

**Kavayitri Bahinabai Chaudhari  
North Maharashtra University, Jalgaon**



**School of Computer Sciences**

Master of Science in Information Technology

**M. Sc. (Information Technology)**

**Syllabus**

*[under Academic Flexibility]*

**Faculty of Science and Technology**

**With effect from July 2023-24**

## Programme Objectives (POs):

- 1) To provide advanced and in-depth knowledge of Information Technology and its applications.
- 2) To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.
- 3) To enable students, pursue a professional career in Information and Communication Technology in related industry, business and research.

## Program Specific Outcomes (PSOs):

After successful completion of M.Sc. (Information Technology), the student will achieve the following PSOs.

PSO No.	PSO	Cognitive level
ITPSO.1	Understand the concepts and applications in the field of Information Technology.	2
ITPSO.2	Apply Knowledge of contemporary issues in Information Technology with Strong skills in learning new programming techniques.	3
ITPSO.3	Analyse, design, model, develop, test and manage complex software and information management systems.	4
ITPSO.4	Recommend the appropriate IT infrastructure required for the implementation of a project.	3
ITPSO.5	Develop and deploy applications like Web designing and development, Mobile application development, and Network and communication technologies.	6

**KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON**  
**School of Computer Sciences, M.Sc. (Information Technology) PROGRAMME (A. Y. 2023-24)**  
**Credit distribution structure for Two Years/One Year PG Degree and Ph. D.**  
**Programme**

Year (2 Yr PG)	Level	Sem (2 Yr)	Major (Core) Subjects		RM	OJT/FP	RP	Cumulative Credits	Degree
			Mandatory (MIT)	Elective (MITE)					
I	6.0	Sem-I	MIT-411 (4) (T) MIT-412 (4) (T) MIT-413 (2) (T) MIT-414 (2) (P) MIT-415 (2) (P)	MITE-417A (2) (T) MITE-417B (2) (P) OR MITE-418A (2) (T) MITE-418B (2) (P)	MIT-416 (4)	-	-	22	PG Diploma (After 3- Yr Degree)
		Sem-II	MIT-421 (4) (T) MIT-422 (4) (T) MIT-423 (4) (T) MIT-424 (2) (T) MIT-425 (2) (P) MIT-426 (2) (P)	MITE-427(4) (T) OR MITE-428(4) (T)	-	-	-	22	
Cum. Cr. For PG Diploma			32	8	4	-	-	44	
Exit option: PG Diploma (44 Credits) after Three Year UG Degree									
II	6.5	Sem-III	MIT-511(4) (T) MIT-512 (4) (T) MIT-513 (4) (T) MIT-514 (2) (T) MIT-515 (2) (P) MIT-516 (2) (P)	MITE-517(4) (T) OR MITE-518(4) (T)	-	-	-	22	M.Sc. (CS) After 3-Yr UG Or PG Degree after 4-Yr UG
		Sem-IV	MIT-521(4) (T) MIT-522 (4) (T)	-	-	MIT-523 (14) (P)	-	22	
Cum. Cr. for 2 Yr PG Degree			26	4	-	14	-	44	
Total Cr. for 2 Yr PG Degree			58	12	4	14	-	88	
2 Years-4 Sem. PG Degree (86 credits) after Three Year UG Degree or 1 Year-2 Sem PG Degree (44 credits) after Four Year UG Degree									

**Abbreviations:** Yr.: Year; Sem.: Semester; OJT: On Job Training; Internship/ Apprenticeship; FP: Field projects; RM: Research Methodology; Research Project; RP; Cumulative Credits: Cum. Cr., T- Theory Course, P – Practical course, MIT- School Specific Core Course, MITE- School Specific Elective Course

**Note:** The courses which do not have practical, ‘P’ will be treated as ‘T’.

**KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON**  
**School of Computer Sciences, PG DEGREE M. Sc. (Information Technology) PROGRAMME (A. Y. 2023-24)**  
**Credit distribution structure for Two Years/ One Year PG (M.Sc.) Degree Programme**

**Teaching and Examination scheme, Master of Science (M. Sc)**  
**M.Sc. (Level 6.0) Sem- I (Name of Courses for - Major, RM, OJT, RP courses)**

Sr No	Course Category	Name of the course (Title of the Paper)		Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
						Theory	Practical	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
						T	P			
1	Major	MIT-411 (4) (T)	Object oriented Programming using JAVA	4	60	4	-	40	60	3
		MIT-412 (4) (T)	Operating Systems	4	60	4	-	40	60	3
		MIT-413 (2) (T)	Web Design	2	30	2	-	20	30	2
		MIT-414 (2) (P)	LAB on Object Oriented Programming using JAVA	2	60	-	4	20	30	2
		MIT-415 (2) (P)	LAB on Web Design	2	60	-	4	20	30	2
2	Elective (Select Any One Group)	MITE-417A (2) (T)	Computer Graphics and Digital Image Processing	2	30	2	-	20	30	2
		MITE-417B (2) (P)	LAB on Computer Graphics and Digital Image Processing	2	60	-	4	20	30	2
		MITE-418A (2) (T)	Object Oriented Programming using C++	2	30	2	-	20	30	2
		MITE-418B (2) (P)	LAB on Object Oriented Programming using C++	2	60	-	4	20	30	2
3	Research	MIT-416	Research Methodology	4	60	4	-	40	60	3
Total				22	420	16	12	220	330	

**KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON**  
**School of Computer Sciences, PG DEGREE M. Sc. (Information Technology) PROGRAMME (A. Y. 2023-24)**  
**Credit distribution structure for Two Years/ One Year PG (M.Sc.) Degree Programme**

**Teaching and Examination scheme, Master of Science (M. Sc)**  
**M.Sc. (Level 6.0) Sem- II (Name of Courses for - Major, RM, OJT, RP courses)**

Sr No	Course Category	Name of the course (Title of the Paper)		Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
						Theory	Practical	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
						T	P			
1	Major	MIT-421 (4) (T)	Linux Administration and Programming	4	60	4	-	40	60	3
		MIT-422 (4) (T)	Database Management System (DBMS)	4	60	4	-	40	60	3
		MIT-423 (4) (T)	Computer Networks	4	60	4	-	40	60	3
		MIT-424 (2) (T)	Data Structures and Algorithms	2	30	2	-	20	30	2
		MIT-425 (2) (P)	LAB on Linux Administration & Programming	2	60	-	4	20	30	2
		MIT-426 (2) (P)	LAB on Database Management System (DBMS)	2	60	-	4	20	30	2
2	Elective (Select Any One)	MITE-427 (4) (T)	Mathematical Foundations of Information Technology OR	4	60	4	-	40	60	3
		MITE-428 (4) (T)	Optimization Algorithms							
Total				22	390	18	08	210	330	-

**KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON**  
**School of Computer Sciences, PG DEGREE M. Sc. (Information Technology) PROGRAMME (A. Y. 2023-24)**  
**Credit distribution structure for Two Years/ One Year PG (M.Sc.) Degree Programme**

**Teaching and Examination scheme, Master of Science (M. Sc)**  
**M.Sc. (Level 6.5) Sem- III (Name of Courses for - Major, RM, OJT, RP courses)**

Sr No	Course Category	Name of the course (Title of the Paper)		Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
						Theory	Practical	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
						T	P			
1	Major	MIT-511 (T)	Web Application Development Technology	4	60	4	-	40	60	3
		MIT-512 (T)	Ruby and Rails	4	60	4	-	40	60	3
		MIT-513 (T)	Software Engineering	4	60	4	-	40	60	3
		MIT-514 (T)	Mobile Application Development	2	30	2	-	20	30	2
		MIT-515 (2) (P)	LAB on Web Application Development Technology	2	60	-	4	20	30	2
		MIT-516 (2) (P)	LAB on Ruby and Rails	2	60	-	4	20	30	2
2	Elective (Select Any One)	MITE-517 (4) (T)	Data Warehousing and Data Mining (DWDM) OR MITE-518 (4) (T)	4	60	4	-	40	60	3
Total				22	390	18	08	220	330	--

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**School of Computer Sciences, PG DEGREE M. Sc. (Information Technology) PROGRAMME (A. Y. 2023-24)**  
**Credit distribution structure for Two Years/ One Year PG (M.Sc.) Degree Programme**

**Teaching and Examination scheme, Master of Science (M. Sc)**  
**M.Sc. (Level 6.5) Sem- IV (Name of Courses for - Major, RM, OJT, RP courses)**

Sr No	Course Category	Name of the course (Title of the Paper)		Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
						Theory	Practical	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
						T	P			
1	Major (NPTEL Swayam)	MIT-521	Getting Started with Competitive Programming (NPTEL, Swayam)	4	60	4	-	-	100	3
		MIT-522	Object Oriented System Development Using UML, Java and Patterns (NPTEL, Swayam)	4	60	4	-	-	100	3
2	FP/OJT, RP	MIT-523	Full Time Industrial Training	14	300	-	30	100	200	3
Total				22	420	8	30	100	400	--

**Note:** Major Courses MIT-521 and MIT-522 must be completed from NPTEL (Swayam).

# Semester-I

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Course Code: **MIT-416**

**Research Methodology**

Clock Hours: **60**

**Total Marks: 100**

## **Course Objectives:**

- 1) To study and understand the research issues & challenges, research goals, scientific methods
- 2) To study Sampling, External Validity, Levels of Measurement, Scaling and Qualitative Measures. Data Preparation, Descriptive Statistics and Correlation; and Inferential Statistics
- 3) Reviewing Literature and Research Papers; Writing Research Papers, Thesis, Reports and Project Proposals Plagiarism and Copyrights.

## **Unit-I**

**[08]**

**Max Marks:10**

**Research Foundations:** Research, Research Goals and Quality Research, Types of Research, Variables, Hypotheses and Data; Structure, Positivism and Post-Positivism; Scientific Methods, Reasoning and Arguments; Mathematical Methods of Proof and Research Fallacies.

## **Unit-II**

**[08]**

**Max Marks:15**

**CS Research Context:** Nature of Computer Science, Scientific Methods in Computer science, Types of Research in CS, Research Methods in Computer Science, Research Paradigms in CS, Grand Challenges for CS Research.

## **Unit-III**

**[10]**

**Max Marks:12**

**Measurements:** Sampling, External Validity, Levels of Measurement, Scaling and Qualitative Measures.

**Research Design:** Internal Validity, Types of Designs, Experimental Design, Probabilistic Equivalence, Hybrid Experimental Designs and Quasi-Experimental Design.

## **Unit-IV**

**[11]**

**Max Marks:25**

**Sampling:** Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

## **Unit-V**

**[11]**

**Max Marks:20**

**Data Analysis:** Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.

## **Unit-VI**

**[12]**

**Max Marks:18**

**Research Skills:** Reviewing Literature and Research Papers; Writing Research Papers, Thesis, Reports and Project Proposals; Formatting, Appendices, Citation Formats and Style; General Conventions, Issues, Plagiarism and Copyrights.

## **References:**

1. Research Methodology: a step-by-step guide for beginners, Kumar, Pearson Education.
2. Kothari C.K. (2004) 2/e, Research Methodology – Methods and Techniques (New Age International, New Delhi).
3. Practical Research Methods, Dawson, C., UBSPD Pvt. Ltd.



**Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT-416C.1	Understand the research issues & challenges, research goals, scientific methods	2
MIT-416C.2	Use of Sampling, External Validity, Levels of Measurement, Scaling and Qualitative Measures. Data Preparation, Descriptive Statistics and Correlation; and Inferential Statistics	4
MIT-416C.3	Able to Reviewing Literature and Research Papers; Writing Research Papers, Thesis, Reports and Project Proposals Plagiarism and Copyrights.	6

Course Code: **MIT-411**

**Object Oriented Programming using  
JAVA**

Clock Hours: **60**

Total Marks: **100**

**Course Objectives:**

- 1) To learn fundamentals of Java programming language and its constructs.
- 2) To understand concept of object-oriented programming concept using Java.
- 3) To study the concept of the Inheritance, Interfaces, Lambda Expressions, and Inner Classes.
- 4) To understand the concept of the Exceptions and Generic Programming
- 5) To learn about the Graphics Programming, Event Handling, Swing Components, and Database Programming

**Unit-I**

**[08]**

**Max Marks:12**

**An Introduction to Java:** Java as a Programming Platform, The Java “White Paper” Buzzwords, Java Applets and the Internet, Common Misconceptions about Java, The Java Programming Environment, Installation, A Simple Java Program, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays.

**Unit-II**

**[08]**

**Max Marks:12**

**Objects and Classes:** Introduction to Object-Oriented Programming, Using Predefined Classes, Defining Your Own Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages, The Class Path, Documentation Comments

**Unit-III**

**[10]**

**Max Marks:16**

**Inheritance, Interfaces, Lambda Expressions, and Inner Classes:** Classes, Super classes, and Subclasses, Object: The Cosmic Superclass, Generic Array Lists, Object Wrappers and Autoboxing, Methods with a Variable Number of Parameters, Enumeration, Classes, Reflection, Interfaces, Examples of Interfaces, Lambda Expressions, Inner Classes, Proxies

**Unit-IV**

**[10]**

**Max Marks:16**

**Exceptions and Generic Programming:** Dealing with Errors, Catching Exceptions, Assertions and Logging, Why Generic Programming? Simple Generic Class, Generic Methods, Bounds for Type Variables, Inheritance Rules for Generic Types, Wildcard Types, Reflection and Generics

**Unit-V**

**[12]**

**Max Marks:24**

**Graphics Programming, Event Handling and Swing Components:** Introducing Swing, Creating a Frame, Positioning a Frame, Displaying Information in a Component, Working with 2D Shapes, Using Color, Using Special Fonts for Text, Displaying Images, Basics of Event Handling, Actions, Mouse Events, The AWT Event Hierarchy, Swing and the Model View-Controller Design Pattern, Introduction to Layout Management, Text Input, Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes.

**Unit-VI**

**[12]**

**Max Marks:20**

**Deployment and Concurrency and Database Programming:** JAR Files, Storage of Application Preferences, Service Loaders, Applets, Java Web Start, Threads, Interrupting

Threads, Thread States, Thread Properties, Synchronization, Blocking Queues, Thread-Safe Collections, Callables and Futures, Executors, Synchronizers, Threads and Swing, The Design of JDBC, The Structured Query Language, JDBC Configuration, Working with JDBC Statements, Query Execution, Scrollable and Updatable Result Sets, Row Sets, Metadata.

#### References:

1. Cay S. Horstmann Core Java Volume I—Fundamentals (December 2015), Tenth Edition, Prentice Hall, ISBN: 9780134177335
2. Cay S. Horstmann Core Java, Volume II—Advanced Features (December 2016), Tenth Edition, Prentice Hall, ISBN: 9780134177878
3. Herbert Schildt, Java: The Complete Reference, Ninth Edition, McGraw Hill Education, ISBN 978-0-07-180855-2

#### Course Outcome:

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT-411C.1	Understands the fundamentals of Java programming language and its constructs.	2
MIT-411C.2	Implement the applications using the concept of the Inheritance, Interfaces and Inner Classes.	3
MIT-411C.3	Understand how to use concept of the Graphics Programming, Event Handling, Swing Components, and JDBC in their application.	2

Course Code: MIT-412

**Operating Systems**

Clock Hours: **60**

Total Marks: **100**

#### Course Objectives:

To provide a clear description of the concepts that underlie operating systems.

**Unit-I** [04] Max Marks:08

Introduction: review of computer organization, introduction to popular operating systems like UNIX, Windows, etc., OS structure, system calls, functions of OS, evolution of OSs.

**Unit-II** [03] Max Marks:06

Computer organization interface: using interrupt handler to pass control between a running program and OS.

**Unit-III** [08] Max Marks:12

Concept of a process: states, operations with examples from UNIX (fork, exec), Process scheduling, interprocess communication (shared memory and message passing), UNIX signals.

**Unit-IV** [04] Max Marks:06

Threads: multithreaded model, scheduler activations, examples of threaded programs.

**Unit-V** [06] Max Marks:10

Scheduling: multi-programming and time sharing, scheduling algorithms, multiprocessor scheduling, thread scheduling (examples using POSIX threads).

**Unit-VI** [08] Max Marks:12

Process synchronization: critical sections, classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).

**Unit-VII** [06] Max Marks:10  
Deadlocks: modelling, characterization, prevention and avoidance, detection and recovery.

**Unit-VIII** [07] Max Marks:12  
Memory management: with and without swapping, paging and segmentation, demand paging, virtual memory, page replacement algorithms, working set model, implementations from operating systems such as UNIX. Current Hardware support for paging: e.g., Pentium/ MIPS processor etc.

**Unit-IX** [07] Max Marks:12  
Secondary storage and Input/Output: device controllers and device drivers, disks, scheduling algorithms, file systems, directory structure, device controllers and device drivers, disks, disk space management, disk scheduling, NFS, RAID, other devices. operations on them, UNIX FS, UFS protection and security, NFS

**Unit-X** [04] Max Marks:06  
Protection and security: Illustrations of security model of UNIX and other OSs. Examples of attacks.

**Unit-XI** [03] Max Marks:06  
Epilogue: Pointers to advanced topics (distributed OS, multimedia OS, embedded OS, real-time OS, OS for multiprocessor machines).

**All above topics shall be illustrated using UNIX as case-studies.**

**References:**

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne (2009), Operating System Concepts, 8th Ed., John Wiley ISBN 0-471-69466-5.
2. William Stallings (2014), Operating Systems: Internals and Design Principles. Pearson, 8th Ed. ISBN-13: 978-0-13-230998-1
3. AS Tanenbaum (2009), Modern Operating Systems, 3rd Ed., Pearson. ISBN: 0135013011
4. AS Tanenbaum, AS Woodhull (2006), Operating Systems Design and Implementation, 3rd Ed., Prentice Hall ISBN-10: 0131429388
5. M. J. Bach (1986), Design of the Unix Operating System, Prentice Hall of India ISBN0. - 13-201757-1 025

**Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT412C.1	Analyse design aspects and data structures/policies/algorithms used for file subsystem, memory subsystem, process subsystem and i/o subsystem of Unix OS.	4
MIT412C.2	Differentiate between threads and processes and compare different processor scheduling algorithms.	4
MIT412C.3	Identify the need to create the advance and special purpose operating system.	2

Course Code: **MIT-413**

**Web Designing**

Clock Hours: **30**

Total Marks: **50**

**Course Objectives:**

The student should be able to

- 1) understand the basics of web development.
- 2) learn the concepts of HTML 5.0.

- 3) understand the importance style sheet and able to apply the internal and external style sheet to format the web pages.
- 4) learn the concepts of XML related technologies.
- 5) learn the concepts of modelling information.

#### **Unit-I**

**[02] Max Marks:05**

**Introduction to Web Development:** Components of Web application, Static vs. dynamic web pages, A survey of browsers, servers and scripting languages, URL, Introduction to HTML, HTML5, XHTML and CSS, Semantic markup, Web Page Designing Principles, Page layout, Website organization

#### **Unit-II**

**[05] Max Marks:07**

**HTML 5.0:** Structure of HTML5 Document, Elements, tags and attributes, DOCTYPE declaration, HEAD section, Coding text elements, Headings and paragraphs, Inline elements for formatting and emphasizing text, div and span elements, Events, WEB Form2.0, SVG, Canvas, Audio & Video, Geolocation, Drag & Drop, Web Workers.

#### **Unit-III**

**[05] Max Marks:10**

**CSS to format elements of a web page:** CSS applications, Selectors: Basic Rule, Grouping, class and ID selectors, attribute selectors, document structure, Specificity, Inheritance, cascade, Values and Units, Fonts, Colors Working with text, text alignment, spacing(letter/word), Text decoration, Text Shadows, CSS box model, Spacing, borders and backgrounds, Page layout using CSS, Floating elements, Multicolumn layout, Ways to include CSS in a web page.

#### **Unit-IV**

**[08] Max Marks:10**

**HTML and CSS skills:** Working with links and lists, Working with images, Working with tables, Working with forms, Adding audio, video to web pages, JavaScript for image rollovers, image swaps, slide shows, tabbed data and data validation

#### **Unit-V**

**[05] Max Marks:10**

**Core Concepts of XML:** Parts of an XML document, Document Prolog, The XML declaration, The document type declaration, Elements, Attributes, Namespaces, Entities, Comments, CDATA Section, Processing instructions, XSL, Displaying XML with CSS, JAVA Script, XSLT

#### **Unit-VI**

**[05] Max Marks:08**

**Modelling Information:** Simple Data storage, Dictionaries, Records, XML and Databases, Narrative Documents, Flows and sections, Blocks and inlines, Complex structures, Metadata, Linked Objects

#### **References:**

1. Anne Boehm, Murach's HTML, XHTML and CSS, Shroff Publishers and Distributors Pvt. Ltd., ISBN 13: 978-93-5023-095-4
  2. Learning XML, Erik T. Ray, O'Reilly, Shroff Publishers and Distributors Pvt. Ltd., ISBN 13: 978-81-8404-896-4
  3. Eric A. Meyer, CSS: The Definitive Guide, Visual Presentation for the Web, 3rd Edition, O'Reilly Media, November 2006, ISBN:978-0-596-52733-4| ISBN 10:0-596-52733-0(Print), ISBN 978-0-596-15940-5, 10:0-596-15940-4(Ebook)
  4. Benoit Marchal, XML by Example, 2nd Edition, Microsoft Press 2001, ISBN-10: 0-7897-2504-5, ISBN-13: 978-0-7897-2504-2.
- Auxiliary Resources :  
<https://www.tutorialspoint.com/html5/>

#### **Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT413C.1	Demonstrate simple and impressive web page design techniques from basic to advance to focus on goal oriented and user centric designs.	3
MIT413C.2	Set up page layouts, color schemes, typography in the designs.	6
MIT413C.3	Develop valid and concise code for webpages using XML, CSS and HTML.	6

Course Code: **MIT-414**

**LAB on Object Oriented Programming  
using JAVA**

Clock Hours: **60**

Total Marks: **50**

### ***Course Objectives:***

The student should be able to

- 1) Write java applications that demonstrate string operations, package creation, inheritance, inner classes.
- 2) Write java applications that uses various swing components and handle several events.
- 3) Write java applications that demonstrates, generic programming, JDBC and multithreading.

### ***Assignments:***

1. Write a program that demonstrate program structure of java.
2. Write a program that demonstrate string operations.
3. Write a program that demonstrate package creation and use in program.
4. Write a program that demonstrate inner class.
5. Write a program that demonstrate inheritance.
6. Write a program that demonstrate 2D shapes on frames.
7. Write a program that demonstrate text and fonts.
8. Write a program that demonstrate event handling for various types of events.
9. Write a program to illustrate use of various swing components.
10. Write a program that demonstrate use of dialog box.
11. Write a program to create own dialog box.
12. Write a program to create toolbar, menu & popup menu.
13. Write a program to implement file handlings.
14. Write a program that demonstrate Applet programming.
15. Write a program to implement generic programming.
16. Write a program that demonstrate JDBC on applet/application.
17. Write a program that demonstrate multithreading.

### ***Course Outcomes:***

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT414C.1	Create java applications that demonstrate string operations, package creation, inheritance, and inner classes.	6
MIT414C.2	Write Java application programs using Implementing user interface: 2D shapes, events, dialog box, menu and popup menu.	5
MIT414C.3	Develop Applets, multithreaded, generic and JDBC applications.	6

**Course Objectives:**

- 1) To understand design concept of web pages using different features.
- 2) To introduce the concept of XML and HTML5 for the construction of web pages using various technologies supported by it.

**Assignments:** Demonstrate following Assignments with appropriate HTML tags and CSS

1. Design a web page for clickable table of contents (TOC) of your first semester syllabus. Every click should display detailed content.
2. Design a web page for online books catalog.
3. Design a first page of online newspaper.
4. Design a web page for lecture schedule of current semester.
5. Demonstrate various CSS features
6. Design a web page that displays student feedback form for a scheduled course.
7. Design a web page that allows mp3 downloads.
8. Design a web page for nursery for plant selection using XML.
9. Design a web page for restaurant/ice cream parlor using XML.
10. Create a dictionary database using XML.
11. Design a narrative document using XML.
12. Display XML file using CSS
13. Display XML file of your choice using XSL
14. Display XML file using DSO data binding
15. Demonstrate Event Handling.
16. Draw Circle, Rectangle, Line, Ellipse and Polygon using SVG.
17. Create a Drawing Application with Canvas using HTML5.
18. Display Audio & Video playlist on browser using HTML5.
19. Display your location's coordinates of Longitude and latitude on Google Map.
20. Create a web page for shopping cart using Drag and Drop Events.
21. Design a web page which demonstrate Web Workers feature.

**Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT415C.1	Demonstrate simple and impressive web page design techniques from basic to advance to focus on goal oriented and user centric designs.	3
MIT415C.2	Set up page layouts, color schemes, typography in the designs.	6
MIT415C.3	Develop valid and concise code for webpages using XML, CSS and HTML.	6

**Course Objectives:**

- 1) To equip students with the fundamental knowledge and basic technical competence in the field of Digital Image Processing.
- 2) Give an in-depth knowledge about the basic theory and algorithms related to Digital Image Processing.
- 3) Provide awareness about the current technologies and issues specific to Digital Image Enhancement, Restoration, Segmentation, Color Image Processing, and Morphological Image Processing.

**Unit-I**

[08] Max Marks:06

**Introduction to Digital Image Processing & Applications:** Digital Image Processing. Applications of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image Sensing and Acquisition. Image Sampling and Quantization. Some Basic Relationships Between Pixels.

**Unit-II**

[08] Max Marks:08

**Image Enhancement:** Background, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods, Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering.

**Unit-III**

[08] Max Marks:08

**Image Restoration and Color Image Processing:** A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening.

**Unit -IV**

[06] Max Marks:06

**MATLAB/OpenCV/SciLab Image processing toolbox:** Matrix Operations, Introduction to Image Processing Tool Box, Image Read & Write, Filters (spatial and frequency domain), Image Restoration and Reconstruction, Morphological Operations, Edge Detection and linking, Segmentation.

**References:**

1. R.C.Gonzalez & R.E.Woods, Digital Image Processing, Pearson Education, 3rd edition, ISBN. 13:978-0131687288
2. S. Jayaraman Digital Image Processing TMH (McGraw Hill) publication, ISBN-13:978-0-07-0144798
3. Gonzalez, Woods & Steven, Digital Image Processing using MATLAB, Pearson Education, ISBN-13:978-0130085191

**Course Outcomes:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MITE417AC.1	Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics and Digital Image Processing; expose students to MATLAB/OpenCV/SciLab Image Processing Toolbox.	6
MITE417AC.2	Demonstrate various algorithms for scan conversion and filling of basic primitives objects and their comparative analysis and	3



	applied 2-D and 3-D geometric transformations, viewing and clipping on graphical objects.	
MITE417AC.3	Use the Mathematics for digital image representation, image acquisition, image transformation, image enhancement and restoration.	3

Course Code: MITE-417 B

**LAB on Computer Graphics and Digital  
Image Processing**

Clock Hours: 60

Total Marks: 50

**Course Objectives:**

The student should be able to

- get acquainted with digital image processing.
- apply different image enhancement techniques, interpolation techniques, filtering techniques on the given image.

**Assignments**

1. Introduction to Image Processing Toolbox
2. Read an 8 bit image and then apply different image enhancement techniques:
  - (a) Brightness improvement
  - (b) Brightness reduction
  - (c) Thresholding
  - (d) Negative of an image
  - (e) Log transformation
  - (f) Power Law transformation.
3. Implement different interpolation techniques using MATLAB/ SciLab/OpenCV
4. Read an image, plot its histogram then do histogram equalization. Comment about the result.
5. (a) Implement Gray level slicing (intensity level slicing) in to read cameraman image.
  - (b) Read an 8 bit image and to see the effect of each bit on the image.
  - (c) Read an image and to extract 8 different planes i.e. ‘bit plane slicing.’
6. Implement various Smoothing spatial filter.
7. Read an image and apply
  - (a) Gaussian 3x3 mask for blurring
  - (b) High pass filter mask with different masks
  - (c) Laplacian operator with centre value positive and negative
  - (d) High boost filtering.
8. Write a program to implement various low pass filters and high pass filter in frequency domain.
9. Write a program for erosion and dilation, opening & closing using inbuilt and without inbuilt function.
10. Implement and study the effect of Different Mask (Sobel, Prewitt and Roberts)
11. Implement various noise models and their Histogram
12. Implement inverse filter and wiener filter over image and comment on them

**Course Outcomes:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MITE417BC.1	Implement various algorithms for scan conversion, filling objects, 2-D and 3-D geometric transformations, viewing and clipping on graphical objects.	5



MITE417BC.2	Make use of MATLAB and Image Processing Toolbox to implement image transformation, image enhancement in spatial and frequency domain.	3
MITE417BC.3	Write Java application programs using Implementing user interface: 2D shapes, events, dialog box, menu and popup menu.	3
MITE417BC.4	Develop Applets, multithreaded, generic and JDBC applications.	6

Course Code: **MITE-418 A**

**Object Oriented Programming using C++**

Clock Hours: **30**

**Total Marks: 50**

**Course Objectives:**

- 1) To familiarize the Object-Oriented Programming (OOP) concepts, such as abstraction, encapsulation, instances, initializations, polymorphism, overloading, inheritance etc.
- 2) To write programs to solve problems using generic programming constructs such as templates and using standard template library
- 3) To understand and know the importance of pointers and learn file handling and exception handling in real-world problems.

**[05] Max Marks:15**

**Unit-I**

**Fundamentals:** Object-Oriented Programming (OOP): Need, Benefits of OOP, C++ programming Basics: Data types, Enumerations, Arrays, Strings, Pointers and references, Control structures. Functions: Function prototypes, parameter lists and return values, default values, global scoping, referencing, the 'const' keyword, referencing of strings, constant pointers, inline functions, static functions, function overloading, friend functions. OOP Concepts: The 'Struct' keyword, Functions within structures, Data encapsulation and classes, 'this' pointer, Constructors and Destructors, Overloading constructors, Copy Constructor, Assignment and Copy Initialization, Methods and their return values, Objects and Memory requirements, Static Class members, friend class.

**Unit-II**

**[10] Max Marks:15**

**Inheritance and Polymorphism:** Base Class and derived Class, access specifiers, Constructor and Destructor in Derived Class, Virtual destructor, Protected members, Overriding member functions, Public and Private Inheritance, Multiple Inheritance, Ambiguity in Multiple Inheritance, Composition, Nested Classes.

**Polymorphism:** Operator Overloading: concept of overloading, Overloading Unary Operators, Overloading Binary Operators, Data Conversion, Type casting (implicit and explicit), Pointers-indirect ion Operators, Memory Management: new and delete, Pointers to Objects. Virtual Functions: concept, pure virtual functions and abstract classes, arrays in polymorphism, late binding, Function pointers

**Unit-III**

**[05] Max Marks:05**

**Files and Streams:** Data hierarchy, Classes for File Stream Operations, File Pointers, File I/O with Member Functions, Overloading the Extraction and Insertion Operators, memory as a Stream Object, Command-Line Arguments.

**Unit-IV**

**[05] Max Marks:10**

**Templates and Exception Handling:**

**Templates:** Function templates, Template specialization, Class templates, Non-type parameters for templates, template, and inheritance,

**Exception Handling:** Other error handling techniques, Exceptions, Exception handling in C++, rethrowing an exception, exception specifications, processing unexpected exceptions, stack unwinding, exception handling in constructors, destructors.

**Unit-V**

**[05] Max Marks:05**

**Standard Template Library (STL):** Introduction to STL: Containers, algorithms, adaptors, and iterators, Containers: Sequence container and associative containers, Adaptors: container adaptors,

iterator adaptors, Algorithms: basic searching and sorting algorithms, min-max algorithm, set operations, Iterators: input, output, forward, bidirectional and random access.

### References:

1. Robert Lafore, Object-Oriented Programming in C++, fourth edition, Sams Publishing, ISBN:0672323087.
2. Bjarne Stroustrup, The C++ Programming language, Third edition, Pearson Education ISBN 0-201-88954-4.
3. Meeta Gandhi, Tilak Shetty, RajivShah, Vijay Mukhi's The 'C' Odyssey C++ and Graphics-The future of C, BPB publications, First Edition

### Course Outcomes:

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MITE418AC.1	Understanding C++ language fundamentals	2
MITE418AC.2	Develop C++ applications to demonstrate inheritance, polymorphism	3
MITE418AC.3	Demonstrate file handling, exceptions handling in C++	6
MITE418AC.4	Develop C++ applications using templates and Standard Template Library	6

Course Code: **MITE-418 B**

**LAB on Object Oriented Programming  
using C++**

**Clock Hours: 30  
Total Marks: 50**

### Course Objectives:

- 1) Apply object-oriented approaches to software problems in C++
  - 2) Apply exception handling techniques to software problems in C++
  - 3) Apply generic programming approaches using templates and efficiently use standard template library in software development
1. Write program to demonstrate class, use of constructor, constructor overloading and destructor.
  2. Write program to demonstrate use of arrays, strings, pointers, constants, and references.
  3. Write program to demonstrate use of operator overloading.
  4. Write program(s) to demonstrate use of inheritance.
  5. Write program to demonstrate use of compile time and runtime polymorphism.
  6. Write program to demonstrate use of friend function and friend class.
  7. Write program to demonstrate use of virtual class.
  8. Write program to demonstrate use of static data member and static member function.
  9. Write program to demonstrate file handling.
  10. Write program to demonstrate use of function templates.
  11. Write program to demonstrate use of class templates.
  12. Write program to demonstrate use of exception handling.
  13. Write program to demonstrate command line arguments.
  14. Write program(s) to demonstrate use of STL.

### Course Outcomes:

After completion of this course students shall be able to -

CO No.	CO	Cognitive level
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MITE418BC.1	Develop logic of a program for solving real time problems and isolate and fix common errors in C++ programs.	6
MITE418BC.2	Understand the object-oriented approach for the program development and make use of the OOP concepts (data abstraction, encapsulation, polymorphism, overloading, and of C++ appropriately in problem solving.	3
MITE418BC.3	Create applications using the STL library.	6

# Semester-II

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Course Code: MIT-421

Linux Administration and Programming

Clock Hours: 60

Total Marks: 100

## Course Objectives:

- To know basics of Linux operating system and understanding concept of login process and general-purpose commands.
- To understand file management, permission and disk related commands.
- To understand Linux shell script and system administration tasks.
- To know basics of networking, internet servers and installation, configuration, administration of internet servers.

### Unit-I

[8]

Max Marks:12

Introduction to Linux: Basic idea on Proprietary, Open Source, Free Software etc., Introduction of Various Linux Distribution (Red Hat Enterprise Linux, Cent OS, Fedora Projects, Debian Linux, Ubuntu, etc.); Basic Architecture of Unix/Linux system, Kernel, Shell. Linux File System, Boot block, Super block, Inode table, Data blocks, How Linux access files, storage files, Linux standard directories, LILO, GRUB Boot Loader; Installation of Linux system- Using Live CD, Virtual Machine, Direct Installation; Partitioning the Hard drive for Linux, init and run levels.

### Unit-II

[8]

Max Marks:15

Linux Basics: Login process, Creating Users Account and Group, Getting Help. Services and Process, Files and File System (File Types and Permissions, Links, Size and Space, Date and Time) Working with Files: Reading Files, Searching for files, Copying, Moving, Renaming, Deleting, Linking, and Editing Files; Other Commands: ls, rm, rmdir, pwd, more, less, grep, sort, cat, head, tail, wc, tee, ps, top, tar, unzip, nice, kill, netstat, Disk related commands, checking disk free spaces.

### Unit-III

[12]

Max Marks:18

Linux Shell Script: Shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, creating Shell programs for performing various tasks.

### Unit-IV

[12]

Max Marks:21

System Administration: Common administrative tasks, identifying administrative files – configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su; Getting system information with uname, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware with kudzu, installing and removing packages in Linux. Configure X-windows starting & using X desktop. KDE & Gnome graphical interfaces, changing X windows settings.

### Unit-V

[10]

Max Marks:18

Introduction to Networking and Internet Servers: TCP/IP Networking: Network Classes and Subnetting, Gateways and Routers, Basic introduction to DHCP (Dynamic Host Configuration Protocol), Samba Server, Domain Name System, Mail Servers (SMTP, POP3 and IMAP), FTP Server, Apache Web Server, SSI, CGI.

### Unit-VI

[10]

Max Marks:06

Installation, Configuration and Administration of Internet Servers: Installation and configuration of a simple LAN, Installation and configuration of: Proxy server(Squid), DNS server(BIND), Mail server, Web server(Apache), File server(Samba), DHCP server, Installation and configuration of a SSH server and client, Installation and configuration of FTP server and client.

## References:

1. Collings T., & Wall, K. (2005), Red Hat Linux Networking and System Administration, 3rd Edition, Wiley Publishing, ISBN: 978-0-7645-9949-1
2. Das, S., (2006), Unix Concepts and Applications, 4th Edition, Mcgraw Hill Education, ISBN: 978-0070635463, 0070635463
3. Wale Soyinka, (2012), Linux Administration: A Beginner's Guide, 6th Edition, McGraw Hill Education, ISBN: 978-1259061189, 1259061183
4. Richard Petersen, (2007), Linux: Complete Reference, 6th Edition, Tata McGraw-Hill, ISBN: 978-0070222946, 0070222940
5. Richard Petersen, (2017), Red Hat Enterprise Linux 7: Desktops and Administration, Surfing Turtle Press, ISBN: 978-1936280629, 1936280620
6. Matthew, N. & Stones R., (2011), 4th Edition, Beginning Linux, Wrox, ISBN: 9780470147627

## Course Outcome:

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT421C.1	Understand and demonstrate basic knowledge in Linux operating system.	2
MIT421C.2	Apply and change the ownership and file permissions using Linux commands.	3
MIT421C.3	Implement shell scripts and apply basic of administrative task.	3
MIT421C.4	Understand the networking, internet servers and installation, configuration, administration of internet servers.	2

Course Code: **MIT-422**

**Database Management System  
(DBMS)**

Clock Hours: **60**  
Total Marks: **100**

## Course Objectives:

- 1) The course emphasizes the understanding of the fundamentals of relational systems including data models, database architectures, and database manipulations.
- 2) To develop conceptual understanding of database management system
- 3) To understand how a real-world problem can be mapped to schemas
- 4) To educate students with different Database Languages.
- 5) Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

### Unit-I

[05]

**Max Marks:08**

**Introduction:** Database system application and purpose, Characteristics of DBMS, Database Users, 1-tier, 2-tier and 3-tier architecture of DBMS along with its advantages, Levels of Database Architecture, Data Models, Data-schemas and instances, Data Independence, Role and responsibilities of DBA.

### Unit-II

[10]

**Max Marks:10**

**Database Design and E-R Model:** Overviews of Database Design, ER Modeling concepts, ER Diagrams, Reduction to Relational Schemas, Extended ER Features, Alternative notations for Modelling, Cardinality constraints, Atomic Domains and 1NF, Decomposition using Functional Dependencies (BCNF, 3NF and 4NF).

### Unit-III

[12]

**Max Marks:20**

**Relational Databases:** Structure of Relational Databases, Database Schemas, Keys, Schema diagrams, Relational Query Languages, Relational Operation. Overview of SQL, SQL Data Definition, Basic Structure of SQL Queries, Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of Databases. Join Expressions, Views, Transactions, Integrity Constraints, SQL data types and Schemas, Authorization, Accessing SQL from Programming Languages, Overview of Dynamic SQL and SQL CLI. Functions and

Procedures, Triggers. The relational Algebra fundamental and extended Operations. Tuple and Domain Relational Calculus.

#### **Unit-IV**

[10]

**Max Marks:22**

**Transaction Management and Query Processing:** Transaction Concept, Model, Storage Structure, Atomicity and Durability, Isolation, Levels of Isolation, Overview of Query Processing, Measuring Query Cost, Selection Operation, Sorting, Join Operation, Other Operations and Evaluation of Expression. Overview of Query Optimization, Transformation of Relational Expression, Choice of Evaluation Plan.

#### **Unit-V**

[10]

**Max Marks:15**

**Concurrency Control and Recovery System:** Lock based Protocol, Timestamp based Protocol, Validation based Protocol, Deadlock Handling, Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithms, Buffer Management, Early lock release and logical undo operations, Remote Backup Systems. Case study: ARIES

#### **Unit-VI**

[13]

**Max Marks:25**

**Advanced Topics in Databases:** Introduction to Object Databases: Shortcomings of Relational Data Model, The Conceptual Object Data Model, Objects in SQL:1999 and SQL:2003. Introduction to XML and Web Data: Semi structured Data, Overview of XML, XML Data Definitions, XML Schema, XML Data Manipulation: XQuery, XPath Query Languages: XPath and SQL/XML. Distributed Databases: Overview, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control, Cloud based Databases.

#### **References:**

1. Michael Kifer, Arthur Bernstein, P.M, Lewis and P.K. Panigrahi, "Database Systems: An Application Oriented Approach", Second Edition, Pearson Education, ISBN:978-81-317 0374-8.
2. C.J.Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, ISBN:978-81-7758-556-8
1. A. Silberschatz, H.F.Korth, and S.Sudarshan, "Database System Concepts", TMH Publications, Sixth Edition, ISBN:978-007-132522-6.

#### **Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT422C.1	Apply the relational model, specify integrity constraints, and explain how to create a relational database using an ER diagram and normalization techniques.	3
MIT422C.2	Apply SQL to create, query and manipulate relational databases.	6
MIT422C.3	Determine partitioning and distribution of data across networked nodes of a DBMS and data optimization in a distributed environment.	3

Course Code: **MIT-423**

**Computer Networks**

ClockHours:**60**

Total Marks:**100**

#### **Course Objectives:**

- 1) This module introduces students to local, metropolitan, and wide area computer network and focusses on building a firm foundation for understanding Data Communications and Computer Networks.
- 2) It is based around the OSI Reference Model, that deals with the major issues in the bottom three (Physical, Data Link and Network) layers of the model.
- 3) Also, student learn how data transmission take place between nodes and what are the difficulties encounter during transmission.

- 4) Introduction to the Internet protocol suite and its development.
- 5) Students are also introduced to the areas of Cryptography and Network Security.
- 6) To expose students to emerging technologies and their potential importance.
- 7) This module provides the student with fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in this area.

**Unit-I** [10] Max Marks:20  
Overview of Computer Network, OSI and TCP/IP Reference Models, Guided and Unguided Transmission Media, Analog and Digital Communication, Encoding and Modulation, Nyquist Theorem, Shannon's capacity, Switching techniques- TDM, FDM.

**Unit-II** [15] Max Marks:25  
Framing, Error detection and Error correction- Vertical Redundancy Check (VRC) Longitudinal Redundancy Check (LRC), Hamming Distance, Hamming Code, Cyclic Redundancy Check(CRC), Stop and Wait Protocol, Sliding Window Protocol, Go-Back-n ARQ, Selective-Retry ARQ, HDLC.

**Unit-III** [10] Max Marks:15  
Channel Allocation, ALOHA Systems, CSMA Protocols, Collision Free Protocols, Local Area Networks, Bridges, ATM.

**Unit-IV** [15] Max Marks:25  
Routing- Flooding, Shortest Path Routing, Distance Vector Routing, Link State Routing, Congestion Control-Leaky Bucket and Token Bucket algorithms, IP Protocol, IP Addressing, ARP, RARP, OSPF, BGP, TCP, UDP, DHCP.

**Unit-V** [10] Max Marks:15  
Cryptography and Network Security- Introduction to the Concept of Security, Cryptographic Techniques, Computer-based Symmetric and Asymmetric Key Cryptographic Algorithms, Public Key Infrastructure (PKI), Internet Security Protocols, Network Security.

#### References:

1. Andrew S. Tanenbaum ,(2009). Computer Networks 4<sup>th</sup> Edition , Pearson Prentice Hall.ISBN- 978-81-7758-165-2
2. Behrouz A. Forouzan, (2012).Data Communications and Networking. 5<sup>th</sup> Edition. Mc Graw – Hill, ISBN-10: 0073376221
3. William Stallng, (2013) Cryptography and Network Security 6 edition Pearson Education India, ISBN-10: 9332518777
4. Behrouz A Forouzan and Fender Mukhopahyay, (2010) Cryptography and Network Security, 2<sup>nd</sup> edition, McGraw Hill Education, ISBN-10: 007070208X
5. Atul Kahate, (2009),Cryptography and Network Security, 2<sup>nd</sup> Edition, McGraw Hill Education, ISBN-10: 0070151458
6. Auxiliary Resources:
  - a. <http://nptel.ac.in/courses/106105081/1>
  - b. <http://www.nptelvideos.in/2012/11/computer-networks.html>
  - c. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system-engineering-spring-2009/video-lectures/lecture-9/>

#### Course Outcome:

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT423C.1	Understand of the OSI Reference Model and have an upright knowledge of layers 1-3.	2
MIT423C.2	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.	4

MIT423C.3	Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications.	3
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Course Code: **MIT-424**

**Data Structures and Algorithms**

Clock Hours: **30**

**Total Marks: 50**

**Course Objectives:**

- 1) To impart the basic concepts of data structures and algorithms
- 2) To understand basic concepts about array, stacks, queues, linked lists, trees and graphs
- 3) 3 To impart knowledge of advance topics like AVL Trees, BTrees, B\* and B+ Trees
- 4) To understand concepts about searching and sorting techniques
- 5) Apply hashing concepts for a given problem
- 6) To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**Unit-I**

**[04]**

**Max Marks:03**

**Introduction to Data Structures and Algorithms:** Algorithmic Notation: Format Conventions, Statement and Control Structures. Time and Space Analysis: Data types and Abstract data types, Types of Data structures; Primitive, Non primitive, Linear and Nonlinear Data structures

**Unit-II**

**[04]**

**Max Marks:10**

**Array:** Storage representation, operations and applications (Polynomial addition and subtraction) **Stack:** operations and applications (infix, postfix and prefix expression handling), **Queue:** operations and applications, **Circular Queues:** operations and applications, **Concept of Double ended Queue and Priority Queue,** **Linked representation of stack and queue.**

**Unit-III**

**[05]**

**Max Marks:06**

**Linked Lists:** Operations and Applications of Linear linked list (Polynomial addition and subtraction), Circular linked list and Doubly linked list.

**Unit-IV**

**[05]**

**Max Marks:12**

**Trees:** Binary Trees, Binary Tree: Representations, Operations (insert/delete), Traversal (inorder, preorder, postorder, level order), Threaded Binary Tree, Search Trees: AVL Tree, single and double rotations, B-Trees: insertion and deletion, Introduction to B+ and B\* Trees

**Unit-V**

**[06]**

**Max Marks:09**

**Graphs and Their Applications:** Representation (Matrix/Adjacency) and Traversal (Depth First Search/Breadth First Search), Spanning Trees, Minimal Spanning Tree (Prim's and Kruskals's algorithm), Shortest Paths and All Pair Shortest Path, Dijkstra's, Floyd-Warshall Algorithms.

**Unit-VI**

**[06]**

**Max Marks:10**

**Hash Table:** Hash Function, Collision and its Resolution, Separate Chaining, Open Addressing (linear probing, quadratic probing, double hashing), Rehashing, Extendible Hashing Searching: Linear Search and Binary Search (array/binary tree).

**References:**

1. Tremblay, J. & Sorenson, P.G., (2001), An Introduction to Data Structures with Application, Mcgraw Hill India, ISBN: 978-0074624715, 0074624717
2. Langsam, Y., Augenstein, M.J. & Tenenbaum A.M., (2015), Data Structures using C School of Computer Sciences, KBCNMU, Jalgaon M.Sc. (Computer Science) Syllabus-2019-20 Page 9 and C++, 2nd Edition, Pearson Education ISBN: 978-9332549319, 9332549311
3. Balagurusamy, E., (2013), Data Structures using C, 1st Edition, Mcgraw Hill Education, ISBN: 978-1259029547, 1259029549
4. Weiss, M.A., (2002), Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson India, ISBN: 978-8177583588, 8177583581
5. Horowitz, E., Sartaj S. & Mehta, D. (2008), Fundamentals of Data Structures in C++, Universities Press ISBN: 978-8173716065, 8173716064 \*
6. Lafore, R., (2003), Data Structures & Algorithms in Java, 2nd Edition, Pearson India, ISBN: 978-8131718124, 8131718123



7. Kruse, R., Tondo, C.L., Leung B., & Mogalla S, (2006), Data Structures and Program Design in C, Pearson India, ISBN: 978-8177584233.

***Course Outcome:***

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT424C.1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.	2
MIT424C.2	Understand data structures such as arrays, linked lists, stacks and queues, graphs, trees and hash tables.	2
MIT424C.3	Solve problem involving graphs, trees and apply different sorting and searching algorithms.	3

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Course Code: **MIT-425**

**LAB on Linux Administration and Programming**

Clock Hours: **60**

Total Marks: **50**

***Course Objectives:***

- 1) To understand the Installation of Linux system.
- 2) To understand and make effective use of Linux utilities and shell scripting language to solve problems.
- 3) To understand in C some standard Linux utilities like mv,cp,ls etc.
- 4) To know basics of system administration tasks, installation, configuration and administration of internet servers.

**1. Demonstration on Installation of Linux system**

Direct Installation; Partitioning the Hard drive for Linux, Using Live CD, Virtual Machine, init and run levels

**2. Linux Commands and Shell Programming**

Creating Users Accounts and Groups, Starting and Stopping Services, Files and File System (File Types and Permissions, Links, Size and Space, Date and Time), Working with Files: Reading Files, Searching for files, Copying, Moving, Renaming, Deleting, Linking, and Editing Files, Other Commands: ls, rm, rmdir, pwd, more ,less. grep, sort, cat, head, tail, wc, tee, ps, top, tar, unzip, nice, kill, netstat, Disk related commands, checking disk free spaces  
read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Shell programs for performing various tasks (List to be given by the course instructor)

**3. System Administration**

Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su; Getting system information Backup and restore files, reconfiguration hardware with kudzu, installing and removing packages in Linux. X-Windows administration

**4. Installation, Configuration and Administration of Internet Servers**

- Simple LAN

- Proxy server(Squid), DNS server(BIND)
- Mail server
- Web server(Apache)
- File server(Samba)
- DHCP server
- SSH server and client
- FTP server and client

**Course Outcomes:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT425C.1	Demonstrate the Installation of Linux system.	3
MIT425C.2	Understand the basic commands of Linux operating system and can write shell scripts.	2
MIT425C.3	Implement/Perform system administration tasks, installation, configuration and administration of internet servers.	3

Course Code: **MIT-426**

**LAB on DBMS**

**Clock Hours: 60**

**Total Marks: 50**

**Course Objectives:**

- 1) The course mainly concentrates on understanding of the fundamentals of Data Definition Language and Data Manipulation Languages.
- 2) To develop conceptual understanding of database management system
- 3) To understand how a real-world schema can be implemented
- 4) To educate students with different Database Languages.
- 5) Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.
- 6) Creating database tables and using data types.
  - Create table
  - Modify table
  - Drop table
2. Practical Based on Data Manipulation.
  - Adding data with Insert
  - Modify data with Update
  - Deleting records with Delete
3. Practical Based on Implementing the Constraints.
  - NULL and NOT NULL
  - Primary Key Constraint
  - Foreign Key Constraint
  - Unique Constraint
  - Check Constraint
  - Default Constraint
4. Practical for Retrieving Data Using following clauses.
  - Simple select clause
  - Accessing specific data with Where
  - Ordered By
  - Distinct
  - Group By
5. Practical Based on Aggregate Functions.
  - AVG
  - COUNT

- MAX
  - MIN
  - SUM
  - CUBE
6. Practical Based on implementing all String functions.
  7. Practical Based on implementing Date and Time Functions.
  8. Practical Based on implementing use of UNION, INTERSECTION, SET DIFFERENCE.
  9. Implement Nested Queries & all types of JOIN operation.
  10. Practical Based on performing different operations on a view.
  11. Practical Based on implementing use of Procedures.
  12. Practical Based on implementing use of Triggers
  13. Practical Based on implementing Cursor.
  14. ++VB.NET, C#.NET, JAVA, D2K, etc.
  15. Practical based on creating Data Reports.
  16. Design entity relationship models for a business problem and develop a normalized database structure

**Course Outcomes:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT426C.1	Design and implement a database schema for a given problem-domain.	4
MIT426C.2	Perform basic SQL operations, triggers, procedures, views along with development of forms and reports with database connectivity.	4
MIT426C.3	Realize various data models for Database and Write queries in SQL.	6

Course Code: MITE-427

**Mathematical Foundations of  
Information Technology**

Clock Hours: **60**  
Total Marks: **100**

**Course Objectives:**

- 1) To build the foundation of computer algorithms using mathematical base.
- 2) To introduce the concepts of induction to prove certain property is true for non-negative integers.
- 3) To introduce the concepts of recursive data types, linear recurrences, divided and conquer recurrences and solving recurrences.
- 4) To introduce the concept of generating functions and applications of principle of inclusion and exclusion.
- 5) To apply statistical measures on the data and represent it graphically.
- 6) To relate practical examples to the probability theory and probability distributions to build the foundation for machine learning.
- 7) To understand stochastic processes and apply Markov chain theory to relate real time problems.
- 8) To understand hidden Markov model and Chapman-Kolmogorov equation for solving problems.

**Unit-I** [15] Max Marks:25

**Induction and Recursion:** Mathematical Induction, Strong Induction and Well Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness, The Towers of Hanoi, Merge Sort, Linear Recurrences, Divide-and-Conquer Recurrences, A Feel for Recurrences

**Unit-II** [15] Max Marks:20

**Advance Counting Techniques:** Recursive Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

**Unit-III** [05] Max Marks:10

**Statistics:** Population and sample, parameters and statistics: definition, types: Descriptive and Inferential, applications, Descriptive Statistics: Mean, median, mode and standard deviation, variance, Graphical statistics

**Unit-IV** [15] Max Marks:20

**Probability:** Making decisions under uncertainty, Classical definition of Probability, Events and their Outcomes, Rules of Probability, Probability axioms, Random variables (discrete and continuous), Joint and Conditional probability, independence and Bayes theorem, Distribution of a random vector, Probability mass function, Probability density function and distribution function. Distributions: Binomial, Poisson, Uniform, Exponential, Normal.

**Unit-V** [10] Max Marks:15

**Stochastic Processes:** Definitions and classifications of Stochastic Processes, discrete and continuous Markov models, Hidden Markov Models, Chapman-Kolmogorov equation

**References:**

1. Kenneth H. Rosen, Discrete Mathematics and its Applications 6<sup>th</sup> Ed, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007 ISBN 10: 0070681880
2. Michael Baron (2014) Probability and Statistics For Computer Scientists Second Edition, CRC press. ISBN: 978-1-4822-1410-9
3. Bhat B.R, Srivenkatramana T and Rao Madhava K.S. (1996): Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
4. Croxton F.E, Cowden D.J and Kellin S (1973): Applied General Statistics, Prentice Hall of India ISBN 10: 0201089947 ISBN 13: 9780201089943
5. Hogg, Robert V. & Craig Allen T. (2008). Introduction to Mathematical Statistics, Pearson Education ISBN 0-02-978990-7
6. Goon A.M., Gupta M.K., Dasgupta. B. (2001), Fundamentals of Statistics, Volume I and II, World Press, Calcutta.
7. Ross, S. (2005). Introduction to Probability Models, (6th Ed. Academic Press). ISBN 978-0-12-375686-2
8. Medhi, J. (1994). Stochastic Processes, (2nd Ed. New Age Publisher) ISBN : 978-93-86286-48-2

**Course Outcomes:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MITE427C.1	Build the solid foundation of computer algorithms using mathematical base.	4

MITE427C.2	Understand the recursive data types, linear recurrences, divided and conquer recurrences and solving recurrences.	2
MITE427C.3	Able to relate practical examples to the probability theory and probability distributions to build the foundation for machine learning.	3

Course Code: **MITE-428**

**Optimization Algorithms**

Clock Hours:**60**

Total Marks: **100**

***Course Objectives:***

- 1) To introduce with the branch of OR and its role in decision making.
- 2) To list out various types of applications of operations research (OR).
- 3) To explain Linear Programming Problem (LPP) and practice with techniques to solve various types of LPP (transportation problem, assignment problems, special cases of duality, Integer programming problems)
- 4) Describe the significance, concept of game theory and algorithms to solve game theory problems.
- 5) Introduce critical path analysis using network problems.

**Unit-I**

**[05] Max Marks:08**

**Overview of operations Research:** Introduction, Applications, Role of OR in Decision Making, Feasible and optimal Solutions

**Unit-II**

**[15] Max Marks:20**

**Linear Programming: Special Types:** Transportation Problem as LPP, Initial Basic Feasible Solution, North West corner Rule, Lowest Cost Method, Vogel's Approximation Method, MoDi method for optimization, Degeneracy.

Assignment problem, Hungarian Method, Special cases of assignment problem

**Unit-III**

**[18] Max Marks:24**

**Linear Programming Problems:** Introduction, Formulation of Mathematical model of LPP, Standard form of linear programming problems, Solving LPP using Graphical method, Infeasible LPP, Unbounded LPP, Basic feasible solutions, Simplex method for solving LPP, augmentation using Slack and artificial variables, Big M and two phase method, Degeneracy, alternative optima, Interpretation of final Simplex table, Duality: concept, applications and example.

**Unit-IV**

**[06] Max Marks:08**

**Integer Programming:** Introduction, How it differs from LPP, Pure and mixed integer programming problems, Binary IPP, Techniques to solve IPP.

**Unit-V**

**[08] Max Marks:15**

**Network Models:** Definitions, Applications, Representation of a problem in network form, Critical Path Analysis, Resource planning, Gantt Chart.

**Unit-VI**

**[08] Max Marks:15**

**Game Theory :** Concept, Two party zero sum game, Pay off matrix, Pure and mixed strategy games, Rule of Dominance, Subgame method, Brown's Algorithm

**References:**

1. Hamdy Taha (2010). Operations Research: An Introduction. Pearson Education. ISBN: 978-0132555937
2. L C Jhamb. Quantitative Techniques For Managerial Decisions Vol I, Vol II. Everest Publishing House, ISBN: 8186314628
3. Panneer Selvan R (2006). Operations Research. Prentice Hall of India. ISBN: 978-8120329287

**Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MITE428C.1	Differentiate between feasible and optimal solution.	4
MITE428C.2	Apply solving techniques to all types of LPP.	3
MITE428C.3	Apply solving techniques to network problems and game theory problems as well.	3

## Semester-III

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Course Code: MIT-511

Web Application Development  
Technology

Clock Hours: 60

Total Marks: 100

### Course Objectives:

- 1) Net Framework and creating ASP.Net web applications using standard .net controls.
- 2) Use Web Services and develop simple and complex applications using .Net framework
- 3) Maintain session and controls related information for user used in multi-user web applications

### Unit-I

[10]

Max Marks:25

Desktop Computing vs. Internet Computing, Internet computing infrastructure, Client side scripting vs. Server Side Scripting technologies, Web Server basics and configuration: IIS, Apache etc., Web site hosting basics, Web Publishing, HTML, introduction to .NET framework, Features of .NET framework:CTS,CLS,CLR,.NET technologies, languages'C#.NET,VB.NET, basics of ASP.NET page framework, Visual studio .NET IDE, Page Life Cycle,PostBack, Viewstate, Page directives, ASP.Net page execution cycle, HTTP Pipeline, HTTP Application, HTTP Request, HTTP Response classes, HTTP Modules and HTTP Handlers, State Management, Role of *Global.asax*, Application configuration using *web.config* file

### Unit-II

[15]

Max Marks:25

ASP.NET Control hierarchy, HTML Server Controls, Web Server Controls, User and Server controls, Validation Controls, List bound controls: dropdown lists, list boxes, Repeater, DataList, Data Grid, DataGridView, FormsView controls, Data binding to List Bound Controls, Templating and Styling of ASP.NET server controls

### Unit-III

[20]

Max Marks:25

Web Page Designing principles, CSS anatomy, Anatomy of Master Pages, nesting master pages, Site map file, Web site Navigation controls, properties:TreeView, Sitemap Path, Menu, Other Navigation methods: Response.Redirect(), Server.Transfer(), Personalization through Profiles, Themes/Skins, Web Site security basics: authentication modes:Windows,Forms,passport, authorization, roles/Membership, access rules, login controls,Web services: working, anatomy, hosting

### Unit-IV

[15]

Max Marks:25

Database technology: ADO.NET, Anatomy/architecture of ADO.NET, working with Connection, Command, Data Adaptor, DataReader, DataSet, DataTable objects, Editing data in Data Tables, concurrency control. Introduction to MVC, Data Reports

### References:

1. Richard Anderson, Brian Francis, Alex Homer, Rob Howard, David Sussman, Karli Watson(2002), Professional ASP.NET 1.0, Special Edition, Wrox Press Ltd., 2002, ISBN 1-861007-0-3-5.
2. Chris Hart, John Kauffman, Dave Sussman, and Chris Ullman(2006), Beginning ASP.NET 2.0, Wiley Publishing, Inc., 2006, ISBN-13: 978-0-7645-8850-1, ISBN-10: 0-7645-8850-8.
3. Beginning ASP.NET 4: in C# and VB, Imar Spaanjaars, Wiley Publishing, Inc 2010., ISBN: 978-0-470-50221-1
4. Bill Evjen, Scott Hanselman, Devin Rader (2008), Professional ASP .NET 3.5 in C# and VB, Wiley Publishing Inc.,2008 ISBN:978-0-470-18757-9.
5. Dino Esposito (2008), Programming Microsoft ASP.NET 3.5, Second Edition, Microsoft Press, 2008, ISBN-10: 0735625271, ISBN-13: 978-0735625273

### Auxiliary Resources:

a. Website URLs

1. <https://www.asp.net/>
2. <http://asp.net-tutorials.com/>

b. Video Links

1. <https://www.asp.net/web-forms/videos>
2. [https://www.youtube.com/playlist?list=PL6n9fhu94yhXQS\\_pli-HLIftB9Y7Vnxlo&feature=view\\_all](https://www.youtube.com/playlist?list=PL6n9fhu94yhXQS_pli-HLIftB9Y7Vnxlo&feature=view_all)

**Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT511C.1	Design web applications using ASP.NET.	6
MIT511C.2	Debug and deploy ASP.NET web applications.	3
MIT511C.3	Create database driven ASP.NET web applications and web services.	6

Course Code: **MIT-512**

**Ruby and Rails**

Clock Hours: **60**

**Total Marks: 100**

**Course Objectives:**

- 1) Develop programming skills and logical ability with the use of Ruby Programming language platform.
- 2) Study of Ruby and Rails: Installation and Basics of Ruby, Core, Advanced, Rail Basics.
- 3) Understanding web application development using Rails framework.

**Unit-I**

**[08]**

**Max Marks:12**

**Ruby Installation and Basics:** Ruby/Rails Installation, Introduction to Ruby, Ruby naming convention, Interactive Ruby (IRB) & “ri” (Ruby Interactive) command-line tools, Ruby object, Ruby types: String, Hash, Symbol, Ruby class, Inheritance, Ways of creating Ruby object, Ruby methods, Methods Basics, Methods Advanced: Arguments, Visibility, Method with a! (bang), Modules, Control structures, Exception handling, Ruby operators, Regular expression

**Unit-II**

**[10]**

**Max Marks:15**

**Ruby core:** Basics of block, How does a block look like? Block passing and execution, Proc, & (Amperсанд), lambda, Closure, What is and Why Meta-programming? Ruby language characteristics (that make it a great metaprogramming language), Object#respond\_to?, Object#send, Dynamic typing (and Duck typing), missing\_method, define\_method

**Unit-III**

**[04]**

**Max Marks:06**

**Ruby I/O:** File I/O, File inquiries, Directories, Navigation through Directories

**Unit-IV**

**[10]**

**Max Marks:15**

**Ruby Advanced:** Ruby OOPs concepts, Database Access, Web Application without framework, Sending email, Ruby - XML, XSLT and XPath

**Unit-V**

**[10]**

**Max Marks:15**

**Ruby Advanced:** Ruby TK (GUI for Ruby), Ruby – Multithreading Built in Functions, Variables, Constants, Ruby associated tools

**Unit-VI**

**[12]**

**Max Marks:18**

**Rails Basics:** What is and Why Ruby on Rails? Building HelloWorld Rails application step by step, App directory structure (MVC), Environment, Rake, Gems, Generators, Migration, Console, Bundle, scaffolding, ORM (ActiveRecord), Action controller basics, Action Views, Helpers, Authentication.

**References:**

1. Yukihiro Matsumoto (2008), The Ruby Programming Language, Shroff; First edition, 2008, ISBN-10: 8184044925, ISBN-13: 978-8184044928
2. Michael Fitzgerald, Learning Ruby, Published by O'Reilly Media, Inc., May 2007, ISBN-



- 10: 8184043341, ISBN-13: 978-8184043341
3. Rails AntiPatterns, Wesley Professional Ruby Series, 1st edition, 2010, ISBN-10: 0321604814, ISBN-13: 978-0321604811
  4. Adam Gamble, Cloves Carneiro, Jr. Rida Al Barazi (2007), Beginning Rails4, Apress, 3rd edition, 2013 ISBN-13 (pbk): 978-1-4302-6034-9| ISBN-13 (electronic): 978-1-4302-6035-6

### **Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT512C.1	Understand Ruby Programming language with lexical and syntactic structure of Ruby programs, Datatypes and Objects, Expressions and Operators, Statements and Control Structures, Methods, procs, lambdas, and closures, Classes and modules, Reflection and Metaprogramming.	2
MIT512C.2	Use the Ruby TK (GUI for Ruby).	3
MIT512C.3	Design web applications using Rails framework.	6

Course Code: **MIT-513**

**Software Engineering**

Clock Hours: **60**

**Total Marks: 100**

### **Course Objectives:**

- 1) Knowledge of basic Software Engineering methods and their application, layered technology, process framework of software process models.
- 2) Understanding of software requirements, project management, quality of product, data models, functional and behavioral models.
- 3) Understanding of modularity, coding standards, verification and validation and software testing approaches.

### **Unit-I**

**[10]**

**Max Marks:10**

**Introduction and Process Models:** Nature of Software, Software Engineering the process, Software Myths. Process Models: Generic process model, Prescriptive process models, Specialized process models, Unified process, Personal and Team process model, Process Technology, Product and Process. Agility, cost of change, Agile process, Extreme Programming, Agile Process models: Adaptive Software development, Scrum, Dynamic system development model, Crystal, Feature Driven development, Lean Software development, Agile modelling, Agile Unified process. Tool set for Agile process.

### **Unit-II**

**[10]**

**Max Marks:15**

**Requirement Analysis and Modelling:** Requirement Engineering, Establishing Groundwork, Eliciting Requirements Developing Use cases, Building Requirement model, Negotiating and Validating requirements. Requirement analysis, Scenario based modelling, UML models that supplements use case, Data modelling concepts, class based modelling. Requirement Modelling strategy, Flow oriented modelling, Creating Behavior model, Pattern for Requirement modelling.

### **Unit-III**

**[08]**

**Max Marks:15**

**Quality Assurance and Change Management:** Elements of SQA, SQA Tasks, Goal and Metrics, Formal approaches to SQA, Software Reliability, ISO 9000 Quality standards, SQA Plan. Software Configuration Management, SCM Repository, SCM process.

### **Unit-IV**

**[11]**

**Max Marks:20**

**Design Concept: Design process, Design Concept: Abstraction, Architecture, Pattern, Separation of concept, Modularity, Information hiding, Functional independence, Refinement, Aspects, Refactoring. Design Model: Data design element, Architectural design**

element, Interface design element, Component level design element, Deployment level design element.

#### **Unit-V**

[11]

**Max Marks:20**

**Architectural and Component Level Design:** Software Architectures, Architectural Genres, Architectural styles, Architectural design, Accessing alternatives Architectural design, Architectural mapping using dataflow. Introduction to component, Designing class based component, Conducting component level design, Designing traditional component, component based development.

#### **Unit-VI**

[10]

**Max Marks:20**

**Software Testing:** Strategic approach to software testing, Test strategies for conventional software, Validation Testing, System testing, Software testing fundamentals, Internal and external view of testing, White box testing, Basic path testing, Control structure testing, Black box testing, model based testing, Testing for specialized Environment, Architectures and applications.

#### **References:**

- a) R.S.Pressman, “Software Engineering: A Practitioner’s Approach”, McGraw-Hill International Edition, Seventh Edition, ISBN:978-007-126782-3.
- b) Pankaj Jalote, “Software Engineering: A Precise Approach”, Wiley India Pvt. Limited ISBN: 978-81-265-2311-5.
- c) K. K. Aggarwal and Yogesh Singh, “Software Engineering”, Third Edition, New Age International Publishers, ISBN:978-81-224-2360-0.

#### **Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT513C.1	Apply software engineering principles and techniques, to develop, maintain and evaluate large-scale software systems.	3
MIT513C.2	Produce efficient, reliable, robust and cost-effective software solutions.	4
MIT513C.3	Work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.	3

Course Code: **MIT-514**

**Mobile Application Development**

Clock Hours: **30**

**Total Marks: 50**

#### **Course Objectives:**

- 1) Understand basics of mobile application development and get introduced Android platform and its architecture.
- 2) To learn activity creation and Android UI designing.
- 3) To be familiarized with Intent, Broadcast receivers and Internet services, SQLite Database and content providers; to integrate multimedia, camera and Location based services in Android Application.

#### **Unit-I**

[05]

**Max Marks:05**

**Mobile Application Development:** Introduction to handheld devices Palm, Pocket Pc, Symbian OS smart phones, MS windows based smart phones, BlackBerry, iphone etc., features of handheld devices, Device Applications Vs Desktop application, overview of application development platforms OS-Palm OS, Symbian, BlackBerry, Windows CE, OS for iphone, Android, Programming Languages C/C++, JAVA, IDE tools. Comparison of Android with other

Mobile OS. Comparative study of all versions of Android.

[Note: The unit is to be thought with respect to current scenario of Mobile Development hence above contents may change]

**Unit-II** [05] **Max Marks:18**

**Hello, Android and Installations:** Background, What is android and what isn't, Open Mobile Development Platform, Native Android Applications, Android SDK Features, Introducing the Open Handset Alliance, What Does Android Run On? Why Develop for Android?, Introducing the Development Framework. What Comes in the Box, Developing for Android, Developing for Mobile Devices, Android Development Tools as per current version, Installations, Emulator.

**Unit-III** [08] **Max Marks:10**

**Creating Applications, activities and User Interfaces:** What Makes an Android Application?, Introducing the Application Manifest. Using the Manifest Editor. The Android Application Life Cycle. Understanding Application Priority and Process States. Externalizing Resources. A Closer Look at Android Activities. Fundamental Android UI Design. Introducing Views. Introducing Layouts and fragments, Using Adapters, Creating New Views.

**Unit-IV** [04] **Max Marks:06**

**Intents, Broadcast Receivers, and the Internet:** Introducing Intents, Creating Intent Filters and Broadcast Receivers, Using Internet Resources. Introducing Dialogs and Action Bars, Creating and Using Menus.

**Unit-V** [03] **Max Marks:08**

**Working in the Background:** Introducing Services, Using Background Worker Threads, Using Toast, Introducing Notifications, Using Alarms.

**Unit-VI** [05] **Max Marks:08**

**Data Storage, Retrieval, and Sharing:** FILES, SAVING STATE, AND PREFERENCES: Saving Application Data, Creating and Saving Shared Preferences, Retrieving Shared Preferences, Introducing the Preference Framework and the Preference Activity, Persisting the Application Instance State, Including Static Files as Resources, Working with the File System. DATABASES AND CONTENT PROVIDERS: Introducing Android Databases, SQLite Databases, Content Providers, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Creating Content Providers.

### References:

1. Reto Meier. Professional Android Application Development, Wrox Publications ISBN: 978-0-470-34471-2.
2. Rick Rogers, John Lombardo, Zigurd Mednieks, G. Blake Meike. Android Application Development: Programming with the Google SDK. O'Reilly ISBN 10: 0596521472 / ISBN 13: 9780596521479.

### Auxiliary Resources:

- a) <https://developer.android.com/index.html>

### Course Outcome:

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT514C.1	Compare android with other smartphone OS and desktop OS; Able to understand software stack of android OS.	4
MIT514C.2	Understand Activity lifecycle, UI management, use Intent, Broadcast receivers and Internet services.	2
MIT514C.3	Effectively use SQLite Database and content providers, multimedia, camera and Location based services in Android Application.	3

Course Code: **MIT-515**

**LAB on Web Application  
Development Technology**

Clock Hours: **60**

**Total Marks: 50**

***Course Objectives:***

- 1) Configure and create an ASP.Net application, .net controls based and data driven web application with session and controls used in multi-user web applications
1. Demonstrate followings in IIS:
  - a. Creation of Virtual Directory, Home directory, Home page, hosting of website
2. Demonstrate Page Life Cycle of ASP.NET. Use important page events for your demonstration.
3. Write VB.Net/C# console applications to demonstrate: OO concepts: polymorphism, encapsulation, inheritance, interface inheritance, abstract classes/methods, overloading, overriding, collection classes, properties
4. Demonstrate concept of postback and viewstate using web form server controls of ASP.NET
5. Demonstrate various Web form server controls using sample data entry screen form for registering for a service on website. Also use validation controls to validate input data.
6. Demonstrate DropDown List box, CheckButtonList, RadioButtonList controls.
7. Demonstrate Databinding using Hashtable, ArrayList, DataTable data sources.
8. Demonstrate Repeater control with the help of various templates.
9. Demonstrate paging, sorting, filtering of data in asp:DataGrid/DataGridView.
10. Demonstrate editing process in DataGrid and DataList controls. Make use of necessary templates for proper visual appearance.
11. Demonstrate State Management features of ASP.NET using sample shopping cart application.
12. Create sample website for demonstrating use of Profiles/Themes using skin files.
13. Demonstrate Master Pages and website navigation controls(sitemap path, treeview, menu) using SiteMap file.
14. Demonstrate Properties of website navigation controls.
15. Demonstrate Authorization/Authentication using Login controls and Roles/Membership/AccessRules
16. Demonstrate creation of simple/complex DataReader/DataSet Objects.
17. Demonstrate editing in DataTable objects.
18. Demonstrate Web Service hosting, access in ASP.NET

***Course Outcome:***

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MIT515C.1	Build program using Programming Language supported by .NET framework.	3
MIT515C .2	Design web applications using ASP.NET controls.	3
MIT515C.3	Demonstrate debug and deploy ASP.NET web applications, database driven web applications and web services.	3

**Course Objectives:**

- 1) Install Ruby on Rails and Set up a programming environment for ASP.net programs.
  - 2) Programming and web support using ruby.
1. Demonstrate a Ruby Basic program which manipulate Hash, Array, Strings. Any five methods of each container. Also use !(bang) operator.
  2. Write Ruby program which accepts user input and process it then print the result. Like radius.rb is a file which accept input as float and returns a calculated Area of circle  
tom@laptop:~/courses/ruby/asst\$ ruby radius.rb  
Enter the radius: 2 Area is: 12.5663708
  3. Write a ruby program which prompts for and reads one line of input. It then echos the line, then prints it repeatedly, each time removing every second character. It continues until no more characters can be removed. Treat all characters alike; no special treatment for spaces or punctuation. Like this:  
tom@laptop:~/courses/ruby/asst\$ ruby reduce.rb  
Please enter a line> Sandy.  
Sandy.  
Sny  
Sy  
S  
tom@laptop:~/courses/ruby/asst\$ ruby reduce.rb  
Please enter a line> On Tuesday, Frank in the motor pool buys lunch.  
On Tuesday, Frank in the motor pool buys lunch.  
O usa,Faki h oo olby uc.  
OuaFk oob c  
Oak o  
Oko  
Oo  
O  
tom@laptop:~/courses/ruby/asst\$ ruby reduce.rb  
Please enter a line> Those so aglow point at hues afferent  
Those so aglow point at hues afferent  
Toes go on the feet  
Te oo h et  
T ohe  
Toe  
Te  
T
  4. Demonstrate Inheritance in Ruby by building a superclass called Bird from which our Duck, Goose, and Owl classes will derive their functionality.  
([http://www.gotealeaf.com/books/oo\\_ruby/read/inheritance](http://www.gotealeaf.com/books/oo_ruby/read/inheritance))
  5. Demonstrate a Ruby programs which uses loops like, each, times, do loop, etc. With having use of operators & exceptions which cause to break loop like devide by zero, etc.
  6. Write a Ruby script which demonstrate use of blocks, lambda & proc.
  7. Write a Ruby program which show duck typing, uses respond\_to? Method.
  8. Write a Ruby program which access private methods/attributes outside of class.
  9. Write a Ruby program which define dynamic methods and method will return something also use missing\_method. It should return some result to console if some method is missing.
  10. Create a Basic Ruby on Rails web application which print "Hello World on web browser"
  11. Create a Ruby on Rails web application which shows having Post Section. In which user can Insert, Edit, Delete Post, using scaffolding.
  12. Create a Ruby on Rails web application with Post Model uses variuos type of server validation.





**Unit-VI** [10] **Max Marks:15**

**Classification and Prediction:** Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

**Unit-VII** [10] **Max Marks:15**

**Cluster Analysis:** Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis

**References:**

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. M. H. Dunham. Data Mining: Introductory and Advanced Topics. Pearson Education. 2001.
3. H. Witten and E. Frank. Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann. 2000.
4. D. Hand, H. Mannila and P. Smyth. Principles of Data Mining. Prentice-Hall. 2001
5. Tan Steinbach, Vipin Kumar, Introduction to Data mining, Pearson Education
6. Jarke Vassiliou, Fundamentals of Data Warehouses, IInd Edition, Springer
7. Anahory Murray, Data Warehousing in Real World, Pearson Education
8. Paulraj Ponniah , Data Warehousing.

**Course Outcome:**

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
MITE517C.1	Explain organization of data warehousing and data marts and differentiate between OLTP and OLAP.	2
MITE517C.2	Apply data pre-processing techniques.	3
MITE517C.3	Solve problems related with various aspects of data mining and write basic algorithms for extracting patterns from data.	3

Course Code: **MITE-518** **Natural Language Processing (NLP)** Clock Hours: **60**  
**Total Marks: 100**

**Course Objectives:**

- 1) The prime objective of this course is to introduce the students to the field of Language Computing and its applications ranging from classical era to modern context.
- 2) Course also aims to provide understanding of various NLP tasks and NLP abstractions such as Morphological analysis, POS tagging, concept of syntactic parsing, semantic analysis etc.

**Course provide knowledge of different approaches/algorithms for carrying out NLP tasks; it also discusses concepts of Language grammar and grammar representation in Computational Linguistics.**

**Unit-I** [08] **Max Marks:12**

Introduction to NLP, brief history, NLP applications: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers etc., challenges/Open Problems, NLP abstraction levels, Natural Language (NL) Characteristics and NL computing

approaches/techniques and steps, NL tasks: Segmentation, Chunking, tagging, NER, Parsing, Word Sense Disambiguation, NL Generation, Web 2.0 Applications : Sentiment Analysis; Text Entailment; Cross Lingual Information Retrieval (CLIR).

**Unit-II** [12] **Max Marks:16**

Text Processing Challenges, Overview of Language Scripts and their representation on Machines using Character Sets, Language, Corpus and Application Dependence issues, Segmentation: word level (Tokenization), Sentence level. Regular Expression and Automata

Morphology, Types, Survey of English and Indian Languages Morphology, Morphological parsing FSA and FST, Porter stemmer, Rule based, and Paradigm based Morphology, Human Morphological Processing, Machine Learning approaches.

**Unit-III** [12] **Max Marks:18**

Word Classes and Part-of-Speech tagging (POS), survey of POS tagsets, Rule based approaches (ENG TOWL), Stochastic approaches (Probabilistic, N-gram and HMM), TBL morphology, unknown word handling, evaluation metrics: Precision/Recall/F-measure, error analysis

**Unit-IV** [15] **Max Marks:22**

NL parsing basics, approaches: Top Down, Bottom Up, Overview of Grammar Formalisms: constituency and dependency school, Grammar notations CFG, LFG, PCFG, LTAG, Feature-Unification, overview of English CFG, Indian Language Parsing in Paninian Karaka Theory, CFG parsing using Earley's and CYK algorithms, Probabilistic parsing.

**Unit-V** [15] **Max Marks:22**

Concepts and issues in NL, Theories and approaches for Semantic Analysis, Meaning Representation, word similarity, Lexical Semantics, word senses and relationships, WordNet (English and IndoWordnet), Word Sense Disambiguation: Lesk Algorithm Walker's algorithm, Coreferences Resolution: Anaphora, Cataphora

#### References:

1. Indurkha, N., & Damerau, F. J. (Eds.). (2010). *Handbook of Natural Language Processing, 2nd Edition*. New York: CRC Press Taylor and Francis Group, Boca Raton London, New York. ISBN-10: 1420085921, ISBN-13: 978-1420085921
2. Martin, J. H., & Jurafsky, D. (2013), *Speech and Language Processing*, Pearson Education India; 2 edition, ISBN-10: 9332518416, ISBN-13: 978-9332518414
3. Manning, Christopher and Heinrich, Schutze (1999), *Foundations of Statistical Natural Language Processing*, MIT Press, ISBN-10: 0262133601, ISBN-13: 978-0262133609.
4. Akshar Bharati, Chaitanya, V., Kulkarni, A., & Sangal, R. (July 1997). *Machine translation in Stages* (Vol. 10 no. 3). Mumbai: NCST, Mumbai.
5. Bharati, A., Chaitanya, V., & Sangal, R. (1995). *Natural Language Processing: A Paninian Perspective*, New Delhi: Prentice Hall of India, ISBN 10: 8120309219, ISBN 13: 9788120309210.
6. Steven Bird, Edward Loper (2016), *Natural Language Processing With Python*, Ed. 2, O'Reilly Media, ISBN 1491913428, 9781491913420

Auxiliary Resources:

d. Web Links

1. <https://see.stanford.edu/Course/CS224N>
2. <https://web.stanford.edu/~jurafsky/NLPCourseraSlides.html>

e. Video Links

1. <http://www.nptelvideos.in/2012/11/natural-language-processing.html>  
<https://www.youtube.com/playlist?list=PL6397E4B26D00A269>

#### Course Outcome:

After completion of this course students shall be able to-

CO No.	CO	Cognitive level
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MITE-518C.1	Understand issues and challenges in Natural Language Processing and NLP applications and their relevance in the classical and modern context.	2
MITE-518C.2	Understand Computational techniques and approaches for solving NLP problems and develop modules for NLP tasks and tools.	2
MITE-518C.3	Understand various grammar formalisms, which they can apply in different fields of study.	2

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## Semester-IV

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Course Code: **MIT-521**

Getting Started with Competitive  
Programming  
(NPTEL, Swayam)

Clock Hours: **60**

Total Marks: **100**

The school (Admission Committee with School Swayam Coordinator) should initiate registration by informing students about the MS-521 course on the NPTEL (Swayam) portal in advance, preferably in the month of November-December. The course should be selected based on availability. If the course is not available in the January-June period, then a similar (Programming Skills) course should be selected (decided by the Academic Committee) from the available NPTEL courses.

If the Course on NPTEL is 3 Credit Course, then the marks obtained in the course will be converted to 4 Credit Course.

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Course Code: **MIT-522**

Object Oriented System  
Development Using UML, Java  
and Patterns

Clock Hours: **60**

Total Marks: **100**

(NPTEL, Swayam)

The school (Admission Committee with School Swayam Coordinator) should initiate registration by informing students about the MS-521 course on the NPTEL (Swayam) portal in advance, preferably in the month of November-December. The course should be selected based on availability. If the course is not available in the January-June period, then a similar (Software Engineering/Programming Skills) course should be selected (decided by the Academic Committee) from the available NPTEL courses.

If the Course on NPTEL is 3 Credit Course, then the marks obtained in the course will be converted to 4 Credit Course.

***Course Objectives:***

- 1) To provide comprehensive learning platform to students where they can enhance their employ ability skills and become job ready along with real corporate exposure.
- 2) To enhance students' knowledge in a particular technology and to Increase self-confidence of students and helps in finding their own proficiency.
- 3) To cultivate student's leadership ability and responsibility to perform or execute the given task.

Twelve credits shall be awarded to the Industrial Training/Project course, which will commence in the IVth Semester and the final work and report will be completed at the end of IVth Semester of M.Sc. The student is expected to work on a software development/Research project. The project work should have a coding part. Students will have to submit the bound project report in university prescribed format at the end of the semester. Student will be evaluated with continuous internal evaluation as well as he/she will have to appear for External Project Viva-voce and the marks and the credits will be allotted at the end of IVth semester of the M.Sc. Programme.

***Course Outcomes:***

After completion of this course students will:

- 1) Handle specialized technology and update themselves with latest changes in technological world with ability to communicate effectively.
- 2) Be multi-skilled IT professional with good technical knowledge, management, leadership and entrepreneurship skills.
- 3) Be able to identify, formulate and model problems and find engineering solution based on a systems approach.

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