



# VELS



INSTITUTE OF SCIENCE, TECHNOLOGY  
& ADVANCED STUDIES (VISTAS)

(DEEMED TO BE UNIVERSITY Estd. u/s 3 OF THE UGC ACT, 1956)

**NAAC ACCREDITED**

PALLAVARAM - CHENNAI - INDIA

## School of Computing Sciences

### Department of Information Technology

M.Sc.

### INFORMATION TECHNOLOGY

#### PROGRAM SPECIFIC OUTCOMES

To enable the student to emerge as:

- **PSO1:** An expert in Software Requirement Analysis, Design, Coding, Testing and Documentation.
- **PSO2:** System/Network Administrator with depth knowledge in Network design & analysis, Network security and Software defined networks
- **PSO3:** Specialist in Data mining, embedded systems, Mobile computing, distributed computing, Image processing, Pattern recognition, Virtualization techniques and Cloud Computing.
- **PSO4:** Competent and complete software professional to meet the requirement of corporate world and Industry standard to provide solutions to industry, society and business.
- **PSO5:** Analyst who can apply latest technologies who can analyze and synthesize computing systems through quantitative and qualitative techniques to solve problems in the areas of Information Technology.

- **PSO6:** A thorough and practical expert in the use of state of the art techniques for developing Software based systems.

## **School of Computing Sciences**

### **M.SC IT**

#### **Board of Studies Members**

<b>Sl.No</b>	<b>Name &amp; Address</b>	<b>Designation</b>
1.	<b>Dr.P.Swaminathan</b> , Dean, School of Computing Sciences, Vels University, Chennai.	<b>Chairman</b>
2.	<b>Dr.P.Mayilvahanan</b> , Professor, Department of Computer Applications, School of Computing Sciences, Vels University, Chennai.	<b>Internal Board Member</b>
3.	<b>Dr.S.Prasanna</b> , HOD, Department of Computer Applications, Vels University, Chennai.	<b>Internal Member</b>
4.	<b>Dr.S.Sujatha</b> , HOD, Department of Information Technology, School of Computing Sciences, Vels University, Chennai.	<b>Internal Member</b>
5.	<b>Dr.K.Kalaiselvi</b> , HOD, Department of Computer Science, School of Computing Sciences, Vels University, Chennai.	<b>Internal Member</b>
6.	<b>Dr.K.R.Ananthapadmanaban</b> Professor & HOD, Department of Computer Science, SRM Arts and Science College, Chennai.	<b>External Member</b>
7.	<b>Dr.P.Magesh Kumar</b> , Calibsoft Technologies Pvt Ltd., Chennai.	<b>Industry Member</b>
8.	<b>Dr.JothiVenkateswaran</b> , HOD, Department of Computer Science, Presidency College, Chennai.	<b>Special Invitees</b>
9.	<b>Mr.R.Balamurugan</b> , SCOPUS Ltd, Chennai.	<b>Alumni Member</b>



# VELS



INSTITUTE OF SCIENCE, TECHNOLOGY  
& ADVANCED STUDIES (VISTAS)

(DEEMED TO BE UNIVERSITY Estd. u/s 3 OF THE UGC ACT, 1956)

**NAAC ACCREDITED**

PALLAVARAM - CHENNAI - INDIA

**M.Sc.**

**INFORMATION TECHNOLOGY**

**Curriculum and Syllabus**

**(Based on Choice Based Credit System)**

**Effective from the Academic year**

**2015 - 2016**

**(Modified Version)**

**Department of Information Technology**

**School of Computing Sciences**

## M.Sc. (INFORMATION TECHNOLOGY)

### CURRICULUM

SEMESTER I

Total No. of Credits: 90

CATEGORY	CODE	COURSE	HOURS PER WEEK			CREDIT
			LECTURE	TUTORIAL	PRACTICAL	
CORE	15MIT001	OBJECT ORIENTED PROGRAMMING IN C++	5	0	0	4
CORE	15MIT002	DATA STRUCTURE	5	0	0	4
CORE	15MIT003	DATA STRUCTURE USING C++ LAB	0	0	3	2
CORE	15MIT004	WEB TECHNOLOGY	5	0	0	4
CORE	15MIT005	WEB TECHNOLOGY LAB	0	0	3	2
DSE	15_____	DSE	5	0	0	4
GE	15_____	GE	4	0	0	4
<b>Total</b>			<b>24</b>	<b>0</b>	<b>6</b>	<b>24</b>

## SEMESTER II

CATEGORY	CODE	COURSE	HOURS PER WEEK			CREDIT
			LECTURE	TUTORIAL	PRACTICAL	
CORE	15MIT006	DATABASE MANAGEMENT SYSTEMS	4	0	0	4
CORE	15MIT007	PROGRAMMING IN JAVA	5	0	0	4
CORE	15MIT008	PROGRAMMING IN JAVA LAB	0	0	3	2
CORE	15MIT009	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	2
DSE	15_____	DSE	4	0	0	3
DSE	15_____	DSE	4	0	0	3
DSE	15_____	DSE	4	0	0	4
GE	15_____	GE	3	0	0	2
<b>Total</b>			<b>24</b>	<b>0</b>	<b>6</b>	<b>24</b>

**SEMESTER III**

CATEGORY	CODE	COURSE	HOURS PER WEEK			CREDIT
			LECTURE	TUTORIAL	PRACTICAL	
CORE	15MIT010	ADVANCE JAVA PROGRAMMIN G	4	0	0	4
CORE	15MIT011	.NET FRAMEWORK S	4	0	0	4
CORE	15MIT012	ADVANCE JAVA PROGRAMMIN G LAB	0	0	3	2
CORE	15MIT013	.NET LAB	0	0	3	2
CORE	15MIT014	MINI PROJECT	0	0	8	4
DSE	15_____	DSE	4	0	0	4
GE	15_____	GE	4	0	0	4
<b>Total</b>			<b>16</b>	<b>0</b>	<b>14</b>	<b>24</b>

**SEMESTER IV**

CATEGORY	CODE	COURSE	HOURS PER WEEK			CREDIT
			LECTURE	TUTORIAL	PRACTICAL	
CORE	15MIT015	PROJECT VIVA & VOCE	0	0	30	18
<b>Total</b>			<b>0</b>	<b>0</b>	<b>30</b>	<b>18</b>

## **DISCIPLINE SPECIFIC ELECTIVES (DSE)**

15MIT101	VISUAL BASICS
15MIT102	INTRODUCTION TO CRYPTOGRAPHY
15MIT103	OPERATING SYSTEM
15MIT104	DESIGN AND ANALYSIS OF ALGORITHMS
15MIT105	OBJECT ORIENTED TECHNIQUES
15MIT106	NETWORK SECURITY
15MIT107	TCP/IP
15MIT108	PRINCIPLES OF SECURE CODING
15MIT109	OPEN SOURCE TECHNOLOGY
15MIT110	CLIENT / SERVER COMPUTING
15MIT111	COMPUTER AND INFORMATION SECURITY MANAGEMENT
	PRE-REQUISITE
15MIT112	CLOUD COMPUTING TECHNOLOGIES
15MIT113	DATA MINING & DATA WAREHOUSING
15MIT114	EMBEDDED SYSTEMS
15MIT115	MOBILE COMPUTING

## **GENERIC ELECTIVES**

- 15MIT151 SIMULATION AND MODELING
- 15MIT152 INFORMATION SECURITY AND CYBER LAWS
- 15MIT153 INFORMATION STORAGE & MANAGEMENT
- 15MIT154 ERP SYSTEMS
- 15MIT155 DISTRIBUTED SYSTEMS
- 15MIT156 PATTERN RECOGNITION



**15MIT001**

**PROGRAMMING IN C++**

**5**

**0**

**0**

**4**

### **COURSE OBJECTIVE**

- This course introduces the basic concepts of programming in C++.
- To improve problem solving skills using OOPS concept.
- To make a good programmer, to write code, make the code work, and fix the number of bugs.

### **COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- Understand the difference between object oriented programming and procedural oriented language and data types in C++.
- Program using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.
- Understand functions and parameter passing.
- Do numeric (algebraic) and string-based computation.
- Implement exception handling and templates.
- Develop applications using Console I/O and File I/O
- Understand object-oriented design and programming.
- Understand dynamic memory allocation and pointers.
- Design, implement, and test relatively large C++ programs.

### **UNIT I INTRODUCTION**

**15**

Introduction to OOP – features of OOP - Advantages of OOP – Structures – Unions – Classes – Private member function - Public member function- Friend Function - Inline Function – Static Variables – Static Function- Scope Resolution Operator – Passing objects to functions – function Retuning objects.

### **UNIT II ARRAYS & POINTERS**

**15**

Arrays – Pointers – this pointer - References – Dynamic memory Allocation – Polymorphism- functions Overloading – Ambiguity in function overloading- Default argument – Pointer to Functions – Pointers to Array- Array of Pointers- Constructors – Default constructor- Parameterized Constructor- Copy Constructor- Dynamic Constructor- Constructor Overloading – Destructors.

### **UNIT III OVERLOADING & POLYMORPHISM**

**15**

Operator Overloading – Member Operator Function – Friend Operator Function – Overloading some special operator like [], (), and comma operator – Inheritance – Types of Inheritance – Protected members – Runtime Polymorphism - Virtual base Class – Virtual functions – Pure Virtual functions.

### **UNIT IV EXCEPTION HANDLING**

**15**

Class templates and generic classes – Functions templates and generic functions – Overloading a function templates – Exception Handling – Derived class Exception – over handling generic function – Exception handling Function – terminate(), unexpected(), Uncaught – exception().

### **UNIT V STREAMS**

**15**

Streams – Formations I/O with ios class functions and manipulators – creating own manipulators – overloading << and >> - file I/O – Name Spaces – Conversion functions – Standard Template Library (STL)

**Total Hours: 75**

#### **Text Books:**

1. BalaGuruSamy.E, “Programming with C++”, TMH, India, 2006.
2. Herbert Schildt, “C++ - The complete reference”, Third Edition – Tata McGraw Hill –, 4<sup>th</sup> Edition, 2002.

#### **Reference Books:**

1. Yashwant Kanetkar- “Let us C++” – 2<sup>nd</sup> Edition- McGraw Hill – 2000.



Stacks –Application of stack – Infix to postfix conversion, Recursion, queues – operation on Queue, Queue application, circular queues.

**UNIT III LINKED LIST 15**

Singly linked list –Operation, Application –representation of a polynomial, polynomial addition, doubly linked list-Operation.

**UNIT IV TREES AND GRAPHS 15**

Trees and Graphs: Binary Trees –Operation, tree traversals – Graph Implementation –Definition, Types of graph, Traversal– Shortest Path Problems, Dijkstra’s algorithm.

**UNIT V ALGORITHM 15**

Algorithm-Definition-examples-Complexity-Divide and Conquer- Binary search -Maximum and Minimum-Merge sort.

**Total Hours: 75**

**Text Books:**

1. E. Horowitz, S. Sahni and Mehta – “Fundamentals of Data Structures in C++” - 2<sup>nd</sup> Edition, Universities Press – 2008.
2. Horowitz, S. Shani, and S. Rajasekaran, “computer algorithms”, galgotia pub. Ltd., 2000.

**Reference Books:**

1. E Balagurusamy: Programming in ANSI C, Tata McGraw-Hill, 1998.
2. Ellis Horowitz & Sartaj Sahni: Fundamentals of Data Structure, Galgotia Book Source, 2000.
3. Data structure using C – Aaron M Tanenbaum, Yedidye Langsam, Moshe J Augenstein, PHI Pub

**15MIT003                      DATA STRUCTURES USING C++ LAB                      0                      0                      3                      2**

**COURSE OBJECTIVE**

- To Know the Fundamentals of Data Structure
- To Understand how to implement Data Structure using C++.
- This course gives practical training in C++

**COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- To familiarize the students with language environment.
- Understanding of the concepts of Stack and Queue.
- Understanding of the concepts of Array operation and linked list
- Ability to write object-oriented programs of moderate complexity in C++.
- Understanding of the concepts of inheritance and polymorphism.
- Overload operators in C++.
- To incorporate exception handling in object-oriented programs.
- Understand the difference between function overloading and operator overloading
- Implement Object Oriented Programs using templates concepts.

1. Array operations.
2. Stack using array
3. Stack using pointers
4. Queue using array.
5. Queue using pointers.
6. Singly linked list operations.
7. Program to implement C++ concepts.

8. Program to implement function overloading.
9. Program to implement inheritance.
10. Program to implement operator overloading.

**Total Hours: 45**

<b>15MIT004</b>	<b>WEB TECHNOLOGY</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>
-----------------	-----------------------	----------	----------	----------	----------

### **COURSE OBJECTIVE**

- This subject deals TCP/IP, FTP, WWW and Web technologies like ASP, JVM, DCOM, XML and WAP.
- To incorporate Knowledge on various Web technologies.
- To inculcate knowledge web technological concepts and functioning internet.

### **COURSE OUTCOMES:**

- An expert in creation of web pages, design, Coding, Testing and Documentation.
- Efficient programmer using HTML and ASP.net language.
- Web page designer with deep knowledge of website design, and Internet of Things
- Well versed in the functions of various modules of different types of Web page creation.
- Web developer with deep knowledge in web page design and website design
- Developer of new tools and techniques for web page creation.
- Web site designer with deep knowledge in HTML, Javascript, vbscript, .Net language.
- Specialist in web page creation techniques and website creation.

### **UNIT I INTRODUCTION**

**15**

Internet Basic – Introduction to HTML – List Creating Table – Linking document – Frames - Graphics to HTML Doc – Style sheet – style sheet basic – Add style to document – Creating style sheet rules – Style sheet properties – Font – Text – List – Color and Background color – Box – Display properties.

### **UNIT II INTRODUCTION TO JAVASCRIPT**

**15**

Introduction to JavaScript – Advantage of JavaScript – JavaScript syntax – Data type – Variable – Array – Operator and Expression – Looping Constructor – Function – Dialog box.

**UNIT III OBJECT MODEL 15**

JavaScript document object model – Introduction – object in HTML – Event Handling – Window object – Document object – Browser Object – Form Object – Navigator object – Screen object – Build in object – User defined object – Cookies.

**UNIT IV INTRODUCTION TO ASP .NET 15**

ASP.NET Languages structure – Page event, Properties & Compiler Directives. HTML server controls – Anchor, Tables, Forms, Files. Basic web server Controls – Label, Textbox, Button, Image, Links, Check & Radio button, Hyperlink. Data list Web server controls – Check box list, Radio button list, Drop down list, List box, and Data grid, Repeater.

**UNIT V OBJECTS & CLASSES 15**

Request and Response Objects, Cookies, Working with Data – OLEDB connection class, Command class transaction class, data adaptor class, data set class. Advanced Issues – Email, Application Security – Authentication, IP Address, Secure by SSL & Client Certificates.

**Total Hours: 75**

**Text Book:**

1. Bayross, “Web Enable Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI”, BPB Publications, 2002.

**Reference books:**

1. Jaworski, “Mastering JavaScript”, BPB Publications, 2002
2. T. A Powell, “Complete Reference HTML” (Third Edition), TMH, 2002.
3. G. Buczek, “ASP.NET Developers Guide”, TMH, 2002.

**15MIT005 WEB TECHNOLOGY LAB 0 0 3 2**

**COURSE OBJECTIVE**

- This course introduces the basic concepts of web technology.
- To inculcate knowledge web technological concepts and functioning internet.
- To give practical experience on web technological concepts.

## **COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- Identify, formulate and analyze problems as well as identify the computing requirements appropriate to their solutions.
- Understand and analyze a web page and identify its elements and attributes.
- Develop web pages using mark-up languages like HTML, DHTML and style sheets for making it more presentable to the user.
- Develop dynamic web pages using client side programming and server side programming.
- Develop interactive web applications using ASP.NET Framework.
- Develop XML documents and XML Schema to formulate the web services.

## **VB Script & JAVA Script**

**20**

1. Write a program that outputs the square, square root and cube of integers between 1 and 100.
2. Create a calculator.
3. Write a script to sort numbers and string.
4. Create a program to generate a hit counter.
5. Create a program to verify whether email address provided by user is valid or invalid.
6. Create a program to scroll the text on status bar.
7. A form consists of two multiple choice lists and one single choice list
  - A .The first multiple choice list displays the major dishes available.
  - B. The second multiple choice list displays the stocks available.
  - C. The single Choice list displays the miscellaneous.  
(Milkshake, soft drinks, softy available etc,)
8. Write a script to display a digital clock.



9. Create web page using two image files which switches black and white one another as the mouse pointer moves over the image. Use the on Mouse over and On Mouse event, OnDbclick handler.
10. Build a WWW page with an image and 3 button ., Pick three favorite graphics , label the buttons and make each one swap in the graphic you have chosen
11. Create a frameset that has two frames , side by side  
Make the left-hand frame contain a form with 3 radio buttons:  
AltaVista Info seek When the user clicks on of option buttons, the frame on the right hand side should be loaded with the right search engine.
12. Write a program to implement Employee with all validation

## ASP.NET

25

1. Create a login form , to expire, if the user does not type the password within 100 seconds.
2. Create an employee database and manipulate the record using command object in ASP.
3. Develop an application to illustrate the usage of Request Response Object in ASP.
4. Write an ASP program using Request Object to give the exact list of header sent by the browser to the web server.
5. Create an Active Server page to display the records one by one from a student database .The student database contains roll no, name ,marks &total.
6. Design an ASP application that describe books on the online bookshop ( use ADRotator
  - a. Component, Content Rotator component, Content Link component)
7. Create document and add a link to it. When the user moves the mouse over the link it should load the linked document on its own (User is not required to click on the link).
8. Create a document , which opens a new window without a toolbar , address bar , or a
  - a. Status bar that unload itself after one minute.
9. Create a document that accept the user name in text field form and display the same the next time when the user visits the site information him that he has accessed the site for the second time, and so on.

**Total Hours: 45**

**15MIT006**

**DATABASE MANAGEMENT SYSTEM**

**4**

**0**

**0**

**4**

## COURSE OBJECTIVE

- This course introduces the concepts of database systems design
- This course provides hands on experience in database design and implementation
- Describes about the fundamental data and database concepts
- To compare and contrast the relational database model with other database models

## **COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- Apply knowledge of database design methodology which gives a good formal foundation in relational data model.
- Identify and formulate information storage and derive an information model expressed in the form of ER diagram and other optional analysis forms.
- Apply query processing techniques to automate the real time problems of databases.
- Familiar with relational DB theory and will able to write relational algebra expressions for query.
- Identify and solve the redundancy problem in database tables using normalization.
- Understand the concepts of transactions, their processing so they will familiar with broad range of database management issues including data integrity, security and recovery.
- Design, develop and implement a small database project using database tools.
- Develop Oracle Database Objects using Procedures, Functions, Packages
- Develop Advanced package concepts using Overloading, Forward declarations, One time procedures, Package functions restrictions, PL/SQL compilation checking, Persistent states, Package variables, Package cursors
- Produce readable output using SQL\*Plus,
- Create database triggers, manage subprograms and triggers, object dependencies and manipulate and create Oracle large objects

## **UNIT I INTRODUCTION**

**12**

Database concepts / basic concepts / E-R model/constraints / keys ER diagram / reduction or ER schema / UML/ design of an ER database schema / relational model / views / Tuple Relational Calculus/relational database.

**UNIT II SQL STRUCTURE 14**

SQL / Basic structure / set quotation / join relation / DDL / DML / DCL/ TCL commands/ Keys and constraints /embedded SQL/ Normal Forms 1NF,2NF,3NF,4NF & BCNF normal forms / decomposition. Integrity & security / triggers.

**UNIT III OBJECT RELATIONAL DATA MODEL 12**

Object relational data model / nested relations / complex types / reference / types / querying with complex / types / functions & procedures / file Storage and file structure / file organization, data dictionary storage

**UNIT IV INDEXING AND HASHING-BASIC 12**

Indexing and Hashing-Basic concepts-static hashing-Dynamic/Multiple Key Access/query processing / selection operation / sorting / join operation transaction / concepts / state / atomicity and amiability / Serialisability / transaction definition in SQL / concurrency control / deadlock handling

**UNIT V ARCHITECTURE 10**

Database system architecture / centralized & client server architecture / server system architecture - Distributed Database-Homogeneous and Heterogeneous Database

**Total Hours: 60**

**Text Book:**

1. A. Silberschatz, H.F. Korth, "Database System Concepts", 5<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2005.

**Reference Books:**

1. Ramon a.Mato-Toledo, Pauline K.Cushman – “Database Management Systems” - Schaums’Outline series, TMH, New Delhi Special Indian Edition 2007
2. R.Pannerselvam – “Database Management Systems” - PHI Learning Pvt Ltd, New Delhi - Second Edition,2011.
3. - Sharad Maheswari, Ruchin Jain – “Database Management Systems” - Firewall Media, New Delhi - Second Edition Reprint 2010

**15MIT007**

**PROGRAMMING IN JAVA**

**5 0 0 4**

**COURSE OBJECTIVE**

- This course is to develop programming skills in Java.
- It will focus on more sophisticated features such as design of classes, interfaces, packages and APIs.
- To design and implementation of both graphical applets and standalone applications.

**COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- Create Java programs that solve simple business problems.
- Identify classes, objects, members of a class and relationships among them needed for a specific problem
- Construct a Java class
- Perform a test plan to validate a Java program.
- Document a Java program.
- Write Java application programs using OOP principles and proper program structuring
- Write Java programs to implement error handling techniques using exception handling
- Demonstrate the concepts of polymorphism and inheritance
- Discuss method overriding V/s method overloading
- Understand the benefits of JAVA’s Exceptional handling mechanism compared to other Programming Language
- Write Java programs to implement error handling techniques using exception handling

- Understand the concepts of Applet for web designing
- Understand the Abstract Windowing Toolkit for Layout Managers using Applet

**UNIT I INTRODUCTION 16**

Introduction to Java – Features of Java – Object Oriented Concepts – Lexical issues – Data Types – Variables – Arrays – Operators – Control Statements. Classes – Objects – Constructors – Overloading methods – Access control – Static and fixed methods – inner class – string Class – Inheritance – Overriding methods – using super – Abstract class- Dynamic Method Dispatch- using Final.

**UNIT II PACKAGES 16**

Packages – Access Protection – Importing packages – Interfaces – extending an Interface- Exception Handling – Try catch, Nested Try, Multicatch Statements, Throw, Throws and finally – Exception Classes – user defined exception- Thread – states of a Thread- Thread methods-creation using Thread class- creation using Runnable Interface – Synchronization – Thread Priorities- Multithreading. - Inter thread communication- Deadlock .

**UNIT III STREAMS 14**

I/O Streams – File Streams – Applets – String Class– Methods in String class-String Buffer class– Methods in String Buffer class – Java Util Package – Java Lang Package- Wrapper classes- Collection classes

**UNIT IV NETWORK 14**

Network basics – sockets – IP Address- Proxy servers-ports- InetAddress- Factory methods-Socket classes- Datagrams-TCP/IP sockets-URL – URL Connection – Working with windows ,colors and Fonts-Event Handling- AWT Controls – Layout Manager-Menus.

**UNIT V SERVLETS 15**

Servlets – Environment and role – Architectural role for servlets – Servlet classes- GenericServlet- HttpServlet- doGet(),doHead(),dopost()-HTML support – Installing servlets – servlets API – servlet life cycle - HTML to servlet communication.

**Total Hours: 75**

**Text Book:**

1. P. Naughton and H. Schildt – “Java2 (The Complete Reference)” 5th Edition, 2002

**Reference Books:**

1. Cay S. Horstmann, Gray Cornell – “Core Java 2 Volume 1 Fundamentals” – Addison Wesley,2004.
2. D.R. Callaway, “inside Servlets”, Addison Wesley,2004.
3. Karl Moss, Java Servlets, TMH edition Web Using Java 2 PHI, 2000.

**15MIT008**

**JAVA LAB**

**0 0 3 2**

**COURSE OBJECTIVE**

- This course gives practical training in java programming
- It will focus on more sophisticated features such as design of classes, interfaces, packages and APIs.
- Provide the foundation of good programming skills by discussing keys issues to the design of object-oriented software.

**COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- Write, compile, and execute Java programs that may include basic data types and control flow constructs using J2SE or other Integrated Development Environments (IDEs) such as Eclipse, NetBeans, and JDeveloper.
- Write, compile and execute Java programs using object oriented class structures with parameters, constructors, and utility and calculations methods, including inheritance, test classes and exception handling.
- Write, compile and execute Java programs using arrays and recursion.
- Write, compile and execute Java programs manipulating Strings and text documents.
- Write, compile and execute Java programs that include GUIs and event driven programming.
- Write a final project that may be selected from among the following: applets for inclusion in web pages; applets to access enterprise data bases in robust, enterprise three level applications; secure communications over the internet; or an approved project chosen by the student.

**APPLICATIONS**

**30**

1. Finding area and perimeter of a circle. Use buffered reader class.
2. Sub string removal from a string. Use string buffer class.
3. Determining the order of numbers generate randomly using random class.
4. Implementing of point class for image manipulation.
5. Usage of calendar class and manipulation
6. String manipulation using char array.
7. Database creation for storing e-mail addresses and manipulation.
8. Usage of vectors classes.
9. Implementing threads based application & exception handling.
10. Application using synchronization such as thread based, class based and synchronized statements.

## APPLETS

15

1. Working with frames and various controls.
2. Working with dialogs and menus.
3. Working with panels and layout.
4. Incorporating graphics.
5. Working with colors and fonts.

**Total Hours: 45**

**15MIT009**

**DBMS LAB**

**0 0 3 2**

## COURSE OBJECTIVE

- This course gives training in design and implementation of data bases for the selected problems.
- To familiarize the participant with the nuances of database environments towards an information oriented data-processing oriented framework
- To give a good formal foundation on the relational model of data

## COURSE OUTCOMES:

On successful completion of this course, the student should able to:

- Understand and learn SQL and PL/SQL
- Ability to develop skills of writing applications by using SQL.
- Ability to understand query optimization techniques.

- Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
  - Design different views of tables for different users and to apply embedded and nested queries.
  - Design and implement a database for a given problem according to well-known design principles that balance data retrieval performance with data consistency.
  - Implement different SQL queries which will automate the real life problem related to data storage.
  - Modify the database and provide different constraints by implementing techniques like PL/SQL, cursors and triggers.
1. Table creation using constraints and perform insert, update, delete, select commands.
  2. Exercise using drop,truncate,commit,rollback
  3. Exercise to implement sub queries.
  4. Joins
  5. Aggregate functions
  6. String, math and date functions.
  7. Examples for triggers.
  8. Indexing.
  9. Simple PL/SQL programs.
  10. Cursor examples.
  11. Database backup and restore.

**Total Hours: 45**

<b>15MIT010</b>	<b>ADVANCE JAVA PROGRAMMING</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>
-----------------	---------------------------------	----------	----------	----------	----------

**COURSE OBJECTIVE**

- This course gives an insight into advanced features of Java
- To learn advanced Java programming concepts like interface, threads, Swings etc.
- To develop network programs in Java
- To understand Concepts needed for distributed and multi-tier applications
- To understand issues in enterprise applications development.

**COURSE OUTCOMES:**



On successful completion of this course, the student

- Able to understand the basics of networking standards.
- Able to make use of socket programming for client server communication.
- Able to compile, test and debug the dynamic page using servlet program.
- Able to design a Web page using HTML forms.
- Able to invoke a remote method using RMI application.
- Able to understand the Web based enterprise application using EJB components.
- Able to explain the concepts of JDBC and its types.
- Able to demonstrate the connectivity of JDBC driver with database.
- Able to understand the dynamic Web page using JSP.
- Able to make use of reusable software component using Java Beans tag.

## **UNIT I NETWORKING**

**15**

Networking basics - Sockets overview - client/server - Reserved Sockets - IP Address -DNS- TCP /IP Client Socket - TCP /IP Server Socket - Datagram - Datagram Packet- Datagram Server and Client.

## **UNIT II SERVLET**

**15**

Servlet Introduction - CGI - Servlet Structure - Servlet Life Cycle - HTTP Servlet Class -Generic Servlet Class - Writing your first servlet - Running and Debugging Servlet - HTML Forms.

## **UNIT III RMI and EJB**

**15**

RMI for Distributed computing - RMI Architecture - RMI Registry Service - Creating RMI Application - Running RMI Application - Explaining the EJB Component Model -Types Of EJB - Entity Bean - Session Bean .

## **UNIT IV JDBC**

**15**

Concept of JDBC - JDBC Driver Types - JDBC Process - JDBC/ODBC Driver with Database - Statement Object – Prepared Statement Object - Result Set - Transaction Process

## **UNIT V JSP**

**15**

Introduction to JSP - JSP life cycle - Attributes in JSP - JSP elements - Directives -Declarations - Expressions - Script let - Action Elements - using session Object and Cookies-Working with Java Mail - usage of use Bean Tag.

**Total Hours: 75**

**Text Book:**

1. H.Schildt – “JAVA2 Complete Reference”, 5th Edition ,2004,

**Reference Books:**

1. Dustin R Callaway – “InsideServlets”, 2<sup>nd</sup> Edition, 2000.
2. Ivan Bayross “Web Enabled Commercial Application Development Using JAVA 2.0, 4.” -2006
3. J.McGovern,R.Adatia, Y.Fain “J2EE 1.4 Bible” , 2000

**15MIT011                      ADVANCE JAVA PROGRAMMING LAB                      0                      0                      3                      2**

**COURSE OBJECTIVE**

- This course covers the implementation of advanced program designs with the tools available in the Java programming language.
- This course is designed to teach the student how to write, test, and debug advanced-level Object-Oriented programs using Java.
- To develop network programs in Java

**COURSE OUTCOMES:**

On successful completion of this course, the student

- Able to understand a web application with JSP to Servlet Communication.
- Able to design online application with JSP.
- Able to create JSP program by using Java Bean.
- Able to create online application using JSP.
- Able to create web services using concept of RMI.
- Able to create E-mail applications using HTML and JSP page.
- Able to perform Java Database Connectivity (JDBC) using Java application.
- Able to create application using Meta Data.

1. TCP/IP client server communication.

2. Create Login page with Validation using Servlet?
3. Create Servlet Page Student Registration Form?
4. Write the Servlet Program for doGet and doPost Method?
5. Creating Web Services with RMI
6. Design Web Application with JSP & Servlet?
7. Designing Online Application with JSP
8. Creating JSP program using Java Bean
9. Online Application
10. E-Mail Application
11. Performing Java Data Base Connectivity
12. Create Application with Meta Data JDBC Driver Type2.

**Total Hours: 45**

<b>15MIT012</b>	<b>.NET FRAMEWORK</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>
-----------------	-----------------------	----------	----------	----------	----------

**COURSE OBJECTIVE**

- This course gives an insight into .Net framework.
- To effectively use visual studio .NET.
- To understand the goals and objectives of the .NET Framework. .NET is a revolutionary concept on how software should be developed and deployed.
- To have a working knowledge of the C# programming language.

**COURSE OUTCOMES:**

- To provide the knowledge of Dot Net Frameworks along with C#

- Skill up with .NET Technologies skills so that they are able to develop programming skill
- To use the features of Dot Net Framework along with the features of C#
- To create static and dynamic websites
- The Visual Studio .NET IDE is used for rapid application development and enables quick development.
- Huge demand in the industry that requires people to know .NET development skills.
- The .Net Framework, enables innovation in enterprise application development and deployment. .
- The Net Technologies are in fact gaining popularity, leading to a rise in .Net courses that are designed to help developers acquire skills in this environment.
- Employability Enhancement Program

## **UNIT I INTRODUCTION**

**15**

Introduction to .NET Technologies: Overview of .Net Framework-Feature Of .Net Framework - .Net framework class library - .NET Framework Components -Overview with Focus on CLR, CTS.-MSIL-JIT-Assembly-DLL-Meta Data –Application Architecture.

## **UNIT II C#**

**15**

C# Building Blocks: Introduction to C# –Overview-Types –Expressions- Declarations – Statements - Classes and Struts- OOPS –Constructors and Destructors

## **UNIT III C# WINDOWS CONTROLS**

**15**

Button -TextBox -RichTextBox -Label, LinkLabel -CheckBox -RadioButton -ListBox -ComboBox -TreeView -CheckedListBox -Panel -GroupBox -PictureBox -ToolTip -ErrorProvider -MainMenu -ContextMenus -Common Dialogs -Date TimePicker -MonthCalendar -Splitter -HelpProvider -StatusBar -NotifyIcon -Print Related

## **UNIT IV ASP.NET**

**15**

Data list Web server controls: Check box list – radio button list – drop down list – list box – data grid – repeater control – Other Web server controls: Calendar control and Ad Rotator control. Required Field Validator control- Compare Validator – Range Validator – Custom Validator – Validation Summary Control

**UNIT V OBJECTS AND ADVANCED CONCEPTS IN ASP.NET**

**15**

Request Object - Response Object – State Management for Session ,Application, Cookies, Query String – Introduction to ADO.NET – ADO Vs ADO.NET – Connected ADO.NET Architecture – Disconnected ADO.NET Architecture – Data Reader - Data Adapter – ADO.NET Classes

**Total Hours: 75**

**Text Book:**

1. Joe Duffy, “Professional .NET Framework 2.0” - Wrox Publications, 2006 Edition

**Reference Books:**

1. Steven Holzner, “Visual Basic.NET Programming” – Edition,-Paraglyph Press and DreamTech Press Black Book 2005
2. Alex ,”Professional ASP.NET 1.1” - Homler and Group Wrox Publications, 2003
3. Michael Otey and DenielleOtey “ ADO.NET Complete Reference” Tata Macraw Hill Publication

**15MIT013**

**.NET Lab**

**0 0 3 2**

**COURSE OBJECTIVE**

- This course gives practical training in DOT NET programming
- To understand how to use forms to develop GUI programs under .NET.
- To gain Knowledge of some of the tools available in the .NET Framework class library. (FCL)
- To improve object-oriented programming skill through practice and insights gained by studying a new programming language.

**COURSE OUTCOMES:**

- Skill up with .NET Technologies
- To develop programming skill

- The Visual Studio .NET IDE is used for rapid application development and enables quick development.
- The inheritance concept program help the student to learn oops concept and code reusability
- The login page program is very important all projects.
- The all validation program to validate the webpage to avoid webpage roundtrip so save the time.
- The ADO.net database connection is used to store all data in permanent and manage the database.
- The state management program is identify the web user details and to pass the value from one page to another page.
- The cookies concept program user identification in client side
- The Data Grid control program is to show the records in frond end.
- To provide Employability Enhancement.

1. VB.NET Desktop application and demonstrate the following
  - (a) Link Label control that opens a web browser in your Visual basic applications
  - (b) Dialog box controls, toolbars and menus.
2. VB.NET desktop application to demonstrate error handling and debugging options.
3. VB.NET desktop application to demonstrate .NET framework classes with mathematical methods.
4. VB.NET Desktop application and demonstrate the following:
  - (a) Input Box                      (b)List Box      (c)Masked Textbox
5. VB.NET desktop application to demonstrate how to use a Timer control to create a logon program with a password time-out feature.
6. VB.NET desktop application to demonstrate how to create and manipulate large integer arrays. And Demonstrates the Array. Sort and Array. Reverse methods and how to use a Progress Bar control to give the user visual feedback during long sorts.
7. VB.NET desktop application to demonstrate a simple note-taking utility that demonstrate the how to manage Open. Copy, save As, Insert Date, Sort Text, and Exit commands in a program.
8. VB.NET desktop application to demonstrate how controls are added to a windows form at run time by using program code (not the designer).
9. VB.NET desktop application to demonstrate the graphics methods in the system. Drawing namespace, including DrawEclipse, Fill Rectangle, and Draw Curve.

10. VB.NET desktop application to demonstrate how to create new classes, properties, and method.
11. VB.NET desktop application to demonstrate how ADO.NET is used to establish a connection to a MS Access database and show how the DataGridView control is used to display multiple tables of data on a form. Also demonstrate how navigation bars, datasets, and table adapters are interconnected and bound to objects on a form.
12. Create a web application and demonstrate rendering control tags and server-side controls and user controls.
13. Create a web application and demonstrate control validation, the Tree View, and the MultiView/View Controls.
14. Create web applications and demonstrate data binding to several different controls, including the Grid View. Also illustrate loading and saving data sets as XML and XML schema.
15. Create a web application and demonstrate session state within a web application.

**Total Hours: 45**

### **Discipline Specific Electives (DSE)**

<b>15MIT101</b>	<b>VISUAL BASICS</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
-----------------	----------------------	----------	----------	----------	----------

#### **COURSE OBJECTIVE**

- This course introduces the basic concepts of Visual Programming.
- Identify and describe the purpose of various components of the VB integrated development environment (IDE).
- Build and run small application using Visual Basic.
- Understand the basic problem-solving techniques.

#### **COURSE OUTCOMES:**

- Design, create, build, and debug Visual Basic applications.
- Explore Visual Basic's Integrated Development Environment (IDE).
- Implement syntax rules in Visual Basic programs.
- Students will get the knowledge of to apply loop structures to perform repetitive tasks.

- Students will get the knowledge of to Write and apply procedures, sub-procedures, and functions to create manageable code.
- Create one and two dimensional arrays for sorting, calculating, and displaying of data.
- Students will get the knowledge of Windows applications using forms, controls, and events.

## **UNIT I INTRODUCTION**

**13**

Customizing a Form – Writing Simple Programs – Tool box – Creating Controls – Name Property – Command Button – Access Keys – Image Controls – Text Boxes – Labels – Message Boxes – Grid Editing Tools – Variables – Data Types – String – Numbers

## **UNIT II DISPLAYING INFORMATION**

**10**

Displaying Information – Determinate Loops – Indeterminate Loops – Conditionals – Built in Functions – and Procedures

## **UNIT III ARRAYS**

**13**

Lists – Arrays – Sorting and Searching – Records – Control Arrays – Combo Boxes – Grid Control – Projects with Multiple forms – Do Events and Sub Main – Error Trapping.

## **UNIT IV OBJECTS**

**11**

VB Objects – Dialog Boxes – Common Controls – Menus - MDI Forms – Testing, Debugging and Optimization – Working with Graphics.

## **UNIT V COM/OLE**

**13**

Monitoring Mouse activity – File Handling – File System Controls – File System Objects – COM/OLE – automation – DLL Servers – OLE Drag and Drop.

**Total Hours: 60**



**Text Book:**

1. Gary Cornell – Visual Basic 6:from The Ground Up – Tata McGraw Hill – 2008

**Reference Book**

1. Noel Jerke / visual basic complete ref / TMH,2<sup>nd</sup> Edition, 2002
2. Evangelos Petroustos, “Mastering Visual Basic 6.0” BPB Publication, 2000.
3. Peter “Mastering VB 6.0 Black Book” – NortonTechmedia, 2001.

**15MIT102****INTRODUCTION TO CRYPTOGRAPHY****4****0****0****4****COURSE OBJECTIVE**

The course provides a comprehensive view of symmetric and asymmetric cryptographic Schemes and key management issues.

**COURSE OUTCOMES:**

- Understand the cryptography was the protection of privacy of communications.
- Students start learning how to think from an adversarial viewpoint.
- The goal is to become familiar with basic techniques to protect data in computer and communication environments against several different varieties of fraud.
- To each need corresponds security mechanisms to achieve it.
- students will be confronted with a range of security objectives, different levels of security that can be achieved and some available cryptographic techniques that can be used
- Understand the concept of Data Encryption

- Understand the concept of block cipher modes of operation.
- Understand the concept of Authentication functions

**UNIT I INTRODUCTION 13**

Services, Mechanisms and attacks-the OSI security architecture-Network security model classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition Techniques, steganography)

**UNIT II FINITE FIELDS AND NUMBER THEORY 13**

Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm-Finite fields-Polynomial Arithmetic –Prime numbers-Fermat's and Euler's theorem-Testing for primality -The Chinese Remainder theorem- Discrete logarithms.

**UNIT III BLOCK CIPHERS 10**

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm.

**UNIT IV PUBLIC KEY CRYPTOGRAPHY 11**

Principles of public key cryptosystems-The RSA algorithm-Key management -Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

**UNIT V HASH FUNCTIONS AND DIGITAL SIGNATURES 13**

Authentication functions-Message authentication codes-Hash functions-Hash Algorithms (MD5, Secure Hash Algorithm)-Digital signatures (Authentication protocols, Digital signature Standard).

**Total Hours: 60**

**Text Book:**

1. William Stallings, "Cryptography and Network Security", Pearson Education, 6th Edition, 2013.

## Reference Books:

1. AtulKahate, “Cryptography and Network Security”, McGraw Hill Education India (Pvt Ltd),2nd edition, 2009.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, “ Network Security: Private Communication in a Public World”, Prentice Hall, 2 nd edition, 2002.
3. Charles Pfleeger, Shari Lawrence Pfleeger “Security in computing”, Prentice Hall,4th Edition, 2006.

15MIT103

OPERATING SYSTEM

4 0 0 4

## COURSE OBJECTIVE

- This part aims to provide an overview of operating system principles and its history.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.

## COURSE OUTCOMES:

On successful completion of this course, the student should able to:

- Gain in depth knowledge about the structures of the operating system, different types of operating system and functions performed by modern operating system.

- Identify and apply knowledge of various software and hardware synchronization tools for solving critical section problem in concurrent processes.
- Understand about mutual exclusion and deadlock concepts.
- Understand and analyze various disk scheduling algorithms
- Understand and apply process management and memory management concepts to solve various hardware and software problems.
- Identify various system protection and security mechanisms in order to design efficient software system by using various access control techniques.
- Understand the concepts of deadlock in operating systems and employ the deadlock avoidance techniques in multiprogramming system.

## **UNIT I INTRODUCTION**

**14**

Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

## **UNIT II CONCURRENT PROCESSES**

**14**

Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

## **UNIT III CPU SCHEDULING**

**11**

Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

## **UNIT IV MEMORY MANAGEMENT**

**11**

Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

## **UNIT V I/O MANAGEMENT AND DISK SCHEDULING**

**10**

I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

**Total Hours: 60**

### **Text Book:**

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley Publ, 2002.

### **Reference Books:**

1. Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education
2. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
3. D M Dhamdhare, “Operating Systems : A Concept based Approach”, 2<sup>nd</sup> Edition, 13 TMH
4. William Stallings, “Operating Systems: Internals and Design Principles ”, 6<sup>th</sup> Edition, Pearson Education

**15MIT104**

**DESIGN AND ANALYSIS OF ALGORITHMS**

**4**

**0**

**0**

**4**

### **COURSE OBJECTIVE**

- To provide a solid foundation in algorithm design and analysis.
- To help the student learn the outcomes, include Basic knowledge of graph and matching algorithms.
- To analyze asymptotic runtime complexity of algorithms including formulating recurrence relations.
- To understand basic knowledge of computational complexity, approximation and randomized algorithms.

### **COURSE OUTCOMES:**

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
- Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.
- Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.
- Explain what competitive analysis is and to which situations it applies. Perform competitive analysis.

## **UNIT I INTRODUCTION**

**12**

Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

## **UNIT II ADVANCED DATA STRUCTURES**

**12**

Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps. Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.

## **UNIT III GREEDY METHODS**

**12**

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim’s and Kruskal’s algorithms, Single source shortest paths - Dijkstra’s and Bellman Ford algorithms.

**UNIT IV DYNAMIC PROGRAMMING 12**

Dynamic programming with examples such as Kanpsack, All pair shortest paths – Warshal’s and Floyd’s algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

**UNIT V SELECTED TOPICS 12**

Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

**Total Hours: 60**

**Text Book:**

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India, 2002.

**Reference Books:**

1. RCT Lee, SS Tseng, RC Chang and YT Tsai, “Introduction to the Design and Analysis of Algorithms”, Mc Graw Hill, 2005.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms", 2006.
3. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008.

**15MIT105 OBJECT ORIENTED TECHNIQUES 4 0 0 4**

**COURSE OBJECTIVE**

- To learn and understand various O-O concepts along with their applicability contexts.
- To develop programming solutions for small problems on various O-O concepts
- To understand and appreciate the capabilities and limitations of such programming paradigm

**COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- Understanding of model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism.
- Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections
- Be able to write computer programs to solve real world problems in Java
- To understand the Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams
- Master key principles in OO analysis, design, and development ,
- Be familiar with the application of the Unified Modeling Language (UML) towards analysis and design
- Concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes
- To understand the Java APIs, Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection
- To understand the concepts of Enterprise Java beans
- Understanding the concepts of AWT, AWT v/s Swing, Creating a Swing Applet
- To provide the knowledge of writing of Java as internet programming
- To provide the knowledge of JDBC/ODBC Bridge.

## **UNIT I INTRODUCTION**

**10**

The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

## **UNIT II BASIC STRUCTURAL MODELING**

**14**

Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages. Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.



### **UNIT III OBJECT ORIENTED ANALYSIS**

**14**

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

### **UNIT IV INTRODUCTION TO JAVA**

**14**

Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs, Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).

### **UNIT V JAVA SWING**

**8**

Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application. Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.

**Total Hours: 60**

#### **Text Book:**

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", PHI, 2000.

#### **Reference Books:**

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2002



**UNIT II VIRTUAL PRIVATE NETWORKS 12**

VPN and its types – Tunneling Protocols – Tunnel and Transport Mode – Authentication Header Encapsulation Security Payload (ESP)- IPSEC Protocol Suite – IKE PHASE 1, II – Generic Routing Encapsulation (GRE).

**UNIT III MPLS and MPLS VPN 12**

WAN Topologies- Standard IP based Switching – CEF based Multi-Layer switching-MPLS Characteristics- Frame Mode MPLS Operation – MPLS VPN.

**UNIT IV E-MAIL SECURITY 12**

Security Services for E-mail-attacks possible through E-mail – establishing keys-privacy authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME.

**UNIT V WEB SECURITY 12**

SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL Attacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET),.

**Total Hours: 60**

**Text Book:**

1. Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security”, Prentice Hall, 2nd edition, 2002,.

**Reference Book:**

1. Charles Pfleeger, “Security in Computing”, Prentice Hall, 4th Edition, 2006,
2. Ulysess Black, “Internet Security Protocols: Protecting IP Traffic”, Prentice Hall PTR; 1st edition, 2000,
3. Amir Ranjbar, CCNP ONT Official Exam Certification Guide, Cisco Press, 2007
4. William Stallings, “Cryptography and Network Security”, Pearson Education, 6th Edition, 2013,

**15MIT107 TCP/IP 4 0 0 4**

**COURSE OBJECTIVE**

TCP/IP is arguably the single most important computer networking technology. The Internet and most home networks support TCP/IP as communication protocol. This course provides a foundation to understand various principles, protocols and design aspects of Computer Network and also helps to achieve the fundamental purpose of computer networks in the form of providing access to shared resources.

### **COURSE OUTCOMES:**

- To understand the knowledge of network
- Identify the OSI and TCP/IP layers and their tasks. Distinguish between the OSI reference
- To understand the advanced networking concepts
- To gain expertise in some specific areas of networking such as the design and maintenance of individual networks.
- To gain the concepts of TCP & UDP datagram
- To understand the Concurrent Processing in Client-Server Software-Byte ordering and address conversion functions
- To understand the Window Syndrome - Clark's and Nagle Algorithm - Congestion Control Mechanisms
- To understand the concepts of IPv6 – IPv6
- Advanced Features –V4 and V6 header comparison – V6 Address types –Stateless

### **UNIT I INTRODUCTION TO COMPUTER NETWORKS 10**

Introduction to Layered Architecture(TCP/IP, OSI), Networking Devices, IP addressing, Sub netting, VLSM, CIDR.

### **UNIT II NETWORK LAYER PROTOCOLS 10**

Router IOS- Static and Default Routing-Interior Gateway Routing Protocols: RIP V1&V2, OSPF, EIGRP- Exterior Gateway Routing Protocol: BGP.

### **UNIT III TRANSPORT LAYER PROTOCOLS 14**

TCP & UDP datagram and its characteristics, RTP, Flow Control and Error Control Mechanisms, Silly Window Syndrome - Clark's and Nagle Algorithm - Congestion Control Mechanisms - Token Bucket and Leaky Bucket.

**UNIT IV SOCKET PROGRAMMING**

**14**

Introduction to socket programming- Concurrent Processing in Client-Server Software-Byte ordering and address conversion functions – Socket Interface - System calls used with sockets - Iterative server and concurrent server- Multi protocol and Multi service server- TCP/UDP Client server programs – Thread Creation and Termination – TCP Echo Server using threads- Remote Procedure Call.

**UNIT V NEXT GENERATION INTERNET PROTOCOL**

**12**

Introduction to IPv6 – IPv6 Advanced Features –V4 and V6 header comparison – V6 Address types – Stateless auto configuration – IPv6 routing protocols – IPv4-V6 Tunneling and Translation Techniques.

**Total Hours: 60**

**Text Book:**

1. Douglas E. Comer ,”Internetworking with TCP/IP, Principles, Protocols, and Architecture”, Addison-Wesley, 5th edition, Vol 1, 2005

**Reference Books:**

1. Douglas E. Comer, David L. Stevens ,”Internetworking with TCP/IP Vol. III, Client-Server Programming and Applications”, Addison-Wesley, 2 nd edition, 2000.
2. Wendell Odom,” CCNP Route 642-902, CCIE”, Official Certification Guide, Pearson
3. Behrouz A. Forouzan, “Data Communications and Networking”, McGraw-Hill, 5th edition, 2012.

**15MIT108**

**PRINCIPLES OF SECURE CODING**

**4 0 0 4**

**COURSE OBJECTIVE**

Commonly exploited software vulnerabilities are usually caused by avoidable software defects. Overcoming these defects during the process of development of software leads to secure coding practices. So, the purpose of this course is to identify, explain and demonstrate the problems in insecure coding practices and methods to rectify the same.

## **COURSE OUTCOMES:**

- To know how to respond and to security alerts specifying CVE ID numbers which identify software issues
- Apply new security-enhanced programming models and tools which help ensure security goals.
- To understand security relevant programming bugs – the common security vulnerabilities.
- The root causes of the problems are explained through a number of easy-to-understand source code examples, which depicts clearly how to find and correct these problems in practice.
- The real strength of the course lays in numerous hands-on exercises, which help the participants understand how easy it is to exploit these vulnerabilities by the attackers.
- To understand the Dynamic memory management
- To understand the Integer security and Mitigation strategies principles
- To understand the concepts of DBMS and RDBMS
- To understand SQL and XSS queries
- To understand the concepts of Software engineering
- To understand the concepts of Software security practices and knowledge for architecture

## **UNIT I INTRODUCTION**

**10**

Need for secure systems- Proactive security development process- Security principles to live by and threat modeling

## **UNIT II SECURE CODING IN C**

**14**

Character strings- String manipulation errors – String Vulnerabilities and exploits – Mitigation strategies for strings- Pointers – Mitigation strategies in pointer based vulnerabilities – Buffer Overflow based vulnerabilities

## **UNIT III SECURE CODING IN C++ AND JAVA**

**12**

Dynamic memory management- Common errors in dynamic memory management- Memory managers- Double –free vulnerabilities –Integer security- Mitigation strategies

## **UNIT IV DATABASE AND WEB SPECIFIC INPUT ISSUES**

**10**

Quoting the Input – Use of stored procedures- Building SQL statements securely- XSS related attacks and remedies

**UNIT V SOFTWARE SECURITY ENGINEERING**

**14**

Requirements engineering for secure software: Misuse and abuse cases- SQUARE process model- Software security practices and knowledge for architecture and design

**Total Hours: 60**

**Text Book:**

1. Michael Howard , David LeBlanc, “Writing Secure Code”, Microsoft Press, 2nd Edition, 2003

**Reference Books:**

1. Robert C. Seacord, “ Secure Coding in C and C++”, Pearson Education, 2nd edition, 2013
2. Julia H. Allen, Sean J. Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, “ Software Security Engineering : A guide for Project Managers”, Addison-Wesley Professional, 2008
3. Mark Dowd, John McDonald, and Justing Schuh: Teh Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities, Addison Wesley, 2007

**15MIT109                      Open Source Technology                      4                      0                      0                      4**

**COURSE OBJECTIVE**

- The objective is to introduce students to the idea of positive technological externalities and its role for innovation and growth.
- The course defines the scientific and technological boundaries of open source communities to define the economic value of technological open access goods.
- The objective is to
- map the value creation of open source communities through knowledge networks
- Identify how those networks create increasing return, affecting positively the innovation rate.

**COURSE OUTCOMES:**

- To understand common open source licenses and the impact of choosing a license

- Understand open source project structure and how to successfully setup a project
- To understand software license and copy rights
- To understand the problems with traditional commercial software, Internationalization
- Ability to install and run open-source operating systems. Ability to gather information about Free and Open Source Software projects from software releases and from sites on the internet.
- Ability to contribute software to and interact with Free and Open Source Software development projects
- To understand Tier and Three Tier Web based Application Architecture.
- To understand the LAMP Terminologies, Advantages. Apache, Web server conceptual working, Web browser, HTTP, Installation and Configuration,
- Understand to develop Editing XHTML, W3C XHTML validation services,
- To understand the concepts of DOM and its methods, SOAP.

## **UNIT I INTRODUCTION**

**10**

Open Source Definition, Free Software vs. Open Source Software, Public Domain Software, Open Source History, Initiatives, Principle and Methodologies. Open Standards.

## **UNIT II OPEN SOURCE DEVELOPMENT MODEL LICENSES AND PATENTS**

**12**

What Is a License, Important FOSS Licenses (Apache, BSD, GPL, LGPL), copyrights and copy lefts, Patents Economics of FOSS: Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization.

## **UNIT III OPEN SOURCE OPERATING SYSTEMS**

**13**

Different open source operating systems. Google Chrome OS, BSD, Linux Distributions – Fedora and Ubuntu, Installation, Disk Partitioning, Boot loader. Using Linux – Shell, File system familiarity, Linux Administration – Managing users, services and software, Network Connectivity, Configurations and Security.



## UNIT IV OPEN SOURCE WEB TECHNOLOGIES

15

Two Tier and Three Tier Web based Application Architecture. LAMP Terminologies, Advantages . Apache, Web server conceptual working, Web browser, HTTP, Installation and Configuration, httpd.conf file, Logging, Security, Running a website, MySQL, Database management system, ER diagram, Relational database, Installation, Configuration, Administration, Common SQL queries.PHP, Dynamic content, Server side scripting, Installation, Configuration, Administration, Language syntax, Built-in functions, PHP and MySQL connectivity.

## UNIT V PROGRAMMING ON XHTML AND XML

12

Editing XHTML, W3C XHTML validation services, designing XHTML by using XHTML tables, frames, forms and other elements. CSS and its types. XML, XML namespaces, DTD, XML schema, XML vocabularies, DOM and its methods, SOAP.

**Total Hours: 60**

### Text Book:

1. Programming PHP Rasmus Lerdorf and Levin Tatroe O'Reilly Publications, 2002

### Reference Books:

1. Ware B., B Lee J., Open Source Development with Lamp: Using Linux, Apache, MySQL, Perl, and PHP; Addison-Wesley Professional.
2. Rosebrock E.,FilsonE.,Setting Up LAMP: Getting Linux, Apache, MySQL, and PHP Working Together, SYBEX Inc.
3. Deitel, "Internet and World wide web, How to program" 4<sup>th</sup> Edition, Prentice Ha 2005

15MIT110

CLIENT / SERVER COMPUTING

4 0 0 3

### COURSE OBJECTIVE

Students advance their knowledge of client server computing by writing a research paper or survey paper, or by developing a prototype C/S application. The research paper provides the student with an

opportunity to write an article on client server computing or related topic for submission to a peer reviewed journal or conference. The survey paper provides an excellent starting point for dissertation work. The developmental project reinforces the concepts covered in the course through the application of client server computing techniques to appropriate problem domains.

### **COURSE OUTCOMES:**

- To introduce the client server architecture and fundamentals of distributed systems.
- To understand a client/server network.
- To know how the hardware and software are combined to implement client/server computing.
- To implement the current client/server standards.
- To demonstrate the concepts of a typical client operating system.
- To implement typical client software.
- To demonstrate the difference between client and server hardware technology.
- To demonstrate the uses of client/server productivity software.
- To demonstrate the relationship between client/server productivity software and client/server resource management.

## **UNIT I INTRODUCTION TO CLIENT/SERVER COMPUTING 10**

What is Client/Server Computing – Benefits of Client/Server Computing – Evolution of C/S Computing – Hardware Trends – Software Trends-Evolution of Operating Systems – N/w Trends – Business Considerations.

## **UNIT II OVERVIEW OF C/S APPLICATIONS 14**

Components of C/S Applications – Classes of C/S Applications – Categories of C/S Applications. Understanding C/S Computing : Dispelling the Myths – Obstacles – Upfront & Hidden – Open Systems & Standards – Standards – Setting Organizations – Factors of Success.

## **UNIT III CLIENT HARDWARE & SOFTWARE 14**

Client Component – Client Operating Systems – What is GUI – Database Access – Client Software Products : GUI Environments – Converting 3270/5250 Screens – Database Tools – Client Requirements : GUI Design Standards – Open GUI Standards – Interface Independence – Testing Interfaces .

## **UNIT IV SERVER**

**12**

Categories of Servers – Features of Server Machines – Classes of Server Machines – Server Environment : N/W Management Environment – N/W Computing Environment – Extensions – Network Operating System – Loadable Module.

## **UNIT V SERVER OPERATING SYSTEM**

**10**

OS/2 2.0 – Windows New Technology – Unix Based OS – Server Requirements : Platform Independence – Transaction Processing – Connectivity – Intelligent Database – Stored Procedure – Triggers – Load Leveling – Optimizer – Testing and Diagnostic Tools – Backup & Recovery Mechanisms.

**Total Hours: 60**

### **Text Book:**

1. Patrick Smith & Steve Guengerich, "Client/Server Computing". PHI

### **Reference Books:**

1. Beth Gold-Bernstein, David Marca, 'Designing enterprise client/server systems', phi-1998.
2. Thomas S Ligon, 'Client/Server communications', McGraw Hill series on client/server computing-1997.
3. Robert Orfali, Dan Harley, Jeri Edward, 'The essential client/server survival guide', second edition, Galgotia 1997.

## **15MIT111 COMPUTER AND INFORMATION SECURITY MANAGEMENT PRE-REQUISITE**

**4 0 0 3**

**COURSE OBJECTIVE** The ubiquity of computers and internet in the life of human beings has enabled chance, motive and means to do harm. With such endangers in front of us, it becomes necessary security for security professionals, to learn about how manage computer and information security aspects.

**COURSE OUTCOMES:**

- To understand the Learning from experience-/ weaknesses in Information Security
- To understand the Policies and technologies- A new framework for information security
- To understand t Risk assessment-Richard Baskerville’s risk assessment methodology
- To understand the Quantitative approach to risk assessment-Problems with Quantitative approach
- To understand the Measuring ROI on security- Security patch management
- To understand the building blocks of information security
- To understand the Overview of SSE CMM- SSE CMM relationship to other initiatives.
- To understand the overview of Security Engineering process
- To understand Maintaining information security during downsizing
- To understand the Security Information Security Management in healthcare industry

**UNIT I MYTHS OF INFORMATION SECURITY MANAGEMENT**

**12**

The big picture-Learning from experience-Weaknesses in Information Security-The extent of crime in cyberspace- The cyberspace crimoid syndrome-Policies and technologies- A new framework for information security

**UNIT II INFORMATION SECURITY ASSESSMENTS**

**12**

Risk assessment-Richard Baskerville’s risk assessment methodology- Generations of risk assessment techniques- Quantitative approach to risk assessment-Problems with Quantitative approach – NIST ALE-Baseline approach

**UNIT III SECURITY MANAGEMENT CONCEPTS AND PRINCIPLES**

**14**

Measuring ROI on security- Security patch management- Purposes of Information Security management- The building blocks of information security- Human side of information securitySecurity management- Securing new information technology

**UNIT IV CONFIGURATION MANAGEMENT 12**

Overview of SSE CMM- SSE CMM relationship to other initiatives- Capability levels- Security Engineering- Security Engineering process overview- Basic process areas- Configuration management- Base practices- Establish configuration management

**UNIT V SECURITY MANAGEMENT PLANNING 10**

Maintaining information security during downsizing- Business case for Information SecurityInformation Security Management in healthcare industry- Protecting high tech trade secretsOutsourcing Security

**Total hours 60**

**Text Book:**

1. Donn Parkers, “ Fighting Computer Crime: A New Framework for Protecting Information”, John Wiley&Sons, 2003

**Reference Books:**

1. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw Hill,2003.
2. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.
3. Micki Krause, Harold F.Tripton, “ Information Security Management Handbook”,Auerbach Publications, 2012.

**15MIT112 CLOUD COMPUTING TECHNOLOGIES 4 0 0 4**

**COURSE OBJECTIVE**

- To understand the concept of cloud and utility computing
- To understand the various issues in cloud computing
- To familiarize themselves with the lead players in cloud
- To appreciate the emergence of cloud as the next generation computing paradigm
- To be able to set up a private cloud

## **COURSE OUTCOMES:**

On successful completion of this course, the student should be able to:

- Understanding the key dimensions of the challenge of Cloud Computing
- Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and building private cloud.
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS,.
- Write comprehensive case studies analyzing and contrasting different cloud computing solutions.
- Make recommendations on cloud computing solutions for an enterprise.
- Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud based applications.
- Assessment of own organizations' needs for capacity building and training in cloud Computing related IT areas
- Understand Application Execution Models on Clouds,, consistency on Clouds, Cloud Virtualization, Abstractions and Enabling Technologies

## **UNIT I INTRODUCTION**

**12**

Evolution of Cloud Computing –System Models for Distributed and Cloud Computing–NIST Cloud Computing Reference Architecture -IaaS–On-demand Provisioning -Elasticity inCloud –E.g.of IaaS Providers -PaaS – E.g.of PaaS Providers –SaaS –E.g. of SaaS Providers–Public , Private and Hybrid Clouds.

## **UNIT II VIRTUALIZATION**

**12**

Basics of Virtualization -Types of Virtualization -Implementation Levels of Virtualization -Virtualization Structures -Tools and Mechanisms -Virtualization ofCPU, Memory, I/O Devices -Desktop Virtualization – Server Virtualization.

## **UNIT III CLOUD INFRASTRUCTURE**

**12**

Architectural Design of Compute and Storage Clouds –Layered Cloud Architecture Development –Design Challenges -Inter Cloud Resource Management–Resource Provisioning and Platform Deployment –Global Exchange of Cloud Resources.

#### **UNIT IV PROGRAMMING MODEL**

**14**

Parallel and Distributed Programming Paradigms –Map Reduce, Twister and Iterative MapReduce – Hadoop Library from Apache –Mapping Applications Programming Support -Google App Engine, Amazon AWS -Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack.

#### **UNIT V SECURITY IN THE CLOUD**

**10**

Security Overview –Cloud Security Challenges –Software-as-a-Service Security – Security Governance –Risk Management –Security Monitoring –Security Architecture Design –Data Security –Application Security –Virtual Machine Security.

**Total hours 60**

#### **Text Book:**

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.

#### **Reference Books:**

1. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press,2010.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”,TMH, 2009.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”O'Reilly, 2009.
4. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.

**15MIT113**

**DATA MINING & DATA WAREHOUSING**

**4 0 0 4**

#### **COURSE OBJECTIVE**

This course has been designed with the following objectives: To introduce the concept of data mining with in detail coverage of basic tasks, metrics, issues, and implication. Core topics like classification, clustering and association rules are exhaustively dealt with. To introduce the concept of data warehousing with special emphasis on architecture and design.

## **COURSE OUTCOMES:**

On successful completion of this course, the student should able to:

- Understand importance of abstraction of Knowledge from unstructured sources at sufficient level to be able to keep upto date and converse with computing professionals.
- Synthesis of information from a variety of different sources and understands issues surrounding the integration theory of information collected from these sources.
- Use of high level operational skills and real world case studies for knowledge discovery and data warehousing based principles.
- Understand stages in building a Data Warehouse
- Apply preprocessing techniques for data cleansing
- Analyze multi-dimensional modeling techniques
- Analyze and evaluate performance of algorithms for Association Rules
- Analyze Classification and Clustering algorithm and Apriori Algorithm.
- Understand the areas of probability, statistics and machine learning algorithms which underpin the knowledge discovery enterprise.
- Focus on design and security issues, architecture and network technologies for building, deploying and managing data warehouse, data mining, data visualization and decision support computing systems.
- Extract knowledge using data mining techniques

## **UNIT I OVERVIEW**

**12**

Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data 35 Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation



## **UNIT II CONCEPT DESCRIPTION**

**14**

Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining MultiDimensional Association rules from Relational Databases

## **UNIT III CLASSIFICATION AND PREDICTIONS**

**14**

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

## **UNIT IV DATA WAREHOUSING**

**10**

Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

## **UNIT V OLAP FUNCTION AND TOOLS**

**10**

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

**Total hours: 60**

**Text Book:**

1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcourt India. Private Limited,2002.

**Reference Books:**

1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
2. A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.

**15MIT114****EMBEDDED SYSTEMS****4 0 0 3****COURSE OBJECTIVE**

Objective of this course is to impart training to students to understand programming in Embedded System for IT industry from basic to advance & to provide education & training in design, implementation & testing of Embedded System.

**COURSE OUTCOMES:**

- Ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;
- Ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;
- Ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;
- Ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;
- Ability to function effectively as a member or leader on a technical team;
- Ability to identify, analyze, and solve broadly-defined engineering technology problems;
- Ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;
- Understanding of the need for and an ability to engage in self-directed continuing professional development;
- Understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.

- Knowledge of the impact of engineering technology solutions in a societal and global context; and a commitment to quality, timeliness, and continuous improvement.

**UNIT I INTRODUCTION 10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

**UNIT II TIMING AND CLOCKS 14**

Timing and clocks in embedded systems, Task Modeling and management, Real time operating system issues.

**UNIT III SIGNALS 14**

Signals, frequency spectrum and sampling, digitization(ADC, DAC), Signal Conditioning and Processing, Modeling and Characterization of Embedded Computation System.

**UNIT IV EMBEDDED CONTROL 10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

**UNIT V FAULT-TOLERANCE 12**

Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

**Total hours 60**

**Text Book:**

1. H.Kopetz, “Real-Time Systems”, Kluwer , 2002

**Reference Books:**

1. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer, 2004
2. Shibu K.V., “Introduction to Embedded Systems”, TMH, 2006
3. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2nd ed., 2008, TMH.

**COURSE OBJECTIVE**

- To learn the basics of Wireless voice and data communications technologies.
- To build working knowledge on various telephone and satellite networks.
- To study the working principles of wireless LAN and its standards.
- To build knowledge on various Mobile Computing algorithms.
- To build skills in working with Wireless application Protocols to develop mobile content applications.

**COURSE OUTCOMES:**

On successful completion of this course, the student should be able to:

- Describe the basic concepts and principles in mobile computing
- Understand the concept of channel allocation in cellular systems, CDMA, GPRS.
- Acquire the knowledge to administrate and to maintain a Wireless LAN
- Understand the structure and components for Mobile IP and Mobility Management
- Understand the concept of Data management issues
- Design and implement mobile applications to realize location-aware computing
- Recognize the important issues and concerns on security and privacy
- Understand the concept of Ad Hoc networks
- Program applications on a mobile computing system and interact with servers and database systems

**UNIT I INTRODUCTION****12**

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

**UNIT II WIRELESS NETWORKING****12**

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple

access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

**UNIT III DATA MANAGEMENT ISSUES 12**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

**UNIT IV MOBILE AGENTS COMPUTING 12**

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

**UNIT V AD HOC NETWORKS 12**

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

**Total hours 60**

**Text Book:**

1. J. Schiller, "Mobile Communications", Addison Wesley, 2002

**Reference Books:**

1. Mehrotra, "GSM System Engineering", 2003
2. M. V. D. Heijden, M. Taylor, "Understanding WAP", Artech House, 2004.
3. Charles Perkins, "Mobile IP", Addison Wesley, 2002.
4. Charles Perkins, Ad hoc Networks, Addison Wesley, 2003.

**GENERIC ELECTIVES:**

<b>15MIT151</b>	<b>SIMULATION AND MODELING</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
-----------------	--------------------------------	----------	----------	----------	----------

**COURSE OBJECTIVE**

- Work comfortably at the command line of their computer

- Use computers to investigate simple scientific problems using both data and simulation.
- Solve simple scientific equations.
- Describe how data are acquired, processed, analyzed, and visualized in a variety of scientific domains

### **COURSE OUTCOMES:**

- To understand of use the simulation software
- To carry out simulation tasks
- To understand the types of simulation task
- To write scripting languages to generate other reports.
- To understand the concept of System simulation
- To understand the concept of analog vs. digital Simulation
- To define the telephone system model
- To understand the simulation of PERT Networks

### **UNIT I SYSTEM DEFINITION**

**12**

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

### **UNIT II SYSTEM SIMULATION**

**12**

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

### **UNIT III SIMULATION OF CONTINUOUS SYSTEMS**

**12**

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

#### **UNIT IV SYSTEM DYNAMICS**

**12**

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

#### **UNIT V SIMULATION OF PERT NETWORKS**

**12**

Simulation of PERT Networks, critical path computation, uncertainties in activity duration , resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

**Total hours 60**

#### **Text Book:**

1. Geoffrey Gordon, “ System Simulation”, PHI,2000

#### **Reference Books:**

1. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, “Discrete Event System Simulation”, Pearson Education, 2004
2. V P Singh, “System Modeling and simulation”, New Age International, 2004
3. Averill M. Law, W. David Kelton, “System Modeling and simulation and Analysis”, TMH, 2006.

#### **15MIT152 INFORMATION SECURITY AND CYBER LAWS**

**4 0 0 4**

#### **COURSE OBJECTIVE**

Cyber forensics is a huge field that is constantly evolving and this course aims to achieve the following:

- Teach students the basics of information security and computer communication.

- Familiarize students with Cyber laws and Security policies and Cryptography.
- Learn some of the conventions and experience the ways of improving from existing experiences.

### **COURSE OUTCOMES:**

- Students can establish responsibility and accountability for information security in organizations.
- They can help the organization to continue its commercial activities in the event of significant information security incidents.
- The students will be able to design security procedures and policies.
- Understand the concept of Internet Protocols
- Understand the concepts in Electronics payment systems
- To understand the physical security
- The Student will be able to design countermeasures against common Information Security Attacks
- To familiarize students with Cyber laws and Security policies and Cryptography.
- To learn the Configure Firewall and Issues in ethical hacking
- To implement Information security in a Network Environment.

### **UNIT I HISTORY OF INFORMATION SYSTEMS**

**12**

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security Concepts in Internet and World Wide Web: Brief review of Internet Protocols-TCP/IP, IPV4, IPV6. Functions of various networking components-routers, bridges, switches, hub, gateway and Modulation Techniques.

### **UNIT II BASIC PRINCIPLES OF INFORMATION SECURITY**

**12**

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles. 11 Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.



### **UNIT III PHYSICAL SECURITY**

**12**

Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges Framework for Information Security, ISO 27001, SEE-CMM, Security Metrics, Information Security Vs Privacy

### **UNIT IV MODEL OF CRYPTOGRAPHIC SYSTEMS**

**12**

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN.

### **UNIT V INVESTIGATION AND ETHICS**

**12**

Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types & overview of Cyber Crimes, Cyber Law Issues in E-Business Management Overview of Indian IT Act, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical hacking.

**Total hours 60**

#### **Text Book :**

1. Godbole, "Information Systems Security", Willey, 2000

#### **Reference Books:**

1. Merkov, Breithaupt, "Information Security", Pearson Education, 2002
2. Yadav, "Foundations of Information Technology", New Age, Delhi, 2003



Introduction to Storage Technology Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of 12 storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

## **UNIT II Storage Systems Architecture 12**

Storage Systems Architecture Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

## **UNIT III Introduction to Networked Storage 12**

Introduction to Networked Storage JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.

## **UNIT IV Introduction to Information Availability 12**

Introduction to Information Availability Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

## **UNIT V Introduction to Information Availability 12**

Managing & Monitoring Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds,

availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

**Total hours 60**

**Text Book:**

1. EMC Corporation, Information Storage and Management, Wiley, India.2000

**Reference Books:**

1. Robert Spalding, “Storage Networks: The Complete Reference“, Tata McGraw Hill , Osborne, 2003.
2. Marc Farley, “Building Storage Networks”, Tata McGraw Hill ,Osborne, 2001.

**15MIT154**

**ERP SYSTEMS**

**4 0 0 4**

**COURSE OBJECTIVE**

- To know the basics of ERP
- To understand the key implementation issues of ERP
- To know the business modules of ERP
- To be aware of some popular products in the area of ERP
- To appreciate the current and future trends in ERP

**COURSE OUTCOMES:**

- To make student able to build an understanding of the fundamental concepts of ERP systems
- Understand the concept of Evolution of ERP
- Students will also able to develop and design the modules used in ERP systems.
- Understanding the importance of Supply chain Management.to business operations.

- understanding the concept of Marketplace Dynamics
- understanding the business model and implementing ERP
- understanding the ERP Implementation Life Cycle
- Understanding basic concepts, tools and techniques of Enterprise Resource Planning.

**UNIT I ERP Introduction 12**

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

**UNIT II Business Process Reengineering 12**

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

**UNIT III ERP Marketplace and Marketplace Dynamics 12**

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

**UNIT IV ERP Implementation Basics 12**

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

**UNIT V ERP & E-Commerce 12**

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study

**Total hours 60**

**Text Book:**

1. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008

**Reference Books:**

1. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
2. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2006.
3. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India, 2006.
4. Summer, ERP, Pearson Education, 2008.

**15MIT155****DISTRIBUTED SYSTEMS****4 0 0 4****COURSE OBJECTIVE**

This course is designed to examine the fundamental principles of distributed systems, and provide students hands-on experience in developing distributed protocols. While we still look at issues in distributed operating systems, this course will address distributed systems in a broader sense. Emphasis will be placed on communication, process, naming, synchronization, consistency and replication, and fault tolerance.

**COURSE OUTCOMES:**

- To develop and apply knowledge of distributed systems techniques and methodologies.
- To gain experience in the design and development of distributed systems and distributed systems applications.
- To gain experience in the application of fundamental Computer Science methods and algorithms in the development of distributed systems and distributed systems applications.
- To gain experience in the design and testing of a large software system, and to be able to communicate that design to others.
- Explain various architectures used to design distributed systems, such as client-server and peer-to-peer.
- To build distributed systems using various interprocess communication techniques, such as remote method invocation, remote events, and tuple spaces.
- To explain various distributed algorithms, such as logical clocks and leader election.
- To build distributed systems using various interprocess coordination techniques, such as distributed mutual exclusion, distributed monitors, and tuple spaces.
- To build distributed systems using various techniques for tolerating partial failures, such as leasing and replication.
- To build flat and nested distributed transactions, such as atomic commit protocols, concurrency control in distributed transactions.

## **UNIT I CHARACTERIZATION OF DISTRIBUTED SYSTEMS**

**12**

Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

## **UNIT II DISTRIBUTED MUTUAL EXCLUSION**

**12**

Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

## **UNIT III AGREEMENT PROTOCOLS**

**12**

Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation 25 of Distributed Shared Memory.

## **UNIT IV FAILURE RECOVERY IN DISTRIBUTED SYSTEMS**

**12**

Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

## **UNIT V TRANSACTIONS AND CONCURRENCY CONTROL**

**12**

Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

**Total hours 60**

**Text Book:**

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill,2000

**Reference Books:**

1. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill,2001
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education,2003
3. Tenanuanbaum, Steen," Distributed Systems", PHI,2002
4. Gerald Tel, "Distributed Algorithms", Cambridge University Press,2004.

**15MIT156**

**PATTERN RECOGNITION**

**4 0 0 4**

**COURSE OBJECTIVE**

The objective of this course is to gain an understanding of the methods used in pattern recognition and machine learning:

- Density estimation methods
- Linear models for regression and classification
- Neural networks and kernel methods
- Support Vector Machines (SVMs) and Relevance Vector Machines (RVMs)
- Graphical models and clustering
- Mixture models and expectation maximization (EM)
- Principal component analysis (PCA)



**COURSE OUTCOMES:**

- Approach to thinking about machine learning problems.
- To describe why a particular model is appropriate in a given situations, formulate the model and use it appropriately.
- The core techniques and methods needed to use machine learning in any area.
- The student will be able to analytically demonstrate how different models and different algorithms are related to one another.
- Provide students with the theoretical background needed to Dimension reduction methods, Principal Component Analysis.
- Provide students learn the concepts of Markov Chain, HMM Techniques
- Ability to Nonparametric Techniques such as Density Estimation, Parzen Window.
- To provide the concepts of K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.
- Methods, and discuss how different methods relate to one another and will be able to develop new and appropriate machine learning methods appropriate for particular problems.
- Given a methods of understanding agglomerative hierarchical clustering, Cluster validation.

**UNIT I INTRODUCTION**

**12**

Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

**UNIT II STATISTICAL PATTEN RECOGNITION**

**12**

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminate functions,

**UNIT III PARAMETER ESTIMATION METHODS**

**12**

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

**UNIT IV Nonparametric TECHNIQUES 12**

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

**UNIT V UNSUPERVISED LEARNING & CLUSTERING 12**

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

**Total hours 60**

**Text Book:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.

**Reference Books:**

1. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
2. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.
3. R. O. Duda, P. E. Hart, D. G. Stork, Pattern Classification, 2nd edition, John Wiley & Sons, Inc., 2000.
4. S. Theodoridis, K. Koutroumbas, Pattern Recognition, 3rd edition, Academic Press, 2006.