

## M.Sc. COMPUTER SCIENCE CURRICULUM

**Total number of Credits: 90**

Category	Code No	Course	Hours/Week				Maximum Marks		
			Lecture	Tutorial	Practical	Credits	CA	SEE	Total
<b>SEMESTER I</b>									
Core	21CMCS11	Linux Programming	4	0	0	4	40	60	100
Core	21CMCS12	Design and Analysis of Algorithm	4	0	0	4	40	60	100
Core	21CMCS13	Scripting Language	3	0	4	4	40	60	100
Core	21PMCS11	Linux Programming Lab	0	0	4	2	40	60	100
DSE	21DMCS--	DSE 1	4	0	0	4	40	60	100
DSE	21DMCS--	DSE 2	4	0	0	4	40	60	100
SEC		Soft Skill1/ Sector Skill Course	2	0	0	2	40	60	100
			<b>21</b>	<b>0</b>	<b>8</b>	<b>24</b>			
<b>SEMESTER II</b>									
Core	21CMCS21	Advanced DBMS	4	0	0	4	40	60	100
Core	21CMCS22	ASP .NET Programming	4	0	0	4	40	60	100
Core	21CMCS23	Pattern Recognition	4	0	0	4	40	60	100
Core	21PMCS21	Advanced DBMS Lab	0	0	4	2	40	60	100
Core	21PMCS22	ASP .NET Programming Lab	0	0	4	2	40	60	100
DSE	21DMCS--	DSE 3	4	0	0	4	40	60	100
SI		Internship	0	0	4	2	40	60	100
SEC		Soft Skill2/ Sector Skill Course	2	0	0	2	40	60	100
			<b>18</b>	<b>0</b>	<b>12</b>	<b>24</b>			
<b>SEMESTER III</b>									
Core	21CMCS31	Natural Language Processing	4	0	0	4	40	60	100
Core	21CMCS32	Deep Learning	4	0	0	4	40	60	100
Core	21CMCS32	Mobile Application Development	3	0	4	4	40	60	100
Core	21PMCS31	Mini Project	0	0	4	2	40	60	100
DSE	21DMCS31	DSE 4	4	0	0	4	40	60	100
DSE	21DMCS31	DSE 5	4	0	0	4	40	60	100
SEC		Soft Skill 3/ Sector Skill Course	2	0	0	2	40	60	100
			<b>21</b>	<b>0</b>	<b>8</b>	<b>24</b>			
<b>SEMESTER IV</b>									
Core	21CMCS41	Internet of Things	4	0	0	4	40	60	100
GE	21GMCS41	Generic Elective-I	4	0	0	4	40	60	100
Core	21PMCS41	Project Work	0	0	20	10	40	60	100
			<b>8</b>	<b>0</b>	<b>20</b>	<b>18</b>			

**CA** - Continuous Assessment,

**SEE** - Semester End Examination

## **List of Discipline Specific Elective Courses**

Theory of Automata
Computational Intelligence
Block Chain Technology
Cloud Computing
Software Quality Assurance
Cryptography and its Applications
Big Data Analytics
Parallel and Distributed Computing System
Neural Networks
Advanced Compiler Design
Mobile Computing
R Programming
Artificial Intelligence
Embedded System
Security Issues in Machine Learning

## **List of Generic Elective Courses**

Human Resource Management
Social Networks
Geographical Information System
Technical Writing in Computer Science

## **List of Skill Enhancement Courses**

Soft Skill-I
Soft Skill-II
Soft Skill-III

# **SEMESTER-I**

**Course Objective**

To familiarize students with the Linux environment, to learn the fundamentals of shell scripting/programming, to manage basic Linux administration, to explain execution procedure, debugging and kernel structure.

**Course Outcome****UNIT I LINUX OPERATING SYSTEMS 12**

Introduction – History of UNIX and Linux – System Features – Software Features – Differences between Linux and Other Operating System – hardware requirements - sources of Linux Information Linux Startup and Setup: User accounts – Accessing the Linux system – Linux Commands.

**UNIT II THE SHELL 12**

The command line – Command line Editing - Creating files using the vi editor: Text editors – The vi editor - Managing Documents: Locating files in LINUX – Standard files – Redirection – Filters – Pipes - Ending Processes: ps and kill - The C Shell: Command Line Editing and - C Shell Command Line Editing - C Shell History - The TCSH Shell - TCSH Command Line Completion - TCSH History Editing - TheZ-shell

**UNIT III LINUX FILE STRUCTURE 12**

Linux file types – File structures – managing Files - Managing Directories – File and Directory operation – File Management Operation : File and Directorypermissions.

**UNIT IV THE SHELL SCRIPTS AND PROGRAMMING 12**

Shell Variables – Definition of Variables - Variable values - Strings – Values from Linux commands – Shell Scripts – User Defined commands - Executing Scripts –Script Arguments – Environment Variables and Subshells Variable – Control Structures – Test operations – Conditional Control Structures –Test Expressions – Shell conditions – Shell loops – Simple Programs using shell scripts.

**UNIT V LINUX SOFTWARES 12**

Software Management -Software Package Types - Red Hat Package Manager(RPM) - Debian - Installing Software from Compressed Archives: .tar.gz - Command and Program Directories

- Office and Database Applications - Running Microsoft Office on Linux: Cross Over OpenOffice.org - KOffice - KOffice Applications - GNOME Office - Document Viewers - PDAAccess-DatabaseManagement-SQLDatabases(RDMS)-XbaseDatabases-Editors  
- GNOME Editor: Gedit - K DesktopEditors.

**Total : 60 Hours**

### **Course Outcomes:**

At the end of this course, the Student will be able to:

**CO-1:** Evaluate different types of editors in Linux using for shell programming.

**CO-2:** Analyze Directories and file and directory permissions.

**CO-3:** Apply necessary tools and methods for Linux application development and learn about the features and techniques that are unique to Linux.

**CO-4:** Understand about Linux File Structures and Managing files.

**CO-5:** Understand all the Linux utilities, and implement shell scripting. Write shell scripts to automate various tasks.

### **Text Books:**

1. Richard Petersen, "Linux: The Complete Reference", Sixth Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi, Edition2008.
2. Neil Matthew, Richard stones, Alan Cox, "Beginning Linux Programming", Wrox Publication.

### **Reference Books:**

1. NIIT , "Operating System LINUX", PHI, Eastern Economy Edition, 2006

### **Web Sources:**

1. [www.youtube.com/watch?v=wBp0Rb-ZJak](http://www.youtube.com/watch?v=wBp0Rb-ZJak)
2. [www.javatpoint.com/linux](http://www.javatpoint.com/linux)

**Course Objective:**

This course gives insight into the design and analysis for divide and conquer, sorting, dynamic programming, backtracking, Dynamic Programming, knapsack, tree vertex splitting, biconnected problems.

**UNIT-I:INTRODUCTION 12**

Introduction - Definition of Algorithm – Pseudo Code Conventions – Recursive Algorithms– Time And Space Complexity –Big-“Oh” Notation – Practical Complexities – Randomized Algorithms – Repeated Element – Primarily Testing.

**UNIT- II: DIVIDE AND CONQUER 12**

Divide And Conquer: General Method –Binary Search – Finding the Maximum and Minimum- Merge Sort-Quick Sort- Strassen’s Matrix Multiplication.

**UNIT- III:GREEDY METHOD 12**

Greedy Method: General Method-Knapsack Problem-Tree Vertex Splitting-Job Sequencing with Deadlines-Minimum Cost Spanning Trees- Prim’s Algorithm- Kruskal’s Algorithm-Single Source Shortest Paths.

**UNIT- IV: DYNAMIC PROGRAMMING 12**

Dynamic Programming: General Method-Multistage Graph-All Pair Shortest Path-Optimal Binary Search Trees-0/1 Knapsack -Traveling Sales Person Problem-Flow Shop Scheduling.

**UNIT- V:BACKTRACKING 12**

Backtracking: General Method, 8- Queen’s Problem-Sum of Subsets-Graph Coloring-Hamilton Cycles-Knapsack Problem. Branch and Bound: The Method-0/1 Knapsack Problem-Traveling Salesmen Problem.

**Total :60 Hrs**

**Course Outcomes:**

At the End of the course, the Student will be able to:

CO-1: Analyze the Complexity and performance of algorithms.

CO-2: Analyze Quick sort, Merge sort algorithm, BFS and DFS Algorithms.

CO-3: Apply appropriate algorithm design techniques for solving problems.

CO-4: Understand how the choice of data structures and the algorithm design methods impact the performance of programs.

CO-5: Understand the set of rules design methods in Greedy Method.

**Text book:**

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran “Fundamentals of Computer Algorithms”, Second Edition, University Press, 2013

**Reference books:**

1. Manas Ranjan Kabat, DESIGN AND ANALYSIS OF ALGORITHMS, PHI Learning Pvt. Ltd., 2013.

2. Jean-Paul Trembley, Paul.G.Sorenson, “Introduction to Data structures with Applications”, Tata McGraw Hill, and Second Edition, 2010.

3. G. Brassard and P. Bratley, Fundamentals of Algorithms, PHI, New Delhi, 1997.

**Web Sources:**

1. [www.guru99.com](http://www.guru99.com)

2. [www.youtube.com/watch?v=D6Q\\_wHrzdDs](http://www.youtube.com/watch?v=D6Q_wHrzdDs)



**Course Objective:** Student will understand Scripting languages and its purposes. The course will cover theoretical aspects of the subject with suitable programs through scheduled lectures. The course will cover the Client Side and Server Side Scripting Languages.

**UNIT I HTML****12**

Internet Basics- Introduction to Scripting Languages- Client Side and Server Side Scripting Languages- - 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 VB SCRIPT****12**

Introduction to VBScript - Adding VBScript Code to an HTML Page - VB Script Basics - VBScript Data Types - VBScript Variables - VBScript Constants -VBScript Operators – mathematical- comparison-logical - Using Conditional Statements - Looping Through Code - VBScript Procedures – type casting variables - math functions – date functions – string functions – other functions - VBScript Coding Conventions - Dictionary Object in VBScript - Err Object

**UNIT III JAVA SCRIPT****12**

Introduction to Javascript – Advantages of Javascript – Javascript syntax - Data type –Variable - Array – Operator & Expression – Looping – control structures - Constructor Function – user defined function Dialog Box .

**UNIT IV PERL****12**

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

**UNIT V CGI****9**

CGI and Scripting languages: Introduction to CGI, Alternative Technologies, The Hypertext Transport Protocol, URLs, HTTP, Browser Requests, Server Responses, Proxies, Content Negotiation, The Common Gateway Interface, The CGI Environment, Environment Variables, CGI Output, Forms and CGI, Sending Data to the Server.

**Practical:**

1. Create a table to show your class time table using HTML.
2. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
3. Create a webpage with HTML describing your department use paragraph and list tags.
4. Write a VBScript code that accepts the length, breadth and height and displays the area of a rectangle.
5. Create a form that has an e-mail field and write VBScript code for validation of the email address.
6. Write a java script program to test the first character of a string is uppercase or not.
7. Write a java script for loop that will iterate from 0 to 15 for each iteration, it will check if the current number is odd or even, and display a message to the screen.
8. Write a java script program which computes the average marks of the 10 student's then average is used to determine the corresponding grade.
9. Write a Perl script to substitute a word, with another word in a string.
10. Write a Perl script to validate IP address and email address.
11. Write a Perl script to print the file in reverse order using command line arguments
12. Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc

**Total: 60 Hours**

**Course Outcomes:**

At the end of this course, the Student will be able to:

**CO-1:** Create applications by using the concepts like Java Script, HTML , PERL.

**CO-2:** Create web scraping scripts to programmatically obtain data and content from web pages

**CO-3:** Evaluate techniques used to create scripts for automating system administrative tasks.

**CO-4:** Analyze many of the modern and way cool language features that show up frequently in scripting languages

**CO-5:** Have understanding of server side scripting with PERL & CGI language.

**Text Books:**

1. Ivan Bayross, Web Enable Commercial Application Development Using HTML, DHTML, Java script, PERL and CGI, BPB Publications, 2006.
2. Kathleen Kalata, Internet Programming with VBScript and JavaScript, Thomson learning, 2001.
3. J.Jaworski, Mastering Java script, BPB Publications, 1999.

**Reference Books:**

1. Powell, Thomas; Schneider, Fritz, JavaScript: The Complete Reference, TMH, 2nd edition 2004.
2. T. A. Powell, Complete Reference HTML , (Third Edition), TMH, 2002

**Web Sources:**

1. [www.geeksforseeks.com](http://www.geeksforseeks.com)
2. [www.nptel.ac.in](http://www.nptel.ac.in)

## Course Objective

This course gives practical training in Linux programming to perform the various commands in shell script. It gives hands on training in File operations in C Programming.

1. Write a shell script to perform the file operations using Linux commands.
2. Write a shell script to perform the operations of basic Linux utilities.
3. Write a shell script to perform nCr calculation using recursion.
4. Write the shell script to find the grade of student's marks.
5. Write a Shell script to display the numbers between 1 and 9999 in words.
6. Write a Shell script for Palindrome Checking.
7. Write a shell script to find the biggest of three numbers using command line arguments.
8. Write a shell script to find the number of characters, words and lines for a given file without using "wc" command.
9. Write a C program for implementation of system calls: a) open b) read & close c) create & write d) fork & exec
10. Write a C program for the following commands: a) cp b) mv c) delete
11. Write a C program to convert starting lowercase letter of each word into uppercase in a file.
12. Write a C program to print the contents of the file in reverse order.

**Total: 30 Hours**

## Course Outcome:

At the End of this course, the Student will be able to:

- CO-1: Create basic application using Linux
- CO-2: Evaluate various Linux commands
- CO-3: Apply Operating system concepts using Linux
- CO-4: Apply String manipulation using Linux.
- CO-5: Understand basic Linux commands

**Text Books:**

1. Richard Petersen, "Linux: The Complete Reference", Sixth Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi, Edition2008.
2. Neil Matthew, Richard stones, Alan Cox, "Beginning Linux Programming", Wrox Publication.

**Reference Books:**

1. NIIT , "Operating System LINUX", PHI, Eastern Economy Edition, 2006

**Web Sources:**

1. [www.youtube.com/watch?v=wBp0Rb-ZJak](http://www.youtube.com/watch?v=wBp0Rb-ZJak)
2. [www.javatpoint.com/linux](http://www.javatpoint.com/linux)

# **SEMESTER-II**

## Course Objective

This course aims to give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture, the system catalog, query optimization, centralized DB concepts, Normalization, distributed databases and client server architecture, advanced database concepts.

### **UNIT-1 COMPARISON BETWEEN DIFFERENT DATABASES 12**

Significance of Databases, Database System Applications, Advantages and Disadvantages of different Database Management systems, Comparison between DBMS, RDBMS, Distributed and Centralized DB.

### **UNIT-II RDBMS 12**

Relational Query Languages, The SQL Query Language, Querying Multiple Relations, Creating Relations in SQL, Destroying and Altering Relations, Adding and Deleting Tuples, Integrity Constraints (ICs), Primary and Candidate Keys in SQL, Foreign Keys, Referential Integrity in SQL, Enforcing Referential Integrity.

### **UNIT- III CATEGORIES OF SQL COMMANDS 12**

Data Definition, Data Manipulation Statements: SELECT - The Basic Form Subqueries, Functions, GROUP BY Feature, Updating the Database, Data Definition Facilities, Views, Embedded SQL \*, Declaring Variables and Exceptions, Embedding SQL Statements, Transaction Processing, Consistency and Isolation, Atomicity and Durability, Dynamic SQL.

### **UNIT-IV NORMALIZATION 12**

Functional Dependency, Anomalies in a Database, The normalization process: Conversion to first normal form, Conversion to second normal form, Conversion to third normal form, The boyce-code normal form(BCNF), Fourth Normal form and fifth normal form, normalization and database design, Denormalization

### **UNIT-V QUERY OPTIMIZATION 12**

Algorithm for Executing Query Operations: External sorting, Select operation, Join operation, PROJECT and set operation, Aggregate operations, Outer join, Heuristics in Query Optimization, Semantic Query Optimization, Converting Query Tree to Query Evaluation Plan, multiquery optimization and application, Efficient and extensible

algorithms for multi-query optimization, execution strategies for SQL sub queries, Query Processing for SQL Updates.

**Total : 60 Hours**

### **Course Outcome:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate hierarchy of DBMS.

**CO-2:** Analyze different types of SQL statement.

**CO-3:** Apply normalization in the database & understand the internal data structure.

**CO-4:** Understand the transaction system & could extract data efficiently.

**CO-5:** Understand the notion of transaction and its ACID properties

### **Text Books:**

1. Date C. J, “An Introduction to Database Systems”, Addison Wesley Longman, 8th Edition, 2003.
2. Catell, R.G.G., Barry, D.K., Berler, M., et al, “The Object Data Standard: ODMG 3.0”, Morgan Kaufmann,2000.
3. Silberschatz A., Korth H., and Sudarshan S, “Database System Concepts”, McGraw-Hill, 6th Edition, 2010.

### **Reference Books:**

1. Charles F. Goldfarb, Paul Prescod, “The XML Handbook, Prentice Hall”, 5th Edition, 2004.
2. Thomas M. Connolly, Carolyn Begg, “Database Systems: Practical approach to Design, Implementation and Management”, Pearson Education Limited, 6th edition,2012.

### **Web Sources:**

1. [www.oracle-tutorial.com](http://www.oracle-tutorial.com)
2. [www.studytonight.com](http://www.studytonight.com)



**Course Objective**

This course introduces the concepts and gain knowledge about the ASP.Net and helps the students to develop Dot Net based application using ADO.NET

**UNIT-I INTRODUCTION TO .NET AND ASP.NET****12**

The DOS Paradigm - The GUI Paradigm - The .Net Paradigm - .Net framework - Types, Objects and Namespaces - Setting up ASP.Net and IIS. Overview of dynamic web page-introduction & features of ASP.NET understanding ASP.NET controls-applications-web servers, installation of IIS.

**UNIT-II ASP.NET CONTROLS****12**

ASP.NET Controls: Web form, web forms Controls - server-controls-client controls-adding controls to web Form buttons-text box-labels-checkbox-radio buttons-list box. Adding controls a runtime Running a web application- creating a multiform web project

**UNIT III ASP.NET WEB PROGRAMMING****12**

Form validation: client side and server side validation- Validation controls: required field comparison range- Calendar control- Ad rotator control- Internet Explorer control.How to manage state- how to use view state, session state and application state. How to use cookies. XML In .NET: XML Basics- Attributes- Fundamentals of XML Classes: Document- Text Writer- Text Reader- XML Validations- XML In ADO.NET,-Data Document

**UNIT IV WEBSERVICES****12**

Web Services: Introduction- State Management- View State- Session State- Application State- Service Description Language- Building & Consuming A Web Service. Web Application Development- Caching- Threading Concepts- Creating Threads In .NET Managing Threads- Thread Synchronization- Features Of .NET- Role Based Security & Code - Access Security- Permissions

**UNIT V ADO.NET****12**

ADO.NET: Overview of ADO.NET- from ADO to ADO.NET- ADO.NET Architecture- Accessing data using data adapters and datasets- using command and data Reader- binding data to data bind controls- displaying data in data grid.

**Total: 60 Hours**

**Course Outcome:**

At the End of this course, the Student will be able to:

**CO-1:** Create web application with ASP.Net Controls.

**CO-2:** Evaluate various web service architectures and their standards.

**CO-3:** Apply validation controls in developing online client page design for reservation, banking.

**CO-4:** Understand about DOS, GUI environment for developing good quality software project

**CO-5: Understand** basic building blocks of ASP.net environment

**Text Books:**

1. Mathew Macdonald - The Complete Reference ASP.NET - Tata McGraw Hill Publishing Pvt Ltd, 2005
2. Professional ASP.NET - Wrox publication PVT Ltd, 2007
3. Greg Buczek , ASP.NET Developer's Guide ,Tata McGraw Hill Edition, 2009
4. Michael Otey and DenielleOtey, "ADO.NET Complete Reference", Tata Macraw Hill Publication, 4th Edition,2007.
5. Math J. Croush , "ASP.net & VB.net web programming" (Pearson Education) ISBN-10: 0201734400, 2005

**Reference Books:**

1. Introduction to .NET framework - Wrox publication.
2. ASP.NET Unleashed - BPB Publication.Alex , "Professional ASP.NET 1.1", Wrox Publications, 2nd Edition, 2004.
3. ASP.NET Projects – Building 10 Enterprise Projects – Eric A. Smith

**Web Sources:**

1. [www.tutorialsteacher.com/core](http://www.tutorialsteacher.com/core)
2. [www.pragimtech.com/courses/asp-net-core-mvc-tutorial-for-beginners/](http://www.pragimtech.com/courses/asp-net-core-mvc-tutorial-for-beginners/)

**Course Objective**

The students can learn about supervised and unsupervised pattern classifiers and familiarize about different feature extraction techniques. The learning also explores the role of Hidden Marko model and SVM in pattern recognition and to understand the application of Fuzzy logic and genetic algorithms for pattern classifier.

**UNIT I PATTERN CLASSIFIER****12**

Overview of Pattern recognition – Discriminate functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

**UNIT II CLUSTERING****12**

Clustering for unsupervised learning and classification–Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.

**UNIT III FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION****12**

Principal Component Analysis (PCA) – Fisher Linear discriminate analysis – Expectation – maximization (EM) – Gaussian mixture models. Feature selection through functional approximation – Elements of formal grammars, Syntactic description – Stochastic grammars – Structural Representation.

**UNIT IV HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE****12**

State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection.

**UNIT V NEURAL PATTERN RECOGNITION****12**

Neural Networks fundamentals, Learning in neural networks, Artificial Neural Networks model, activation functions, weights, Neural Network based Pattern Associators, Introduction Feed forward Network Architecture, Training in Feed forward Networks, GDR, Derivation of Delta Rule, Back propagation Algorithm, Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms

**TOTAL: 60 Hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate the feature extraction and elements of Pattern Recognition

**CO-2:** Analysis function, model and problems in Pattern Recognition

**CO-3:** Apply fuzzy logic and Pattern Classifiers using Genetic Algorithms

**CO-4:** Understand the fundamentals of Pattern Recognition techniques.

**CO-5:** Understand the Syntactic Pattern Recognition techniques.

**Text Books:**

1. M. Narasimha Murthy and V. Susheela Devi, "Pattern Recognition", Springer 2011.
2. Menahem Friedman , Abraham Kandel, "Introduction to Pattern Recognition Statistical, Structural, Neural and Fuzzy Logic Approaches", World Scientific publishing Co. Ltd, 2000.

**Reference Books:**

1. Andrew Webb, "Stastical Pattern Recognition", Arnold publishers, London,1999
2. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
3. Robert J.Schalkoff, "Pattern Recognition Statistical, Structural and Neural Approaches", John Wiley & Sons Inc., New York, 1992.
4. R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification", John Wiley, 2001
5. S.Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press. 2009.

**Web Sources:**

1. [www.mygreatlearning.com/blog/pattern-recognition-machine-learning/](http://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/)
2. [minigranth.in/pattern-recognition-tutorial/introduction-pattern-recognition](http://minigranth.in/pattern-recognition-tutorial/introduction-pattern-recognition)

**Course Objective**

The student learns to work in DDL, DML, TCL and DCL, Joins. The student will be able to create cursors, manage users.

1. Learning basic DDL, DML, DCL and TCL commands
2. Working with dual table.
3. Use of Joins and Subqueries.
4. Views, sequences and indexes.
5. Managing users, privileges and roles.
6. PL/SQL-Data types, control structures.
7. Creating procedures with PL/SQL.
8. Error handling in PL/SQL.
9. Cursor Management in PL/SQL.
10. Writing Programs on Packages & triggers.
11. Embedding PL/SQL in high level language.
12. Implementation of Triggers & Assertions for Bank Database.

**Total: 30 Hours**

**Course Outcomes:**

At the end of this course, the student will be able to:

**CO-1:** Create an application to check user defined exception using PL/SQL.

**CO-2:** Evaluate the functionalities of trigger and cursor.

**CO-3:** Analyze different types of built-in function in PL/SQL.

**CO-4:** Apply DDL, DML and DCL statement using SQL.

**CO-5:** Apply various types of joins in tables.

**Text Books:**

1. A. Silberschatz, H. F. Korth, S. Sudharsan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
2. Ivan Bayross, SQL, PL/SQL, The programming language of Oracle, Second Revised Edition, BPB Publication, 2015

**Reference Books:**

1. R.Elmasri, S.B.Navathe, Fundamentals of Database systems, Fifth Edition,Pearson Education,2008.
2. C. J. Date, Introduction to Database Systems, Fifth Edition, Pearson Education, 2005.

**Web Sources:**

1. [www.guru99.com/dbms-tutorial.html](http://www.guru99.com/dbms-tutorial.html)
2. [www.oracletutorial.com](http://www.oracletutorial.com)

**Course Objective:** This course gives practical training in Network programming using Active Server Pages ActiveX Data Object Dot Net with various applications.

1. Demonstration of Login Processing using ASP.NET
2. Demonstration of Validation controls in ASP.NET
3. Deployment of Calendar Control in ASP.NET
4. Traversing and selecting a Product Name displayed in dropdown list, through coding in The Form Load Event in ASP.NET
5. Creation of Web Application in ASP.NET for Conditions-based book issue in a Library
6. Construction of Banking Application with Implementation of Web-user controls in ASP.NET.
7. Create web Application for Course Registration in ASP.NET with ADO.NET
8. Create web Application for Airline reservation in ASP.NET with ADO.NET
9. Create web Application for Shopping Cart in ASP.NET with ADO.NET
10. Create web Application for Job portal in ASP.NET with ADO.NET
11. Create web Application for On-Line Telephone Billing System in ASP.NET with ADO.NET
12. Create web Application for Hospital Management System in ASP.NET with ADO.NET

**Total: 30 Hours**

**COURSE OUTCOMES:**

At the End of this course, the Student will be able to:

**CO-1:** Create login processing application using ASP .NET.

**CO-2:** Create Banking application and library application using ASP .NET.

**CO-3:** Analyze validation controls in ASP .NET

**CO-4:** Analyze Calendar Control in ASP. NET

**CO-5:** Apply Data Grid control in ADO .NET.

**Text Books:**

1. Joe Duffy, Professional .NET Framework 2.0, Wrox Publications, 2006 Edition.
2. Steven Holzner, Visual Basic.NET Programming – Black Book, Paraglyph Press and DreamTech Press, 2005 Edition.

**Reference Books:**

1. Alex, Professional ASP.NET 1.1, Wrox Publications, 2<sup>nd</sup> Edition, 2004.
2. Michael Otey and Denielle Otey, ADO.NET Complete Reference, Tata McGraw Hill Publication, 4<sup>th</sup> Edition, 2007.

**Web Sources:**

1. <http://www.projects.students3k.com/projects/mini-projects-in-asp-net>.
2. [www.vbtutor.net/index.php/visual-basic-net-tutorials/](http://www.vbtutor.net/index.php/visual-basic-net-tutorials/)



# **SEMESTER-III**

**Course Objective**

The Course provides the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks, such as speech recognition, machine translation, spam filtering, text classification and spell checking.

**Course Outcome****UNIT I OVERVIEW AND LANGUAGE MODELLING 12**

Overview - Origins and challenges of NLP-Language and Grammar-Processing Indian Languages - NLP Applications-Information Retrieval - Language Modeling: Various Grammar - based Language Models - Statistical Language Model.

**UNIT II WORD LEVEL AND SYNTACTIC ANALYSIS 12**

Word Level Analysis - Regular Expressions - Finite-State Automata - Morphological Parsing - Spelling Error Detection and correction - Words and Word classes - Part-of Speech Tagging. Syntactic Analysis – Context - free Grammar - Constituency - Parsing - Probabilistic Parsing.

**UNIT III SEMANTIC ANALYSIS AND DISCOURSE PROCESSING 12**

Semantic Analysis - Meaning Representation - Lexical Semantics – Ambiguity - Word Sense Disambiguation - Discourse Processing – Cohesion - Reference Resolution – Discourse Coherence and Structure.

**UNIT IV NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION 12**

Natural Language Generation - Architecture of NLG Systems - Generation Tasks and Representations - Application of NLG. Machine Translation - Problems in Machine Translation - Characteristics of Indian Languages - Machine Translation Approaches - Translation involving Indian Languages.

**UNIT V INFORMATION RETRIEVAL AND LEXICAL RESOURCES 12**

Information Retrieval - Design features of Information Retrieval Systems – Classical - Nonclassical - Alternative Models of Information Retrieval – valuation Lexical Resources: World Net - Frame Net - Stemmers - POS Tagger - Research Corpora.

**Total: 60 Hours**

**Course Outcome:**

At the End of this course, the Student will be able to:

**CO-1:** Analyze experimental results and write reports for each course project to develop scientific writing skills.

**CO-2:** Apply core computer science concepts and algorithms, such as dynamic programming.

**CO-3:** Apply the methods to new NLP problems and will be able to apply the methods to problems outside NLP.

**CO-4:** Understand the linguistic phenomena and to explore the linguistic features relevant to each NLP task.

**CO-5:** Understand natural language processing and to learn how to apply basic algorithms in this field.

**Text Books:**

1. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.

**Reference Books:**

1. Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2nd Edition, Prentice Hall, 2008.
2. James Allen, “Natural Language Understanding”, 2nd edition, Benjamin /Cummings publishing company, 1995.

**Web Sources:**

1. [www.towardsdatascience.com/a-practitioners-guide-to-natural-language-processing-part-i-processing-understanding-text-9f4abfd13e72](http://www.towardsdatascience.com/a-practitioners-guide-to-natural-language-processing-part-i-processing-understanding-text-9f4abfd13e72)
2. [www.javatpoint.com/nlp](http://www.javatpoint.com/nlp)

**Course Objectives**

To understand the major technology trends driving Deep Learning and apply fully connected deep neural networks. This course is used to analyse the key parameters and hyper parameters in a neural network's architecture.

**UNIT I PROBABILITY AND INFORMATION THEORY****9**

Random Variables- Probability Distributions- Marginal Probability- Conditional Probability- Expectation- Variance and Covariance- Bayes' Rule-Information Theory - Numerical Computation- Overflow and Underflow- Gradient-Based Optimization- Constrained Optimization- Linear Least Squares.

**UNIT II MACHINE LEARNING BASICS****9**

Machine Learning Basics and under fitting, Hyper parameters and Validation Sets Estimators-Bayesian Statistics- Supervised and Unsupervised Learning-Stochastic Gradient Descent- Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR- Gradient-Based Learning- Hidden Units-Architecture Design- Back-Propagation and other Differentiation Algorithms.

**UNIT III REGULARIZATION FOR DEEP LEARNING****9**

Regularization for Deep Learning: Parameter Norm Penalties- Norm Penalties as Constrained Optimization- Regularization and Under-Constrained Problems- Dataset Augmentation- Noise Robustness- Semi-Supervised Learning- Multi-Task Learning- Optimization for Training Deep Models: Pure Optimization- Challenges in Neural Network Optimization- Basic Algorithms- Algorithms with Adaptive Learning Rates- Optimization Strategies and Meta-Algorithms.

**UNIT IV CONVOLUTIONAL NETWORKS****9**

Convolutional Networks: The Convolution Operation, Pooling- Convolution- Basic Convolution Functions -Structured Outputs, Data Types -Efficient Convolution Algorithms- Random or Unsupervised Features -Basis for Convolutional Networks.

**UNIT V SEQUENCE MODELLING****9**

Sequence Modeling: Recurrent and Recursive Nets- Unfolding Computational Graphs-

Recurrent Neural Networks- Bidirectional RNNs-Deep Recurrent Networks - Recursive Neural Networks- Echo State Networks- LSTM –Gated RNNs- Optimization for Long-Term Dependencies.

**Total : 45 hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

CO-1: Analyze mathematical foundation of neural network.

CO-2: Apply Efficient Convolution Algorithms.

CO-3: Understand the Concept of Convolutional Networks.

CO-4: Understand about Information theory.

CO-5: Understand Supervised and Unsupervised Learning.

**Text Books:**

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press,2016.
2. Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition, 2017.

**Reference Books:**

1. Nikhil Buduma, O'Reilly, Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Shroff Publishers, 2019.
2. Douwe Osinga, O'Reilly,Deep learning Cook Book, Practical recipes to get started Quickly, Shroff Publishers, 2019.

**Web Sources:**

1. <https://keras.io/datasets/>
2. <http://deeplearning.net/tutorial/deeplearning.pdf>
3. <https://arxiv.org/pdf/1404.7828v4.pdf>

**Course Objective**

Understand system requirements for mobile applications, Generate suitable design using specific mobile development frameworks, Generate mobile application design, Implement the design using specific mobile development frameworks, Deploy the mobile applications in marketplace for distribution.

**UNIT I INTRODUCTION 9**

Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.

**UNIT II USER INTERFACE 9**

Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.

**UNIT III APPLICATION DESIGN 9**

Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.

**UNIT IV APPLICATION DEVELOPMENT 9**

Intents and Services – Storing and Retrieving data –Communication via the Web – Communication Methods(JSON)- Notification and Alarms – Graphics and Multimedia – Video Streaming-Telephony – Location based services – Map Integration -Packaging and Deployment – Designing APP across multiple devices and operating systems(Phonegap)- Security and Hacking.

**UNIT V TOOLS 9**

Google Android Platform – Eclipse Simulator – Android Application Architecture –Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.

**Practicum:**

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.
12. Create an application to handle images and videos according to size.

**Total: 60 Hours**

**Course Outcome**

At the End of this course, the Student will be able to:

**CO-1:** Create design using JSON.

**CO-2:** Analyze the requirements for mobile applications.

**CO-3:** Understand the Develop design for mobile applications for specific requirements

**CO-4:** Understand the basic Frameworks and tools used in mobile application.

**CO- 5:** Understand the capabilities and limitations of mobile devices.

**Text Books:**

1. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, "Programming Android", O'Reilly,2011.
2. Reto Meier, Wrox Wiley, "Professional Android 2 Application Development",2010.
3. Alasdair Allan, "iPhone Programming", O'Reilly,2010.

**Reference Books:**

1. Wei-Meng Lee, “Beginning iPhone SDK Programming with Objective-C”, Wrox Wiley,2010.
2. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and interactions”, Wiley,2009.

**Web Sources:**

1. [www.learnvern.com/course/android-tutorial](http://www.learnvern.com/course/android-tutorial)
2. [www.udemy.com/course/learn-android-application-development-y/](http://www.udemy.com/course/learn-android-application-development-y/)



**Course Objectives :** The objective of the mini project is to help the student develop the ability to apply theoretical and practical tools / techniques to solve real life problems related to industry academic institutions.

Students are to take up sample project development activities with the guidelines given below:

Preparing a project - brief proposal including:

- Problem Identification
- Developing a model for solving the problem
- A statement of system / process specifications proposed to be developed (Data Flow Diagram)
- List of possible solutions including alternatives and constraints
- Cost benefit analysis
- Time line activities

A report highlighting the design finalization [based on functional requirements & standards (if any)]

A presentation including the following:

- Implementation phase (Hardware / Software / both)
- Testing & Validation of the developed system
- Learning in the project

Consolidated report preparation.

**Course Outcome:**

At the End of this Course, the Student will be able to:

CO-1: Create new project with Report:

CO-2: Evaluate project scope and Objectives.

CO-3: Analyze Software, Hardware and tools needed for the project.

CO-4: Apply technical knowledge to solve project problem.

CO-5: Understand the implementation of Project

**Total: 60 Hours**

# **SEMESTER-IV**

**Course Objective:** Student will understand the evolution of internet technology and need for IoT. The course will cover the basics of communications concepts, characteristics of sensors, protocols and the need of security in the Internet of Things.

**UNIT I: EVOLUTION OF IOT** **12**

Review of computer communication concepts- OSI layers – components - packet communication – Networks - TCP-IP – subnetting - IPV4 addressing and challenges. IPV6 addressing - IoT architecture reference layer.

**UNIT II: INTRODUCTION TO IOT COMPONENTS** **12**

Characteristics IoT sensor nodes - Edge computer - cloud and peripheral cloud - single board computers- open source hardware's - Examples of IoT infrastructure.

**UNIT III: IOT PROTOCOLS AND SOFTWARES** **12**

MQTT – UDP - MQTT brokers - publish subscribe modes – HTTP - COAP - XMPP and gateway protocols – IoT Communication Pattern – IoT protocol Architecture - Selection of Wireless technologies.

**UNIT IV: IOT SECURITY** **12**

Need for encryption - standard encryption protocol - light weight cryptography - Quadruple Trust Model for IoT – Threat Analysis and model for IoT-A, Cloud security

**UNIT V: ARDUINO PROGRAMMING** **12**

Arduino UNO-Setup-IDE Overview-Sktech structure- Data types-Operators-Control statement-Loops-Arrays-String- Math Library-Random Number-Interrupts-Example Program.

**Total: 60 Hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Analyze the concepts the network concepts like TCP-IP, subnetting, IPV4.

**CO-2:** Analyze the characteristics sensors, edge computer cloud and its peripherals.

**CO-3:** Apply selection of wireless technologies.

**CO-4:** Understand the architecture of IoT reference layer.

**CO-5:** Understand the protocols like MQTT, UDP, etc.,

**Text Books:**

1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, “Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model”, Springer Open, 2016 2.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, “From Machine to Machine to Internet of Things”, Elsevier Publications, 2014.

**Reference Books:**

1. LuYan, Yan Zhang, Laurence T. Yang, Huansheng Ning, The Internet of Things: From RFID to the Next-Generation Pervasive Network, Aurbach publications, March,2008.
2. Vijay Madiseti , Arshdeep Bahga, Adrian McEwen (Author), Hakim Cassimally “Internet of Things A Hands-on-Approach” Arshdeep Bahga & Vijay Madiseti, 2014.
3. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2015

**Web Sources:**

1. [data-flair.training/blogs/iot-tutorial/](http://data-flair.training/blogs/iot-tutorial/)
2. [mindmajix.com/iot-tutorial](http://mindmajix.com/iot-tutorial)

**OBJECTIVES**

The objective of the project is to help the student develop the ability to apply theoretical and practical tools / techniques to solve real life problems related to industry academic institutions and research laboratories. After the completion of this project work the student should be able to describe the Systems Development Life Cycle (SDLC) in their carried out project:

- Evaluate systems requirements.
- Evaluate a problem definition.
- Collect information to determine requirements.
- Perform and evaluate feasibility studies like cost-benefit analysis technical feasibility time feasibility and Operational feasibility for the project.
- Work on data collection methods for fact finding.
- Construct and evaluate data flow diagrams.
- Construct and evaluate data dictionaries/ decision trees/ decision table.
- Create and evaluate graphical tools as systems flow charts entity-relationship (ER) diagrams and state transition diagrams.
- Decide the S/W requirement specifications and H/W requirement specifications.
- ♣ Plan the systems design phase of the SDLC.
- Distinguish between logical and physical design requirements.
- ♣ Design and evaluate system outputs.
- Design and evaluate systems inputs.
- Design and evaluate validity checks for input data.
- Design and evaluate user interfaces for input.
- Estimate storage requirements.
- Decide and describe various data structures.
- Perform coding for the project.
- Documentation requirements and prepare documentation.
- Perform various testing techniques/strategies.
- Be able to generate various reports in project.
- Able to deploy the project on machine/Lab/Real time environment
- Brief the maintenance procedures.
- To decide the future scope and further enhancement of the system.
- Plan for appendices (if any) to be placed in support with the project report documentation.

## **TYPE OF PROJECT**

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories / Educational Institution / Software Company. Students are encouraged to work in the various areas of computer applications .However it is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Supervisor and if approved the student can commence working on it.

### **Course Outcome:**

At the End of this Course, the Student will be able to:

**CO-1:** Create new project with Report:

**CO-2:** Evaluate project scope and Objectives.

**CO-3:** Analyze Software, Hardware and tools needed for the project.

**CO-4:** Apply technical knowledge to solve project problem.

**CO-5:** Understand the implementation of Project

**Total: 150 Hours**

# Discipline Specific Electives

# THEORY OF AUTOMATA

4004

## Course Objective

The goal of this course is to provide an understanding of basic concepts in the theory of computation. Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines.

### UNIT I AUTOMATA THEORY 12

Introduction – Structural representation – Automata and Complexity –Alphabets – Strings – Languages – Problems. Finite Automata: Introduction– Deterministic Finite Automata – Non-Deterministic Finite Automata - Application: Text Search – Finite Automata with Epsilon-Transitions.

### UNIT II REGULAR EXPRESSIONS 12

Regular Expressions – Finite Automata and Regular Expressions – Applications of Regular Expressions - Algebraic Laws for Regular Expressions – Proving Languages not to be Regular – Decision Properties of Regular Languages – Equivalence and Minimization of Automata – Moore and Mealy Machines.

### UNIT III CONTEXT-FREE GRAMMARS 12

Definition – Derivations using a Grammar – Leftmost and Rightmost Derivations – The Language of a Grammar – Sentential Forms - Parse Trees - Pushdown Automata: Definition –Languages of a PDA – Equivalence of PDA's and CFG's - Deterministic Pushdown Automata.

### UNIT IV TURING MACHINE 12

Introduction – Notation - Description – Transition Diagram – Languages – Turing Machines and Halting – Programming Techniques for Turing Machines – Multitape Turing Machine – Restricted Turing Machines – Turing Machines and Computers.

### UNIT V INTRACTABLE PROBLEMS 12

The Classes P and NP - The NP Complete Problem – Complements of Languages in NP – Problems solvable in polynomial space.

**Total : 60 Hours**



## **Course Outcome**

At the End of this course, the student will be able to:

**CO - 1:** Analyze problem-solving situations in related areas of theory in computer science.

**CO - 2:** Apply Regular Expression and its concepts.

**CO - 3:** Apply context-free languages, push-down automata.

**CO - 4:** Apply the concept of CFG

**CO – 5:** Understand the concept of heoretical foundations of computer science.

### **Text Books:**

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education, 2001.

### **Reference Books:**

1. S.P.Eugene Xavier, “Theory of Automata, Formal Languages and Computation”, New Age International,2004.
2. A.M.Natarajan, A.Tamilarasi, P.Balasubramani, “Theory of Computation, New Age International”,2003.
3. E.V.Krishnamurthy, “Introductory Theory of Computer Science”, East-West Press Pvt. Ltd,1983.
4. Bernard M. Moret, “ The Theory of Computation”, Pearson Education,1998.

### **Web Sources:**

1. [www.nptel.ac.in](http://www.nptel.ac.in).
2. [www.ocw.mit.edu/courses/mathematics/18-404j-theory-of-computation-fall-2006](http://www.ocw.mit.edu/courses/mathematics/18-404j-theory-of-computation-fall-2006).
3. [www.coursera.org/courses](http://www.coursera.org/courses).

# COMPUTATIONAL INTELLIGENCE

4 0 0 4

## Course Objective:

The course makes students familiar with basic principles of various computational methods of data processing that can commonly be called computational intelligence. To help the students to design and build CI algorithms and approaches to real-life problems, analyses and improve these algorithms and approaches, discuss decisions made during the development processes

## UNIT I INTRODUCTION

12

Artificial Intelligence – a brief review – Pitfalls of traditional AI – Why Computational Intelligence? – Computational intelligence concept - Importance of tolerance of imprecision and uncertainty - Constituent techniques – Overview of Artificial Neural Networks, Fuzzy Logic, Evolutionary Computation

## UNIT II KNOWLEDGE REPRESENTATION AND REASONING

12

Proposition Logic – First Order Predicate Logic – Unification – Forward Chaining - Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering – Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information – Prolog Programming.

## UNIT III UNCERTAINTY

12

Non monotonic reasoning - Fuzzy Logic - Fuzzy rules - fuzzy inference - Temporal Logic- Temporal Reasoning - Neural Networks - Neuro-fuzzy Inference.

## UNIT IV LEARNING

12

Probability basics – Bayes Rule and its Applications – Bayesian Networks – Exact and Approximate Inference in Bayesian Networks – Hidden Markov Models – Forms of Learning – Supervised Learning – Learning Decision Trees – Regression and Classification with Linear Models – Artificial Neural Networks – Nonparametric Models – Support Vector Machines – Statistical Learning – Learning with Complete Data – Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning

## UNIT V INTELLIGENCE AND APPLICATIONS

12

Natural language processing-Morphological Analysis-Syntax analysis-Semantic Analysis-AI applications – Language Models – Information Retrieval – Information Extraction – Machine Translation – Machine Learning – Symbol-Based – Machine Learning: Connectionist – Machine Learning.

**Total : 60 hours**

### **Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate Fuzzy Logic applications

**CO-2:** Analyze Problem-solving through various searching techniques.

**CO-3:** Apply Computational Intelligence techniques for information retrieval

**CO-4:** Apply the Intelligent techniques for problem solving

**CO-5:** Understand fundamental concepts in Computational intelligence.

### **Text Books:**

1. Kumar S., “Neural Networks - A Classroom Approach”, Tata McGraw Hill, 2004.
2. Konar A., “Computational Intelligence: Principles, Techniques and Applications”, Springer Verlag, 2005.
3. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Third Edition, Pearson Education / Prentice Hall of India, 2010.

### **Reference Books:**

1. Elaine Rich and Kevin Knight, Artificial Intelligence, Third Edition, Tata McGraw-Hill, 2010.
2. Patrick H. Winston. “Artificial Intelligence”, Third edition, Pearson Edition, 2006.
3. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI, 2006.
4. Nils J. Nilsson, Artificial Intelligence: A new Synthesis, Harcourt Asia Pvt. Ltd., 2000.

### **Web Sources:**

1. <http://www.softcomputing.net/tutorial.html>
2. [www.tutorialteacher.net](http://www.tutorialteacher.net)



**Total: 60 Hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate a method for solving a problem case study with different perspective

**CO-2:** Analyze limitations and proofs are another essential part of block chain technologies, which are learned for betterment of creating block chain.

**CO-3:** Apply latest crypto currency aspects leads students to understand some of basic concepts of Black Market and Global Economy

**CO-4:** Understand block chain technologies basics

**CO-5:** Describing the history behind the block chain and learning about Vulnerability, Attacks and Side chain gives an additional support for creating a secured block chain.

**Text Book:**

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19,2016).

**Reference Books:**

1. Draft version of “S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, ‘Blockchain Technology: Crypto currency and Applications’, Oxford University Press,2019.
2. Josh Thompson, ‘Block chain: The Block chain for Beginnings, Guild to Block chainTechnology and Block chain Programming’, Create Space Independent Publishing Platform,2017.

**Web Sources:**

1. <https://www.blockchainexpert.uk/book/blockchain-book.pdf>
2. [https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering\\_Blockchain\\_2nd Edition. pdf](https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering_Blockchain_2nd Edition. pdf)
3. [https://www.gsb.stanford.edu/sites/gsb/files/publication-pdf/study-blockchain-impact-moving-beyond-hype\\_0.pdf](https://www.gsb.stanford.edu/sites/gsb/files/publication-pdf/study-blockchain-impact-moving-beyond-hype_0.pdf)

# CLOUD COMPUTING

4004

**Course Objective:** This course introduces the fundamental concepts of cloud computing, its services and tools. Analyze the comparative advantages and disadvantages of cloud computing.

## **UNIT I CLOUD COMPUTING 12**

History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

## **UNIT II WEB-BASED APPLICATION 12**

Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon EC2 – Google App Engine – IBM Clouds.

## **UNIT III CENTRALIZING E MAIL COMMUNICATIONS 12**

Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community Collaborating on Group Projects and Events for the Corporation

## **UNIT IV COLLABORATING ON CALENDARS SCHEDULES AND TASK MANAGEMENT 12**

Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files.

## **UNIT V COLLABORATING VIA WEB-BASED COMMUNICATION TOOLS 12**

Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis.

**Total: 60 Hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Create applications by utilizing cloud platforms.

**CO-2:** Evaluate cloud computing driven commercial systems such as Google Apps and Microsoft Azure.

**CO-3:** Analyze own organization's needs for capacity building and training in cloud related IT areas.

**CO-4:** Apply appropriate technologies and approaches for the related issues to cloud computing.

**CO-5:** Understanding the key dimensions of the challenges of cloud computing.

**Text Books:**

1. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August2008.
2. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July2008.

**Reference Books:**

1. velete, Antony. T, Cloud computing a practical approach 2010, TMH, 4<sup>th</sup> Edition, 2007.
2. Jennings, Roger, Cloud computing with Windows Azure platform, PHI,2009.

**Web Sources:**

1. [www.coursera.com](http://www.coursera.com)
2. [www.javatpoint.com](http://www.javatpoint.com)

## **SOFTWARE QUALITY ASSURANCE**

**4 0 0 4**

### **Course Objective:**

This course introduces the basic concepts of Software Quality Control and Assurance with different quality measures and standards for real time software projects as case studies.

### **UNIT I INTRODUCTION**

**12**

Quality and the quality system - standards and procedures technical activities. Software tasks - management responsibility - quality system - contract review - design control - document control - purchasing product identification and traceability.

### **UNIT II PROCESS CONTROL**

**12**

Checking - Identification of Testing Tools - Control of Nonconforming Product - Corrective Action- Verification: Verification techniques – Inspections, reviews, walk-throughs – Case studies.

### **UNIT III QUALITY AUDITS**

**12**

Handling,Storage,PackingAndDelivery-QualityRecords-InternalQualityAudits-Training-Servicing- Statistical Techniques-Views On Quality – Cost Of Quality - Quality Models – Quality Frameworks – Verification And Validation – Defect Taxonomy – Defect Management – Statistics And Measurements – IEEE Standards – Quality Assurance And Control Processes.

### **UNIT IV QUALITY ASSURANCE TECHNOLOGIES**

**12**

QAAndNewTechnologies-QAandHuman-Computerinterface-ProcessModeling- Standards And Procedures- Coverages: Block, Conditions, Multiple Conditions, MC/DC, Path – Data Flow Graph–DefinitionAndUseCoverages–C-Use,P-Use,Defclear,Def-Use–FiniteStateMachines– Transition Coverage.

### **UNIT V INDIAN STANDARDS**

**12**

ISO – ISO Standards-Development Process-ISO Certification – ISO Consulting Service And Consultants-E-Business- 9001 - Elements of ISO 9001 - Improving Quality System - Case Study.

**Total : 60 hours**



**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Analyze Software Quality Management – Quality Factors, components and Plans.

**CO-2:** Apply Software Quality Metrics and Quality Assurance Standards.

**CO-3:** Apply various tools for Testing.

**CO-4:** Apply different verification techniques for software development.

**CO-5:** Understand Software Quality Audit and illustrate Quality frameworks concepts.

**Text Books:**

1. Claude Y. Laporte, Alain April , “Software Quality Assurance”, Wiley-IEEE Computer Society Press,2018.
2. Watts S. Humphrey, “Managing the software process”, Addison Wesley,1999.

**Reference Books:**

3. Tsum S.Chow, “Software Quality Assurance a Practical Approach”, IEEE Computer Society press,1985.
4. RogerS.Pressman,”SoftwareEngineering-APractitioner’sapproach”, McGrawHill,8<sup>th</sup> Edition, 2019.

**Web Sources:**

1. <http://www.tutorialsspace.com/Software-Engineering/>
2. <http://www.nptel.com>

# **CRYPTOGRAPHY AND ITS APPLICATIONS 4004**

**Course Objective:** To understand the fundamentals of Cryptography, acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity. To understand the various key distribution and management schemes and to explore how to deploy encryption techniques to secure data in transit across data networks.

## **UNIT I INTRODUCTION & NUMBER THEORY 12**

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Finite Fields and Number Theory: 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 algorithms.

## **UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 12**

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange – Elliptic curve arithmetic-Elliptic curve cryptography.

## **UNIT III HASH FUNCTIONS AND DIGITAL SIGNATURES 12**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature & authentication Protocols.

## **UNIT IV SECURITY PRACTICE & SYSTEM SECURITY 12**

Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems.

## **UNIT V CASE STUDY ON E-MAIL, IP & WEBSECURITY 12**

E-mail Security: 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. IPSecurity: Overview of IPsec - IP and IPv6  
- Authentication Header - Encapsulation Security Payload (ESP) - Web Security:  
SSL/TLS Basic Protocol-computing the keys - Encoding- Secure Electronic Transaction  
(SET).

**Total: 60 Hours**

### **Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Analyze computer and network security threats, classify the threats and develop a Security model to prevent, detect and recover from the attacks.

**CO-2:** Apply Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms.

**CO-3:** Apply Knowledge and understanding of Basics of number theory, Key management, Public key cryptosystems, Message authentication, Hash functions and algorithms.

**CO-4:** Understand network security designs using available secure solutions (such as PGP, SSL, IPsec, etc).

**CO-5:** Understand with advanced security issues and technologies.

### **Text Books:**

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.

### **Reference Books:**

1. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, India Edition, 2010.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill Second Edition, 2010.

### **Web Sources:**

3. [www.javatpoint.com](http://www.javatpoint.com)
4. [www.geeksforgeek.com](http://www.geeksforgeek.com)

# **BIG DATA ANALYTICS**

**4004**

**Course Objective:** To explore, design, and implement basic concepts of big data & analytics methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and its application to the business needs.

## **UNIT I INTRODUCTION TO BIG DATA 12**

Introduction to Big Data Platform – Challenges of Conventional Systems - Nature of Data- Evolution Of Analytic Scalability - Intelligent data analysis- Analytic Processes and Tools -Analysis vs Reporting - Modern Data Analytic Tools

## **UNIT II MINING DATA STREAMS 12**

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing -Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream –Real Time Analytics Platform (RTAP) Applications

## **UNIT III ADVANCED ANALYTICS 12**

Analyzing, Visualization and Exploring the Data, Statistics for Model Building and Evaluation, Advanced Analytics - K-means clustering, Association rules-Speedup, Linear Regression, Logistic Regression, Naïve Bayes, Decision Trees, Time Series Analysis, Text Analysis.

## **UNIT IV HADOOP 12**

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop - Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming

## **UNIT V FRAMEWORKS 12**

Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

**TOTAL: 60 Hours**

### **Course Outcome:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate Big Data real time analytics platform applications.

**CO-2:** Analyze big data platform and learn intelligent data analysis and compare old and modern data analytic tool.

**CO-3:** Apply advanced analytics techniques to gain knowledge of latest techniques.

**CO-4:** Understand the data streams concepts and stream computing.

**CO-5:** Understand the fundamental concepts of big data platform and know about the basic concepts of nature and evolution of big data.

**Text Book:**

1. Prajapati, Big Data Analytics with R and Hadoop, 2014

**Reference Book:**

1. Stephan Kudyba, Big Data, Mining, and Analytics: Components of Strategic Decision Making, Auerbach Publications, March 12, 2014.
2. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author), Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, 2013

**Web Sources:**

1. [www.intellipaat.com/blog/big-data-tutorial-for-beginners/](http://www.intellipaat.com/blog/big-data-tutorial-for-beginners/)
2. [www.simplilearn.com/tutorials/data-analytics-tutorial](http://www.simplilearn.com/tutorials/data-analytics-tutorial)

## **PARALLEL AND DISTRIBUTED COMPUTING SYSTEM 4004**

**Course Objective:** To learn parallel and distributed algorithm development techniques for shared memory and message passing models, to study the main classes of parallel algorithms, to study the complexity and correctness models for parallel algorithms.

### **UNIT I INTRODUCTION 12**

Basic Techniques - Parallel Computers for Increase Computation Speed - Parallel & Cluster Computing

### **UNIT II PARALLEL PROGRAMS 12**

Message Passing Technique - Evaluating Parallel Programs and Debugging - Portioning And Divide And Conquer Strategies Examples

### **UNIT III PIPELINING TECHNIQUES 12**

Pipelining - Techniques Computing Platform - Pipeline Programs Examples.

### **UNIT IV SHARED MEMORY 12**

Synchronous Computations - Load Balancing - Distributed Termination Examples - Programming With Shared Memory - Shared Memory Multiprocessor Constructs For Specifying Parallel List - Sharing Data Parallel Programming Languages And Constructs - OpenMP.

### **UNIT V DISTRIBUTED SHARED MEMORY SYSTEMS: 12**

Distributed Shared Memory Systems And Programming Achieving Constant Memory Distributed Shared Memory Programming Primitive - Algorithms – Sorting And Numerical Algorithms.

**Total: 60 hours**

### **Course Outcome:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate concepts of Parallel computing systems.

**CO-2:** Analyze about Cluster Computing systems.

**CO-3:** Apply Message Passing Technique.

**CO-4:** Apply Parallel programs and debugging.

**CO-5:** Understand Pipelining Techniques and examples.

**Text Books:**

1. Barry Wilkinson, Michael Allen, "Parallel Programming", Pearson Education, 2nd Edition.
2. Jaja, "Introduction to Parallel algorithms", Pearson, 1992.

**Reference Book:**

1. Calvin Lin, Larry Snyder, "Principles of Parallel Programming", Addison-Wesley, 2008.

**Web Sources:**

1. [www.coursere.org](http://www.coursere.org)
2. [www.nptel.ac.in](http://www.nptel.ac.in)

**Course Objectives:**

Provide an understanding of the basic mathematical elements of the theory of fuzzy sets. Provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories. Explain the concepts of neural networks, fuzzy logic, and genetic algorithms.

**UNIT I BASIC LEARNING ALGORITHMS****12**

Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feedforward and Feedback – Learning Process: Error Correction Learning – Memory Based Learning – Hebbian Learning – Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space – Pattern Association – Pattern Recognition – Function Approximation – Control – Filtering - Beamforming – Memory – Adaptation - Statistical Learning Theory – Single Layer Perceptron – Perceptron Learning Algorithm – Perceptron Convergence Theorem – Least Mean Square Learning Algorithm – Multilayer Perceptron – Back Propagation Algorithm – XOR problem – Limitations of Back Propagation Algorithm.

**UNIT II RADIAL-BASIS FUNCTION NETWORKS AND SUPPORT VECTOR MACHINES RADIAL BASIS FUNCTION NETWORKS****12**

Cover's Theorem on the Separability of Patterns - Exact Interpolator – Regularization Theory – Generalized Radial Basis Function Networks - Learning in Radial Basis Function Networks Applications: XOR Problem – Image Classification. **SUPPORT VECTOR MACHINES:** Optimal Hyperplane for Linearly Separable Patterns and Nonseparable Patterns – Support Vector - insensitive Loss Function – Support Vector Machine for Pattern Recognition – XOR Problem - Machines for Nonlinear Regression

**UNIT III COMMITTEE MACHINES AND NEURO DYNAMICS SYSTEMS****12**

Ensemble Averaging - Boosting – Associative Gaussian Mixture Model – Hierarchical Mixture of Experts Model(HME) – Model Selection using a Standard Decision Tree – A Priori and Post priori Probabilities – Maximum Likelihood Estimation – Learning Strategies for the HME Model – EM Algorithm – Applications of EM Algorithm to HME



Model - Dynamical Systems – Attractors and Stability – Non-linear Dynamical Systems- Lyapunov Stability – Neurodynamical Systems – The Cohen-Grossberg Theorem.

**UNIT IV ATTRACTOR NEURAL NETWORKS 12**

Associative Learning – Attractor Neural Network Associative Memory – Linear Associative Memory – Hopfield Network – Content Addressable Memory – Strange Attractors and Chaos- Error Performance of Hopfield Networks - Applications of Hopfield Networks – Simulated Annealing – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs - Memory Annihilation of Structured Maps in BAMS – Continuous BAMS – Adaptive BAMS – Applications

**UNIT V SELF ORGANISING MAPS AND PULSED NEURON MODELS 12**

Self-Organizing Map – Maximal Eigenvector Filtering – Sanger’s Rule – Generalized Learning Law – Competitive Learning - Vector Quantization – Mexican Hat Networks - Self-organizing Feature Maps – Applications - Spiking Neuron Model – Integrate-and-Fire Neurons – Conductance Based Models – Computing with Spiking Neurons.

**TOTAL: 60 Hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate the Architecture of different neural networks.

**CO-2:** Analyze wide variety of learning algorithms.

**CO-3:** Apply supervised learning.

**CO-4:** Understand about unsupervised learning.

**CO-5:** Understanding limitations of various learning algorithms.

**Text Books:**

1. NunesDaSilva I ,Artificial Neural Networks A Practical Course”,SPRINGER,ISBN-9783319431611,January, 2017

**Reference Books:**

1. Satish Kumar, “Neural Networks: A Classroom Approach”, Tata McGraw-Hill Publishing Company Limited, New Delhi,2004.
2. Simon Haykin, “Neural Networks: A Comprehensive Foundation”, 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi,2001.

**Web Sources:**

1. [www.edureka.com](http://www.edureka.com)
2. [www.coursera.org](http://www.coursera.org)

**Course Objective:** This course gives an insight into introduction, parsing techniques of compiler, working with syntax, grammar and semantics of programming languages proving students with an analogy to help them understand how grammar works for programming languages.

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

Introduction – Structure of a optimizing Compiler – Compiler writing tools – Basic constructs of High level programming languages – Data structures – Parameter transmission. Lexical Analysis – Role of Lexical analyzer – Finite Automata – Regular Expressions to Finite Automata – Minimizing number of states of Deterministic Finite Automaton –Implementation of Lexical analyzer in C.

**UNIT II PARSING TECHNIQUES****12**

Parsing Techniques – Context free Grammars – Derivations and Parse trees –Ambiguity – Capabilities of Context free grammar-Handling errors in Context free grammars-Parsers and Recognizers - Top down and Bottom up Parsing –Grammar analysis Algorithm- Handles – Shift Reduce parsing – Operator precedence parsing – Recursive Descent parsing – Predictive Parsing.

**UNIT III AUTOMATICPARSINGTECHNIQUES12**

Automatic Parsing Techniques – LR parser – Canonical Collection of LR(0) items – Construction of SLR parsing tables – LR(1) sets of items construction-LALR(1) – Construction of canonical LR parsing tables- Use of Bison or YACC.

**UNIT IV INTERMEDIATE CODE****12**

Syntax Directed Translation – Semantic action – Implementation of syntax directed translators – Intermediate code: Prefix notation, Quadruples, Triples, and Indirect triples –Methods of translation of assignment statements, Boolean expressions and Control statements.

**UNIT V LOWERBOUNDALGORITHM****12**

Symbol Tables and Code Generation: Representing information in a symbol table –Data structures for symbol table – Introduction to code optimization – Basic blocks –DAG representation – Error detection and Recovery – Semantic Processing- Code generation and

local code optimization.

**Total: 60 Hours**

**Course Outcome:**

At the End of this course, the Student will be able to:

**CO-1:** To understand the introduction of compiler and phases of compiler.

**CO-1:** Evaluate concepts of lexical analyzer and Finite Automation.

**CO-2:** Analyze key concepts of context-free grammar.

**CO-3:** Apply different parsing techniques and construction of syntax tree.

**CO-4:** Understand advanced features of automatic parsing techniques specifically LR parser, SLR parser.

**CO-5:** Understand the concepts of construction of LR, SLR parsing table.  
to construct code generator.

**Text Books:**

1. V.Aho, Ravi Sheethi, "Compilers-Principles, Techniques and Tools", Pearson Education, 3rd Edition,2007.
2. David Galles, "Modern Compiler Design", Pearson Education Asia,2007.

**Reference Books:**

1. Steven S. Muchnick, "Advanced Compiler Design & Implementation", Morgan Kaufmann Publishers,2000.
2. C. N. Fisher and R. J. LeBlanc, "Crafting a Compiler with C", Pearson Education, 2000.

**Web Sources:**

1. [www.nescoacademy.com](http://www.nescoacademy.com)
2. [www.nptel.ac.in](http://www.nptel.ac.in)

**Course Objective:**

This course introduces the basic concepts of mobile computing, communication systems, mobile and wireless devices, GSM – Architecture – Routing Strategies –TCP.

**UNIT I INTRODUCTION 12**

Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing – Wireless Transmissions –Multiplexing – Spread Spectrum and Cellular Systems- Medium Access Control –Comparisons.

**UNITII TELECOMMUNICATION SYSTEMS 12**

GSM – Architecture – Sessions –Protocols – Hand Over and Security – UMTS and IMT – 2000– Satellite Systems - Types of Satellite System - Routing- Localization

**UNIT III WIRELESS LAN 12**

IEEE S02.11: System Architecture-Protocol Architecture, Physical Layer, 802.11b and 802.11a– Hiper LAN: WATM, BRAN, HYPERLAN2 – Bluetooth: User Scenarios, Architecture, Radio Layer, BasebandLayer,LinkManagerProtocol,L2CAP,Security,SDP– SecurityandLinkManagement.

**UNIT IV MOBILE NETWORK LAYER 12**

Mobile IP – Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies.

**UNITV MOBILE TRANSPORT LAYER 12**

Congestion Control – Implication of TCP Improvement – Mobility – Indirect – Snooping – Mobile – Transaction oriented TCP - TCP over wireless – Performance - Case study analysis: Smart Phone Enhanced Shopping, Advances on Sensors for HealthSystems.

**TOTAL: 60 Hours****Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate about various wireless LAN techniques.

**CO-2:** Analyze radio signal propagation issues and their impact on communication system performance.

**CO-3:** Understand about various wireless systems and standards and their basic operation cases.

**CO-4:** Understand the techniques of radio spectrum allocation in multi-user systems and their impact on networks capacity.

**CO-5:** Understand how the various signal processing and coding techniques of GSM and its Architecture.

**Text Books:**

- 1.J. Schiller, “Mobile Communications”, Pearson Education, Delhi, 2ndedition, 2013.
- 2.Hansmann, Merk, Nicklous, Stober, Principles of Mobile Computing, 2nd Edition, Springer India, 2004.

**Reference Books:**

1. Pahalavan, Krishnamurthy, Principle of wireless Networks: A unified Approach, Pearson Education, Delhi,2003.
2. Martyn Mallick, Mobile and Wireless Design Essentials, WileyDreamtech India Pvt. Ltd., New Delhi,2004.
3. W.Stallings, Wireless Communications and Networks, 2nd Edition, Pearson Education, Delhi,2004.

**Web Sources:**

1. [www.nptel.ac.in](http://www.nptel.ac.in)
2. [www.nescoacademy.com](http://www.nescoacademy.com)

**Course Objective**

To provide a basic understanding of R programming, data structures, functions, how to work with packages, files and know about the data visualization and data management techniques.

**UNIT I INTRODUCTION TO R 12**

Overview of R programming - Evolution of R - Applications of R programming - Basic syntax - Basic Concepts of R: Reserved Words, Variables & Constants, Operators, Operator Precedence, Data Types, Input and Output - Data structures in R: Vectors, Matrix, List in R programming Data Frame, Factor.

**UNIT II FUNCTIONS 12**

Control flow - If...else, If else() Function - Programming for loop - While Loop, Break & next, Repeat Loop - Functions - R Functions - Function Return Value - Environment & Scope R Recursive Function R Infix Operator - R Switch Function - Strings: String construction - rules - String Manipulation functions.

**UNIT III PACKAGES AND RESHAPING 12**

R packages - Study of different packages in R - R Data Reshaping: Joining Columns and Rows in a Data Frame - Merging Data Frames - Melting and Casting.

**UNIT IV FILES AND OBJECTS CLASS 12**

Working with files - Read and writing into different types of files - R object and Class Object and Class: R S3 Class - R S4 Class R Reference Class - R Inheritance.

**UNIT V DATA VISUALIZATION AND DATA MANAGEMENT 12**

Data visualization in R and Data Management - Bar Chart, Dot Plot, Scatter Plot (3D), Spinning Scatter Plots, Pie Chart - Histogram (3D) [including colorful ones], Overlapping Histograms - Boxplot, Plotting with Base and Lattice Graphics Missing Value Treatment - Outlier Treatment - Sorting Datasets - Merging Datasets - Binning variables.

**Total: 60 Hours****Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate functions in R and implement simple iterative algorithms.

**CO-2:** Analyze probability distribution tools such as ANOVA.

**CO-3:** Apply to implement simple algorithms in R independently

**CO-4:** Apply visualization techniques in R in an efficient way.

**CO-5:** Understand the basics of R programming including matrix and vectors etc.

**Text Books:**

1. Norman Matloff, “The Art of R Programming-a tour of statistical software design”, William Pollock,2011.
2. Paul Teetor “R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics”, O'Reilly Cookbooks, O'Reilly Media ,2011.

**Reference Books:**

1. Rob Kabacoff, “R in Action Book”, Manning Publications Co,2011.
2. Nina Zumel , John Mount , Jim Porzak, “Practical Data Science with R”, Dreamtech, 2014.
3. Richard Cotton, “Learning R: A Step-by-Step Function Guide to Data Analysis”, O'Reilly Media,2013.

**Web Sources:**

1. [www.statmethods.net/r-tutorial/](http://www.statmethods.net/r-tutorial/)
2. <http://www.r-tutor.com/>



**Course Objective:**

The course will address key AI technologies in an attempt to help in understanding their role in cyber security and the implications of these new technologies to the world of politics. AI deficiently will complement and strengthen the cyber security practices and will improve their applications in enhancing our security.

**UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 12**

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems– Algorithms and Optimization Problems –Searching with Partial Observations – Constraint Satisfaction Problems – ConstraintPropagation–BacktrackingSearch–GamePlaying–OptimalDecisionsinGames–Alpha– Beta Pruning – Stochastic Games.

**UNIT II SOFTWARE AGENTS AND APPLICATIONS 12**

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems- AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – MachineTranslation–SpeechRecognition–Robot–Hardware–Perception–Planning–Moving.

**UNIT III CYBER SECURITY VULNERABILITIES ANDSAFEGUARDS 12**

Cyber Security Vulnerabilities-Overview- vulnerabilities in software-System administration-Complex Network Architectures- Open Access to Organizational Data-Weak Authentication- Unprotected Broadband communications-Poor Cyber Security Awareness- Cyber Security Safeguards- Access control- Cryptography- Deception-Denial of Service Filters-Ethical Hacking- Firewalls-Intrusion Detection Systems- Threat Management.

**UNIT IV SECURING WEB APPLICATION, SERVICES AND SERVERS 12**

Basic security for HTTP Applications and Services- Basic Security for SOAP Services- Identity Management and Web Services- Authorization Patterns- Security Considerations- Challenges - Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software- Botnet detection-Spam filter applications- Hacking incident forecasting-cyber security ratings.

## **UNIT V CYBER FORENSICS AND CASE STUDIES**

**12**

Introduction to Cyber Forensics- Conducting disk-based analysis- Investigating Information-hiding-Scrutinizing E-mail- Tracing Internet access- Tracing memory in real-time-Case study: Cyber Security Regulations- Roles of International Law- Cyber Security Standards-The INDIAN Cyberspace- National Cyber Security Policy2013.

**Total: 60 Hours**

### **Course Outcomes:**

At the End of this course, the Student will be able to:

CO-1: Create self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.

CO-2: Interpret the modern view of AI as the study of agents that receive percepts from the environment and perform actions.

CO-3: Analyze the dimensions along which agents and environments vary, along with key functions that must be implemented in a general agent.

CO-4: Understand the concepts of Artificial intelligence

CO-5: Understand major challenges and the complexity of AI problems.

### **Text Books**

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, 2010.
2. James Graham, Richar Howard,Ryan Olson, "Cyber Security Essentials", CRC Press, Tailor and Francis Group, 2011.
3. Nina Godbole, Sunit Belapur, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Publications, April, 2011.

### **Reference Books:**

1. Patterson, Introduction to Artificial Intelligence & Expert Systems, PHIPoole, Computational Intelligence, OUP,2012
2. Saroj Kaushik, Logic & Prolog Programming, Saroj Kaushik, New Age International Expert Systems, Giarranto, VIKAS, 2014

### **Web Resources:**

1. [www.edureka.com](http://www.edureka.com)
2. [www.towardsdatascience.com](http://www.towardsdatascience.com)

**Course Objective**

To learn parallel and distributed algorithm's development techniques for shared memory and message passing models. To study the main classes of parallel algorithms. To study the complexity and correctness models for parallel algorithms.

**UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 12**

Definition of Embedded System - Embedded Systems Vs General Computing Systems - History of Embedded Systems - Classification, Major Application Areas - Purpose of Embedded Systems - Characteristics and Quality Attributes of Embedded Systems.

**UNIT II TYPICAL EMBEDDED SYSTEM: 12**

Core of the Embedded System - General Purpose and Domain Specific Processors - ASICs, PLDs, Commercial Off- The Shelf Components (COTS) - Memory - ROM, RAM - Memory according to the type of Interface - Memory Shadowing - Memory selection for Embedded Systems - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces.

**UNIT III EMBEDDED FIRMWARE 12**

Reset Circuit - Brown-out Protection Circuit - Oscillator Unit - Real Time Clock - Watchdog Timer - Embedded Firmware Design Approaches and Development Languages.

**UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 12**

Operating System Basics - Types of Operating Systems – Tasks - Process and Threads - Multiprocessing and Multitasking - Task Scheduling.

**UNIT V TASK COMMUNICATION 12**

Shared Memory - Message Passing - Remote Procedure Call and Sockets - Task Synchronization: Task Communication/Synchronization Issues - Task Synchronization Techniques - and Device Drivers - Case-Study: How to Choose an RTOS.

**Total: 60 hours**

## **Course Outcome**

At the End of this course, the Student will be able to:

**CO-1:** Apply concept of Embedded system and General Computing systems.

**CO-2:** Understand the History and Classification of Embedded systems.

**CO-3:** Understand the Major Application Areas, Purpose of Embedded Systems.

**CO-4:** Understand about the Core of the Embedded System.

**CO-5:** Understand of General Purpose and Domain Specific Processors.

### **Text Books:**

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill., 2009
2. Raj Kamal, "Embedded Systems", TMH, 2nd edition,2008.
3. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley,2002.

### **Reference Books:**

1. Lyla, "Embedded Systems", Pearson,2013.
2. David E. Simon, "An Embedded Software Primer", Pearson Education, Ist Edition, 2002.

### **Web Sources:**

1. [www.tutorialandexample.com/embedded-systems-tutorial/](http://www.tutorialandexample.com/embedded-systems-tutorial/)
2. [www.studyelectronics.in/embedded-programming-tutorial](http://www.studyelectronics.in/embedded-programming-tutorial)

## **SECURITY ISSUES IN MACHINE LEARNING 4004**

### **UNIT I INTRODUCTION TO MACHINE LEARNING 12**

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net)

### **UNIT II CLASSIFICATION AND REGRESSION ALGORITHMS 12**

Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks Learning And Generalization, Overview of Deep Learning.

### **UNIT III SECURITY IN MACHINE LEARNING 12**

Security Vulnerabilities in Machine Learning Algorithms, Evasion Attacks (Adversarial Inputs), Data Poisoning Attacks, Model Stealing Techniques, Possible Solutions to Ensure Machine Learning Security

### **UNIT IV ADVANCED LEARNING 12**

Sampling-Basic Sampling methods, Monte Carlo, Gibbs Sampling – Computational Learning Theory – Mistake Bound Analysis – Reinforcement learning – Markov Decision processes, Deterministic and Non- deterministic Rewards and Actions, Temporal Difference Learning Exploration.

### **UNIT V CASE STUDY 12**

Possible case studies: Machine learning for intrusion detection, Machine learning for side channel analysis, Privacy preserving machine learning, Adversarial machine learning.

**Total: 60 Hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Evaluate concepts of machine learning.

**CO-2:** Analyze appreciate supervised and unsupervised learning and their applications

**CO-3:** Analyze security issues in machine learning.

**CO-4:** Understand the analysis of time series and overview of deep learning.

**CO-5:** Understand the security issues in machine learning.

**Text Books:**

1. Christopher Bishop, "Pattern Recognition and Machine Learning" Springer,2007.
  2. KevinP.Murphy, "MachineLearning: A Probabilistic Perspective", MIT Press, 2012.
  3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014.
- Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.

**Reference Books:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall/CRC Press, Second Edition, 2014.

**Web Sources:**

1. [www.analyticsvidhya.com/blog/2018/07/using-power-deep-learning-cyber-security/](http://www.analyticsvidhya.com/blog/2018/07/using-power-deep-learning-cyber-security/)
2. [www.simplilearn.com/how-ai-and-machine-learning-impact-cyber-security-article](http://www.simplilearn.com/how-ai-and-machine-learning-impact-cyber-security-article)

**Syllabus**  
**Generic Electives**

**Course Objective**

To teach relevant, practical and applicable human resource management skills to equip the student with the foundation competencies for working as HR practitioners in business. To highlight the important challenges facing managers and employees in today's business climate. To introduce contemporary theory and practice in modern human resource management and the range of tools and methods available to address HR challenges and problems.

**UNIT I HUMANRESOURCE MANAGEMENT 12**

Meaning - Scope & Objectives of HRM - Evolution of HRM - Difference between PM & HRM - HRM function's - HR as a Strategic Business Partner - HR Policy & procedures - Competitive challenges influencing HRM Qualities & qualification of HR Manager - Roles and Responsibilities of HR Manager / Departments.

**UNIT II HUMANRESOURCE PROCESS 12**

Human Resource Planning – Job Analysis and Design - Recruitment - Selection and placement process – Types of interviews – Placement - Orientation & Induction - Determining training needs - Training Approaches - Separation process & Exit interview.

**UNIT III MANAGINGCAREERS 12**

Career Development vs. Employee development - Career stages – Career Choices and Preferences - Mentoring and Coaching - Time Management.

**UNIT IV PERFORMANCE MANAGEMENT 12**

Purposes of Performance Management - Performance Appraisal Methods - Punishment and Promotion, Job evaluation - Wage & Salary administration – Concepts - Pay structure - Incentives – Bonus - Insurance.

**UNIT V CONTEMPORARY ISSUESIN HRM 12**

Talent Management - Competency Mapping - Industrial Relations – Health & Safety issues - grievance handling - D Work Life Balance - Quality of Work Life - HRD in India - International HRM.

**Total: 60 Hours**



## **Course Outcome**

At the End of this course, the Student will be able to:

**CO-1:** Analyze the emerging trends, opportunities and challenges in performance appraisal.

**CO-2:** Assess the major HRM functions and processes of HRM planning, job analysis and design, recruitment, selection, training and development, compensation and benefits, and performance appraisal.

**CO-3:** Apply the Concept of job application and how it is practically applied in the organization.

**CO-4:** Understand various recent techniques related to HRM.

**CO-1:** Understand History and evolution of HRM.

### **Text Books:**

1. Aswathappa.K, “Human Resource Management, Text and Cases”, Tata McGraw Hill, New Delhi,2014.
2. Gupta. S.C, “Advanced Human Resource Management, Strategic Perspective”, ANE Books Pvt. Ltd, New Delhi,2009.

### **Reference Books:**

1. Angela Baron and Michael Armstrong, “Human Capital Management (Achieving Added Value Through People)”, Kogan Page Limited, United States,2007.
2. Anuradha Sharma and Aradhana Khandekar, “Strategic Human Resource Management”, Response Books, New Delhi,2006.
3. Beer et al, “Managing Human Assets”, The Free Press: Maxwell Mac Millan Inc, New York,1984.
4. Dreher Dougherty, “Human Resource Strategy: A behavioral perspective for the General Manager”, McGraw – Hill Higher Education, Singapore,2001.

### **Web Sources:**

1. [www.hrmexam.com/hrm-tutorial/](http://www.hrmexam.com/hrm-tutorial/)
2. [www.youtube.com/watch?v=aA1OIFHZWtU](http://www.youtube.com/watch?v=aA1OIFHZWtU)

**Course Objective**

The Students should be able to understand the concept of semantic web and related applications by acquiring adequate knowledge from ontology. The students will also be able understand the human behavior in social web and visualizing the social networks.

**UNIT 1 INTRODUCTION 12**

Introduction to Semantic Web - Limitations of current Web – Development of Semantic Web– Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.

**UNITII MODELLING, AGGREGATING AND KNOWLEDGEREPRESENTATION 12**

Ontology and their role in the Semantic Web - Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modelling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.

**UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 12**

Extracting evolution of Web Community from a Series of Web Archive –Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks – Multi-Relational characterization of dynamic social network communities.

**UNIT IV PREDICTING HUMAN BEHAVIOUR ANDPRIVACYISSUES 12**

Understanding and predicting human behavior for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online

environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and counter measures.

## **UNIT 5 VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS12**

Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co-citation networks.

**Total: 60 Hours**

### **Course Outcome**

At the End of this course, the Student will be able to:

- CO-1:** Apply the basic knowledge's and limitations of semantic web.
- CO-2:** Apply Electronic sources for network analysis, various information's about blogs and online communities can be learned.
- CO-3:** Apply Ontology based semantic web modelling and aggregation for social network can be deeply grasped by students.
- CO-4:** Understand basic knowledge about web social networks with detailed extraction evolution of web communities can be learned.
- CO-5:** Understand various applications of community mining algorithms with tools for detecting social network infrastructures.

### **TextBooks:**

1. Peter Mika, "Social Networks and the Semantic Web", 1st Edition, Springer2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer,2010.

### **Reference Books:**

1. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", 1st Edition Springer,2011.
2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.

3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009.
4. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer,2009.

**Web Sources:**

1. [www.simplilearn.com/social-media-tutorial-video](http://www.simplilearn.com/social-media-tutorial-video)
2. [www.udemy.com/course/meteor-tutorial/](http://www.udemy.com/course/meteor-tutorial/)

## **GEOGRAPHICAL INFORMATION SYSTEM      4 0 0 4**

### **Course Objective**

GIS is a combination of software and hardware with capabilities for manipulating, analyzing and displaying spatially-referenced information. By linking data to maps, a GIS can reveal relationships not apparent with traditional item-referenced information systems and data base management products, and by displaying information in a graphic form can communicate complex spatial patterns succinctly. The course emphasizes the concepts needed to use GIS correctly and effectively for manipulating, querying, analyzing, and visualizing spatial-based data.

### **UNIT I INTRODUCTION TO GIS      12**

What is GIS - What GIS can do - Types of GIS projects - Remote sensing, GPS, SDSS Continental Drift – Representing Geography - Geographic Representations - Nature of Geographic Data - Spatial Autocorrelation - Spatial Sampling - Georeferencing - Global Navigation Systems.

### **UNIT II CREATING, MAINTAINING AND USING GEOGRAPHIC DATABASES      12**

GIS Data Collection and Correction - Geographic Databases - Accessing Geographic Data - Distributed GIS- Geographic Data Analysis : Geovisualization - Vectors and Rasters - Measurement and Transformation- Uncertainty in GIS - ArcGIS : Exploring ArcGIS - Spatial Data - Metadata - ArcCatalog -ArcToolbox.

### **UNIT III WORKING WITH ARCMAP      12**

Map documents - Windows and Menus - Help system - Data frames – Layers - Symbols and styles - Map scales and labeling - Coordinate Systems and Map Projections - Map projections and GIS - Coordinate Systems - Spheroids and datums - Common projection systems - Projecting data. Basic Editing in ArcMap : Editing overview - The EditorToolbarSnapping features - Creating adjacent polygons - Editing features - Editing attributes – Saving work.

### **UNIT IV COORDINATE SYSTEMS AND MAP PROJECTIONS      12**

Map projections and GIS - Coordinate Systems - Spheroids and datums – Common projection systems-Projecting data-Drawing and Symbolizing Features-

Types of maps - Classifying numeric data - Using map layers - Editing symbols and using styles – Displaying rasters.

## **UNIT V WORKING WITH TABLES**

**12**

Tables - Joining tables - Statistics - Summarizing tables - Editing and calculating tables - Queries - What are queries - Selecting - Using queries in GIS analysis - Spatial Joins - Types of joins - Setting up a spatial join - Spatial Data Modeling: Types of Models - Tools for Modeling – Future GIS – Case study with GIS.

**Total: 60 hours**

### **Course Outcome:**

At the End of this course, the Student will be able to:

**CO-1:** Analyze the fundamental concepts of geographic information systems and their differences from other types of information systems.

**CO-2:** Apply Utilize modern industry-standard GIS software for conducting basic GIS analyses and producing cartographic output.

**CO-3:** Apply predominantly using ESRI's ArcGIS software .

**CO-4:** Apply critical thinking skills in solving geospatial problems.

**CO-5:** Understand competency with the ArcMap software to enhance and interpret data.

### **Text Books**

1. Longley, Paul A., Michael F. Goodchild, David J. Maguire, David W. Rhind, "Geographic Information Systems and Science", 4th Edition, John Wiley & Sons, 2012.
2. O'Sullivan, D. and D. Unwin, "Geographic Information Analysis", 2nd Edition, John Wiley and Sons, 2010.

### **Reference Books:**

1. Longley, Goodchild, Maguire, Rhind, "Geographic Information Systems and Science", 2<sup>nd</sup> Edition, Wiley, 2005.
2. Gorr, W and Kurland K. "GIS Tutorial: Workbook for ArcView 9", ESRI Press, 2005.

**Web Sources:**

1. [www.gisgeography.com/what-gis-geographic-information-systems/](http://www.gisgeography.com/what-gis-geographic-information-systems/)
2. [www.coursera.org/specializations/gis](http://www.coursera.org/specializations/gis)

## **TECHNICAL WRITING IN COMPUTER SCIENCE 4 0 0 4**

### **Course Objectives:**

This course is designed to develop skills that will enable to produce clear and effective scientific and technical documents. While the emphasis will be on writing, oral communication of scientific and technical information will form an important component of the course, as well.

### **UNIT I INTRODUCTION 12**

Foundation of Reading & Writing - Introduction to Technical Writing- Introduction to research papers - articles, technical notes - Document Development Life Cycle - Software Tools ( Latex, etc.) - concept of technical publication

### **UNIT II KNOWLEDGE ABOUT TECHNICAL WRITING 12**

Documentation development life cycle: Role of a Technical writer- Principles of Technical Writing, Documentation deliverables - Printed documentation and Online Help Systems - Working with images and illustrations -Characteristics of Technical Writing - Measures of Excellence in Technical Documents - The Content Approach - Acquiring the Three Types of Knowledge - Understanding Audience and Purpose - Collaborative Writing - Writing for Multiple Audiences

### **UNIT III ORGANIZING THE INFORMATION 12**

Introduction – Visuals - Technical definition – Extensions - Mechanism Description - Mechanism in Operation - Planning Stage - Technical Writing Process: Document development process - Estimating Technical Documentation - Documentation Planning - Selection of Tools - Information Architecture - Templates and Page design - Audience Profiling Task Analysis - Content Development - Elements of Style - Technical Reviews - Editorial Reviews - Formatting and pagination - Document Conversions - Content Publishing - Quality Control - Content Maintenance

### **Unit IV RESEARCHING YOUR SUBJECT 12**

Academic vs. Workplace Research - Conducting Secondary Research - Primary Research - Focus on Process - Laboratory Report - Feasibility, recommendation, and evaluation reports – Instructions - Checklist for the technical report - Style of writing -Grammar and Editing English Grammar - Punctuation and Mechanics - MS Style Guides & Proof Reading

### **UNIT V CASE STUDY 12**

Design Specification, User Manual / Guides, Hardware Manuals, Installation Manuals,



Online Help, Web sites, Analytical/Feasibility Reports, Proposals (Business Development Perspective), Lab/Science Reports, Project proposal writing, Abstracts, Progress reports.

**Total: 60 Hours**

**Course Outcomes:**

At the End of this course, the Student will be able to:

**CO-1:** Analyze basic concepts of technical writer.

**CO-2:** Analyze issues related to workplace research that you will have to conduct as a technical writer.

**CO-3:** Apply graphical tools that you can use to design visuals with the output process of the report in mind

**CO-4:** Apply visuals to communicate a large amount of information quickly and efficiently.

**CO-5:** Understand issues related to various types of academic and workplace research.

**Text Books:**

1. Markel, Mike. Technical Communication. 7th ed. New York, NY: Bedford/St. Martin's, ISBN: 9780312403386, 2003

**Reference Books:**

1. Diana. A Pocket Style Manual. 4th Ed. New York, NY: Bedford/St. Martin's, 1999. ISBN: 9780312406844, 2014
2. Perelman, Leslie C., James Paradis, and Edward Barrett. The Mayfield Handbook of Technical and Scientific Writing. New York, NY: McGraw-Hill. ISBN: 9781559346474, 2011

**Web Sources:**

1. [www.instructionalsolutions.com/blog/become-a-technical-writer](http://www.instructionalsolutions.com/blog/become-a-technical-writer)
2. [www.nptel.ac.in](http://www.nptel.ac.in)

**SYLLABUS**  
**SKILL ENHANCEMENT COURSES**

## SOFTSKILLS – I

- 2 0 0 2

### Course Objective:

- To enable participants Business Communication Skills
- To enhance participants E-mail writing skills
- To impart Leadership and Team Bonding skills

		Credit Hours
<b>1.</b>	<b>READING COMPREHENSION AND VOCABULARY</b> Filling the blanks – Cloze Exercise – Vocabulary building – Reading and answering Questions.	<b>06</b>
<b>2.</b>	<b>LISTENING AND ANSWERING QUESTIONS.</b> Listening and writing – Listening and sequencing sentences – Filling in the blanks – Listening and answering questions.	<b>06</b>
<b>3.</b>	<b>GROUP DISCUSSIONS</b> Why GD part of a selection process – Structure of a GD – strategies in GD – Team Work – Body Language	<b>06</b>
<b>4.</b>	<b>CONVERSATION.</b> Face to face Conversation and Telephone conversation.	<b>06</b>
<b>5.</b>	<b>SELF- INTRODUCTION AND ROLE PLAY</b>	<b>06</b>
<b>Total</b>		<b>30 Hours</b>

### Course Outcome

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

- CO 1 Prioritize power of understanding and aids assimilation of vocables. Vocabulary to charge communication with educated words
- CO 2 Develop comprehensive knowledge through listening leading to answering questions
- CO 3 Build observation power and infuse self-confidence through group discussions
- CO 4 Identify methodology for befitting constructional ability
- CO 5 Experiments with inward looking and visualization of the ‘otherness’ of situations

### Books Recommended

- Barun K. Mitra. Personality Development and Soft Skills. Oxford University Press. New Delhi.2011.
- S.P. Sharma. Personality Development. Pustaq Mahal. New Delhi. 2010.Meenakshi Raman and Sangeetha Sharma. Technical Communication. Oxford University Press. New Delhi. 2009.
- Tiko, Champa & Jaya Sasikumar. Writing with a Purpose.OUP. New Delhi. 1979

### Web Source:

- <https://www.skillsyouneed.com/ips/communication-skills.html>
- <https://blog.smarp.com/top-5-communication-skills-and-how-to-improve-them>
- <https://blog.hubspot.com/service/phone-etiquette>

**Course Objective:**

- To enable students to develop their communication skills effectively
- To enhance students Reading, Writing, Listening and Speaking skills
- To develop their self-confidence through communication

**Credit Hours**

<b>1. PRESENTATION SKILLS</b>	<b>06</b>
Elements of an effective presentation – structure of presentation – voice modulation – Audience analysis – Body language	
<b>2. SOFT SKILLS</b>	<b>06</b>
Time Management – Articulateness – Assertiveness – Stress management	
<b>3. RESUME / REPORT PREPARATION / LETTER WRITING</b>	<b>06</b>
Structuring the resume / Report – Business letters – E-Mail Communication	
<b>4. INTERVIEW SKILLS</b>	<b>06</b>
Kinds of Interviews – Required by Skills – Corporate Culture – Mock Interviews	
<b>5. 30 FREQUENTLY ASKED QUESTIONS</b>	<b>06</b>
<b>Total</b>	<b>30 Hours</b>

**Course Outcome**

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

- CO1 Illustrate the essential of presentation skills, thoughts, structure, voice modulation, audience analysis and body language
- CO2 Utilize the psychological skills pertaining to time management, articulation, assertion and stress management
- CO3 Construct methodology for preparation of resume, reports, business letters and email communication
- CO4 Appraise learners with varied skills needed for expose to interviews
- CO5 Categorize the nature of questions asked usually in interviews

**Books Recommended**

- Barun K.Mitra. Personality Development and soft skills. Oxford University Press. New Delhi. 2011.
- S P Sharma. Personality Development. Pustaq Mahal. New Delhi. 2010.
- Meenakshi Raman and Sangeetha Sharma. Technical Communication. Oxford University Press. New Delhi. 2009.

**Web Sources:**

- <https://www.skillsyouneed.com/ips/communication-skills.html>
- <https://www.businessnewsdaily.com/5836-top-interviewing-skills.html>
- <https://gdpi.hitbullseye.com/Group-Discussion.php>

### SOFT SKILLS III

2 0 0 2

#### Course Objective:

- To enable students to develop their soft skills and Body Language
- To enhance students Reading, Writing, Listening and Speaking skills
- To develop their self-confidence to excel at Interviews

	<b>Credit Hours</b>
<b>UNIT-I</b>	<b>06</b>
Powerful Presentation	
<b>UNIT-II</b>	<b>06</b>
Reinforcement	
<b>UNIT-III</b>	<b>06</b>
Using visual aids	
<b>UNIT-IV</b>	<b>06</b>
Types and Methods of Presentations	
<b>UNIT-V</b>	<b>06</b>
Obstacles to Presentation	
<b>Total</b>	<b>30 Hours</b>

#### Course Outcome:

- CO1 To develop participants social and professional skills  
CO2 To help participants manage time effectively  
CO3 To build a strong resume to suit corporate requirements  
CO4 To face interviews confidently  
CO5 To enhance their aptitude abilities

#### Books Recommended:

- Roz Townsend: Presentation Skills for the Upwardly Mobile, Emerald, Chennai.
- Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Publishing Company Limited, 2001.
- Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.

#### Web Sources:

- <https://www.skillsyouneed.com/ips/communication-skills.html>
- <https://venngage.com/blog/presentation-skills/>
- <https://gdpi.hitbullseye.com/Group-Discussion.php>