SYLLABUS FOR THE BATCH FROM THE YEAR 2023 TO YEAR 2025

Programme Code: MIT

Programme Name: M.Sc. (Information Technology)

(Semester I-IV)

Examinations: 2023-2025

P.G. Department of Computer Science & Applications

Khalsa College, Amritsar

Programme name: M.Sc. (Information Technology)
Programme code: MIT
Programme Duration :2years

Programme Objectives

1.	To impart sound knowledge in Information Technology and to enable students to apply the acquired skills creatively in computer and related technologies in practical scenarios.
2.	To effectively utilize knowledge of computing principles to develop sustainable solutions to the present and the prospective computing problems.
3.	To effectively initiate, create and to communicate innovation through social, legal, ethical, and cultural issues inherent in the discipline of computing concepts and solutions to bridge the gap between computing industry experts and business leaders.
4.	To exhibit computing expertise through corporate leadership and entrepreneurship;
5.	To address in the broad areas of multi-disciplinary in nature, and to keep pace with advances in Information Technology.

Program Specific Outcomes (PSOs):

PSO-1	This programme provides understanding about techniques, technologies and methods used in managing and implementing information technology systems.
PSO-2	Widens and deepens the understanding of computing technologies and covers high level concepts that enable the effective management and planning of IT projects and services.
PSO-3	Students gain knowledge in the areas like Artificial Neural Netwoks, image processing, Programming languages, Database Technologies, Advanced Operating System, Mobile Technologies and core computing subjects. This make students employable according to current demand of IT Industry as they understand all dimensions of the concepts of software application and projects.

M.Sc. (Information Technology)

Semester I

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	MIT-411 (Major)	Internet Of Things (IOT)	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**4-5**
2	MIT-412 (Major)	Distributed Computing	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**6-7**
3	MIT-413 (Major)	Advanced Computer Organization and Architecture	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**8-9**
4	MIT-414 (Major)	Network Operating System	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**10-12**
5	MIT-415 (Major)	R Programming	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**13-14**
Skill Enhancement Course(SEC)														
6	MIT-416P	Programming Laboratory-I(R Programming)	**0**	**25**	**75**	**100**	**0**	**0**	**6**	**0**	**0**	**4**	**4**	**15**
						Total Marks600							**24**	

M.Sc. (Information Technology)

SEMESTER-I
MIT-411: Internet of Things (IoT)
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Understand the definition and significance of the Internet of Things.
2.	Discuss the architecture, operation, and business benefits of an IoT solution.
3.	Examine the potential business opportunities that IoT can uncover.
4.	Explore the relationship between IoT, cloud computing, and big data.
5.	Identify how IoT differs from traditional data collection systems.

UNIT-I

M2M to IoT: M2M to IoT, The Vision, Introduction: Machine to Machine (M2M),IoTfrom M2M to IoT, M2M towards IoT, the global context, differing characteristics, M2M value chains, IoT value chains, An emerging industrial structure for IoT, The international-driven global value chain and global information monopolies, M2M to IoT, An Architectural Overview-Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, Standards considerations.

UNIT-II

IoT Architecture: State of the Art, Introduction, Architecture Reference Model, Reference model and architecture, IoT reference model, IoT Reference Architecture, Functional view, Information view, Deployment and operational view, Other relevant architectural views.

UNIT-III

IoT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems.

OpenSource Prototyping Platformsfor IoT: Basic Arduino Programming, Extended Arduino Libraries, Arduino, Based Internet Communication, Raspberry PI, Sensors and Interfacing.

UNIT-IV

Business Process in IoT: IoT Analytics, Creative Thinking Techniques, Modification, Combination Scenarios, Decentralized and Interoperable, Approaches, Object, Information Distribution, Architecture, Object Naming Service (ONS), Service Oriented Architecture, Network of Information, Etc.

Course Outcomes:

At the end of this course the student shall be able :

1.	To understand the application areas of IOT.
2.	To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
3.	To understand building blocks of Internet of Things and characteristics.

Reference:

1. From Machine-to-Machine to the Internet of Things: Introduction to a New Ageof Intelligence, Jan Holler, VlasiosTsiatsis, Catherine Mulligan, StamatisKarnouskos, Stefan Avesand, David Boyle, Academic Press.
2. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT,2014.
3. The Internet of Things: Connecting Objects to the Web. HakimaChaouchi (Editor). ISBN: 978-1-848-21140-7 June 2010, Wiley.
4. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications,2013.

M.Sc. (Information Technology)
SEMESTER-I
MIT-412: Distributed Computing
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1	This course is an introduction to the design of distributed systems and algorithms that support distributed computing.
2	It aims to provide a practical exposure into the design and functioning of existing distributed systems.
3	Understanding of security techniques for security authentication.
4	Understanding of cryptographic algorithms, authentication and access control.

UNIT -I

Introduction: Characterization & classification of distributed systems, Resource Sharing, Web Challenges, Distributed system models. Hardware & software issues.

Communication: Inter-process communication, Layered protocols, Client server protocols, RPC, group communication.

UNIT -II

Coordination, synchronization & consistency: Logical clocks, Physical clocks, mutual exclusion, election algorithms, atomic broadcast, sequential consistency transaction distributed consensus, Threads: Thread synchronization, implementation issues, and threads vs. RPC. Models of distributed computing: Client server and RPC, RPC architecture, External data representation and marshalling.

UNIT -III

Group models and peer to peer: Groups for service replication/ reliability, groups for parallelism / performance, client/ server vs. peer-to-peer, multicast, atomic broadcast.

Distributed file system: File system architecture, Security, Naming/ location transparency, R/W semantics, cache coherence, replication.

UNIT -IV

Distributed shared memory: DSM architecture, consistency models and relation to caching, release consistency, comparison with message passing and RPC.

Security: Introduction, overview of security techniques, cryptographic algorithms, digital signatures, authentication and access control.

Case study: CORBA, MACH

References:

1. Distributed systems, concepts and design, 3rd Edition, Addison Wesley by George Colouris, Jean Dollimore and Tim Kinder berg, 2006.
2. Distributed system, 2nd Edition, Addison Wesley by SapeMullender, 2006.
3. Distributed Computing: Fundamentals, Simulations, and Advanced Topics, Wiley, by Jennifer Welch HagitAttiya 2nd Edition (2006).
4. "Distributed Systems – Principles and Paradigms" by Andrew S Tanenbaum and Maaten Van Steen (2016).

Course Outcomes:

At the end of this course the student shall be able to:

CO-1	Demonstrate knowledge of the basic elements and concepts related to distributed system technologies.
CO-2	Demonstrate knowledge of the core architectural aspects of distributed systems.
CO-3	Design and implement distributed applications.
CO-4	Overview of security techniques
CO-5	Demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems).
CO-6	Apply important methods in distributed systems to support scalability and fault tolerance.
CO-7	Digital signatures, authentication and access control.

M.Sc. (Information Technology)
SEMESTER-I
MIT-413: Advanced Computer Organization and Architecture
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	To make students know about the Parallelism concepts in Uniprocessor systems.
2.	To give the students an elaborate idea about the different memory systems and buses.
3.	To introduce the advanced processor architectures to the students.
4.	To make the students know about the importance of multiprocessor and pipeline computers.
5.	To give students idea about pipeline designing.
6.	To study about data flow computer architectures.

UNIT -I

Paradigms of Computing: Hardware taxonomy: Flynn's classification, Software taxonomy: Kung's taxonomy, SPMD, Instruction set architectures-CISC and RISC, Inter processor communication

Parallel Computational Models: Combinational circuits, PRAM Models, VLSI Models, conditions for Parallelism-Program Partitioning and Scheduling-program flow Mechanisms-Speed up performance laws-Amdahl's law, Gustafson's law-Memory bounded speedup Model.

UNIT -II

Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic Uniprocessor Architecture, Parallel Processing Mechanism.

Parallel Computer Structures: Pipeline Computers, Array Computers, Multiprocessor Systems Architectural Classification Schemes: Multiplicity of Instruction-Data Streams, Serial versus Parallel Processing, Parallelism versus Pipelining

UNIT –III

Pipelining : An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors.

Principles of Designing Pipelined Processors: Instruction Prefetch and Branch Handling, Data Buffering and Busing Structures, Internal Forwarding and Register Tagging, Hazard Detection and Resolution, Instruction pipeline design, Arithmetic pipeline design.

UNIT -IV

Superscalar and Super pipeline Design: Superscalar Pipeline Design, Super pipelined Design Structures and Algorithms for Array Processors: SIMD Array Processors, SIMD Computer Organizations, Masking and Data Routing Mechanisms, Inter-PE Communications Parallelism .

Text Book:

1. Kai Hwang,‖Advanced Computer architecture Parallelism ,scalablity ,Programmablity ‖, Mc Graw Hill,N.Y, 2003

References:

1. Computer Architecture and Parallel Processing, Faye A. Briggs, McGraw-Hill International Editions, 2003
2. Computer Systems Organization & Architecture, John d. Carpinelli, Addison Wesley, 2002
3. David A. PaΣerson and John L. Hennessey, ―Computer organizaΘon and design‖ Elsevier, Fifth edition, 2014.

Course Outcomes:

At the end of this course the student shall be able to:

CO-1.	Demonstrate concepts of parallelism in hardware/software.
CO-2.	Understanding the parallel computational models.
CO-3.	Understanding the parallel processing mechanism in uniprocessor systems.
CO-4.	Describe the architectural features of advanced processors.
CO-5.	Interpret performance of different pipelined processors.
CO-6.	Design instruction pipeline and arithmetic pipeline.
CO-7.	Familiar with the concept of pipeline, array and multiprocessor systems.

M.Sc. (Information Technology)
SEMESTER-I
MIT-414: Network Operating Systems
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

.

Course Objectives:

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

1.	Make students learn about basics of Network and Operating system concepts that will help them to understand the requirements of Network Operating System.
2.	Make student learn about Active Directory.
3.	Learn the functions which are unique to network operating systems.
4.	Install and configure a network operating system on different platforms.
5.	Install and configure common network utilities such as DNS.
6.	Install and configure common network servers such as SMTP and FTP servers.

Unit-I

Introduction of various Network Operating Systems: Types of Operating system, My SQL, Unix/Linux.

Introduction to Computer Networks: Reference Model: OSI and TCP/IP reference model, IP routing.
Overview of Network Operating System: Introduction, Characteristic, Types, Architecture, Shell, Kernel, File System, Hardware requirements.

Unit-II

Introduction to Active Directory: Role of Active Directory DS Server, Features of Active Directory, Common Terminologies and Active Directory Concepts, Active Directory Schema, Active Directory Objects, Active Directory concepts, Active Directory Data structure and storage architecture, DNS support for Active Directory, Active Directory DNS support components.

Unit-III

Disk Management: Terminology and Concepts, Managing Disks, Disk Quotas, Disk Fragmentation, Remote Storage, RAID and Mirroring.
Servers: Managing DHCP, DNS and Proxy servers.

User, Group and Computer Accounts: Creating and Managing user, Group and Computer Accounts, Managing Access Controls, Troubleshooting Accounts.

Unit-IV

Performance Monitoring and Security: Task Management, System Monitoring, Performance Logs and Alerts, Monitoring Memory, Network and Process Objects, Auditing Security Events, Audit Policy and Event Viewer.
Introdcution to Microsoft Network Monitoring Tool: Introduction to netmon tool, Installation and configuration of Netmon.
Case and Comparative Studies of MySQL, Unix/Linux OR any other OS.

References:

1. MCSA/MCSE; Exam 70-291, Implementing, Managing and Maintaining a Windows Server 2003 Network Infrastructure by Shinder Deborah Littlejohn, Shroff Publishers, 7th Reprint, 2005.
2. Networking: The Complete Reference by Craig Zacker, Tata McGraw-Hill, Seventh Reprint, 2004.
3. Unix Concepts and Applications, Sumitabha Das,4th Edition, Tata McGraw Hill, 2017.
4. Unix and Shell Programming: A Text Book, Behrouz A. Forouzen, Cengage India Private Limited, 2005.
5. Linux: A Practical Approach, B.Mohamad Ibrahim, Lakshmi Publications, Ist Edition, 2017.
6. Linux Security, R. J. Hontanon, Sybex publishers, 2001.
7. The Internet: Douglas E. Comer, 4thEdition, 2006.
8. MCTS- Guide to Microsoft Windows Server 2008 Network Infrastructure Configuartion, Micheal Bender, Course Technology Cengage Learning,1st edition, 2009.

Course Outcomes:

On completion of this course students will able to:

CO-1.	Recall basic concepts of Network and Operating System.
CO-2.	Learn about Network Operating System.
CO-3.	Understand real life applications and manage Network Operating System.
CO-4.	Acquire the knowledge about active directory.
CO-5.	Understand protection and security provided to systems and various permission available to different types of users and admin.
CO-6.	Understand Telnet and FTP, Distributed Systems. Case and Comparative Studies of MySQL, Unix/Linux OR any other OS.

M.Sc. (Information Technology)
SEMESTER-I
MIT-415: R Programming
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hourse (Per Week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Objectives:

1	This course introduces R, which is a popular statistical programming language. The course covers data reading and its manipulation using R, which is widely used for data analysis internationally.
2	Understand and implement functions that support linear modelling, non-linear modelling, classical statistics, classifications, clustering and more. The course also covers different control structures and design of user-defined functions.
3	Learn how to develop the program in R Programming. Learn how to develop an open-source scripting language for predictive analytics and data visualization.

UNIT-I

Introduction to R, Installation of R interpreter, overview of R, features of R, major R data structures, Vectors, matrices, arrays, lists and data frames, Common Vector Operations,subletting of vector. Creating matrices, matrix operations, Applying functions to matrix Rows and Columns, Adding and deleting rows and columns.

UNIT-II

Creating list, list operations, applying list functions. Creating Data Frames, Merging Data Frames, Applying functions to Data Frames, Factors and Tables, factors and levels, Common functions used

with factors, Control statements: Loops, looping Over Non-vector Sets, if-else , writing user defined function, scope of the variable, Rscriptfile.

UNIT-III

Input/ Output: scan (), read line () Function, recursion, replacement functions, Printing to the Screen Reading and writing CSV and text file. Math functions, function for statistical distributions, linear algebra operations on vector and matrices, Basics of simulation, simulation programming in R: Built random variable generator.

UNIT-IV

Object –oriented programming: S3 generic functions, writing S3 andS4Classes.Stringmanipulation,GraphicsinR:Simplegraphics (Bar, Multiple Bar, Histogram, Pie, Box-Plot, Scatter plot), Low-level and High-Levelplotfunctions,par()commandtogeneratemultipleplots.Customizinggraphs,savinggraphto file, performance enhancement: speed and memory, functional programming and memory issue,Debugging.

References:

1. Dennis,B.(2012):The R Student Companion,Taylor & Francis Group.
2. Matloff,N.(2011):TheArtofRProgramming:ATourofStatisticalSoftwareDesign,
3. William.Lander,J.P.(2014):RforEveryone:AdvancedAnalyticsandGraphics,Addison-WesleyData&AnalyticsSeries.

Course Outcomes:

At the end of this course the student shall be able to:

CO-1	Develop an R script and execute on R Programming Environment.
CO-2	Build new packages for sharing and reusability.
CO-3	Install, load and deploy the required packages.
CO-4	Join columns and rows in a data frame using bind functions
CO-5	Utilize R Data types for developing programs and learn all the basics of R-Programming (Data types, Variables, and Operators.
CO-6	Applying string manipulation functions.
CO-7	Developing packages, data frames
CO-8	Learning with different file systems and CSV file systems.

M.Sc. (Information Technology)
SEMESTER-I
MIT-416P
Programming Laboratory – I
(R Programming)
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Practical Marks: 75**
Practical Internal Assessment M: 25

Course Objectives:

1.	Understand and implement functions that support linear modelling, non-linear modelling, classical statistics, classifications, clustering and more.
2.	Learn how to develop the program in R Programming.
3.	Learn how to develop an open-source scripting language for predictive analytics and data visualization.

Programming laboratory based on R Programming

Course Outcomes:

At the end of this course the student shall be able to:

CO-1.	Show the installation of the R Programming Environment.
CO-2.	Utilize R Data types for developing programs and Learn all the basics of R-Programming (Data types, Variables, and Operators.
CO-3.	Implementation of R-loops with different examples, learn the basics of functions in R and implement with example.
CO-4.	Join columns and rows in a data frame using bind functions, developing packages, data frames, and string manipulation functions.
CO-5.	Learning with different file systems and CSV file systems.

M.Sc. (Information Technology)
Semester II

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution of The Course			Total Credit Per Course L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	**MIT-421 (Major)**	Mobile Computing	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**17-18**
2	**MIT-422 (Major)**	Optional Paper Option (i): Distributed Databases Option (ii): Cloud Computing	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**19-20** **21-22**
3	**MIT-423 (Major)**	Image Processing	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**23-24**
4	**MIT-424 (Major)**	Fuzzy Systems	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**25-27**
5	**MIT-425 (Major)**	Advanced Operating System	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**28-30**
Skill Enhancement Course(SEC)														
6	**MIT-426P**	Programming Laboratory-II	**0**	**25**	**75**	**100**	**0**	**0**	**6**	**0**	**0**	**4**	**4**	**31**
					Total Marks 600								**24**	

M.Sc. (Information Technology)

SEMESTER-II
MIT-421: Mobile Computing
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	To provides complete knowledge of mobile communication process.
2.	To provide leaning about various components used in mobile telephony such as mobile station, base station, switching centres etc.
3.	To teach working model used behind the mobile communication and elaborating the relation between wired and wireless systems of communications.
4.	To deeply study about the mobile network layer and platforms of mobile applications.

UNIT-I

INTRODUCTION TO MOBILE COMPUTING: Introduction and need for Mobile Computing Mobility and portability, Mobile and Wireless devices, Applications, Brief History of wireless communication. Current Wireless Systems: Overview of Paging Systems, Cordless Phones, Cellular Telephone Systems, Satellite Communication, Wireless LANs, Bluetooth, Modern

WIRELESS TRANSMISSION: General Concepts of multiplexing and modulation, Spread Spectrum, Cellular Systems.

MOBILE NETWORK LAYER:

Mobile IP — DHCP — AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols — DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) – MANET Vs VANET — Security.

UNIT-II

MEDIUM ACCESS CONTROL LAYER: Why specialized MAC- hidden and exposed terminals, near and far terminals, General Concepts and comparison of SDMA, FDMA, TDMA, CDMA

MOBILE PLATFORMS AND APPLICATIONS:

Mobile Device Operating Systems — Special Constraints & Requirements — Commercial Mobile Operating Systems — Software Development Kit: iOS, Android, BlackBerry, Windows Phone — MCommerce — Structure — Pros & Cons — Mobile Payment System — Security Issues

UNIT -III

Mobile TCP: Traditional TCP , Congestion Control, Slow start, Fast retransmit / Fast recovery , Implications on mobility , Classical TCP improvements , Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit / Fast recovery, Transmission / Timeout freezing, Selective Retransmission, Transaction oriented TCP , TCP over 2.5/3G wireless networks

GSM: Mobile Services (Bearer, Tele-and-supplementary services),

System Architecture –(Radio subsystem , Network and switching subsystem , Operation subsystem), Protocols –(Localization and calling , Handover), Value Added Services –(SMS: Architecture, Mobile Originated and Mobile Terminated procedures) , Cell Broadcast Service:(Architecture, Message Transfer Procedure) , MMS:(Architecture, Protocol framework, Message Transfer Procedure) , Location Services:(Logical Reference Model, Control Procedures, Network, Architecture, determination of Location Information, Location based services), GPRS.

UNIT-IV

INTRODUCTION TO 3G MOBILE NETWORKS: UMTS - System architecture, radio interface, UTRAN – (Architecture, Functions of RNC, Core network), Handover – (Hard and soft handover)

WIRELESS APPLICATION PROTOCOL-Architecture, Wireless datagram protocol, Wireless transport layer security. Wireless transaction protocol, Wireless session protocol, Wireless application environment, WAP Push Architecture, protocols

References:

1. Mobile Communications: Jochen Schiller, Pearson Education, 2nd Edition
2. Mobile Computing: Implementing Pervasive Information and Communications Technologies by ShambhuUpadhyaya, Kevin Kwiat, AbhijitChaudhury, Springer First Edition,2008
3. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
4. William.C.Y.Lee,“Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,TataMcGraw Hill Edition ,2006.
5. Theodore S. Rappaport “Wireless Communication-Principles and Practice”, Second Edition, Pearson Education

Course Outcomes:

At the end of this course the student shall be able to:

CO-1.	Imparting knowledge about working process of wireless communications.
CO-2.	Implementation knowledge of mobility, portability through various Wireless Communication Medias.
CO-3.	Study of mobile network layer including different types of protocols to handle network layer.
CO-4.	Deal with real world applications of mobile platform like iOS, Android, BlackBerryand Windows.
CO-5.	Exhibits complete understanding about cellular networks and mobile adhoc networks.
CO-6.	Adapting TCP/IP extensions in mobile and cellular technology.

M.Sc. (Information Technology)

SEMESTER-II

MIT-422
Option (i)
Distributed Databases
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	To get acquaint students with the basics of Distributed DBMS, different Architectural Models for DDBMS, Data allocation, Relational Database Design, Information Requirements for Data allocation, Query Processing & Optimization in context of distributed databases.
2.	Students will learn about data distribution, data distribution mechanism/ techniques along with its pros/cons.
3.	The key goal is to prepare students for a professional career in the field of data administration and database design.
4.	To learn about Distributed Relational Database Query Processing & Optimization
5.	To get acquaint students with Query Decomposition and Distributed Concurrency Control issues, methods and their merits and demerits.

UNIT -I

Introduction

Concepts, Advantages and Disadvantages of Distributed database management system (DDBMS), Promises of DDBMS, Homogenous and Heterogeneous DDBMS. Functions of a DDBMS. Distributed Database Management System Architecture , Multidatabase management system(MDBS)

UNIT-II

Architectural Models for DDBMS (Distributed Database Management System): Autonomy, Distribution, Heterogeneity factors; Client Server Systems,Two-tier, three-tier and multi -tier Peer-to-Peer Distributed Systems, Global Directory Issues, Inheritance.

Distributed Relational Database Design

Fragmentation: Reasons, Alternatives, Degree, Information requirement. Horizontal, Vertical, Hybrid Fragmentation.

UNIT -III

Allocation: Allocation Problem, Information Requirements for allocation.

Distributed Relational Database Query Processing & Optimization, Objectives & Phases of distributed query language

Query Decomposition: Global and Local Query Optimization, Localization of Distributed Data, Query Optimization, Introduction to Distributed Query Optimization Algorithms, characterization of Query process, Layers of Query process, Query decomposition.

UNIT-IV

Distributed Concurrency Control, Objectives, Distributed Serializability, centralized two phase locking, Centralized two phase locking, Distributed two-phase locking: Majority locking Protocol, Biared Protocol,Quorum consensus Protocol

References:

1. M.TamerOzsu, Patrick Valdureiz, *'Principles of Distributed Database Systems'* Second Edition, Prentice Hall, 2002.
2. RomezElmasri, ShamkantB.Navathe, *'Fundamentals of Database Systems'* Pearson Education, 2005.
3. Silberschatz, Korth, Sudershan "Database System Concepts" 4th Ed. McGraw Hill,2006.
4. Connolly &Begg "Database Systems – A practical approachto design, Implementation and Management, 3rd Ed. Pearson Education, 2005.
5. George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, Distributed Systems: Concepts and Design, Fifth Edition, Pearson Education, 2017.

Course Outcomes:

CO-1.	Knowledge & Understanding: Distributed Databases and their design & development
CO-2.	Intellectual Cognitive/ analytical skills: Data Distribution and Allocation strategies
CO-3.	Practical Skills: Algorithmic knowledge about distributed database design and allocation.
CO-4.	Transferable skills: Usage of DDBMS design and allocation models
CO-5.	Be able to apply methods and techniques for distributed quey processing and optimisation

M.Sc. (Information Technology)
SEMESTER-II
MIT-422
Option (ii)
Cloud Computing
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	The fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges.
2.	The basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations.
3.	Cloud computing risks, challenges and threats to infrastructure, data and access control. Cloud computing security architectural issues, Identity management and Autonomic security.
4.	Different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS).

UNIT -I

Introduction: Definition, Vision, Reference Model, Benefits, Limitations, Terminology, Open Challenges.

Virtualization: Definition, Type of Virtualization, Benefits, Limitations, Virtualization and Cloud, Virtual Appliance.

UNIT-II

Cloud Computing Architecture: Service Models, Deployment Models, Cloud Entities, Cloud Clients, Service Level Agreement (SLA) and Quality of Service (QoS) in Cloud Computing.

Programming Models in Cloud: Thread Programming, Task Programming and Map–Reduce Programming.

UNIT-III

Cloud Security: Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud.

UNIT-IV

Advance Topic in Cloud: Energy Efficiency in cloud, Centeralizing e-mail communications, Cloud Computing for the community, Cloud Computing for corporation, Federated Cloud Computing.

References:

1. RajkumarBuyya, Christian Vecchiola and ThamaraiSelvi, Mastering Cloud Computing: Foundation and Application Programming, Tata McGraw Hill, ISBN–13: 978–1–25–902995–0, New Delhi, India, Feb 2013.
2. Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy, O'Reilly,ISBN–13: 978–8–18–404815–5.
3. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., ISBN–13: 978–8–12–652980–3, New Delhi, India, 2011.
4. Dr.Saurabh Kumar, Cloud Computing: Insights Into New–Era Infrastructure, Wiley India Pvt. Ltd, ISBN–13: 978–8–12–652883–7, New Delhi, India, 2011.
5. Fern Halper, Hurwitz, Robin Bloor, Marcia Kaufman, Cloud Computing for Dummies, Wiley India Pvt. Ltd, ISBN–13: 978–0–47–059742–2, New Delhi, India, 2011.
6. John W. itinghousejamesF.Ransome, "Cloud Computing Implementation, Management and Security" , CRC Press.

Course Outcomes:

Students will be able to:

CO-1.	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO-2.	Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacenters to build and deploy cloud applications that are resilient, elastic and cost-efficient.
CO-3.	Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.
CO-4.	Illustrate the fundamental concepts of cloud storage
CO-5.	Analyze the core issues of cloud computing such as security, privacy, and interoperability.

M.Sc. (Information Technology)
SEMESTER-II
MIT-423: Image Processing
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	To study the image fundamentals and mathematical transforms necessary for image processing.
2.	To understand the image enhancement techniques
3.	To study image restoration procedures.
4.	To Learn the image compression procedures.
5.	Understanding of image enhancement and Image restoration techniques.

UNIT –I

Digital Image Processing Systems: Introduction, Structure of human eye, Image formation in the human
eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels

Image Enhancement in the Spatial Domain: Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters.

UNIT-II

Image Enhancement in the Frequency Domain: Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering, Introduction to Fourier transform, DFT and 2- D DFT,

Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.

Techniques of Colour Image Processing: Colour image signal representation, colour system transformations, extension of processing techniques to colour domain.

UNIT- III

Image Data Compression: Fundamentals, Redundancies: Coding, Interpixel, Psychovisual, Fidelity criteria, Image compression models, Error free compression, Lossy compression.

Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images

UNIT- IV

Image Segmentation: Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation

Image Representation and Description: Representation schemes, Boundary descriptors, Regional descriptor

References:

1. Digital Image Processing by Gonzalez & Wood, Addison Wesley,Pearson; 4th edition (10 May 2017)
2. Rosenfield, A and Kak, A.C., Picture processing, Academic PressN.Y., 1982.
3. Jain, A.K., Fundamentals of Digital Image Processing, Englewood Cliffs, Prentice Hall, Pearson (23 September 1988).
4. Chris Soloman, Stuart Gibson, Fundamentals of Digital Image Processing: A Practical Approach using MatLab, John Wiley 1st edition (20 December 2010).
5. Pratt, W.K. Digital Image Processing, John Wiley, 4th EditionN.Y./1978.
6. Solomon Chris , Toby Breckon Fundamentals of Digital Image Processing :A Practical Approach with Examples in Matlab1st edition (January 4, 2011)

Course Outcomes:

At the end of this course the student shall be able to:

CO-1.	Evaluate the techniques for image enhancement and image restoration.
CO-2.	Analyse images in the frequency domain using various transforms.
CO-3.	Review the fundamental concepts of a digital image processing system.
CO-4.	Categorize various compression techniques.
CO-5.	Interpret image compression standards.

M.Sc. (Information Technology)
SEMESTER-II
MIT-424: Fuzzy Systems
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

The objective of this course is:

1.	To explain few applications of both Neural Networks and Fuzzy Logic in different fieldsReasoning.
2.	To introduce the various learning rules of Neural Networks both supervised and unsupervised.
3.	To introduce the concept of Fuzzification & Defuzzification.
4.	To provide knowledge on associative memories and their applications.
5.	To introduce Fuzzy Logic, Fuzzy relations and Fuzzy mathematics.
6.	To explain the concept of Fuzzy control and also help to design FLC.

UNIT -I

Introduction: The Case for Imprecision, A Historical Perspective, The Utility of Fuzzy Systems, Limitations of Fuzzy Systems

The Illusion: Ignoring Uncertainty and Accuracy, Uncertainty and Information, The Unknown, Fuzzy Sets and Membership, Chance Versus Fuzziness

Classical Sets and Fuzzy Sets: Classical Sets: Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions, Fuzzy Sets: Fuzzy Set Operations, Properties of Fuzzy Sets, Alternative Fuzzy Set Operations

UNIT -II

Classical Relations and Fuzzy Relations: Cartesian Product, Crisp Relations: Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition, Fuzzy Relations: Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Tolerance and Equivalence Relations: Crisp Equivalence Relation, Crisp Tolerance Relation, Fuzzy Tolerance and Equivalence Relations: Value Assignments, Max–Min Method

Properties of Membership Functions, Fuzzification and DeFuzzification:Features of the Membership Function, Various Forms, Fuzzification, Defuzzification to Crisp Sets, λ-Cuts for Fuzzy Relations, Defuzzification to Scalars

Logic and Fuzzy Systems: Part I Logic: Classical Logic, Fuzzy Logic, Approximate Reasoning, Other Forms of the Implication Operation

UNIT -III

Fuzzy Systems: Natural Language, Linguistic Hedges, Fuzzy (Rule-Based) Systems, Graphical Techniques of Inference

Development of Membership Functions: Membership Value Assignments: Intuition, Inference, Rank Ordering, Neural Networks, Genetic Algorithms, Inductive Reasoning

Decision Making with Fuzzy Information: Fuzzy Synthetic Evaluation, Fuzzy Ordering, Non-transitive Ranking, Preference and Consensus, Multiobjective Decision Making

Fuzzy Classification: Classification by Equivalence Relations, Crisp Relations, Fuzzy Relations, Cluster Analysis, Cluster Validity, *c*-Means Clustering, Fuzzy *c*-Means (FCM), Fuzzy *c*-Means Algorithm

UNIT -IV

Introduction to MATLAB: Fuzzy Logic Toolbox, Fuzzy Logic Simulink Demos.

MATLAB simulation: Fuzzy Logic Controller (FLC) implementation. Simulink Fuzzy Logic Controller (FLC) implementation.Applications of FLC to Control System. Develop Fuzzy Inference System for various applications.

References:

1. Fuzzy Logic wit Engineering Applications by Timothy J. Ross, Wiley, Third Edition
2. Fuzzy logic intelligence, Control and Information by John Yen and Reza Langari, Pearson Education, 2003.
3. Uncertain Rule-based Fuzzy Logic System: Introduction and New Directions by Jerry M. Mendel, PrenticeHall.
4. Fuzzy Sets, Fuzzy Logic and Fuzzy System – edited by George J. Keir& Bo Yuan 1996. World Scientific Press.
5. Fuzzy Set Theory: Foundations and Applications by George J. Klir, Ute. St. Clair, Bo Yuan, Prentice Hall,1997.
6. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers by RudraPratap, Oxford University Press, 2010.

Course Outcomes:

After the completion of the course, students should be able to:

CO-1.	Apply basic and advanced differences between Classical Sets versus Fuzzy sets, Classical Relations versus Fuzzy relations.
CO-2.	Design Membership functions.
CO-3.	Analyse Fuzzy rule-based systems, Graphical techniques of inference and develop these membership functions.
CO-4.	Apply decision making techniques with fuzzy information like fuzzy rank ordering, Preference & consensus or Fuzzy c means clustering etc.

M.Sc. (Information Technology)
SEMESTER-II
MIT-425: Advanced Operating Systems
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	The aim of this course is to study, learn, and understand the main concepts of advanced operating systems.
2.	To get a comprehensive knowledge of the architecture of distributed systems.
3.	To understand the deadlock and shared memory issues and their solutions in distributed environments.
4.	To know the security issues and protection mechanisms for distributed environments.

UNIT I

Architectures of Distributed Systems: System Architecture types, issues in distributed operating systems, communication networks, communication primitives. Theoretical Foundations, inherent limitations of a distributed system, lamp ports logical clocks, vector clocks.

Casual ordering of messages: global state, cuts of a distributed computation, termination detection. Distributed Mutual Exclusion, introduction, the classification of mutual exclusion and associated algorithms a comparative performance analysis.

Distributed Deadlock Detection: -Introduction, deadlock handling strategies in distributed systems, issues in deadlock detection and resolution, control organizations for distributed deadlock detection, centralized and distributed deadlock detection algorithms, hierarchical deadlock detection algorithms. Agreement protocols, introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, and applications of agreement algorithms. Distributed resource management: introduction-architecture, mechanism for building distributed file systems, design issues, log structured file systems.

UNIT -II

Distributed shared memory-Architecture:algorithms for implementing DSM, memory coherence and protocols, design issues. Distributed Scheduling, introduction, issues in load distributing, components of a load distributing algorithm, stability, load distributing algorithm,performance comparison – selecting a suitable load sharing algorithm – requirements for load distributing, task migration and associated issues. Failure Recovery and Fault tolerance: introduction, basic concepts, classification of failures, backward and forward error recovery, backward error recovery- recovery in concurrent systems, consistent set of check points, synchronous and asynchronous check pointing and recovery, check pointing for distributed database systems, recovery in replicated distributed databases.

UNIT III

Protection and security–preliminaries: the access matrix model and its implementations-safety in matrix model, advanced models of protection. Data security, cryptography: Model of cryptography, conventional cryptography, modern cryptography, private key cryptography, data encryption standard, public key cryptography, multiple encryption, authentication in distributed systems.

Multiprocessor operating systems: basic multiprocessor system architectures, inter connection networks for multiprocessor systems, caching, hypercube architecture. Multiprocessor Operating System, structures of multiprocessor operating system, operating system design issues, threads- process synchronization and scheduling.

UNIT –IV

Database Operating systems: Introduction, requirements of a database operating system Concurrency control : theoretical aspects, introduction, database systems, a concurrency control model of database systems, the problem of concurrency control, serializability theory, distributed database systems, concurrency control algorithms, introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms, concurrency control algorithms, data replication.

References:

1. MukeshSinghal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001.

2. Andrew S.Tanenbaum, "Modern operating system", PHI, 2003
3. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.

Course Outcomes:
At the end of this course the student shall be able to

1.	Analyze the design issues of distributed operating systems.
2.	Evaluate design issues of multi-processor operating systems.
3.	Identify the requirements Distributed File System and Distributed Shared Memory.
4.	Formulate the solutions to schedule the real time applications.

M.Sc. (Information Technology)
SEMESTER-II
MIT-426P
Programming Laboratory-II
Skill Enhancement Course (SEC)

Time: 3 Hrs **Total Marks: 100**
Credit Hours (Per Week):4 **Practical Marks: 75**
Practical Internal Assessment M: 25

Course Objectives:
The objectives of this course is:

1.	To explain few applications of both Neural Networks and Fuzzy Logic in different fields Reasoning.
2.	To introduce the various learning rules of Neural Networks both supervised and unsupervised.
3.	To introduce the concept of Fuzzification & Defuzzification.
4.	To provide knowledge on associative memories and their applications.
5.	To introduce Fuzzy Logic, Fuzzy relations and Fuzzy mathematics.
6.	To explain the concept of Fuzzy control and also help to design FLC.

Programming Laboratory based on Image Processing or Fuzzy Systems or Mobile Computing.
Course Outcomes:
After the completion of the course, students should be able to:

CO-1.	Basic Use of MATLAB.
CO-2.	Applications of Major Concepts used in Fuzzy in MATLAB.
CO-3.	Implementation of Fuzzy Logic Controller (FLC).

M.Sc. (Information Technology)

Semester III

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	MIT-531 (Major)	Network Protocols	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**33-35**
2	MIT-532 (Major)	Advanced Web Technologies using ASP.NET	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**36-37**
3	MIT-533 (Major)	Linux Administration	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**38-39**
4	MIT-534 (Major)	Data Security	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**40-41**
5	MIT-535 (Major)	Microprocessor and its Applications	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**42-43**
Skill Enhancement Course(SEC)														
6	MIT-536P	Programming Laboratory-III(Based on Advanced Web Technologies using ASP.NET)	**0**	**13**	**37**	**50**	**0**	**0**	**6**	**0**	**0**	**2**	**2**	**44**
													22	

M.Sc. (Information Technology)
SEMESTER-III
MIT-531: Network Protocols
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Theory Marks: 75

Theory Internal Assessment Marks:25

Credits		
L	**T**	**P**
3	**1**	**0**

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 mar**
4.
5.
6. **ks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
7. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	The goal of this course is to familiarize students with the concepts of network protocols, data communication and Internetworking.
2.	To understand the principles of computer networking, including protocol features, protocol layering, and addressing, routing, and basic network security issues.
3.	Students will be able to enumerate the architectural structures of the ISO/OSI and TCP/IP and explain functions of each layer.

UNIT-I

Review of Basic Concepts: TCP/IP Protocol Suite, Underlying Technologies: LAN (802.3), Wireless Lans (802.11) , Point-to-point WANS, Switched WANS, Protocols , Standards, Standards Organizations: Internet Standards, Internet Administration, IEEE Standards ,Frame Format, Addressing, Ethernet Evolution, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Ten-Gigabit Ethernet

IPv4 Addresses: Address Space, Notation, Range of Addresses, Operations, CLASSFUL ADDRESSING: Classes, Classes and Blocks, Two-Level Addressing, Three-Level Addressing: (Subnetting & Supernetting)

Classless addressing: Variable-Length Blocks, Two-Level Addressing-(Block Allocation, Subnetting), SPECIAL ADDRESSES: Special Blocks, Special Addresses in Each block, NAT -Address Translation, Translation Table

UNIT-II

Delivery and Forwarding of IP Packets: DELIVERY: Direct Delivery & Indirect Delivery, FORWARDING: Forwarding Based on Destination Address, Forwarding Based on Label

Internet Protocol Version IPv4: DATAGRAMS, FRAGMENTATION: Maximum Transfer Unit, Fields Related to Fragmentation, OPTIONS: Format, Option Types

Checksum: Checksum Calculation at the Sender, Checksum Calculation at the Receiver, Checksum in the IP Packet, IP PACKAGE

Address Resolution Protocol (ARP): ADDRESS MAPPING: Static Mapping, Dynamic Mapping, THE ARP PROTOCOL: Packet Format, Encapsulation, Operation, Proxy ARP, ARP Package, Reverse address resolution protocol, Primary and backup RARP servers.

Internet Control Message Protocol Version: Message Format, Error Reporting Messages, Query Messages, Checksum, DEBUGGING TOOLS, Ping, Traceroute

ICMP package: Input Module, Output Module

UNIT-III

Routing Protocols (RIP, OSPF, and BGP) : Introduction: Cost or Metric, Static versus Dynamic Routing Tables, **Routing Protocol**: INTRA- AND INTER-DOMAIN ROUTING, **Distance vector routing**-(Bellman-Ford Algorithm, Distance Vector Routing Algorithm, Count to Infinity, RIP, RIP Message Format, Requests and Responses, Timers in RIP, RIP Version 2, Encapsulation, **Link state routing**- Building Routing Tables, OSPF, Areas, Metric, Types of Links, Graphical Representation, OSPF Packets, Link State Update Packet, Other Packets, Encapsulation, **Path vector routing**: Reachability, Routing Tables, BGP:Types of Autonomous , Systems, Path Attributes, BGP Sessions, External and Internal BGP, Types of Packets, Packet Format, Encapsulation

Transport Layer: Transport-layer services, Process-to-Process Communication, addressing: Port Numbers, Encapsulation and Decapsulation, Multiplexing and Demultiplexing, Flow Control, Error

Control, Combination of Flow and Error Control, Congestion Control, Connectionless and Connection-Oriented Services

Transport-layer protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-*N* Protocol, Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking

UNIT-IV

User Datagram Protocol: User Datagram, UDP Services, Process-to-Process Communication, Connectionless Services, Congestion Control, Encapsulation and Decapsulation, Queuing, Multiplexing and Demultiplexing, Comparison between UDP and Generic Simple Protocol, UDP APPLICATIONS:UDP Features, Typical Applications, UDP package: Control-Block Table, Input Queues, Control-Block Module, Input Module, Output Module, Examples

Transmission Control Protocol: TCP SERVICES: Process-to-Process Communication, Stream Delivery Service, Full-Duplex Communication, Multiplexing and Demultiplexing, Connection-Oriented Service, Reliable Service, TCP FEATURES: Numbering System, Flow Control, Error Control, Congestion Control, Segment, Format, Encapsulation, A TCP connection: Connection Establishment, Data Transfer, Connection Termination, Connection Reset, State transition diagram ,Scenarios, TCP implementation issues.

References:

1. Douglas E.Comer, Internetworking with TCP/IP: Principles, Protocols
2. Forouzan, TCP-IP, Protocol Suit, TMH.
3. Comer, Internetworking with TCP-IP, Vol. 3.
4. Unix Network Programming, W. Richard Stevens.
5. SNMP, Stallings, Pearson.
6. TCP-IP Network Administration, Hunt Craig.

Course Outcomes:

On Completing the course, the students will be able to:

CO-1.	Define network protocol structures and functions
CO-2.	Explain the structures and functions of data link and MAC layers
CO-3.	Discuss the network layer concept and local area network (LN) design
CO-4.	Express the working principles of transport layer protocols (TCP and UDP)

M.Sc. (Information Technology)
SEMESTER-III
MIT-532: Advanced Web Technologies using ASP.NET
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	The students will Study the architecture of Dot Net framework
2.	Understand the basic principles of website development using IDE
3.	Learn advanced windows and web development techniques using dot NET

UNIT-I

Introduction to .Net Framework

Developing console applications, C# Type Conversion Methods, boxing and unboxing, compiling & building projects, using command line argument, compiling a C# program using command Line utility CSC.EXE

Introduction to Web Applications:

Standard Controls: Display information, accepting user input, submitting form data, displaying images, Using the panel control, Using the hyperlink control.

Validation Controls: Using the required field validator control, Using the range validator control using the compare validator control, Using the regular expression validator control, Using the custom validator control, Using the validation summary controls.

UNIT-II

Rich Controls: Accepting file uploads, displaying a calendar, displaying advertisement, displaying different page views, Displaying a wizard.

Designing Website with Master Pages: Creating master pages, modifying master page content, Loading master page dynamically.

SQL Data Source Control: Creating database connections, executing database commands, Using ASP.NET parameters with the SQL data source controls, programmatically executing SQL data source commands, Caching database data with the SQL data Source controls.

UNIT-III

List Controls: Dropdown list control, Radio button list controls, list box controls, bulleted list controls, custom list controls.

Grid View Controls: Grid view control fundamentals, using field with the grid view control, working with grid view control events extending the grid view control.

UNIT-IV

Building Data Access Components with ADO.NET: Connected the data access, Disconnected data access, executing a synchronous database commands, Building data base objects with the .NET framework.

Maintaining Application State: Using browser cookies, using session state, Using profiles.

Caching Application Pages and Data: page output caching, partial page caching, data source caching, data caching, SQL cache dependences.

References:

1. ASP.NET 3.5: Stephen Walther, Pearson Education, 2005
2. ASP.NET 4.0: In Simple Steps by Kogent Learning Solutions Inc.
3. ASP.NET 4.5: Black Book by Kogent Learning Solution Inc
4. ASP.NET: The Complete Reference Book by Matthew Macdonald ,McGraw Hill education

.

Course Outcomes:On Completing the course, the students will be able to:

CO-1.	Evaluate C# and the .NET framework namespace contents.
CO-2.	Develop the console and GUI applications using C# .Net.
CO-3.	Set up various navigation techniques for integrating web pages within the site.
CO-4.	Create the dynamic web page using ASP.NET Controls which interact with databases.
CO-5.	Manage cookies and sessions as state management techniques.

M.Sc. (Information Technology)
SEMESTER-III
MIT-533: Linux Administration
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (Per Week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

The objectives of this course is to:

1.	Learn installation of Linux OS software packages and command line installation.
2.	Understand how to manage file systems and administering a Linux system.
3.	Learn Setting up LAN and Setting up DHCP & NIS.
4.	Know about Setting up Print Server, File Server and Web Server.
5.	Learn Troubleshooting system problems.

UNIT-I

Introduction: Introduction to LINUX, Installing LINUX, Partitions, LILO, Installing software packages. Updating with Gnome, updating with KDE, Command line installing.
File Structure: LINUX files, File structure, File & Directory permission, Operations on a file.

UNIT-II

Administering Linux: Creating a user A/C, modifying a user A/C, deleting a user A/C, Checking Disk Quotas, System Initialization, System start-up & shutdown, Installing & managing H/W devices.
Setting Up A LAN: Understanding LAN, setting up Wireless LAN, Understanding IP address, Troubleshooting LAN.

UNIT-III

Setting Up Print Server: Choosing CUPS, Working with CUPS Printing, Managing Printing, Configuring Print Server.

Setting Up File Server: Setting up an NFS, SAMBA, Installing & Running send mail.

Troubleshooting: Troubleshooting LINUX in GRUB mode.

UNIT-IV

Setting Up Web Server: Configuring the Apache Server, Starting & stopping the server, Monitoring Server Activities.

Setting Up DHCP & NIS: Setting up DHCP Server, setting up DHCP Client, Setting up Network Information Service.

References:

1. Redhat Linux (10) Bible: Christopher Negus, 2003
2. Linux Unleashed: Tim Parker, 2006
3. Linux Administration Tools: Charles Fisher, 2007
4. Linux: The Complete Reference, Sixth Edition by Richard Petersen
5. Linux Administration: A Beginners Guide Sixth Edition by Wale Soyinka

Course Outcomes:

On Completing the course, the students will be able to:

CO-1.	Make appropriate decisions during the configuration process to create a properly functioning Linux environment.
CO-2.	Use programs and utilities to administer a Linux machine.
CO-3.	Explain how a Linux server can be integrated within a multi-platform environment.
CO-4.	Analyse the need for security measures for a Linux environment.
CO-5.	Identify the different uses and advantages of Linux in a business environment in order to participate in discussions regarding network servers and services.

M.Sc. (Information Technology)
SEMESTER-III
MIT-534: Data Security
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Define terms related to computer data security.
2.	Describe the ways in which the security of an information system can be endangered.
3.	Demonstrate competence in detecting potential security vulnerabilities, and demonstrate ways of recovering from the effects of attacks.
4.	Analyse the offered system, and point to the potential safety problems.
5.	Suggest the optimal way to organize information system security.

UNIT-I

Introduction: History of Cryptography. Mathematical background: Probability theory, Information theory, Complexity theory, Number theory. Symmetric (Private) Key Cryptographic Systems: Caesar, Affine, Monoalphabetic Substitution, Transposition, Homophonic substitution, Vignere, Beauford and DES Family, Product ciphers, Lucifer and DES.

UNIT-II

Asymmetric (Public) Key Cryptographic Systems: Concept of PKCS, RSA Cryptosystem- Variants of RSA, Primality testing, Security of RSA, Merkle, Hellamn, Security of Merkle, Hellaman, ElGamal.

Elliptical Curve Cryptography. Stream ciphers and block ciphers: The one time pad, Synchronous stream ciphers, Self-synchronizing stream ciphers, Feedback shift registers Linear Complexity, Non-linear feedback shift registers, Stream ciphers based LFSRs. Non-linear Combination generators, Non linear filter generators, Clock controlled generators, The alternating step generators, The shrinking generators.

UNIT-III

Digital Signatures: Properties, Generic signature schemes, Rabin Lamport, Matyasmeyer, RSA, Multiple RSA and ElGamal Signatures, Digital signature standard, Blind Signatures, RSA Blind. Secret Sharing Algorithms: Threshold secret sharing, Shamir scheme, Blakley scheme and modular Scheme.

UNIT-IV

Pseudo random number generators: Definition of randomness and pseudo-randomness, Statistical tests of randomness, Linear congruential generator, Modern PRNGs (a brief description).

Course Outcomes:

At the end of this course the student shall be able to

1.	Describe the concept of privacy including personally private information, potential violations of privacy due to security mechanisms, and describe how privacy protection mechanisms run in conflict with security mechanisms.
2.	Describe how an attacker can infer a secret by interacting with a database.
3.	Explain how to set a data backup policy or password refresh policy.
4.	Discuss how to set a breach disclosure policy.
5.	Describe the consequences of data retention policies.

References:

1. Padmanabhan T R, Shyamala C and Harini N, “Cryptography and Security”, Wiley Publications 2011.
2. Josef Pieprzyk, Thomas Hardjono and Jenifer Seberry, “Fundamentals of Computer Security”, Springer 2010.
3. Douglas R Stinson, “Cryptography:Theory and Practice”, CRC Press 2005.
4. Alfred J Menezes, Paul C Van Oorshot and Scott A. Vanstone, “Handbook of Applied Cryptography”, CRC press 1996

M.Sc. (Information Technology)
SEMESTER-III
MIT-535: Microprocessor and its Applications
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Learn detailed software and hardware architecture of 8088/8086 microprocessor.
2.	Understand the concept of Interrupts and their significance in 8088/8086 microprocessor.
3.	Analyse how different peripherals are interfaced with microprocessor.
4.	The student will be able to understand the future trends in microprocessor.

UNIT-I

Introduction to Microprocessor, General Architecture of Microcomputer System, Microarchitecture of 8088/8086 microprocessor , bus interface unit, execution unit concept of pipelining, Memory Address space and data organization , Register organization , Memory segmentation , Physical address generation, addressing modes of 8088/8086

UNIT-II

Description of various pins of 8088/8086 microprocessor , Minimum mode and maximum mode configurations, system clock, Bus cycle

Memory control signals, Read and write Bus cycles, hardware organization of memory address space, memory bus status code, program and data storage memory

UNIT-III

I/O interface, I/O address space and data transfer, I/O Control Signals, memory mapped I/O, Isolated I/O, I/O instructions, I/O bus cycles, Output ports, 8255A Programmable Peripheral Interface (PPI), Serial communication interface (USART and UART) – the RS- 232 C interface.

UNIT-IV

Interrupt Interface of 8086/8088 Microprocessor, Types of Interrupt, Interrupt Vector Table (IVT), Enabling and Disabling Interrupts, interrupt service routine

Features of Pentium processor, internal architecture of Pentium processor, operating modes. software architecture of Pentium processor, Register Sets , enhancement to instruction set.

References:

1. BARRY B. BREY, " THE INTEL MICROPROCESSORS-Architecture, Programming and Interfacing", Pearson Education India. Eighth Edition(2008)
2. Walter Triebel, Avtar Singh: The 8088 and 8086 Microprocessor – Architecture, Software and Interfacing Techniques, PHI, Delhi. Fourth Edition.
3. Douglas V. Hall: Microprocessors and Interfacing – Programming and Hardware, Tata McGraw Hill Publishing Company Ltd., New Delhi. Second Edition
4. Microcomputer Systems: The 8086/8088 Family - Yu Cheng Liu and Glen A Gibson – PHI. Second Edition

Course Outcomes:

At the end of this course the student shall be able:

CO-1.	To illustrate the architecture of 16 bit 8088 /8086 microprocessor.
CO-2.	To use the various addressing modes and data transfer instructions of the microprocessor
CO-3.	To prepare students for higher processor architecture and embedded systems
CO-4.	To understand the working of Programmable Peripheral interface.
CO-5.	To introduce the operations and interfacing techniques of 8088/8086 microprocessor.

M.Sc. (Information Technology)
SEMESTER-III
MIT-536 P
Programming Laboratory-III
(Based on Advanced Web Technologies using ASP.NET)
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 50**

Credits		
L	**T**	**P**
0	**0**	**2**

Practical Marks: 37

Practical Internal Assessment Marks:13

Course Objectives:

1.	The students will Study the architecture of Dot Net framework and implement it using C# programming and visual studio.
2.	Understand the basic principles of website development using IDE and implement it.
3.	Learn advanced web development techniques using cookies and session, database connectivity and user profiles.

Programming Laboratory based on Advanced Web Technologies using ASP.NET.

Course Outcomes:

On Completing the course, the students will be able to:

CO-1.	Implement C# and the .NET framework namespace contents.
CO-2.	Develop the console and GUI applications using C# .Net.
CO-3.	Set up various navigation techniques for integrating web pages within the site.
CO-4.	Create the dynamic web page using ASP.NET Controls which interact with databases.
CO-5.	Manage cookies and sessions as state management techniques.

M.Sc. (Information Technology)

Semester IV

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	MIT-541 (Major)	Advanced Java Technology	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**46-47**
2	MIT-542 (Major)	Optional Paper Option (i): Network Security Option (ii): Big Data Analytics Option (iii): Ethical Hacking	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**48-53**
3	MIT-543 (Major)	Artificial Neural Network	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**54-55**
Skill Enhancement Course(SEC)														
6	MIT-544P	Programming Laboratory-III(Based on Advanced Java Technology)	**0**	**13**	**37**	**50**	**0**	**0**	**6**	**0**	**0**	**2**	**2**	**56**
	MIT-545P	Project Work	**0**	**50**	**150**	**200**	**0**	**0**	**24**	**0**	**0**	**8**	**8**	**57**
													22	

M.Sc. (Information Technology)
SEMESTER-IV
MIT-541
Advanced Java Technology
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

At the end of this course, the students will know:

1.	To understand object-oriented programming concepts and apply them in solving problems.
2.	To introduce the major conceptual knowledge of Multithreading, Java I/O Basics, Applets, Event handling, AWT and servlets and demonstrate how they relate to design of programs
3.	To introduce the implementation of packages, inheritance and interfaces.
4.	To introduce the concept of exception handling and multithreading.

UNIT-I

Java I/O: I/O Basics, Streams, reading Console input and writing console output, Print Writer Class, Reading & Writing Files, Byte Streams, Character Streams & Serialization.

UNIT-II

Multithreaded Programming: The Java Thread Model, Thread Priorities, Synchronization, Interthread communication, Suspending Resuming and Stopping Threads.

Event Handling: The Delegation Event Model, Event Classes, Event Listener Interfaces.

UNIT-III

Applets: Applet Basics, Applet Architecture, Applet: Display, Repaint, Parameter Passing.

AWT: Window Fundamentals, Working with Frame Windows, Graphics, Color and Fonts.

UNIT-IV

Servlets: Life Cycle of a Servlet, The Servlet API, Reading Servlet Parameters, Handling HTTP Requests and Responses, Cookies & Session Tracking.

References:

1. The Complete Reference – JAVA 2 by Ptrick Naughton & Herbert Schildt TMH Publications.
2. The Java Tutorial Continued by Compione, Walrath, Huml SUN JAVA Tutorial Team, Addison Wessley,2007.
3. Java2 Black Book Steven Holzner OT Dreamtech Press, www.idgbooksindia.com, 2007.
4. "Introduction to Java Programming", Y. Daniel Mliang, Pearsons Publications.
5. Programming with JAVA - E Balgurusamy
6. JAVA: How to Programme- Paul Deital and Harvey Deital

Course Outcomes:

On Completing the course, the students will be able to:

CO-1.	Understand ability of the concept of OOPs as well as the purpose and uses principles of inheritance, polymorphism, encapsulation and method overloading in core java and as well all the advanced concepts like Multithreading, Applets, Servlets, AWT and I/O Basics in advanced java.
CO-2.	Create a java applications and programs using sound oops practices.
CO-3.	Develop programs using the java collection API as well as the java standard class library.
CO-4.	Develop ability of applying the conceptual approach of working with graphics
CO-5.	Develop and understand the concept of web applications through Applets & Servlets programming.

M.Sc. (Information Technology)
SEMESTER-IV
MIT-542
Option (i)
Network Security
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Understand principles of network security and to guarantee a secure network by monitoring and analyzing the nature of attacks through various tools.
2.	Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an organization

UNIT-I

Essential of Network Perimeter Security: Terms. Defense in depth

Packet Filtering: TCP/IP Primer, How Packet filtering Works, TCP And UDP Ports, TCP's Three way handshake, The Cisco Router as a packets filter, An Alternative packet filter: IP Chains, The Cisco ACL, Effective Users of Packets-filtering devices, Tracking Rejected Traffic, Problem with Packets Filters, Dynamic packet Filtering and be Reflexive.

UNIT-II

Stateful Firewalls: How a Stateful Firewall works, The concept of state ,Stateful Filtering and stateful Inspection.

Proxy Firewalls: Fundamentals of Proxying, Pros And Cons of Proxy Firewalls, Types of Proxies, Tools of Proxying.

UNIT-III

Security Policy: Firewalls Are Policy, How to develop Policy, Perimeter Consideration.

Network Instruction Detection: Network instruction detection basics, The roles of Network IDS in a parameter defense, IDS Sensor placement, Using an IDS Management Networks.

The Need for Host Hardening: Removing or Disabling of Unnecessary Programs. Limiting access to data and Configuration Files, Controlling User and Privileges, Maintaining Host Security Logs, Applying Patches, additional Hardening Guidelines.

UNIT-IV

Host Defenses : Hosts and the perimeter, Antivirus Software, Host-Based Firewalls, Host – based Instruction detection, Challenges Of host defenses components.

Instruction Prevention System: What is IPS, IPS Limitation, NIPS, Host-Based Instruction Prevention System, Monitoring file Integrity, Monitoring Application Behaviour.

Fundamentals of Secure Premier Design: Gathering Design Requirements, Design Elements for Premier Security.

Separation Resources: Security Zones, Common Design Elements, VLAN-Based Separation.

References:

1. Roberta Bragg, "Network Security: The Complete Reference", 2017

2. J. Michael Stewart, Network Security, Firewalls And VPNs, 2nd edition

3. Charlie Kaufman, "Network Security: Private Communication in a Public World", Pearson, 2nd edition, 2016.

4. David Kim and Michael G. Solomon, "Fundamentals Of Information Systems Security", 2nd edition, 2013

Course Outcomes:

On Completing the course, the students will be able to:	
CO-1.	Understand the basics of Network Security.
CO-2.	Understand the concept of packet filtering and how to secure a message over insecure channel by various means
CO-3.	Understand various Security zones
CO-4.	Identify the function and types of a firewall, and how does it keep a computer secure and safe from viruses
CO-5.	Understand the implementation of IDS and IPS, Security policies, host Hardening and Host defence.

M.Sc. (Information Technology)
SEMESTER-IV
MCS-542
Option (ii)
Big Data Analytics
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Theory Marks: 75

Theory Internal Assessment Marks:25

Credits		
L	**T**	**P**
3	**1**	**0**

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

COURSE OBJECTIVES

The objective of this course is to:

1.	Study the basic technologies that forms the foundations of Big Data.
2.	Study the programming aspects of cloud computing with a view to rapid prototyping of complex applications.
3.	Understand the specialized aspects of big data including big data application, and big data analytics on Structured, Unstructured Data.
4.	Study different types Case studies on the current research and applications of the Hadoop and big data in industry.

UNIT-I

An Overview of Big Data and Big Data Analytics. Understanding Hadoop Ecosystem (Hadoop Distributed File System, MapReduce, Hadoop YARN, HBase, Combining HBase and HDFS, Hive, Pig,

Sqoop, ZooKeeper, Flume, Oozie). MapReduce Framework, Techniques to Optimize MapReduce Jobs, Role of HBase in Big Data Processing.

UNIT-II

Developing Simple MapReduce Application, Points to Consider while Designing MapReduce. Controlling MapReduce Execution with InputFormat, Reading Data with Custom RecordReader, Organizing Output Data with OutputFormats, Customizing Data with Record Writer, Optimizing MapReduce Execution with Combiner, Controlling Reducer Execution with Partitioners.

UNIT-III

YARN Architecture, Working of YARN, YARN Schedulers, Backward Compatibility withYARN, YARN Configurations, YARN Commands, YARN Containers. Introduction to NoSQL. Types of NoSQL Data Models, Schema-Less Databases, Materialized Views, Distribution Models.

UNIT-IV

Analytical Approaches, Introducing to various Analytical Tools, Installing R, Handling Basic Expressions in R, Variables in R, Working with Vectors, Storing and Calculating Values in R, Creating and Using Objects, Interacting with Users, Handling Data in R Workspace, Executing Scripts, Reading Datasets and Exporting Data from R, Manipulating and Processing Data in R, Working with Functions and Packages in R, Performing Graphical Analysis in R, Techniques Used for Visual Data Representation, Types of Data Visualization

References:

1. Big Data, Black Book by DT Editorial Services, Dreamtech Press.
2. Big Data Computing and Communications edited by Yu Wang, Hui Xiong, Shlomo Argamon, XiangYang Li, JianZhong Li Springer
3. Big Data Analytics Beyond Hadoop by Vijay Srinivas Agneeswaran, FT Press.

Course Outcomes:At the end of this course the student shall be able to:

CO-1.	Identify Big Data and its business implications and the working of R language.
CO-2.	Learn HDFS concepts and Interfacing with HDFS
CO-3.	List the components of Hadoop and Hadoop Eco-System.
CO-4.	Access and Process Data on Distributed File System
CO-5.	Manage Job Execution in Hadoop environment and develop Big Data solutions using Hadoop eco system.

M.Sc. (Information Technology)
SEMESTER-IV
MIT-542
Options (iii)
Ethical Hacking
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Introduces the ethical hacking methodologies.
2.	Covers applying cyber security concepts to discover and report vulnerabilities in a network.
1.	Explores legal and ethical issues associated with ethical hacking.

UNIT-I

Introduction:

Network Security, Functionality and ease of use Triangle, Essential Terminology and Elements of Security (Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit), Concept of ethical hacking Phases involved in hacking,

Penetration Testing and Ethical Hacking

Foot Printing Introduction to foot printing, Information gathering methodology of the hackers, Active and passive reconnaissance.

UNIT-II

Scanning

Scanning, Elaboration phase, active scanning. Enumeration, DNS Zone transfer. Detecting live systems on the target network, Discovering services running /listening on target systems, Understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting

UNIT-III

System Hacking

Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Key(stroke) Loggers, Understanding Sniffers and their working, Comprehending Active and Passive Sniffing, Man-in-the-Middle Attacks, ARP Spoofing/Poisoning and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

Trojans and backdoors: Trojan, Overt and Covert Channels, Working of Trojans, Different Types of Trojans, Different ways of Trojan's entry into a system, Indications of a Trojan Attack .

UNIT-IV

Session Hijacking Understanding Session Hijacking, Spoofing vs. hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session hijacking Tools.

Hacking Wireless Networks Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

References:

1. Network Security and Ethical Hacking, RajatKhare, Luniver Press, 30-Nov-2006.
2. Ethical Hacking, Thomas Mathew, OSB Publisher, 28-Nov-2003.
3. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill, 2005.
4. Ethical Hacking and Network defense, Simpson, Cengage Learning, 2009. 5. Hackers Beware, Eric Core, EC-Council Press, 2003

Course Outcomes:

On Completing the course, the students will be able to:

CO-1.	Plan a vulnerability assessment and penetration test for a network.
CO-2.	Execute a penetration test using standard hacking tools in an ethical manner.
CO-3.	Report on the strengths and vulnerabilities of the tested network.
CO-4.	Identify legal and ethical issues related to vulnerability and penetration testing.

M.Sc. (Information Technology)
SEMESTER-IV
MIT-543
Artificial Neural Networks
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**
Credit Hours (per week):4 **Theory Marks: 75**
Theory Internal Assessment M: 25

Note: 1. Medium of Examination is English Language.
2. The question paper covering the entire course shall be divided into three sections.

Instructions for Paper Setters:
Section A: It will have question No.1 consisting of 10 very short answer questions from the entire syllabus. Students will attempt 6 questions. Each question will carry **2.5 marks** with answer to each question up to 10 lines in length. The total weightage being **15 marks**.
Section B: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 2, 3, 4 and 5 will be set by the examiner from Unit-I of the syllabus. The students will be required to attempt any two questions. Each question will carry **15 marks.** The total weightage of this section shall be **30 marks.**
Section C: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 6, 7, 8 and 9 will be set by the examiner from Unit-II of the syllabus. The students will be required to attempt any two questions. Each question will carry **15 marks.** The total weightage of this section shall be **30 marks**.

Course Objectives:

1.	Enable students to understand important concepts and theories of artificial neural networks (ANNs)
2.	Enable students to understand how ANN can be designed and trained
3.	Enable students to calculate simple examples of ANNs.
4.	Give students an appreciation of some of the limitations and possibilities of ANNs.

UNIT-I

Neural Network Technology: Evolution of ANN, Architecture of ANN, Knowledge representation.

Neural Network Learning: Basic learning rules, supervised by unsupervised learning, Method of steepest Descent, LMS Algorithm.

UNIT-II

Single Layer Perceptrons-I: Preceptron Model, Preceptron learning algorithms: Simple learning algorithm.

UNIT-III

Single Layer Perceptrons-I :Pocket algorithm without and with Ratches, Linear Machines, Kessler's construction, Linear Machines Learning algorithm, Representing Boolean functions.

Single Layer Perceptrons-II :Anderson's BSB Model, Hopfied's Model, K-Means Clustering, Topology-Preserving Maps, ART1 and ART2.

UNIT-IV

Multilayer Preceptrons : Back-Propagation, Applications of Back-propagation : NETtalk, Handwritten Character Recognition, Pattern Recognition.

References:

1. [SG] Gallant S.L., Neural Networks Learning & Expert Systems, MIT Press, 1993.
2. [SH] Haykin S., Neural Networks : A Comprehensive Foundation, Pearson Education Inc.,Second Edition, 2003.
3.[FS] Freeman J.A., Skapura D.M., Neural Network Algorithms, Applications and Programming Techniques, Addison-Wesley Publications, 1992.

Course Outcomes:

On Completing the course, the students will be able to:

CO-1.	Describe various types of ANNs
CO-2.	Explain how ANNs can be trained.
CO-3.	Carry out simple simulations of ANNs.
CO-4.	Understand how ANNs can be design

M.Sc. (Information Technology)
SEMESTER-IV
MIT-544 P
Programming Laboratory-IV
(Based on Advanced Java Technology)
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 50**

Credits		
L	**T**	**P**
0	**0**	**2**

Practical Marks: 37

Practical Internal Assessment Marks:13

Course Objectives:

1.	To introduce the object-oriented programming concepts.
2.	To understand object-oriented programming concepts and apply them in solving problems.
3.	To introduce the principals of inheritance and polymorphism and demonstrate how they relate to design of abstract class.
4.	To introduce the implementation of packages and interfaces.
5.	To introduce the concept of exception handling and multithreading.

Programming Laboratory based on Advanced Java Technology.

Course Outcomes:

On Completing the course, the students will be able to:

CO-1.	Understand the concept of OOPs as well as the purpose and uses principal of inheritance, polymorphism in encapsulation and method overloading.
CO-2.	Identify classes, objects, members of a class and the relationship among them. needed for a specific problem.
CO-3.	Create a java applications programs using sound oops practices.
CO-4.	Develop programs using the java collection API as well as the java standard class library.
CO-5.	Understand exception handling.

M.Sc. (Information Technology)
SEMESTER-IV
MIT–545 P
Project Work
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 200**

Credits		
L	**T**	**P**
0	**0**	**8**

Practical Marks: 150

Practical Internal Assessment Marks:50

Course Objectives:

1.	Develop skills in presentation and discussion of research topics in a public forum.
2.	Exposure to a variety of research projects and activities in order to enrich their academic experience
3.	It makes the student confident in designing an Online Project with advanced technologies on their choice
4.	Students are trained to meet the requirements of the Industry.

The Project is to be prepared based on some current problems from industry / business / academic domain using some currently available technology / platform.

Note:

1. The end semester project work evaluation is to be conducted by following panel of examiners:-
   a. Internal Examiner
   b. External Examiner.
2. The Project are to be submitted as per the common ordinances for P.G. courses under semester system.

Course Outcomes: On Completing the course, the students will be able to:

CO-1.	Carry out time planning for the project.
CO-2.	Follow correct grounding and shielding practices
CO-3.	Do effective trouble-shooting of the mini project.
CO-4.	Demonstrate a through and systematic understanding of project contents.
CO-5.	Understand methodologies and professional way of documentation and communication.
CO-6.	Know the key stages in development of the project.