.cs.berkeley.edu
8. http://www-formal.stanford.edu/jmc/whatisai/
9. http://nptel.ac.in/courses/106106126/4
10. https://www.coursera.org/specializations/deep-learning#courses
11. https://www.deeplearningbook.org/
12. https://medium.freecodecamp.org/an-introduction-to-q-learning-reinforcement-learning- 14ac0b4493cc

MAPPING WITH PROGRAM OUTCOMES

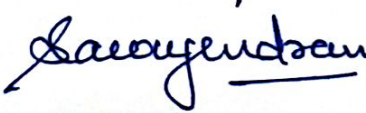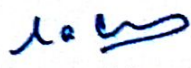| COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	L		L
CO2	S	M	S	M	M
CO3	M	S	L	M	S
CO4	L	M	M	S	S
CO5	S	S	S	M	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr Hemalatha M
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr Maria Priscilla G
BOS Chairman

Academic Council – Member Secretary

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MITC01	Advanced Software Engineering	DSC	50	5	-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to understand the various concepts of Software Engineering and its relevant skills. This course helps students to learn the skills and practices to build modern software products and services

DEPARTMENT OFFERING

MScComputeScience

PREREQUISTE

Higher Secondary Level – Basic of

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	To understand Software Engineering Lifecycle Models	Remember
CO2	To do project management and cost estimation	Understand
CO3	To gain knowledge of the System Analysis and Design concepts.	Apply
CO4	To understand software testing approaches	Apply
CO5	To be familiar with DevOps practices	Apply

SYLLABUS

UNIT I   INTRODUCTION   **11 HOURS**

Introduction- Software Engineering Ethics- Software Process: Software Process Models- Process Activities – The rational Unified Process- Agile Software Development:Agile methods- Plan driven and Agile development- Extreme Programming – Agile Project Management- Scaling Agile Methods.

UNIT II REQUIREMENT ENGINEERING: 11 HOURS

Non-functional and functional requirements- The software requirement document- requirement specification- requirement engineering processes- requirement elicitation and analysis – requirement validation – requirements management- System modeling: Context models- interaction models- structural models- behavioral models – model-driven engineering- ArchitecuralDesign:Architectural design decisions- Architectural views- architectural patterns- application architecture. Design and implementation:Object oriented design using UML- Design patterns.

UNIT III SOFTWARE TESTING: 11 HOURS

Development Testing – Test driven development- Release testing- User testing- Security Engineering: Security risk management- design for security- system survivability.

UNIT IV SOFTWARE REUSE: 11 HOURS

The reuse landscape- application frameworks- software product lines. Distributed Software Engineering: Distributed system issues – client- server computing – Architectural pattern for distributed systems- software as a service

UNIT V DEVOPS   11 HOURS

DevOps:Motivation-Cloud as a platform-Operations- Deployment Pipeline:Overall ArchitectureBuilding and Testing-Deployment- Case study: Migrating to Microservices.

TEXT BOOKS

1. Ian Somerville, —Software Engineering‖. 10th ed, Pearson Education. 2017

REFERENCE BOOKS

1. Len Bass, Ingo Weber and Liming Zhu, —DevOps: A Software Architect's Perspective‖, Pearson Education, 2016
2. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, —Fundamentals of Software Engineering‖.2 ed, PHI. 2009

WEB RESOURCES

1. https://nptel.ac.in/courses/106101061/5

MAPPING WITH PROGRAM OUTCOMES

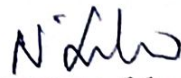| COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	L	M	M
CO2	S	S	L	L	M
CO3	S	M	S	L	L
CO4	S	M	S	L	L
CO5	S	M	S	L	L

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Arthi R
Course Co-ordinator

Verified by
Dr Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr Sumathi N
BOS Chairman

Academic Council – Member Secretary

SEMESTER II

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MITC02	NETWORK SECURITY	DSC	50	5	-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to understand Network Security and Classical encryption Techniques. Gain knowledge about Cryptography, Governance and Compliance.

DEPARTMENT OFFERING

MScComputerScience

PREREQUISTE

Higher Secondary Level – Basic of systems

Bridge Course – If not studied in Higher Secondary Level

EXPECTED SKILL

Domain Knowledge / Entrepreneurship / Employability / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Acquire the knowledge in Network Security	Remember
CO2	Analyze the vulnerabilities in any computing system and hence be able to design a security solution	Understand
CO3	Evaluate security mechanisms using rigorous approaches by key ciphers.	Apply
CO4	Apply the various Authentication schemes to simulate different applications.	Apply
CO5	Understand various Security practices and System security standards	Apply

SYLLABUS

UNIT I COMPUTER AND NETWORK SECURITY CONCEPTS   11 HOURS

Computer and Network Security Concepts: Computer Security Concepts - The OSI Security Architecture - Security Attacks - Security Services - Security Mechanisms - Fundamental Security Design Principles - Attack Surfaces and Attack Trees - A Model for Network Security - Standards. **Classical Encryption Techniques**: Symmetric Cipher Model - Substitution Techniques - Transposition Techniques - Steganography.

UNIT II DATA AND ADVANCED ENCRYPTION STANDARDS   11 HOURS

Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure - The Data Encryption Standard - A DES Example - The Strength of DES 1- Block Cipher Design Principles. **Advanced Encryption Standard:** Finite Field Arithmetic - AES Structure - AES Transformation Functions - AES Key Expansion - An AES Example - AES Implementation.

UNIT III BLOCK CIPHER AND PUBLIC-KEY CRYPTOGRAPHY   11 HOURS

Block Cipher Operation: Multiple Encryption and Triple DES - Electronic Codebook - Cipher Block Chaining Mode - Cipher Feedback Mode - Output Feedback Mode - Counter Mode - XTS-AES Mode for Block-Oriented Storage Devices - Format-Preserving Encryption. **Public-Key Cryptography and RSA**: Principles of Public-Key Cryptosystems - The RSA Algorithm.

UNIT IV NETWORK CONTROL AND TRANSPORT SECURITY   11 HOURS

Network Access Control and Cloud Security: Network Access Control - Extensible Authentication Protocol - IEEE 802.1X Port-Based Network Access Control - Cloud Computing - Cloud Security Risks and Countermeasures - Data Protection in the Cloud - Cloud Security as a Service - Addressing Cloud Computing Security Concerns. **Transport-Level Security**: Web Security Considerations - Transport Layer Security - HTTPS - Secure Shell (SSH).

UNIT V E-MAIL AND IP SECURITY   11 HOURS

Electronic Mail Security: Internet Mail Architecture - Email Formats - Email Threats and Comprehensive Email Security - S/MIME - Pretty Good Privacy - DNSSEC - DNS-Based Authentication of Named Entities - Sender Policy Framework - DomainKeys Identified Mail - Domain-Based Message Authentication, Reporting, and Conformance. **IP Security**: IP Security Overview - IP Security Policy - Encapsulating Security Payload - Combining Security Associations - Internet Key Exchange - Cryptographic Suites.

TEXT BOOKS

1. William Stallings - Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson Education, 2020.

REFERENCE BOOKS

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd, 2011.

2. BehrouzA.Foruzan, Cryptography and Network Security, 3rd Editon, Mc Graw Hill India, 2015.

3. Roberta Bragg, Mark Rhodes-Ousley, Keith Strassberg, Network Security: The Complete Reference, Tata Mc Graw Hill India, 2017.

WEB RESOURCES

1. https://www.tutorialspoint.com/internet_security/internet_security_email_se.
2. https://searchsecurity.techtarget.com/answer/What-are-the-most-important-email-security-protocols
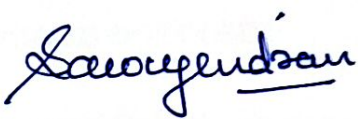
MAPPING WITH PROGRAM OUTCOMES

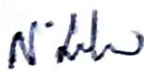| COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	-	-
CO2	M	M	S	M	-
CO3	L	L	S	S	-
CO4	S	S	S	M	-
CO5	S	M	M	M	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by
Dr Govindaraju S
Course Co-ordinator

Verified by
Dr.Anna Saro Vijendran
Dean- School of Computing

Approved by
Dr Sumathi N
BOS Chairman

Academic Council – Member Secretary

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MITE02	Data Communication and Computer Networks	DSE	55		-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating To master the fundamentals of data communications networksLearn how computer network hardware and software operate To understand the network security in WWWTo learn the cloud computing in networks

DEPARTMENT OFFERING

MScComputerScience

PREREQUISTE

Higher Secondary Level – Basic of systems

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	1. Independently know basic computer network technology. L1	Understand
CO2	2. Identify the different types of network topologies and protocols. L2	Analyze
CO3	3. Enumerate the layers of the OSI model and TCP/IP function of each layer. L3	Apply
CO4	4. Identify the network security in World wide web L1	Apply
CO5	5. Able to know the cloud computing techniques mobile and IOT L3	Analyze

SYLLABUS

11Hours

UNIT I: DATA COMMUNICATION

Data Communication: Components of a Data Communication System, Simplex, Half-Duplex and Duplex Modes of Communication; Analog and Digital Signals; Noiseless

and Noisy Channels; Bandwidth, Throughput and Latency; Digital and Analog Transmission; Data Encoding and Modulation Techniques; Broadband and Baseband Transmission; Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms

UNIT II: NETWORK MODELS   11Hours

Computer Networks: Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet. **Network Models**: Layered Architecture, OSI Reference Model and its Protocols; TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses; Switching Techniques

UNIT III: FUNCTIONS OF OSI AND TCP/IP LAYERS   11Hours
Functions of OSI and TCP/IP Layers: Framing, Error Detection and Correction; Flow and Error Control; Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs.;IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery; Routing Algorithms, TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP.

UNIT IV NETWORK SECURITY AND WORLD WIDE WEB   11Hours
World Wide Web (WWW): Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP.
Network Security: Malwares, Cryptography and Steganography; Secret-Key Algorithms, Public-Key Algorithms, Digital Signature, Virtual Private Networks, **Firewalls**.

UNIT V: INTERMEDIATE CODE GENERATION   11Hours
Mobile Technology: GSM and CDMA; Services and Architecture of GSM and Mobile Computing; Middleware and Gateway for Mobile Computing; Mobile IP and Mobile Communication Protocol;
Cloud Computing and IoT: SaaS, PaaS, IaaS, Public and Private Cloud; Virtualization, Virtual Server, Cloud Storage, Database Storage, Resource Management, Service Level Agreement, Basics of IoT.

TEXT BOOKS

1. Andrews S. Tanenbaum, David J Wetherall; Computer Networks; Edition 5, Pearson Education,2012

REFERENCE BOOKS

1. The TCP/IP Guide, by Charles M. Kozierok, Free online Resource, http://www.tcpipguide.com/free/index.html.
2. William Stallings, Data & Computer Communications, PHI, Edition 6, 2012

WEB RESOURCES

1. http://aima.cs.berkeley.edu

2. http://www-formal.stanford.edu/jmc/whatisai/
3. http://nptel.ac.in/courses/106106126/4
4. https://www.coursera.org/specializations/deep-learning#courses
5. https://www.deeplearningbook.org/
6. https://medium.freecodecamp.org/an-introduction-to-q-learning-reinforcement-learning- 14ac0b4493cc

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	L		
CO2	S	M	S	M	M
CO3	M	S	L	M	S
CO4	M	L	M	S	S
CO5	S	L	S	M	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by	Verified by	Approved by
Dr Hemalatha M	Dr Anna Saro Vijendran	Dr Sumathi.N
Course Co-ordinator	Dean- School of Computing	BOS Chairman

Academic Council - Member Secretary