SECOND SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit *	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
MSc(CS)201	Advanced RDBMS & PL/SQL	3	1	-	4	100	25	-	125	40	15	-	55
MSc(CS)202	Advanced Computer Networks	3	1	-	4	100	25	-	125	40	15	-	55
MSc(CS)203	.Net Technology	3	1	-	4	100	25	-	125	40	15	-	55
MSc(CS)204	Elective – I	3	1	-	4	100	25	-	125	40	15	-	55
MSc(CS)205	Elective – II	3	1	-	4	100	25	-	125	40	15	-	55
MSc(CS)206	**Lab-IV**: Programming in RDBMS & PL/SQL	-	-	2x2	2	-	50	100	150	-	30	50	80
MSc(CS)207	**Lab-V**: Programming based on paper-III	-	-	2x2	2	-	50	50	100	-	30	25	55
MSc(CS)208	**Lab-VI:** Programming Lab in Network	-	-	2x2	2	-	50	50	100	-	30	25	55
MSc(CS)209	GD/PI based on Indian Knowledge System	-	-	2x2	2	-	25	-	25	-	15	-	15
	TOTAL	15	5	16	28	500	300	200	**1000**	200	180	100	**480**

* **L+T+(P/2)**

S.No	Elective -I	Elective -II
I.	Formal Automata Theory	AI & Expert System
II.	Big Data	Digital Signal Processing
III.	Open Source Software with Case Study of Linux	Soft Computing
IV.	MOOC	MOOC

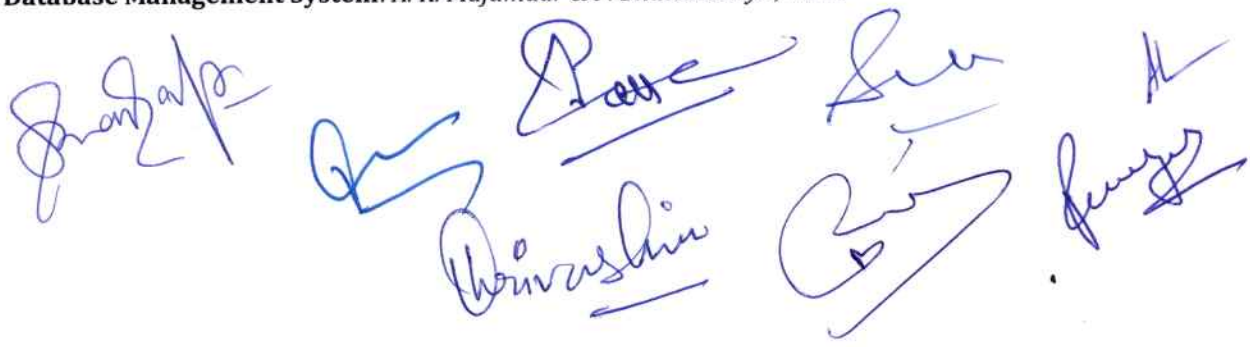
Detailed Syllabus:

MSc(CS)201- Advanced RDBMS & PL/SQL

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT - I: Overview of Database Management** Data, Information and knowledge, Importance of database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases, Client/Server databases, Object-oriented databases, Object-relational databases, Introduction to ODBC concept.	10	1
II	**UNIT - II: ER Model & Relational Algebra** Entity - Relationship model as a tool for conceptual design-entities, attributes and relationships. ER diagrams; Concept of keys; Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features. **Relational Algebra:** select, project, cross product different types of joins (inner join, outer joins, self-join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages.	10	2
III	**UNIT – III : Normalization** Introduction, Pitfalls in database design, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce-Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF.Issues in physical design; Concepts of indexes, Denormalization. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Security & Authorization in SQL.	10	3
IV	**UNIT - IV: SQL and Relational Database Design** Introduction to SQL constructs (SELECT...FROM, WHERE... GROUP BY... HAVING... ORDERBY....), CREATE, INSERT, DELETE, UPDATE, ALTER, LIKE, DROP, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references. Transaction control commands –grant, privileges, commit, Rollback, Savepoint.	10	4
V	**UNIT - V: PL/SQL** Introduction to PL/SQL variables – literals – data types – advantages of PL/SQL; Control statements : if ; iterative control – loop, while, for, goto ; exit when; Cursors : Types –implicit, explicit – parameterized cursors – cursor attributes; Exceptions: Types – internal , user-defined , handling exceptions – raise statement; Triggers; PL/SQL tables and records: Declaring PL/SQL tables - referring PL/SQL tables, inserting and fetching rows using PL/SQL table, deleting rows; records - declaration of records - deleting records; Sub programs: Functions -procedures - in, out, inout parameters; purity functions - packages - package specification -advantages of packages - private and public items - cursors in packages.	10	5

Books Recommended:

- **Database System Concept**: *A. Silberschatz , H.F. Korth and S. Sudarshan*, TMH
- **Fundamentals of Database Systems**: *Elmasri & Nawathe*, Pearson Education
- **An Introduction to Database Systems**: *C. J. Date*, AWL Publishing Company
- **SQL, PL/SQL**: *Ivan Bayross*, BPB Publication
- **An Introduction to database systems**: *Bipin Desai*, Galgotia Publication.
- **Database Management System**: *A. K. Majumdar & P. Bhattacharya*, TMH



M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer	1	II
Course Code	Course Title		Course Type
MSc(CS)202	Advanced Computer Network		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0

Maximum Marks	Sessional	Theory
125	25	100

Learning Objective (LO):

The course aims to develop understanding about security in network communication. It introduces the real time threats and its causes so that student will be able to do secure programming.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Understand of computer network.	U
2	Know the basic concepts of bandwidth, data communication etc.	U
3	Make more employable.	An
4	Open up new areas in the field of research and development in the area of computer networking.	An
5	Learn the ideas about cyber security and networking technologies.	An

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)202
Advanced Computer Network

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT – I** **Introduction to Computer Networking:** The Concept of Networking, Data Communication, Required network elements, The role of Standards Organization. Line Configuration, Various Topologies, Transmission Mode, Categories of Networks- LAN, MAN, WAN. The benefits of a Computer Networks. The OSI and TCP/IP Reference Model: The Concept of Layered Architecture, Design Issues for the Layers. Interfaces and services, Detailed Functions of the Layers. Comparison between OSI and TCP/IP Reference model.	10	1
II	**UNIT – II** **Transmission of Digital Data:** Bandwidth, Nyquist and Shannon's theorems for maximum data rate of a channel. Transmission media- Co-axial, UTP, Fiber optic and wireless. Analog and digital data Transmission- Serial and Parallel transmission. Modulation Techniques – AM, FM, PM. ADSL Modem. Multiplexing and Switching: The Concept of Multiplexing- FDM, TDM, WDM, CDM. The Concept of Switching- Circuiting, Message switching, Packet switching. Virtual Circuit and Datagram.	10	2
III	**UNIT – III** **Data Link Layer :** Line Discipline, Flow Control- stop and wait, sliding window, Go back N, Selective Repeat. Error Detection and Correction – Parity, CRC, Hamming Code. ALOHA, Slotted ALOHA, CSMA/CD, HDLC. IEEE standards for LAN's and MAN's – Ethernet, DQDB,The concept of ICMP, ARP, RARP, SNMP, SMTP, MIME, POP3 Protocols.	10	3
IV	**UNIT – IV** **Network Layer and Transport Layer:** IP Addressing, Classes of IP Adresses, Subnet Mask. IPv4 and IPv6 Header Formats. Routing algorithms - Distance Vector, Link State. TCP Header Format, UDP Header Format. Congestion Control Algorithms – Leaky Bucket and Token Bucket. Internetwork, Networking Devices – Repeater, Bridge, Router, Gateway, Switch, Hub	10	4
V	**UNIT – V** **Cyber Security and Networking Technologies:** The Importance of Security in Networking. Confidentiality, Authentication, Integrity, Non Repudiation. Traditional Cryptography - Data Encryption Standards, RSA algorithm. Deffie Hellman Algorithm. Virus, Worm, Trojan Horse, DoS, Spoofing, Phishing. X.25, Frame Relay, Cell Relay -ATM, ATM Cell, ATM Switch – Multistage Switch. Banyan Network. DSL, ADSL, SONET, SMDS.	10	5

Books Recommended:

- Computer Networks - A. S. Tanenbaum
- Data Communication and Networking - B. A. Forouzan

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	Course Title		Course Type
MSc(CS)203	.Net Technology		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0

Maximum Marks	Sessional	Theory
125	25	100

Learning Objective (LO):

The course aims to develop programming skills based on .NET frame work. Programming skills leads student to have critical thinking for solving any technical issues using software.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.	U
2	Describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE).	U
3	Create applications using Microsoft Windows Forms and also ADO .NET.	AP
4	Design web applications using ASP.NET.	U
5	Understand the OOP and Exception handling in .NET(U)	E

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)203
.Net Technology

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT-I** **Introduction:** architecture and components of .NET framework 4.5, managed code, intermediate language, metadata and JIT compiler, common language runtime, automatic memory management, private and shared assemblies, exploring Visual Studio .NET IDE.	10	1
II	**UNIT – II** **Introduction to C#:** Identifiers, keywords, data types, variables, constants, operators, precedence, associatively, type conversion, decision and loop statements ,enumerations, namespaces. Object Oriented Programming: encapsulation, inheritance, polymorphism, abstraction, interfaces.	10	2
III	**UNIT – III** **Introduction to Windows Programming**: Creating windows forms, windows controls, menus and dialogue boxes. MDI application. **Overview of xml**. Window programming vs. Window presentation foundation, main features of WPF 4.5, WPF 4.5 architecture, types of WPF applications, , WPF properties.	10	3
IV	**UNIT – IV** **Introduction to ADO.NET:** Introduction to SQL, architecture of ADO.NET, Data Provider, Data set components, creating a connection to a database through ADO.Net , OLEDB database, ODBC data source, ADO.NET commands, data adapters, creating data view.	10	4
V	**UNIT –** **Introduction to ASP.NET:** ASP.NET life cycle, exploring ASP.NET 4.5 web application, creating a sample ASP.NET 4.5 website, application structure and state, global. asax application file, web forms – standard controls, validation controls, master pages, web services.	10	5

Books Recommended:

Textbook: 1. Kogent Learning Solutions Inc., .NET 4.5 Programming – Black Book (dreamtech)

References:

- Joseph Albahari, Ben Albahari, C# 6.0 in a Nutshell
- Christian Nagel, Professional C# 6 and .NET Core 1.0
- Andrew Troelsen, Philip Japikse, C# 6.0 and the .NET 4.6

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	Course Title		Course Type
MSc(CS)204	Elective – I (Formal Automata Theory)		Elective
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0
Maximum Marks	Sessional		Theory
125	25		100

S.No	Elective -I
I.	Formal Automata Theory
II.	Big Data
III.	Open Source Software with Case Study of Linux

Learning Objective (LO):

Student will learn mathematical relation of computing model. It helps to design and enhance new computing model and its operation.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Construct finite state machines and the equivalent regular expressions.	Ap
2	Prove the equivalence of languages described by finite state machines and regular expressions.	U
3	Construct pushdown automata and the equivalent context free grammars.	E
4	Prove the equivalence of languages described by pushdown automata and context free grammars. Be able to construct Turing machines and Post machines	Ap
5	Understand undecidability.	R

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)204
Formal Automata Theory

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT – I** Alphabet, String and language, Finite state Machines, finite automata with Є-moves, Conversion of NDFA to DFA, Removal of Є-transition from NDFA, Two way finite automata, finite automata with output, Mealy & Moore machines, Applications of finite automata, minimization of finite automata.	10	1
II	**UNIT – II** Chomsky classification of Languages, Regular Expression and Language, Properties of Regular languages, Pumping lemma for regular sets, Closure properties of regular sets, Decision algorithms for Regular sets, Myhill-Nerode theorem.	10	2
III	**UNIT – III** Context free grammars and their properties, derivation tree, simplifying CFG, ambiguity in CFG, Chomsky Normal form, Greibach Normal form, Pumping lemma for CFL, Closure properties of CFL.	10	3
IV	**UNIT – IV** Pushdown automata: Informal description, Definition, Determinism and Non determinism in PDA, Equivalence of PDA's and CFL's. Two way PDA, Concept of Linear Bounded Automata, context sensitive grammars and their equivalence, Turning machine construction, determinism and non-determinism in TM, Multi tape, multi-track TM.	10	4
V	**UNIT – V** Decidability, Universal turning machine and decidable problem, recursive function theory, Recursively enumerable sets, recursive sets, partial recursive sets, Church's hypothesis, post correspondence problem, Russell's paradox.	10	5

Books Recommended:

- **Theory of Computer Science, Automata Languages & computation**, *K.L.P. Mishra, N. Chandrashekharan*, PHI.
- **Introduction to Automata Theory Language and Computation**, *John E. HopcraftandJeffary D. Ullman*, Narosa Publication house.
- **Introduction to Formal Languages, Automata Theory and Computation**, *Kamala Krithivasan and Rama. R*,Pearson.
- **Introduction to Automata Theory Languages and Computation**, *John E. Hopcraft, Jeffary, D. Ullman and Rajeev Motwani.*

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	Course Title		Course Type
MSc(CS)204	Elective – I (Big Data)		Elective
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0
Maximum Marks	Sessional		Theory
125	25		100

S.No	Elective -I
I	Formal Automata Theory
II	Big Data
III	Open Source Software with Case Study of Linux

Learning Objective (LO):

Student will learn concepts of BigData, MongoDB, Spark, Zookeeper, etc and it also develops how Bigdata is maintained and managed.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Understand the building blocks of Big Data.	U
2	Articulate the programming aspects of cloud computing (map Reduce etc). Also get the knowledge about the big data programming languages apache, pig, hive and spark.	Ap
3	Understand the specialized aspects of big data with the help of different big data applications.	U
4	Represent the analytical aspects of Big Data along with the knowledge of big data database such as mongodb and nosql.	An
5	Know the recent research trends related to Hadoop File System, MapReduce and Google File.	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)204
Big Data

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT – I: Introduction to Data Warehousing and OLAP Technology for Data Mining** What is Data Mining?, KDD(Knowledge Discovery from Databases) Process, What Kinds of Data Can Be Mined?, Data Mining Functionality, Are all the patterns interesting?, Attribute Types, What is Data Warehouse?, Data Warehouse Architecture, Data Cube: A multi-dimensional data model, Schemas for Multidimensional Data Models, OLAP Operations, Data Warehouse Usage(Applications). , Data Mining Primitive, Architecture of Data Mining System.	10	1
II	**UNIT – II: Introduction Concept of Big Data** Big Data- Define Data, Web Data, Classification of Data- Structured, Semi-Structured, and Unstructured. Big Data Definitions, Challenges of Conventional system, Why We Need Big Data, Difference between Big Data and Small Data, Importance of Big Data. Big Data Characteristics (4V's Volume, Velocity, Variety, and Veracity), Big Data Types, Big Data Handling Techniques. Complexity of Big Data, Big Data Processing Architectures, Big Data Technologies, Big Data Business Value. Big Data Analytics Application. Big Data Challenges and Future Scope.	10	2
III	**UNIT – III: INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE** **Big Data –** Apache Hadoop & Hadoop EcoSystem: Hadoop Core Component, Features of Hadoop, The Hadoop Distributed File System: HDFS data Storage, Hadoop Physical Organization, HDFS Commands, MapReduce Framework, MapReduce Programming Model, MapReduce Map task,Reduce Task and MapReduce Execution, Hadoop YARN, Hadoop2 Execution Model, Hadoop Ecosystem Tools, Hadoop Ecosystem.	10	3
IV	**UNIT – IV: NoSQL Big Data Management, Mongo DB** **NoSQL:** What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NoSQL DataStore, NoSQL Data Architecture pattern, NOSQL to Manage Big Data. **Data Base for the Modern Web:** Introduction to MongoDB, features of MongoDB, Data Types,Mongo DB Query Language and Database Command.	10	4
V	**UNIT – V: Hive and Pig:** **Pig**: Apache Pig, Application of Apache Pig, Feature, Pig Architecture, Pig- Grunt Shell, Installing Pig, Pig Latin Data Model, Pig Latin and Developing Pig Latin Scripts: Apache Pig Execution, Commands. **HIVE AND HIVEQL. Hive:** Introduction, Characteristics, limitation, Hive Architecture and Installation, Comparison with Traditional Database (RDBMS), Hive Datatype and File Formats, Hive Data Model, Hive Integration and Workflow Steps, Hive Built-in Functions, HiveQL.	10	5

Books Recommended:

- **Big Data Analytics**, *Raj Kamal and Preeti Saxena*, McGraw Hill Education
- **Big Data: Black Book**, *DT Educational Services*, Dreamtech Press
- **Big Data Analytics**, *Seema Acharya & Shubhashini Chellappan*, Wiley India
- **Big Data Analytics**, *M. Vijayalakshmi & Radha Shankarmani*, Wiley India

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	Course Title		Course Type
MSc(CS)204	Elective – I (Open Source Software with Case Study of Linux)		Elective
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0

Maximum Marks	Sessional	Theory
125	25	100

S.No	Elective -I
I	Formal Automata Theory
II	Big Data
III	Open Source Software with Case Study of Linux

Learning Objective (LO):

Objective of this course is to develop a skill to handle operating system and students will be able to know about commands of Linux and how to manage OS tasks.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Learn about LINUX Commands.	U
2	Learn Vi editor commands.	U
3	Learn Shell Scripting	An
4	Manage administrative commands of LINUX	U
5	Handle security issues in LINUX environment.	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)303
Open Source Software with case study of LINUX

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT – I: Introduction :** Introduction to Multi-user System, Emergency and history of Unix, Feature and benefits, Versions of Unix. **System Structure:-**Hardware requirements, Kernel and its function, introduction to System calls and Shell. **File System :** Feature of Unix File System, Concept of i-node table, links, commonly used commands like who, pwd, cd, mkdir, rm, ls, mv, lp, chmod, cp, grep, sed, awk, pr, lex, yacc, make, etc. Getting started (login / logout), File system management, file operation, system calls, buffer cache **.Vi Editor:-**Intro to text processing, command and edit mode, invoking vi, command structure, deleting and inserting line, deleting and replacing character, searching strings, yanking, running shell command, command macros, set windows, set auto indent, set number, intro to exrc file.	10	1
II	**UNIT – II: Shell Programming :** Introduction to shell feature, wild card characters, i/out redirections, standard error redirection, system and user created shell variables, profile files, pipes/tee, background processing, command line arguments, command substitution, read statement, conditional execution of commands, special shell variables $ #, #?, $* etc. Shift commands, loops and decision making-for, while and until, choice making using case...esac, decision making if ....fi, using test, string comparison, numerical comparison, logical operation, using expr.	10	2
III	**UNIT – III: Introduction to Shell :** Features, changing the login shell, cshrc, login, logout files, setting environment, variables, history and alias mechanism, command line arguments, redirection/appending safely, noclobber, noglob, ignore eof, directory stacks (pushd, popd), feature of other shell (rsh, vsh). **Process Control :** Process management, process states and transition, regions and control of process, sleep and waking, process creation, process killing, signals, system boot and init process, traps, sitting process priorities	10	3
IV	**UNIT – IV: Inter-process Communication :** I/O Sub system, terminal drives, disk drives, messages, shared memory, semaphores, memory management, swapping, demand paging. **System Calls and Unix -C Interface :** File handling calls like - access (), open(), create(), read(), write(), close(), fseek(), process control system calls like kill(), exec(), fork(), wait(), signal(), exit(), comparing stdio library and calls.	10	4
V	**UNIT – V:** System Administration : Process and Scheduling, Security, Basic System Administration:- Adding a User, User Passwords, Delete of a User, Adding a Group, Deleting a Group, Super User, Startup and Shutdown. Advanced System Administration:-Managing Disk Space, Backup and Restore, Managing System Services. Xwindows:- Introduction to Xwindows concept.	10	5

Books Recommended:

- 1. Design of Unix Operating System - Maurice Bach
- 2. Advanced Unix - Stephan Prata
- 3. The Unix Programming Environment - Kennighan and Pike
- 4. Unix Programmers Guide - P. P. Selvester
- 5. Introduction to Unix System - Rachell Morgan
- 6. Complete Reference Red Hat Linux - Richard Peterson
- 7. Complete Reference Unix

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	**Course Title**		**Course Type**
MSc(CS)205	Elective – II(AI and Expert System)		Elective
Credit	**Hours Per Week (L-T-P)**		
	L	T	P
4	3	1	0

Maximum Marks	Sessional	Theory
125	25	100

S.No	Elective -II
I	AI and Expert System
II	Digital Signal Processing
III	Soft Computing

Learning Objective (LO):

Students will learn about the basics of various AI concepts such as problem solving, logic, reasoning, learning and various algorithm related to these concepts.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Define the heuristics and apply them for solving complex problem with understanding of different heuristic based search techniques.	E
2	Understand of different knowledge structure and inference mechanism with ability to apply them in intelligent solutions of complex problem.	Ap
3	Understand the existence of uncertainty in problem solving and how mathematical /statistical models are used to overcome these problems.	E
4	Understand planning system and different types of planning required for problem solving process	U
5	Understand expert system and their various field.	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)205
AI and Expert System

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT – I** **Introduction to AI:** Foundations of AI, Philosophy and History; AI problems, AI technique; The Turing Test. **Intelligent Agents:** Agents and Environments, the Concept of Rationality, the Nature of Environments and the Structure of Agents. **Problem solving & State Space Search:** General problem solving: defining problems as State Space Search, Problem Characteristics; Production Systems & their characteristics.	10	1
II	**UNIT – II** **Exhaustive Searches:** Generate and Test, Breadth First Search, Depth First Search and DFID **Heuristic Search Techniques:** Branch and Bound technique; Best first search; A* algorithm; Problem Reduction AND/OR Graphs and AO* algorithm. **Local Searches & Optimizations:** Hill climbing and its variants. **Constraint Satisfaction Problems:** Definition; Constraint Propagation and Backtracking. **Game Playing:** Mini-Max Search Procedure; Alpha-Beta Cutoffs; Additional Refinements.	10	2
III	**UNIT – III** **Knowledge Representation:** Types of Knowledge; Knowledge Representation Issues; **Logic:** First order Predicate Logic; Representation of facts in FOL; Inference in FOL; Resolution Principle, Clausal Form and Unification; **Inference Mechanisms:** Forward and Backward Chaining; **Slot and Filler Structures:** Semantic Networks; Frame Systems and value inheritance; Conceptual Dependency; Scripts;	10	3
IV	**UNIT – IV** **Reasoning under Uncertainty:** Non-monotonic Reasoning Logics for Non-monotonic Reasoning, Default Reasoning Minimalistic Reasoning, Implementation Issues, Truth Maintenance Systems; Probabilistic Reasoning and Uncertainty; Statistical Reasoning; Probability Theory; Bayes Theorem and Bayesian networks; Certainty Factor; Dempster-Shafer Theory **Planning:** Overview; The Blocks Word; Component of a Planning System: Goal Stack Planning; Nonlinear Planning;	10	4
V	**UNIT – V** **Expert Systems:** Introduction, Characteristics, History and Applications of expert systems; Expert System Shells; Rule Based Systems Architectures, Non Production System Architectures; Knowledge Acquisition and Validation; Case Studies: MYCIN & DENDRAL. **Learning:** Rote learning; Learning by Taking Advise; Induction; Explanation based learning; Discovery; Analogy.	10	5

Books Recommended:

- **Artificial Intelligence**, *Rich E., Knight K. and Nair S. B.*, McGraw Hill Education
- **Artificial Intelligence: A Modern Approach,** *Russell S. J. and Norvig P.*, Pearson Education
- **Introduction to Artificial Intelligence and Expert Systems**, *Patterson D. W.*, PHI
- **Principles Of Artificial Intelligence**, *Nilson N. J.*, Narosa Publications

Artificial Intelligence, *Winston P. H.*, Pearson Education

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	Course Title		Course Type.
MSc(CS)205	Elective – II (Digital Signal Processing)		Elective
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0
Maximum Marks	Sessional		Theory
125	25		100

S.No	Elective -II
I	AI and Expert System
II	Digital Signal Processing
III	Soft Computing

Learning Objective (LO):

Students will be able understand how does digital signal propagate. He/She is able to know working of digital communication devices through and its process of exchanging data.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Understand Digital Signals and its propagation.	U
2	Know the sampling of digital Signals.	U
3	Understand the process of conversion of digital signals into analog and vice versa.	R
4	Know the required devices for digital Signal Processing.	An
5	Know the application of digital Signal Processing.	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)205
Digital Signal Processing

Unit No.	Topics	No. of Hours	CO No.
I	UNIT – I Realization of Systems: Realization of digital linear system, Signal flow graph. IIR & FIR Structure. MATLAB Programming for realization of IIR & FIR Structure Only.	10	1
II	UNIT – II Infinite Impulse Response Filter design (IIR): Analog & Digital Frequency transformation. Designing by impulse invariance & Bilinear method. Butterworth and Chebyshev Design Method.	10	2
III	UNIT – III Finite Impulse Response (FIR) Filter Design: Rectangular, Triangular, Hamming, Blackman & Kaiser window. Linear Phase and Optimal Filter.	10	3
IV	UNIT – IV Multirate DSP: Introduction, Sampling Rate Conversion, Decimation of Sampling rate by an Integer factor, Interpolation of sampling rate by an Integer Factor, Sampling rate alteration or conversion by a rational factor. Filter design and implementation for sampling rate alteration or conversion: Direct form FIR digital filter structures, Polyphase filter structure, Time varying digital filter structures. Sampling rate conversion by an arbitrary factor: First order approximation & Second order approximation method. Applications of Multirate Digital Signal Processing (MDSP)	10	4
V	UNIT – V Applications of Digital Signal Processing: Introduction, Applications of DSP: Digital Sinusoidal Oscillators, Digital Time Control Circuits, Digital Comb Filters. Applications in broader sense: Removal of noise from pictures.	10	5

Books Recommended:

- Digital Signal Processing, J. Johnson, Pearson – PHI
- Digital Signal Processing, Proakis, Manolakis & Sharma, Pearson Education
- Digital Signal Processing, Nair, PHI
- Discrete Time Signal Processing, Oppenheim & Schafer, Pearson - PHI
- Digital Signal Processing, Vallavaraj, Salivahanan, Gnanapriya, TMH
- Digital Signal Processing by Hussain, Umesh Publications.

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	**Course Title**		**Course Type.**
MSc(CS)205	Elective – II (Soft Computing)		Elective
Credit	**Hours Per Week (L-T-P)**		
	L	T	P
4	3	1	0

Maximum Marks	Sessional	Theory
125	25	100

S.No	Elective -II
I	AI & Expert System
II	Digital Signal Processing
III	Soft Computing

Learning Objective (LO):

Student will be able to apply various computational techniques such as fuzzy logic, neural network, genetic algorithms and probabilistic reasoning. These techniques are used to solve complex problems that may involve uncertainty, imprecision, or incomplete information.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Understand Artificial Neural Network concept with the help of Biological Neural Network.	U
2	Implement algorithms to train ANN by using learning algorithms.	Ap
3	Test fuzzy set operations and binary relations.	E
4	Understand Genetic algorithms.(CL)	An
5	Understand programming in MATLAB.	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)205
Soft Computing

Unit No.	Topics	No. of Hours	CO No.
I	**UNIT - I: Introduction to Fuzzy Logic System** Fuzzy Sets Operation Of Fuzzy Sets, Properties Of Fuzzy Sets, Fuzzy Relations, Fuzzy Arithmetic, Membership Functions, Fuzzy To Crisp Conversion. Fuzzy Logic, Fuzzy Rule Based Systems, Fuzzy Decision Making, Fuzzy Database, Fuzzy Intelligent System.	10	1
II	**UNIT - II: Introduction to Artificial Neural Networks** Introduction to Artificial Neural Network, Artificial Neuron, Classification of Artificial NeuralNetwork, Architecture of a Artificial Neural Network, Activation Function, Training an Artificial Neural Network, Application of Artificial Neural Network.	10	2
III	**UNIT - III: Perceptron and Associative Memories** Amari General Learning Rule, HEBB Learning Rule, ADLINE, Perceptron Layer Network, Associative memory: Auto associative Memory, Bi-directional memory, Back-propagation Network: Architecture, Training Algorithm Application of Back-propagation algorithm	10	3
IV	**UNIT - IV: Evolutionary Computing** Introduction, overview of evolutionary computing, Genetic algorithms and optimization, The schema theorem: the fundamental theorem of genetic algorithms, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of genetic algorithms with fuzzy logic, Known issues in GAs.	10	4
V	**UNIT - V: Soft Computing Tools** Introduction to MATLAB, Features, Using MATLAB as a Calculator, Creating MATLAB Variables, Basic Plotting: Creating simple plots, adding titles, axis labels and annotations, specify line style and color, Matrix Genertaion : vector, matrix, matrix indexing,creating submatrix, transposing matrix, concatenation, generation of matrix, Programing in MATLAB: M-File scripts, Control flow and operators. Toolbox Introduction, Introduction to Simulink.	10	5

Books Recommended:

- **Soft Computing**, SarojKaushik, TMH Publications.
- **Fuzzy systems and Fuzzy Logic**, *Klir and Uuna*, PHI Publications.
- **Introduction to Artificial Neural Networks**, *S. N. Sivanandam and M. Paulraj*, Vikas publication.
- **Soft Computing and Intelligent systems Design**, *Fakhreddine O. Karry and Clarence de Silva*
- **Neural Network Design**, *Hagan & Demuth*, Vikas Pub. Comp.
- **Fundamentals of Artificial Neural Networks**, *M.A.Hassaoun.*

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	**Course Title**		**Course Type**
MSc(CS)206	Lab-IV: Programming in RDBMS & PL-SQL		Core
Credit	**Hours Per Week (L-T-P)**		
	L	T	P
2	-	-	4

Maximum Marks	Sessional	Practical
150	50	100

Learning Objective (LO):

The learning objective of the course is know how Database is managed by developing SQL queries and PL- SQL triggers etc.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Develop programming skills by implementing theoretical concepts into practical in DBMS Lab.	Ap
2	Inculcate knowledge of SQL query and running it.	Ap
3	Design PL- SQL programs and running it in machine and evaluation of its efficacy.	Ap
4	Analysis Query Execution time.	Ap
5	Analysis Query Execution Efficacy.	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO5	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)206
Lab-IV: Programming in RDBMS & PL-SQL

Unit No.	Topics	No. of Hours	CO No.
I	Introduction to SQL constructs (SELECT...FROM, WHERE... GROUP BY... HAVING... ORDERBY....), CREATE, INSERT, DELETE, UPDATE, ALTER, LIKE, DROP, VIEW definition and use, Temporary tables,	10	1
II	Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references	10	2
III	. Transaction control commands –grant, privileges, commit, Rollback, Savepoint. Introduction to PL/SQL variables – literals – data types – advantages of PL/SQL; Control statements : if ; iterative control – loop, while, for, goto ; exit when;	10	3
IV	Cursors : Types –implicit, explicit – parameterized cursors – cursor attributes; Exceptions: Types – internal , user-defined , handling exceptions – raise statement; Triggers; PL/SQL tables and records: Declaring PL/SQL tables - referring PL/SQL tables, inserting and fetching rows using PL/SQL table, deleting rows; records - declaration of records - deleting records;	10	1
V	Sub programs: Functions -procedures - in, out, inout parameters; purity functions - packages - package specification -advantages of packages - private and public items - cursors in packages.	10	3

Books Recommended:

- **Database System Concept**: *A. Silberschatz , H.F. Korth and S. Sudarshan*, TMH
- **Fundamentals of Database Systems**: *Elmasri & Nawathe*, Pearson Education
- **SQL, PL/SQL**: *Ivan Bayross,* BPB Publication

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	Course Title		Course Type
MSc(CS)207	Lab-V: Programming based on paper-III		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
2	-	-	4

Maximum Marks	Sessional	Practical
100	50	50

Learning Objective (LO):

The course aims to develop programming skills based on .NET frame work. Programming skills leads student to have critical thinking for solving any technical issues using software.**Course Outcomes (CO):**

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Learn about .NET framework.	Ap
2	Understand website designing and its concepts.	Ap
3	Learn client-server paradigm.	Ap
4	Design web applications using ASP.NET.	Ap
5	Understand the OOP and Exception handling in .NET(U)	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	-	1	-	3	2	-	-	-	3	1	-	-	-
CO5	3	3	3	2	1	1	3	-	-	-	-	3	2	-	-	3

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)207
Lab-V: Programming based on paper-III

Unit No.	Topics	No.of Hours	CO No.
I	**Programs to explain following concepts**: Data types, variables, Constant, **ControlStructures**: conditional statements, loops, **Arrays:** creating array in vb.net, Dynamic arrays.	10	1
II	**Programs on Functions:** defining Function, Function returning a value, Recursive function, Param Arrays, Passing Array as Function Arguments,	10	2
III	**Programs Related to following concepts:**MustInherit keyword, using MustOverride, MustOverridable, **Exception Handling.**	10	3
IV	**Programs Related to following concepts:** classes : class Member Constructor and Destructors, Parameterized Constructor, Shared Members of vb.net Class, **Inheritance**: Base and Derived Classes, Base Class Initialization.	10	4
V	**Programs related to** :Asp.net- Life Cycle, , Asp.net state management, Web application, Web forms, Controls in web forms, Events in Web form.	10	5

Books Recommended:

Textbook:

1. Kogent Learning Solutions Inc., .NET 4.5 Programming – Black Book (dreamtech)

References:

1. Joseph Albahari, Ben Albahari, C# 6.0 in a Nutshell
2. Christian Nagel, Professional C# 6 and .NET Core 1.0
3. Andrew Troelsen, Philip Japikse, C# 6.0 and the .NET 4.6

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	Course Title		Course Type
MSc(CS)208	**Lab-VI:** Programming Lab in Network		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
2	-	-	4

Maximum Marks	Sessional	Practical
100	50	50

Learning Objective (LO):

Student will learn about data transmission in any computer network through simulation and develop a view that helps him to understand real time data transmission.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Understanding for computer network concepts	Ap
2	Understand installation and configuration of server.	Ap
3	Learn simulation for any network.	Ap
4	Learn Analysis of transmission of packets.	Ap
5	Learn how does communication Protocols work.	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO5	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Detailed Syllabus:
MSc(CS)208
Lab-VI: Programming Lab in Network

Unit No.	Topics	No. of Hours	CO No.
I	Basic Network Commands	10	1
II	Crimping of LAN Cable	10	2
III	Network Simulation in Cisco Packet Tracer	10	3
IV	Server Installation in Cisco Packet Tracer	10	4
V	Server Configuration in Cisco Packet Tracer	10	5

M.Sc. (CS) Semester-II

Program	Subject	Year	Semester
M.Sc.	Computer Science	1	II
Course Code	**Course Title**		**Course Type**
MSc(CS)209	GD/PI Based on Indian Knowledge System		Core
Credit	**Hours Per Week (L-T-P)**		
	L	T	P
2	-	-	4
Maximum Marks	**Sessional**		-
25	25		00

Learning Objective (LO):

The objective of the course is to develop public speaking skills, team work, communication in group among students.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	Achieve confidence in public speaking.	Ap
2	Know how to behave in group.	Ap
3	Observe how to work with team.	Ap
4	Be better equipped to resolve conflicts.	Ap
5	Be able to express themselves in a professional and diplomatic manner.	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO5	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

MSc(CS)209
(GD/PI Based on Indian Knowledge System)

Unit No.	Topics	No. of Hours	CO No.
I	Group Discussion	50	1
II	Debate		2
III	Extempore		3
IV	Presentation		4
V	Leadership		5

M.Sc. (CS) Semester-III

Program	Subject	Year	Semester
M.Sc.	Computer Science	2	III
Course Code	Course Title		Course Type
MSc(CS)301	Data Science using Python		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0
Maximum Marks	Sessional		Theory
125	25		100

Learning Objective (LO):

The course aims to understand concept of data science, machine learning algorithm and developed basic model using python.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to :	CL
1	To Make students understand the fundamental of data science.	E
2	To make student understand mathematics behind data analysis.	U
3	To impart fundamentals of machine learning algorithms.	Ap
4	To introduce python based programming toolkit for developing basic model.	Ap
5	To design and develop Model.	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

CO-PO/PSO Mapping for the course:

PO / CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation