



**MASTER OF SCIENCE (INFORMATION TECHNOLOGY)  
CURRICULUM AND SYLLABUS**

(For students admitted from the academic year 2017-18)

**SCHOOL OF INFORMATION TECHNOLOGY  
SRM UNIVERSITY  
TADONG, GANGTOK - 737102**

**SRM UNIVERSITY SIKKIM**  
**SCHOOL OF INFORMATION TECHNOLOGY**  
**MASTER OF SCIENCE ( INFORMATION TECHNOLOGY)**  
**R-2017**

Semester I								
S.No	Career Stream Title	Course Code	Course Name	L	T	P	L+T+P	C
			<b>Theory</b>					
1	Core	MIT1711	Computer Organization and Architecture	3	1	0	4	4
2		MIT1712	Data Communication and Networks	3	1	0	4	4
3		MIT1713	Database Management System	3	0	0	3	3
4		MIT1714	Advanced Java Programming	3	0	0	3	3
			<b>Practical</b>					
5	Practical	MIT1715	Oracle Practical	0	0	4	4	2
6		MIT1716	Advanced Java Programming Practical	0	0	4	4	2
7		MIT1717	Open Source Technologies	0	1	4	5	3
			<b>Total</b>	<b>12</b>	<b>3</b>	<b>12</b>	<b>27</b>	<b>21</b>

Semester II								
S.No	Career Stream Title	Course Code	Course Name	L	T	P	L+T+P	C
			<b>Theory</b>					
1	Core	MIT1721	Design and Analysis of Algorithm	3	1	0	4	4
2		MIT1722	Distributed Systems	3	1	0	4	4
3		MIT1723	Cryptography and Network Security	3	1	0	4	4
4		MIT1724	Software Engineering	3	0	0	3	3
5		MIT1725	Python Programming	3	0	0	3	3
			<b>Practical</b>					
6	Practical	MIT1726	Software Development Practical	0	0	4	4	2
7		MIT1727	Python Programming Practical	0	0	4	4	2
8		MIT1728	Mini Project [Internal Evaluation]	0	0	4	4	2
			<b>Total</b>	<b>15</b>	<b>3</b>	<b>12</b>	<b>30</b>	<b>24</b>

Semester III								
S.No	Career Stream Title	Course Code	Course Name	L	T	P	L+T+P	C
			<b>Theory</b>					
1	Core	MIT1731	Mobile and Pervasive Computing	3	1	0	4	4
2		MIT1732	Information Storage Management	3	1	0	4	4
3		MIT1733	Big Data Analytics	3	0	0	3	3
4		MIT1734	Cloud Computing	3	0	0	3	3
5	Elective	MIT1735	Internet of Things (IoT)	3	0	0	3	3
		MIT1736	Machine Learning	0	2	2	4	3
			<b>Practical</b>					
6	Practical	MIT1737	Network Programming Practical	0	0	4	4	2
7		MIT1738	Big Data Analytics Practical	0	0	4	4	2
8		MIT1739	Cloud Computing Practical	0	0	4	4	2
			<b>Total</b>	<b>15</b>	<b>2</b>	<b>12</b>	<b>29</b>	<b>23</b>

Semester IV								
S.No	Career Stream Title	Course Code	Course Name	L	T	P	L+T+P	C
1	Major Core Project	MIT1741	Project Work	0	0	35	35	18
			<b>Total</b>	<b>0</b>	<b>0</b>	<b>35</b>	<b>35</b>	<b>18</b>

**Total Credits : 86**

## Semester I

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1711	COMPUTER ORGANIZATION AND ARCHITECTURE	3	1	0	4	4

### LEARNING OUTCOMES:

1. Understand the working of basic computer components and CPU operation.
2. Data Representation in computers.
3. Understand the concepts related to computer memory.
4. Understand Microprocessors, their working and current microprocessors.

### UNIT I – INTRODUCTION

Computer Operation-Introduction , Computer Organization, Von Neumann architecture, Device controller-Device Interface signals, I/O Drivers, CPU operation-CPU states, CPU Registers, Clock, CPU memory communication, Instruction format and Instruction cycle, Macro operation & micro operation, RTL (Register Transfer Language), Instruction set design, Bus Concept, Instruction execution

### UNIT II-DATA REPRESENTATION AND DIGITAL LOGIC

Fixed point Numbers -Representation types, Sign Extension, 1's complement, 2's complement, Floating point Numbers-IEEE Representation (Only Single precision), Normalization, Excess code, Gates-AND, OR, NOT, X-OR, X-NOR, NAND, NOR, Flip-flops-R-S, JK, D,T, Half adder and Full adder, Encoder and Decoder, Multiplexer and Demultiplexer.

### UNIT III-MEMORY ORGANIZATION AND MANAGEMENT

Classification of memory -By functionality(main, auxiliary, cache, associative, virtual), By access(random access, sequential access, semi random), By capability(RAM, ROM), Memory hierarchy, Memory parameters, Main memory Limitation, Instruction prefetch, Write Buffer, Cache memory-Cache principle, Cache hit and cache miss, Mapping( direct, associative, se associative), Cache replacement, Cache write, Cache coherence

### UNIT IV-MICROPROCESSORS

Introduction to microprocessors-Microcontroller, RISC & CISC Microprocessors, Scalar & super scalar processors, Vector & array processors, Intel 8086-Pin description, Operating modes-Maximum mode pin description, Minimum mode pin description, 8086 Register organization, BIU & EU, Addressing modes of 8086, Interrupts

### UNIT V-INTRODUCTION TO ADVANCED MICROPROCESSORS

Chronology of Intel processors-Pentium, Pentium Pro, Pentium II, Pentium III, Pentium IV, Itanium, Latest Intel processors-Atom, I3,I5, I7, AMD processors, MIPS processors, SUN's Sparc processor, Mobile/Tablet processors

### TEXT BOOKS:

1. Tripti Dodiya & Zakiya Malek "Computer Organization and Advanced Microprocessors", Cengage .

### REFERENCE BOOKS:

1. B Govindrajalu, "Computer Architecture and Organization", Tata McGraw-Hill.
2. Badri Ram, "Advanced Microprocessors and Interfacing", Tata McGraw-Hill.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1712	DATA COMMUNICATION AND NETWORK	3	1	0	4	4

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To learn the basic elements of data communication system.
2. To describe communication protocols and data transmission modes.
3. To describe different components of computer network
4. To identify different types of network

### UNIT I - INTRODUCTION TO COMPUTER NETWORK

Network-Protocol & standard –Standard Organizations-Topology - Base Band & Broad Band Topology – Transmission mode- Addressing-Categories of Network-OSI Model- Layers of OSI model –TCP/IP protocol Suite-Difference between TCP/IP and OSI model.

### UNIT II - PHYSICAL LAYERS AND MEDIA

Analog and Digital Signals-Periodic Analog Signal-Digital signals-Transmission impairment-Data rate limits-Digital Transmission- Analog Transmission-Multiplexing-Guided & unguided Transmission Media-switching

### UNIT III - DATA LINK LAYER

Types of Errors-Block coding-Cyclic Codes-Checksum-Flow and Error Control-Multiple access using ALOHA-CSMA-CSMA/CD-CSMA/CA-Channelization-IEEE standard-Wireless LAN-Cellular Telephony.

### UNIT IV - NETWORK, TRANSPORT AND APPLICATION LAYER

Virtual Circuit and Datagram Subnet-Routing algorithm-Unicast routing Protocol-Multicast Routing Protocol-Congestion-Congestion Control algorithm-DNS in the internet-Remote logging-EMAIL architecture-www and HTTP Architecture.

### UNIT V - NETWORK SECURITY

Introduction to Cryptography-Symmetric key Cryptography-Asymmetric key Cryptography-Security services-Message Confidentiality-Digital Signature –firewalls-SSL/TLS.

### TEXT BOOKS:

1. Behrouz A. Forouzan, Introduction of Data Communication and Networking, - Tata McGrawHill, 1999.
2. Andrew S Tanenbaum ,Computer Networks,Third edition, Tata McGraw Hill,2006

### REFERENCE BOOKS:

1. Fred Halsall ,Data Communications, Computer Networks and Open Systems, 4th Edition , Addison Wesley,, 2000.
2. Jean Walrand ,Communication Network (A first course), Second Edition, Tata McGraw Hill ,1998.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1713	DATABASE MANAGEMENT SYSTEM	3	0	0	3	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To learn different database models and design of databases
2. To give a good formal foundation on the relational model of data
3. To understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, and data object locking and protocols.
4. To familiarize with the nuances of database environments towards an information-oriented data-processing oriented framework

### UNIT I - INTRODUCTION

Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – Relational Model. E-R model – diagram, generalization, specialization- Data base design - Informal design guidelines for relational schemas; functional dependencies; normal forms based on primary keys, general definitions of 2nd and 3rd normal forms; Boyce-codd normal forms, 4NF, 5NF.

### UNIT II - RELATIONAL MODEL AND QUERY EVALUATION

Relational Query Languages – Relational Algebra – Tuple and domain Relational Calculus – SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design

### UNIT III - DATA STORAGE AND QUERYING

Record storage and Primary file organization- Secondary Storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+Tree - Query processing- query optimization.

### UNIT IV - TRANSACTION MANAGEMENT

Transaction – Properties – Concurrent execution – Serializability – Concurrency control – Protocols – Recovery System – Database Security

### UNIT V - DATABASE SYSTEM ARCHITECTURES

Concepts of Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases- case studies and their analysis and design.

### TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- “Database System Concepts”, 6<sup>th</sup> Edition, McGraw-Hill, 2011.
2. Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, 7<sup>th</sup> Edition, Pearson Education, 2017.

### REFERENCE BOOKS

1. Raghu Ramakrishnan and Johannes Gehrke, “Database Management System”, 3<sup>rd</sup> Edition, Tata McGraw-Hill Publishing Company, 2014.
2. Hector Garcia-Molina, Jeffrey D.Ullman and Jennifer Widom, “Database System Implementation”- Pearson Education- 2000.
3. Peter Rob and Corlos Coronel- “Database System, Design, Implementation and Management”, Thompson Learning Course Technology- Fifth edition, 2003.
4. C. J. Date, “An Introduction to Database Systems”, 8th Edition, Addison-Wesley, 2006.
5. Guy Harrison, “Next Generation Databases”, Apress, 2015.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1714	ADVANCED JAVA PROGRAMMING	3	0	0	3	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To enable the students to understand the core principles of the Java Language
2. To use visual tools to produce well designed, effective applications.
3. To implement networking concepts using java.

### UNIT I - INTRODUCTION TO CORE JAVA

Class and Object, Object Oriented concepts with respect to Java, Interfaces, Packages, Exception Handling.

### UNIT II - APPLET AND MULTITHREADING

Applets specific methods, creating an Applet, Displaying it using Web Browser with appletviewer.exe, Advantages and Disadvantages of Applet, Multithreading concepts, Thread Lifecycle, creating multithread application, thread priorities, thread synchronization.

### UNIT III - AWT AND SWING

**AWT:** Components and Graphics, Containers, Frames and Panels, Layout Managers, AWT all Components.

**SWING:** Features, components, containers, Exploring Swing

### UNIT IV - NETWORKING WITH JAVA

Networking fundamentals, java.net – networking classes and Interfaces, The Socket class, The URL class, The URL Connection class, The HttpURLConnection Class, Datagrams.

### UNIT V - JAVA BEANS AND SERVLETS

Java Beans introduction, Beans persistence and introspection, The Java Beans API, Introduction to Servlets, Life cycle of Servlets, The servlet API, The javax.servlet Package, The javax.servlet.http Package, handling Http request and Response.

### TEXT BOOKS:

1. Herbert Schildt, Java the Complete Reference, ninth edition, oracle press.

### REFERENCES BOOKS:

1. CAY S. Horstman, Core Java 2 Volume-I, Gary Cornell, ninth edition, Pearson.
2. Herbert Schildt Dale Skrien, Java Fundamentals-A Comprehensive Introduction, special Indian edition, Tata McGraw Hill Education Private Limited.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1717	OPEN SOURCE TECHNOLOGIES	0	1	4	5	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

- To install Linux and Apache server
- To develop programs using MySQL and PHP /Perl

### UNIT I - LINUX OPERATING SYSTEM

Linux Operating System: Open source software and GNU – GNU public license – Difference between Windows and Linux, Installing Linux: Hardware and environmental considerations – Server design Dual booting issues – Methods of Installation, Managing Users : User management tools – User and access permissions,

### UNIT II - LINUX COMMAND LINE

Linux Command Line: The command line: Introduction to BASH – Command line shortcuts – Documentation tools – Files Types – File permissions – File management and manipulation – Editors.

### UNIT III - APACHE WEB SERVER

Basic Concepts – Installing Apache – Configuring Apache – Starting and Stopping Apache – Hosting Multiple sites – Proxy servers and caching – Logs and monitoring – Security – Dynamic Content – URL rewriting – Module construction.

### UNIT IV - MySQL

Introducing MySQL – Prerequisites for MySQL – MySQL versions – MySQL Linux Installation – MySQL Server administration and security – MySQL database functions – Command line interface basics – MySQL CLI environment variables – Using CLI in interactive and non-interactive mode – Creating CLI environment – Utility and administrative statements – commands – Data Definition Language – Data Markup Language.

### UNIT V - PERL AND PHP

Perl: Installing the Perl DBI and MySQL DBD – Introducing the DBI – Functions with DBI – Building basic applications – Building web applications with DBI. PHP: PHP Installation – PHP essentials – PHP MySQL Configuration – PHP MySQL functions – Building MySQL enabled applications with PHP.

### REFERENCES:

1. Paul Kavanagh, “Open Source Software”, Elsevier Digital Press, New Delhi , 2004.
2. Steve Shah, Wale Soyinka, “Linux Administration – A beginners Guide”, TataMcGraw-Hill, Fourth Edition, New Delhi , 2005.
3. Scott Hawkins, “Apache Webserver Administration and e-commerce Handbook”, Pearson Education Asia, New Delhi , 2001
4. Linda McKinnon, Al McKinnon, “Installing and Administartion Linux”, Wiley Dream Tech India Pvt. Ltd., 2<sup>nd</sup> Edition, New Delhi, 2002.
5. Timothy Boronczyk et al., “Beginning PHP6”, Apache, Mysql Web Development, Wiley Dream Tech India Pvt. Ltd, New Delhi, 2009.
6. Jason Gerner et al., “Professional LAMP: Linux, Apache, MySQL and PHP5 Web Development”, Wiley Dream Tech India Pvt. Ltd, New Delhi, 2005.
7. James Lee, Brent Ware , “Open Source Web Development with LAMP”, Addison-Wesley Professional, New York, 2013.



## Semester II

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1721	DESIGN AND ANALYSIS ALGORITHM	3	1	0	4	4

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To introduce the concepts of Algorithm Analysis, Time Complexity, Space Complexity.
2. To discuss various Algorithm Design Strategies with proper illustrative examples.
3. To introduce Complexity Theory.
4. To become familiar with the different algorithm design techniques.

### UNIT I - INTRODUCTION

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.

### UNIT II - BRUTE FORCE AND DIVIDE-AND-CONQUER

Brute Force - Closest-Pair and Convex-Hull Problems-Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex-Hull Problems.

### UNIT III - DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

### UNIT IV - ITERATIVE IMPROVEMENT

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.

### UNIT V - COPING WITH THE LIMITATIONS OF ALGORITHM POWER

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems- Coping with the Limitations - Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

### TEXT BOOKS

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar, Rajesekaran, "Fundamentals of Computer Algorithms", Galgotia Publication Pvt. Ltd., Reprint, 2010.
2. Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, "Introduction to Algorithms" 3rd Edition, The MIT Press Cambridge, Massachusetts London, England, 2014
3. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press, 2015
4. Richard Johnsonbaugh, Marcus Schaefer, "Algorithms", Pearson education, 2004

### REFERENCE BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, Inc., 2006
2. Rajesh K Shukla, "Analysis and Design of Algorithms-A Beginner's Approach", Wiley publisher, 2015

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1722	DISTRIBUTED SYSTEMS	3	1	0	4	4

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

The goal for this course is to provide an in-depth overview of research topics in distributed systems. Topics will include:

1. Communication mechanisms
2. Processes and mobile code
3. Naming and Synchronization
4. Scalability, Consistency, replication, and caching
5. Fault tolerance and Security and access control

### UNIT I - INTRODUCTION

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges.

Case study: World Wide Web.

### UNIT II - COMMUNICATION IN DISTRIBUTED SYSTEM

System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study: Enterprise Java Beans -from objects to components.

### UNIT III - PEER TO PEER SERVICES AND FILE SYSTEM

Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer – Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

### UNIT IV - SYNCHRONIZATION AND REPLICATION

Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control - Timestamp ordering – Atomic Commit protocols -Distributed deadlocks – Replication – Case study – Coda.

### UNIT V - PROCESS & RESOURCE MANAGEMENT

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

### TEXT BOOKS:

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems: Concepts and Design”, Fourth Edition, 2006, Pearson Education, Inc. New Delhi.
2. Andrew S. Tanenbaum, Maarten van Steen, “Distributed Systems: Principles and Paradigms”, 2nd Edition, 2007, PHI Learning Pvt. Ltd., New Delhi.

### REFERENCE BOOKS:

1. Hagit Attiya, Jennifer Welch, “Distributed Computing: Fundamentals, Simulations, and Advanced Topics”, 2nd Edition, 2005, Wiley India Pvt. Ltd., New Delhi.
2. Mordechai Ben-Ari, “Principles of Concurrent and Distributed Programming”, 2nd Edition, 2006, Pearson Education, Inc. New Delhi.
3. Mei-Ling Liu, “Distributed Computing: Principles and Applications”, 2004, Pearson Education, Inc. New Delhi.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1723	CRYPTOGRAPHY AND NETWORK SECURITY	3	1	0	4	4

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To gain knowledge about the cryptographic algorithms.
2. To get an insight into the working of different existing cryptographic algorithms.
3. To learn how to use cryptographic algorithms in security.

### UNIT I - INTRODUCTION TO THE CONCEPTS OF SECURITY

The need for security - Security Approaches - Principles of Security – Who Attacks Networks? Types of Attacks - Threats, Vulnerabilities and Controls Threats in Networks - Threats in Transit: Eavesdropping and Wiretapping, Protocol Flaws, Impersonation, Network Security Controls.

### UNIT II - CRYPTOGRAPHIC TECHNIQUES

Terminologies used in Cryptography; Plain Text and Cipher Text - Substitution Techniques - Transposition Techniques. Encryption and Decryption: Characteristics of Good Encryption Technique; Properties of Trustworthy Encryption Systems; Types of Encryption Systems – Based on Key, Based on Block; Confusion and Diffusion; Cryptanalysis.

### UNIT III - SYMMETRIC KEY ENCRYPTION

Data Encryption Standard (DES) Algorithm – Overview of the DES Algorithm; Double and Triple DES – Double DES, Triple DES; Security of the DES; Advanced Encryption Standard (AES) Algorithm – Overview of Rijndael, Strength of the Algorithm; DES and AES Comparison - An overview of Asymmetric Key Cryptography.

### UNIT IV - PUBLIC KEY ENCRYPTION

Characteristics of Public Key System; RSA Technique – Encryption-Method; Key Exchange; Diffie-Hellman Scheme; Cryptographic Hash Functions; Digital Signature – Properties of Digital Signature, Public Key Protocol; Certificates; Certificate Authorities.

### UNIT V - SYSTEM, E-MAIL, IP & WEB SECURITY

**System security:** Internet Firewalls for Trusted System: Roles of Firewalls –Types of Firewalls - Firewall designs -Intruder – Intrusion detection system – Firewalls design principles. **E-mail Security:** Security Services for E-mail- attacks through E-mail - Pretty Good Privacy. **IP Security:** Overview of IPSec-IP & IPv6-Authentication Header-Encapsulation Security Payload. **Web Security:** SSL/TLS Basic Protocol-computing the keys- client authentication -Secure Electronic Transaction (SET).

### TEXT BOOKS:

1. W. Stallings, Cryptography and Network Security Principles and practice, 5/e, Pearson Education Asia, 2012.
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay, Cryptography and Network Security, second edition, Tata McGraw Hill, 2011

### REFERENCE BOOKS:

1. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security”, Prentice Hall of India, 2002.
2. Stinson. D. Cryptography: Theory and Practice, third edition, Chapman & Hall/CRC, 2010.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1724	SOFTWARE ENGINEERING	3	0	0	3	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To identify and categorize business, access and view layer objects of the application
2. To derive OOA & OOD phases using UML diagrams and CASE tools
3. To build an Analysis Model and subsequently architect a suitable design

### UNIT I - INTRODUCTION TO SOFTWARE ENGINEERING

Characteristics of software -The Changing Nature of software – Legacy Software and Software myths – A Generic view of process – Software Engineering: A layered Technology and A process framework- A process framework - Capability Maturity Model Integration, Personal and Team Process Models- Process Models – Prescriptive models- Different approaches and models for System Development- Waterfall- Prototyping - Spiral (including WIN-WIN Spiral) – RAD- The Incremental Process Models and Evolutionary Process Models - Specialized Process Models and The Unified Process- An agile view of Process.

### UNIT II - REQUIREMENTS ANALYSIS AND DESIGN

System Engineering - Requirements Engineering – Requirements Engineering Tasks- Activities in Requirements Determination- Requirements Anticipation- Requirements Investigation Fact finding methods- Requirements Specifications Software requirement Specification (SRS) Structure and contents of the requirements Specification analysis modeling, types of requirements - functional and non- functional, Quality criteria, requirements definition, SRS format, Fundamental problems in defining requirements

### UNIT III - UML DIAGRAMS

UML Architecture – UML Diagrams: UseCase Diagram, Class Diagram, Sequence Diagram, Collaboration Diagram, Activity Diagram, State chart diagram, Object Diagram and relationships, Component Diagram and Deployment Diagram, Packages and UML extensibility mechanisms with suitable examples and Case studies

### UNIT IV - OO ANALYSIS

Business Process Analysis- OOA steps- Identify Actors, Business Process Model - Identify UseCase, Usecase Documentation- Identify classes using Classification theorems: Noun phrase approach, Class pattern approach, Usecase driven sequence diagram approach, and CRC approach – Case study on Identifying object Relationships Attributes, Methods: Case study approach.

### UNIT V - OO DESIGN

OOD steps – Axioms and Corollaries - Design Business layer classes — Design Access layer classes – Compare Relational, Distributed and Object Oriented Database – Various Table Class Mapping – Design View layer classes

### REFERENCE BOOKS:

1. Roger, S. Pressman (2004), Software Engineering: A Practitioner Approach, McGraw Hill International Edition, Sixth Edition, New Delhi
2. Waman, S Jawadekar (2004), Software Engineering: Principles and Practice, McGraw Hill Education Pvt. Limited, New Delhi.
3. Srimathi.H, Srirarm. H & Krishanmoorthy .A (2006), “Object Oriented Analysis and Design using UML”, Scitech Publications , 2<sup>nd</sup> edition, India

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1725	PYTHON PROGRAMMING	3	0	0	3	3

### LEARNING OUTCOMES:

1. To be able to understand core programming basics
2. To solve problems
3. To explore real-world software development challenges
4. To create practical and contemporary applications.

### UNIT I - INTRODUCTION TO PYTHON AND PROGRAMMING

Conceptual introduction: topics in computer science, algorithms; modern computer systems: hardware architecture, data representation in computers, software and operating system; installing Python; basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages;

### UNIT II - CONDITIONAL LOGIC, FILE HANDLING AND STRING

Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers

### UNIT III - LIST OPERATION

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

### UNIT IV - CLASSES AND OBJECT

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects, inheritance, polymorphism, operator overloading (`_eq_`, `_str_`, etc); abstract classes; exception handling, try block

### UNIT V - GRAPHICAL USER INTERFACE

Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames

### TEXT BOOK:

1. Kenneth Lambert , Fundamentals of Python: First Programs, Course Technology, Cengage Learning, 2012 ISBN-13: 978-1-111-82270-5

### REFERENCE BOOKS:

1. Allen downy, Thinking python : How to think like a computer scientist, Green Tea Press
2. Mark Lutz, “ Programming Python “, O Relly Publisher.

## Semester III

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1731	MOBILE AND PERVASIVE COMPUTING	3	1	0	4	4

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To introduce the concepts of mobile communication system and pervasive computing.
2. To understand the concepts of emerging mobile technology.
3. To be aware of pervasive computing practices.

### UNIT I - MOBILE COMPUTING

Challenge in Mobile computing - Middleware and Gateways – Developing Mobile Computing Applications – Mobile Computing Architecture: Architecture for Mobile Computing – Three-Tier Architecture – Design Considerations for Mobile Computing

### UNIT II - TELECOMMUNICATION SYSTEMS

Current Wireless Systems: Overview of Paging Systems, Cordless Phones, Cellular Telephone Systems, Satellite Communication, Wireless LANs, Blue tooth. Medium access control, Telecommunication Systems – SDMA, TDMA, CDMA, GSM Satellite Systems - GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security.

### UNIT III - WIRELESS NETWORKS

Wireless Standards Wireless LAN – IEEE 802.11 – Infrared vs Radio Transmission, Infrastructure Networks, Ad-hoc Networks, HIPERLAN, Wi-Fi, Emerging Technologies: - Bluetooth – RFID -Wireless Broadband (WiMax) - Mobile IP

### UNIT IV SHORT MESSAGE SERVICE (SMS)

Value Added Services through SMS – GPRS- GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations –Data Services in GPRS- Applications for GPRS – Limitations of GPRS – CDMA and 3G- Spread Spectrum Technology- CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

### UNIT V - PERVASIVE COMPUTING

Introduction to Pervasive Computing: Past, Present and Future Pervasive Computing - Pervasive Computing Market – m-Business – Application Examples: Retail, Airline check-in and booking – Sales force automation – Health care – Tracking – Car information system – E-mail access via WAP - Device Technology: Hardware – Human Machine Interfaces – Biometrics – Mobile OS – Programming for Pervasive devices.

### TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.
2. Jochen Burkhardt, Pervasive Computing: Technology and Architecture of Mobile Internet Applications, Addison-Wesley Professional; 3rd edition, 2007

### REFERENCE BOOKS:

1. Stojmenovic and Cacute: Handbook of Wireless Networks and Mobile Computing, Wiley, 2002.
2. Ashok K.Talukder and Roopa R.Yuvagal, “Mobile Computing”, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2010.
3. UweHansmann, L. Merk, M. Niclous, T. Stober and U.Hansmann, “Pervasive Computing”, Springer Verlag, 2003.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1732	INFORMATION STORAGE MANAGEMENT	3	1	0	4	4

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. The evolution of storage and implementation models
2. Storage devices principles including structure, host I/O processing, & core algorithms
3. Storage classes (SAN, NAS, CAS), interconnection protocols, and management principles
4. Storage network design principles and Networked storage capabilities (Snaps, mirroring, virtualization)
5. Backup, Business Continuity, and Disaster Recovery principles

### UNIT I - INTRODUCTION TO INFORMATION STORAGE

Introduction to Storage Technology: Data proliferation, evolution of various storage Technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

### UNIT II - DATA CENTER ENVIRONMENT

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. Modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure Components, properties, performance, and specifications, RAID levels & parity algorithms, hot Sparing, Front end to host storage provisioning, mapping and operation.

### UNIT III - STORAGE NETWORKING TECHNOLOGIES

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and Comparison. Applications, Elements, connectivity, standards, management, security and Limitations of DAS, NAS, CAS & SAN.

### UNIT IV - BACK-UP, ARCHIVE AND REPLICATION

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data centre concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

### UNIT V - CLOUD COMPUTING

Information storage on cloud: Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

### TEXTBOOKS:

1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors; Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Hausteine; Storage Network explained : Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, Wiley India.

### REFERENCE BOOKS:

1. John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.
2. Nick Antonopoulos, Lee Gillam; Cloud Computing : Principles, System & Application, Springer.
3. Anthony T. Velete, Toby J.Velk, and Robert Eltenpeter, Cloud Computing : A practical Approach,

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1733	BIG DATA ANALYTICS	3	0	0	3	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To get introduced to big data analytics and to understand the importance of big data.
2. To explore the fundamental concepts of big data analytics.
3. To acquire knowledge of handling unstructured and semi-structured data using NoSQL database.
4. To gain knowledge on Hadoop related tools such as HBase, Pig, and Hive for big data analytics.
5. To make familiar with the Visualization Techniques.

### UNIT I - INTRODUCTION TO BIG DATA

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Statistical Inference - Prediction Error.

### UNIT II - DATA ANALYSIS

Classification, Clustering, and Mining, Information Extraction, Regression and Feature Selection, Reasoning: Logic and its Limits, Dealing with Uncertainty, Bayesian Inference, Forecasting, Neural Models, Introduction to Deep Learning.

### UNIT III - HADOOP

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop-Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job Run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

### UNIT IV - NoSQL DATABASES

Evolution of Document Databases – Design and use of NoSQL Databases – Storage and Retrieval of Unstructured Data – NoSQL Applications and query options. Types of NoSQL Databases, Graph Databases – Neo4j; Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

### UNIT V - FRAMEWORKS AND VISUALIZATION

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.

### TEXT BOOKS:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
3. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, 2012.

### REFERENCE BOOKS

1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
2. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
3. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007.
4. PeteWarden, “Big Data Glossary”, O’Reilly, 2011.



Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1734	CLOUD COMPUTING	3	0	0	3	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. To understand cloud fundamentals and architecture
2. To identify list of cloud services and service providers
3. To demonstrate cloud security

### UNIT I - CLOUD FUNDAMENTALS

Cloud computing Definition – Cloud Models such as NIST, Cube, Private, Public, Hybrid and Community clouds – Cloud Characteristics – Benefits, Disadvantages, Challenges and obstacles of Cloud Computing – Cloud Cost Measurement, Capital expenditure, Total cost and SLA – Cloud Architecture – Types of Cloud Services (IaaS, PaaS, SaaS, IaaS).

### UNIT II - CLOUD PLATFORMS

Abstraction – Load balancing and virtualization : case study Google cloud – Hypervisors : Case study VMware vSphere - Machine Imaging – Capacity Planning with baseline metrics, measurement, load testing, network capacity and scaling – PaaS services : Case study Force.com – PaaS Frameworks: Case study Drupal, EccenbtexAppBase Spuareospace ,WaveMaker and Wolf.

### UNIT III - CLOUD SERVICE PROVIDERS

Google Web Services : Explore and survey Google Application, Google analytics, Google Translate, Google Toolkit, APIs and Google App Engine - Amazon Web services: Components, Elastic Compute Cloud (EC2), Amazon Storage Systems, Amazon Elastic Block Store, and Amazon Database Services – Microsoft Cloud Services : Windows Azure platform and Windows Live.

### UNIT IV - CLOUD INFRASTRUCTURE AND SECURITY

Cloud Management: Responsibilities, Lifecycle, Management Products and Standards -Cloud security: CSA Cloud Reference Model – Implement Cloud security for Infrastructure, Data, Network, Storage and Host – Disaster recovery and management.

### UNIT V - SOFTWARE ORIENTED ARCHITECTURE

Storage and Backup: Network service model infrastructure, Communication and Management of SOA – Moving applications to cloud, Service attributes and Cloud bursting – Cloud storage, provisioning, unmanaged and managed storage – Cloud backup, types and features and storage interoperability – Cloud Mail services.

### TEXT BOOKS:

1. Barrie Sosinsky , “Cloud Computing Bible”, Wiley Publishing Inc., New York , 2011.
2. Kris Jamsa , “Cloud Computing: SaaS, PaaS,IaaS, Virtualization, Business Models, Security and More”, Jones and Bartlett Learning LLC, Boston, USA , 2002.

### REFERENCE BOOKS:

1. George Reese , “Cloud Application Architectures: Building Applications and Infrastructures in the cloud” ,O’Reilly Media Inc. Cambridge,USA, 2009.
2. Anthony T.Velte, Toby J. Velte, Robert Elsenpeter , “Cloud Computing: A practical approach” , McGrawHill, New Delhi, 2010.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1735	INTERNET OF THINGS (IOT)	3	0	0	3	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3. Market forecast for IoT devices with a focus on sensors

### UNIT I - INTRODUCTION

Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device

### UNIT II - SEVEN GENERATIONS OF IOT SENSORS TO APPEAR

Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap

### UNIT III - TECHNOLOGICAL ANALYSIS

Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module

### UNIT IV - IOT DEVELOPMENT EXAMPLES

ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks -Focus on Wearable Electronics

### UNIT V - PREPARING IOT PROJECTS

Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator project- Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings -Initializing the camera

### TEXT BOOKS:

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024', Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015

### REFERENCE BOOKS:

1. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market
2. Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

Course Code	Course Title	L	T	P	TOTAL OF LTP	C
MIT1736	MACHINE LEARNING	0	2	2	4	3

### LEARNING OUTCOMES:

At the end of this course the learner is expected:

1. Be able to formulate machine learning problems corresponding to different applications.
2. Understand a range of machine learning algorithms along with their strengths and weaknesses.
3. Understand the basic theory underlying machine learning.

### UNIT I - INTRODUCTION

Introduction to Machine Learning; What is Machine Learning; Supervised Learning; Unsupervised Learning. Matrices and Vectors; Addition and Scalar Multiplication; Matrix Multiplication Properties; Inverse and Transpose

### UNIT II - REGRESSION

Linear: Model Representation; Cost Function; Gradient Descent; Gradient Descent for Linear Regression; Gradient Descent for Multiple Variables; Gradient Descent-Feature Scaling, Learning Rate, Features and Polynomial Regression, Normal Equation, Normal Equation Non-invertibility. Logistic: Classification, Hypothesis Representation, Decision Boundary, Cost Function, Simplified Cost Function and Gradient Descent, Advanced Optimization, Multiclass Classification-One-vs-all Regularization: The problem of Overfitting, Cost Function, Regularized Linear Regression, Regularized Logistic Regression

### UNIT III - NEURAL NETWORKS

Representation-Neurons and the Brain, Model Representation, Multiclass Classification; Learning- Cost Function, Backpropagation Algorithm, Backpropagation Intuition, Gradient Checking, Random Initialization  
Applying Machine Learning: Evaluating a Hypothesis, Model Selection and Training/Validation/Test Sets, Diagnosis Bias vs Variance, Regularization and Bias/Variance, Learning Curves. System Design: Error Analysis, Trading off Precision and Recall, Data for Machine Learning. Support Vector Machines: Optimization Objectives, Kernels I, Kernels II, Using an SVM

### UNIT IV - UNSUPERVISED LEARNING:

K-Means Algorithm; Dimensionally Reduction; Anomaly Detection; Recommender Systems: Problem Formulation, Content Based Recommendations, Collaborative Filtering Collaborative Filtering Algorithm, Vectorization: Low Rank Matrix Factorization, Implementation Detail: Mean Normalization  
Large Scale Machine Learning: Learning With Large Datasets, Stochastic Gradient Descent, Mini-Batch Gradient Descent, Stochastic Gradient Descent Convergence, Online Learning, Map Reduce and Data Parallelism

### UNIT IV - APPLICATION EXAMPLE: PHOTO OCR

Problem Description and Pipeline, Sliding Windows, Getting Lots of Data Amd Artificial Data, Ceiling Analysis.

### TEXT BOOK:

1. Tom Mitchel, Machine learning, Mc. Graw Hill, 1997

### REFERENCE BOOKS:

1. Hastie TR Tibshirani & JH Friedman, “ The elements of Statistical Learning: Data mining Inference and Prediction. Springer 2001
2. Willi Richard, Luis Pedro Coelho, “ Building Machine Learning System with python”, Packet Publishing.
3. Duad, Richard, Peter gart & David Stork, “ Pattern Classification”, 2nd Edition Wiley Interscience 2000.