Dr. AMBEDKAR GOVERNMENT ARTS COLLEGE

(AUTONOMOUS)
VYASARPADI, CHENNAI – 600 039

MINUTES OF THE MEETING OF BOARD OF STUDIES - M.Sc - COMPUTER SCIENCE

Meeting of the Board of Studies in Computer Science [for revising the M.Sc Computer Science course syllabus] was held on 11-06-2019 (Tuesday) at 12.00 A.M at the Department of Computer Science of this College.

- The syllabus is revised as per the TANSCHE norms. As per the guidelines, Extra disciplinary subjects are included in the 2nd and 3rd semester.
- The board members discussed the syllabus and necessary corrections are incorporated, wherever applicable.
- This syllabus is approved and it is with effect from the academic year 2019-20.

S.No.	Members Present	Signature
1	**Dr. A. Murugan** – **Chairman** Associate Professor & HOD of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	
2	**Dr. Sornam** – **University Nominee** Professor of Computer Science University of Madras, Chennai – 600 108.	
3	**Dr. Vidya Priya** – **College Nominee (External)** Associate Professor, PG & Research department of Computer Science Quaid-e-millath College for Women, Chennai.	
4	**Dr J Senthil Kumar** – **College Nominee (External)** Assistant Professor Govt. Arts College, Perumbakkam, Chennai.	
5	**Dr. (Mrs.) K. Shyamala** – **Member** Associate Professor of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	11/06/19
6	**Mr. K. Radhakrishnan** – **Member** Assistant Professor of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	11/6/19
7	**Mrs. N.Vanitha** – **Member** Assistant Professor of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	
8	**Mrs. B.Jayapradha** – **Member** Assistant Professor of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	11/6/19

9	**Dr. G.Sekar** – **Member** Assistant Professor of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	present / 11.6.19
10	**Dr. Behin Sam** – **Member** Assistant Professor of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	11/06/2019
11	**Mr. Krishna Kumar** – **Member** Assistant Professor of Computer Science Dr. Ambedkar Government Arts College (Autonomous) Vyasarpadi, Chennai – 600 039	11/6/19
12	**Mr Suresh Thangavel**, **-Industrialist** Information Security Manager Tata Consultancy Services, Thoraipakkam Chennai 97	11/06/2019
13	**Mr Vasantha Raj** - **Alumni** Assistant Professor of Computer Science, Muthukumarasamy College, Kodungaiyur, Chennai – 118.	V. Vasantha Raj 11/06/19

Dr. Ambedkar Government Arts College

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M.Sc. DEGREE COURSE IN COMPUTER SCIENCE

(SEMESTER WITH CHOICE-BASED CREDIT SYSTEM)
(effective from the Academic Year 2019- 2020)

REGULATIONS

1. ELIGIBILITY FOR ADMISSION

Candidates with Bachelor's degree in Computer Science or Computer Science & Technology or B.C.A. degree of University of Madras or any other degree accepted as equivalent thereto by the Syndicate.

2. DURATION OF THE COURSE

The Course duration shall be two years consisting of four semesters. In order to be eligible for the award of the degree the candidate shall successfully complete the course in a maximum period of five years reckoned from the date of enrolment for the first semester of the course.

3. STRUCTURE OF THE COURSE AND EVALUATION PATTERN

The duration of Semester-End examination for theory and practical subjects shall be 3 hours. The maximum mark for each Theory Paper is 100 marks with 25 marks for Continuous Internal Assessment and 75 marks for Semester-End Examinations The maximum mark for each Practical Paper is 100 marks with 40 marks for Continuous Internal Assessment and 60 marks for Semester-End Examinations (including all Soft Skill papers).

For Project work, the marks assigned shall be

Continuous Internal Assessment	75 marks
Semester-End Examination	
Project Report	150 marks
Viva-voce	75 marks

For the conduct of Semester-End Examinations in Practical subjects, the Controller of Examinations will appoint one External Examiner and one Internal Examiner. The Controller of Examinations will set the questions and distribute to the Department. The Examiners will conduct the examinations and award the marks on the same day and forward to the Controller of Examinations. The College Principal/Head of the Department will coordinate and provide the laboratory and other facilities for conducting the examinations.

Project work should be individual project. Project evaluation and Viva-voce shall be conducted both by Internal and External Examiners.

4. COURSE OF STUDY AND SCHEME OF EXAMINATION

Both the Theory and Practical Examinations will be conducted in the Semester itself.

S. No	Core Elective	Paper Code	Paper Title	Lecture /Lab Hours	Credit
1	CC I	19PACSC1	Design and Analysis of Algorithms	5	4
2	CC II	19PACSC2	Advanced Web Technology	5	4
3	CC III	19PACSC3	Advanced Data Base Management Systems	5	4
4	CC IV	19PACSC4	Algorithms Lab	4	3
5	EC I	**	Elective – I	5	3
6	CC V	19PACSC5	Advanced Web Technology Lab	4	3
7	SS I	19PASBE1	Soft Skill Paper I	2	2
			Total	30	23
8	CC VI	19PBCSC1	Distributed Operating System	5	4
9	CC VII	19PBCSC2	Advanced Java Programming	5	4
10	CC VIII	19PBCSC3	Compiler Design	4	4
11	EC II	**	Elective – II	4	3
12	EC III	**	Elective – III	4	3
13	CC IX	19PBCSC4	Advanced Java Programming - Lab	4	3
14	EDC I	19PBCSD1	Extra-Disciplinary Subject – I	2	3
15	SS II	19PBSBE2	Soft Skill Paper II	2	2
			Total	30	26
16	CC X	19PCCSC1	Digital Image Processing	5	4
17	CC XI	19PCCSC2	Internet of Things	5	4
18	CC XII	19PCCSC3	Machine Learning	5	4
19	EC IV	**	Elective – IV	5	3
20	CC XIII	19PCCSC4	Machine Learning using Python - lab	4	3
21	EDC II	19PCCSD2	Extra-Disciplinary Subject – II	2	3
22	SS III	19PCSBE3	Soft Skill Paper III	2	2
23	SS IV	19PCSBE4	Soft Skill Paper IV	2	2
	**Internship	19PCINT1	During summer vacation of I Year - 4 to 6 weeks	--	2
			Total	30	27
24	CC XIV	19PDCSP1	Project Work	--	16
			TOTAL		**92**

**** Internship will be carried out during the summer vacation of the first year and certificate should be sent to the COE office and the same will be included in the Third Semester Marks Statement.**

LIST OF ELECTIVES - ONE OF THE FOLLOWING

ELECTIVE – I 1st Semester

Sub Code	Paper
19PACSE1A	Cloud Computing
19PACSE1B	Data Mining
19PACSE1C	Theory of Computation

ELECTIVE – II -- 2nd Semester

Sub Code	Paper
19PBCSE1A	Optimization Techniques
19PBCSE1B	Scientific Computing
19PBCSE1C	Data Science and Big Data Analytics

ELECTIVE – III - 2nd Semester

Sub Code	Paper
19PBCSE2A	Cryptography and Network Security
19PBCSE2B	Mobile Computing
19PBCSE2C	Embedded Systems

ELECTIVE – IV - 3rd Semester

Sub Code	Paper
19PCCSE1A	Software Project management
19PCCSE1B	Object Oriented System Development
19PCCSE1C	Soft Computing

Extra-Disciplinary Course Subjects (EDC) - to be offered to other Departments

EDC	Sub Code	Paper
EDC – I	19PBCSD1	Advanced Computing Skills
EDC – II	19PBCSD2	Internet Programming

Soft Skill Subjects (SS)

Sub Code	Paper
19PASBE1	Employability Skills (SS I)
19PBSBE2	Leadership and Communication Skills (SS II)
19PCSBE3	Managerial Skills (SS III)
19PCSBE4	Personality Development (SS IV)

5. PASSING REQUIREMENTS

a) For all subjects the passing requirement is as follows: i) candidate secures not less than 50% of marks in Semester-End Examination (a minimum of 38 Marks out of 75 in the External Examination) and not less than 50% in aggregate of the total maximum marks prescribed in each Theory & Practical, and in Project work minimum 50% each in dissertation and Vivo-voce examination and not less than 50% in aggregate of the total maximum marks prescribed, shall be declared to have passed in the respective subject.

b) A candidate who passes in all subjects and in the Project work within the maximum period of five years reckoned from the date of admission to the course shall be declared to have qualified for the degree.

c) The relative overall performance of the candidate shall be determined by the overall percentage of Marks obtained in all subjects evaluated a follows:

$$AM = \frac{\text{Sum of all marks obtained}}{\text{Sum of maximum marks}} \quad X\ 100$$

This score shall be entered in the transcript given to the candidate on successful completion of the course calculated to two decimal points.

6. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

(i) Candidates shall register their names for the First Semester Examination after the admission in the PG Courses.

(ii) Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) Semester subjects.

(iii) Candidates shall be eligible to go to subsequent semester, only if they earn, sufficient attendance as prescribed there for by the Controller of Examinations from time to time.

Provided in the case of candidate earning less than 50% of attendance in any one of the Semesters due to any extraordinary circumstance such as medical grounds, such candidates who shall produce Medical Certificate issued by the Authorized Medical Attendant (AMA), duly certified by the Principal of the College, shall be permitted to proceed to the next semester and to complete the course of study. Such candidate shall have to repeat the missed semester by rejoining after completion of final semester of the course, after paying the fee for the break of study as prescribed by the Controller of Examinations from time to time.

7. PROCEDURE IN THE EVENT OF FAILURE

(a) If a candidate fails in a particular subject (other than Project work) he/she may reappear for the Semester-End examination in the subject in subsequent semesters and obtain passing marks.

(b) In the event of failure in Project Work, the candidate shall reregister for Project Work and redo the Project Work in a subsequent semester and resubmit the dissertation afresh for evaluation. The internal assessment marks shall be freshly allotted in this case.

8. GRADING SYSTEM

As per the University of Madras Norms

9. RANKING

As per the University of Madras Norms

10. **a) PATTERN OF QUESTION PAPER - THEORY**

End semester Examination

Time : 3 Hours Max. 75 Marks

Part –A 10 x 2 = 20 Marks
[Answer **any 10** Questions out of 12 Questions]

Part –B 5 x 5 = 25 Marks
[Answer any **Five** out of Eight Questions]

Part –C 3 x 10 = 30 Marks
[Answer any **Three** out of Five Questions]

Internal Assessment: 25 Marks

The break up for continuous Assessment is as follows:

a) Test	(1 x 10)	: 10 Marks
b) Assignment	(1 x 10)	: 10 Marks
c) Model Examination	(1 x 25)	: 25 Marks
d) Attendance		: 5 Marks
Total		: 50 Marks

50 Marks for continuous assessment can be converted to 25 Marks.

b) PATTERN OF QUESTION PAPER - PRACTICAL

Time : 3 Hours Max. 60 Marks

The break up for continuous assessment for the Practical :

Continuous Assessment	: 40 Marks
Practical	: 60 Marks

Total	: 100 Marks

Internal Assessment: 40 Marks

The break up for continuous Assessment is as follows:

a. Submission of Record/Observation	: 25 Marks
b. Practical Tests (2 x 15)	: 30 Marks
c. Model Practical Examination	: 20 Marks
d. Attendance	: 5 Marks

Total	: 80 Marks (scaled down to 40)

The external examiner will prepare a question paper on the SPOT with the help of the Question Bank supplied by the Controller's office. The duration of the practical examinations for each paper shall be 3 hours carrying 60 Marks.

SEMESTER-I

CORE COURSE-01–DESIGN AND ANALYSIS OF ALGORITHMS

Objective: To learn effective problem solving in Computing applications and analyze the algorithmic procedure to determine the computational complexity of algorithms.

Unit I

Introduction: Algorithm Definition – Algorithm Specification – Performance Analysis-Asymptotic Notations. Elementary Data Structures: Stacks and Queues – Trees – Graphs

Unit II

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

Unit III

The Greedy Method: General Method - Knapsack Problem - Tree Vertex Splitting – Job Sequencing With Deadlines - Minimum Cost Spanning Trees – Prim's method, Krushakal Algorithms - Single Source Shortest Paths.

Unit IV

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths - String Editing - 0/1 Knapsack - The Traveling Salesperson Problem.

Unit V

Backtracking**:** The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: General Method - 0/1 Knapsack Problem.

Text Book:

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009.

References:

1. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcropft, Ullman , LPE
3. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem-TMH.
4. Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen, "Evolutionary Algorithms for Solving Multi-Objective Problems", Springer 2nd Edition, 2007.

COURE COURSE-02-ADVANCED WEB TECHNOLOGY

Objectives:

- Explore the backbone of web page creation by developing .NET skill.
- Provide depth knowledge about ADO.NET
- Understand the need of usability, evaluation methods for web services

UNIT - I

OVERVIEW OF ASP.NET: .NET Frame work-Common Language Runtime- .NET Class Library. **C#**: C# Language Basics- Variables and Data types-Variable Operations-Conditional Logic-Loops-Methods-Building Basic Class-Value types and Reference types-Understanding Namespaces and Assemblies.

UNIT - II

Developing ASP.NET Applications :The Anatomy of a Web Form- Writing Code- Visual Studio Debugging- The Anatomy of an ASP.NET Application- Server controls- The HTML Control Classes-Page Class-Application Events-Web Control Classes-List Controls-Table Controls-Web Control Events and AutoPostBack.

UNIT - III

Error Handling, and Tracing: Exception Handling-Page Tracing-**State Management**: View State-Transferring information between Pages-Cookies-Session States- Session States Configuration- Application State-**Validation**: Understanding Validation -**Rich Controls**: Calendar-AdRotator-Pages with multiple Views-User Controls.

UNIT - IV

ADO.NET: The Data Provider Model- Direct Data Access- Disconnected Data Access-Data Binding: Single Value Data Binding-Repeated Value Data Binding-Data Controls: GridView-Formatting the GridView-Selecting a GridView Row-Editing with the GridView-Sorting and Paging the GridView-Files and Streams: File System Information-Reading and Writing with Streams- Allowing File Uploads.

UNIT - V

XML: The XML Classes-Website Security: Authentication and Authorization-Forms Authentication- Windows Authentication- **Component**: Creating a Component- Properties and State- Data Access Components- Object Data Source- **Caching**: Output Caching-Data Caching-Caching with Dependencies.

Text Book

1. Matthew MacDonald, "Beginning ASP.NET 4 in C# 2010", APRESS, 2010.

Reference Books:

1. Matthew MacDonald," Pro ASP.NET 4 in C# 2010", APRESS, 2010.
2. Bill Evjen, Scott Hanselman, "Professional ASP.NET 3.5 in C# and VB", Wrox Publication,2011
3.Imar Spaanjaars, " Beginning ASP.NET 4 in C# and VB", Wrox Publication,2010

CORE COURSE –03- ADVANCED DATABASE MANAGEMENT SYSTEMS

Objective:

Acquire Knowledge of Database Models, Applications of Database Models and Emerging Trends

Unit-I

Relational and parallel Database Design: Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF and 4NF.

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Unit-II

Parellel Databases : I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization.

Distributed and Object based Databases: Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Distributed Query Processing.

Unit-III

Spatial Database: Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query.

Logic based databases: Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.

Unit-IV

XML Databases: XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments.

Unit-V

Temporal Databases: Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

Text Book

1. Abraham Silberschatz, Henry F Korth , S Sudarshan, “Database System Comcepts”, 6th edition , McGraw-Hill International Edition , 2011
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8th Edition, Pearson Education Reprint 2016.

Reference Books:

1. Ramez Elmasri, Shamkant B Navathe, “Fundamental of Database Systems”, Pearson, 7th edition 2016.
2. Thomas Connolly, Carolyn Begg., “Database Systems a practical approach to Design , Inmplementation and Management “, Pearson Education, 2014.

CORE COURSE- 04 - PRACTICAL – I – ALGORITHMS LAB

Objective:

To Solve the following problems using C/C++ as a tool

1. Binary Search method
2. Finding The Maximum And Minimum
3. Quick sort
4. Merge Sort
5. Selection of k^{th} smallest number
6. Job Sequencing With Deadlines
7. All pairs shortest path problem
8. Single Source Shortest path problem
9. Minimum spanning tree
10. 8-Queens Problem
11. Sum of Sub sets Problem

CORE COURSE- 05 - PRACTICAL – II – ADVANCED WEB TECHNOLOGY LAB

Objective:

To develop interactive web pages using .NET Technologies and to develop Web services.

1. Create a simple class for Employee using appropriate data members and member functions.
2. Create a simple personal web page using ASP.NET.
3. Create an ASP.NET web page for train timetable.
4. Create an application form to apply for a new course in a college, fill the information and submit it (Use Basic Web Server controls).
5. Design Sign Up form and validate User Name (Minimum 8 character Maximum 15 and only characters and under score), Password (Minimum 8 Characters) and Confirm_Password (Both should be same), Phone No (Only digits), Email-id etc. (Use Validation controls).
6. Design a web page to display list of fruits, vegetables, grains etc. (Use DataList Web Server controls). Display the selected fruit, vegetable and grain in a Label control.
7. Design a web page using ASP.Net to illustrate Exception handling in Block level and Page level.
8. Create an employee database and manipulate the records.
9. Create a web form for Online Library data entry (Use Application/Session Variables).
10. Create a web page to demonstrate Grid and Repeater controls.
11. Design a web page to display the XML content.
12. Design a web service for the following arithmetic operations: Add and Subtract. Appropriate Client forms to be designed to submit two integer or real numbers.
13. Design a web page to demonstrate Ouptput Caching.
14. Design a web page to demonstrate Fragment Caching.

ELECTIVE I - CLOUD COMPUTING

Objective:

The objective of this course is to provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications.

UNIT - I

Cloud computing definition- Characteristics- Benefit-Challenges- Distributed Systems- Virtualization-Service-oriented computing- Utility-oriented computing- Building Cloud Computing environments- computing platforms & technologies - Cloud Models – Cloud Service Examples - Cloud Based Services & Applications - Cloud concepts and Technologies.

UNIT - II

Virtualization : Characteristics- taxonomy-types- Pros and Cons- Examples Architecture: Reference model- types of clouds- Compute Service - Storage Services - Cloud Database Services - Application Services - Content Delivery Services - Analytics Services - Deployment And Management Service - Identity And Access Management Services - Open Source Private Cloud Software.

UNIT – III

Design consideration- Reference Architecture for Cloud Application - Cloud Application Design Methodologies - Data Storage Approaches- Development in Python: Design Approaches – Application: Image Processing - Document Storage - Map Reduce - Social Media Analytics.

UNIT – IV

Introduction- Installing Python- Data types & Data Structures- Control Flow- Functions- Modules- Packages- File Handling-Date/Time Operations – Classes- Python for Cloud: Amazon Web Services –Google Cloud Platform - Windows Azure –Map Reduced –Packages of Interest – Designing a RESTful Web API.

UNIT – V

Big Data Analytics: Clustering Big data - Classification of Big Data – Recommendation systems. Multimedia Cloud: Case Study: Live Video Stream App - Streaming Protocols – Case Study: Video Transcoding App-Cloud Security: CSA Cloud Security Architecture - Authentication - Authorization - Identity and Access management - Data Security - Key Management- Auditing- Cloud for Industry, Healthcare & Education.

Text books:

1. Buyya, Vecciola and Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Tata McGraw Hill, 2013.
2. ArshdeepBahga, Vijay Madisetti, "Cloud Computing: A Hands – On Approach" Universities press (India) Pvt. limited 2016.

References:

1. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2016.
2. Michael Miller "Cloud Computing Web based application that change the way you work and collaborate online". Pearson edition, 2008.

ELECTIVE I - DATA MINING

Objectives:

- To introduce the basic concepts of Data Mining
- To study the various techniques of Data mining
- To learn various algorithms used for Information Retrieval from Datasets

UNIT – I

Introduction: Data mining – Kind of Data – Kinds of Patterns – Major issues in Data mining – Data Warehouse - Introduction of Functionalities – Classification – Introduction to Data Warehousing – Modeling: Data cube and OLAP

UNIT - II

Data Preprocessing : Preprocessing the Data – Data cleaning – Data Integration, Data reduction Data Transformation and Data discretization.

UNIT - III

Mining Association Rules: Basic Concepts - Frequent itemset mining - Mining Multilevel associations – Mining Multi dimensional associations – Mining Quantitative associative rules – mining rare patterns and negative patterns

UNIT - IV

Classification and Prediction: Introduction – Decision Tree Induction – Bayesian Classification – Rule based Classification - Classification of Back Propagation. Prediction – Classifier Accuracy.

UNIT - V

Cluster Analysis: Introduction – Types of Data in Cluster Analysis – Requirements of Cluster analysis - Partitioning Methods – Hierarchical Methods - Density Based Methods – Data mining applications.

Text book:

1. J.Han and M. Kamber, “Data Mining Concepts and Techniques”, 2001, Harcourt India Pvt. Ltd, New Delhi.

Reference Book:

1. K.P. Soman , Shyam Diwakar, V.Ajay “Insight into Data Mining Theory and Practice “, Prentice Hall of India Pvt. Ltd, New Delhi

ELECTIVE I - THEORY OF COMPUTATION

Objectives:

The learning objectives of this course are to introduce students to the mathematical foundations of computation including automata theory.

UNIT - 1

Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.

UNIT - II

Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

UNIT - III

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata.

UNIT - IV

Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM. A language that is not Recursively Enumerable (RE).

UNIT - V

An undecidable problem RE – Undecidable problems about Turing Machine – Post's Correspondence Problem – The classes P and NP.

Textbooks:

1. Peter Linz, "An Introduction to Formal Languages and Automata", Third Edition ,Narosa, 2005
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", second Edition, Pearson Education, 2007.

Reference Books:

1. H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education, 2003.
2. Thomas A. Sudkamp," An Introduction to the Theory of Computer Science,Languages and Machines", Third Edition, Pearson Education, 2007.
3. Raymond Greenlaw an H.James Hoover, " Fundamentals of Theory of Computation, Principles and Practice", Morgan Kaufmann Publishers, 1998.

CORE COURSE – 06 - DISTRIBUTED OPERATING SYSTEM

Objectives:

- To study Distributed Operating System concepts
- To understand hardware, software and communication in distributed OS
- To learn the distributed resource management components.

UNIT - I

Introduction to Distributed Systems: Advantages of Distributed Systems over centralized Systems – Advantages of Distributed Systems over Independent Systems - Hardware Concepts – Software Concepts – Design Issues: Transparency, Flexibility, Reliability, Performance and Scalability - Communication in Distributed Systems: Layered Protocols.

UNIT - II

Communication Models: The Client-Server Model - Remote Procedure Call – Group Communication - Synchronization in Distributed Systems: Clock Synchronization – Mutual Exclusion – Election Algorithms – Deadlocks in Distributed Systems: Distributed Deadlock Detection – distributed Deadlock Prevention.

UNIT - III

Processes and Processors in Distributed Systems: Threads – System Models - Processor Allocation: Design issues, Implementation issues – Processor allocation algorithms - Distributed File Systems: Distributed File System Design - Distributed File System Implementation -Trends in Distributed File Systems.

UNIT - IV

Distributed Shared Memory: Introduction - Consistency Models: Strict, Sequential, Causal and Weak Consistencies – Page Based Distributed Shared Memory: Replication, Granularity, achieving sequential consistency, Finding the owner and copies – Object-Based Distributed Shared Memory.

UNIT – V

Multiprocessor Systems: Bus based Multiprocessor – Ring based Multiprocessor – NUMA Multiprocessor - Basic Model of Real Time Distributed Systems - Characteristics- Applications of Real Time Systems - Fault Tolerance in Distributed Systems - Features of Android Operating System and Linux Operating Systems.

Text book:

1. Andrew S. Tanenbaum , "Distributed Operating Systems" , Pearson Edition, 2006.

Reference books:

1.Abraham Silberschatz, Peter B.Galvin, G.Gagne, "Operating Concepts", 6th Edition Addison Wesley publications 2003.

2. MukeshSinghal, N.G.Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill 2000.

CORE COURSE – 07 - ADVANCED JAVA PROGRAMMING

Objectives:

- To deepen student's programming skills by analyzing the real world problem in a programmer's point of view and implement the concepts in real time projects
- To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming.

UNIT - I

Introduction – Servlet Architecture - Servlet Life Cycle-Generic Servlet, Http Servlet-Performing URL redirection-Session Tracking-Using JDBC in Servlets.

UNIT – II

Introduction – JDBC Architecture-Types of Drivers-Statement- Resultset - Prepared Statement-Batch Update - Callable Statement-Creating a New Database and Table with JDBC.

UNIT - III

Java Beans :The Component Model-JavaBeans Architecture-Writing simple beans –
EJB : EJB Component Model-Enterprise JavaBeans-Entity Beans-Session Bean-Message driven beans.

UNIT - IV

Overview – Developing Applications with RMI: Declaring & Implementing Remote Interfaces-Stubs & Skeletons, Registering Remote Objects, Writing RMI Clients –Pushing Data from RMI Servlet.

UNIT - V

Introduction JSP - Examining MVC and JSP - JSP Scripting Elements & Directives - Working with Variables Scopes - Error Pages - Using Java Beans in JSP.

Text Books:

1. J. McGovern, R. Adatia ,Y. Fain and et al, " J2EE 1.4 Bible", Wiley India Pvt. Ltd; 2003.
2. H. Schildt, " Java 2 : "The Complete Reference", 5th Edition, Tata McGraw -Hill, 2002.

Reference Books:

1. Janson Hunter, "Java Servlet Programming", 2nd Edition, O' Reilly Media, 2007.
2. H. M. Deitel and P. J. Deitel, "JAVA: How to Program", 6th Edition, PHI, 2005.
3. D. R. Callaway, " Inside Servlets", Pearson Education, 2007.
4. Joseph O'Neil, " JavaBeans from the Ground Up", Tata McGraw - Hill, 1998.
5. Tom Valesky, "Enterprise JavaBeans", Pearson Education, 2008.

CORE COURSE- 08 - COMPILER DESIGN

Objectives: **Credits : 4**

- Discover principles, algorithms and techniques that can be used to construct various phases of compiler.
- Acquire knowledge about finite automata and regular expressions and learn context free grammars, compiler parsing techniques.

Unit – I

Lexical analysis - Language Processors, The Structure of a Compiler, Parameter passing mechanism – Symbol table - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – Finite automata - Regular expression to automata.

Unit – II

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers.

Unit – III

Semantic Analysis - Inherited and Synthesized attributes – Dependency graphs – Ordering the evaluation of attributes – S-attributed definitions – L-attributed definitions – Applications of Syntax Directed translation – Syntax Directed translations schemes - Storage organization – Stack allocation of space.

Unit – IV

Intermediate Code Generation - Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements - Procedure calls.

Unit – V

Code Generation and Code Optimization - Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peephole Optimization.

Text Book:

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers- Principles, Techniques and Tools", Second Edition, Pearson Education Asia, 2009.

References Books:

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools, Addison-Wesley, 2003.
2. Kennath C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.
3. S.Godfrey Winster, S.Aruna Devi, R.Sujatha, "Compiler Design", yesdee Publishers, Third Reprint 2019.

CORE COURSE 09 -PRACTICAL – III - ADVANCED JAVA PROGRAMMING LAB

Objectives:

- To enable the students to learn and explore the knowledge in Advanced Java Programming.

1. HTML to Servlet Communication
2. Designing Online Applications with JSP
3. Creating JSP program using JavaBeans
4. Working with Enterprise JavaBeans
5. Performing Java Database Connectivity.
6. Implement a Client/Server application using RMI.
7. Update a given Table using Batch Update.
8. Designing Employee Details Applications with JSP.
9. Program for Payroll using JDBC.
10. Creating Mark Sheet using Tables with JSP.

ELECTIVE – II OPTIMIZATION TECHNIQUES

Objective

- To understand the concept of optimization
- To develop mathematical model of real life cases
- To study Optimization algorithms

UNIT – I

Linear Programming Problem (LPP): Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem. Simplex method, Two phase simplex method

UNIT – II

Duality in LPP- dual problem to primal- primal to dual problem-duality simplex method-Revised simplex method-revised simplex algorithm-revised simplex method versus simplex method

UNIT – III

Transportation Model: North West corner Method, Least cost method, and vogel's approximation method. Determining Net evaluation-Degeneracy in TP- Assignment Model : Hungarian assignment model – Travelling sales man problem.

UNIT – IV

Replacement Problem: Replacement policy for equipment that deteriorate gradually, Replacement of item that fail suddenly-Individual and group replacement, Problems in mortality and staffing.

UNIT – V

Project Scheduling PERT/CPM Networks – Fulkerson's Rule – Measure Of Activity – PERT Computation – CPM Computation – Resource Scheduling.

Textbooks:

1. KantiSwarup, P.K. Gupta &Manmohan – Operation Research 1996.
2. S.Kalavathy: Operations Research – Second Edition – Vikas Publishing House Pvt.Ltd.,
3. S.Godfrey Winster, S. Aruna Devi, R.Sujatha, "Compiler Design", Yesdee Publishing.

References:

1. D.Shanthi, N.Uma Maheswari, S.Jeyanthi, "Theory of Computation", Yesdee Publishing.
2. John W.Chinneck, "Feasibility and Infeasibility in Optimization-Algorithms and Computatonal Methods ", Springer, 2015.

ELECTIVE – II SCIENTIFIC COMPUTING

Objective

- To understand the concept of scientific computing
- To study the numerical differentiation and integration methods.

UNIT - I

Bisection methods – Fixed point Iteration method – Newton Raphson method – Graffe's squaring method – Secant method

UNIT - II

Solution of Simultaneous linear equations – Matrix Inversion method – Gauss Elimination – Gauss Jordan methods – Gauss Seidel method – Gauss Jacobi iterative methods

UNIT- III

Newton's divided difference interpolating polynomials – Lagreange's and Hermite's polynomials – Newton forward and backward difference formula – String's and Bessel's Central difference formula – Numerical differentiation using Newton's forward and backward interpolation formula

UNIT - IV

Numerical integration by Trapezoidal rule, Simpon's 1/3 and 3/8 rules – Double integral using Trapezoidal and Simpson's rules.

UNIT - V

Taylor series method for simultaneous first order and second order differential equations– Modified Euler's method – Runge Kutta method for simultaneous differential equations – RK second order and fourth order methods.

Text Books :

1. Steven C. Chapra and Raymond P. Camale, "Numerical Methods for Engineering", 5th Edition, Tata McGraw Hill, 2008.
2. S.S.Sastry, "Introdcutory Methods of Numerical Analysis", 4th Edition, Prentice-Hall of India, 2008

Reference Books :

1. M.K.Jain, S.R.K. Iyengar and R.K.Jain, "Numerical Methods for Scientific and Engineering Computation", 5th Edition, New Age International (P) Ltd., 2007.
2. S. Arumugam, A. Thangapandi Issac and A. Somasundaram, "Numerical Methods", 2nd Edition, Scitech Publications Pvt. Ltd., 2008

V.Rajaram, "Computer Oriented Numerical Methods", 3rd Edition, PHI, 2005.

ELECTIVE II - DATA SCIENCE AND BIG DATA ANALYTICS

Objectives:

The course provides grounding in basic and advanced methods to big data technology and tools, including MapReduce and Hadoop and its ecosystem.

UNIT- I Big Data Overview – Data Structures – Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – Big Data Ecosystem - Data Ana lytics Lifecycle – Data Discovery – Data Preparation – Model Planning – Model Building – Communicate Results – Operationalize.

UNIT- II Introduction to R programming – R Graphical User Interfaces – Data Import and Export – Attribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Befor Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables Data Exploration Versus Presentation -– Statistical Methods of Evaluation : Hypothesis Testing – Difference of Means – Wilcoxon Rank-Sum Test – Type I and Type II Errors – Power and Sample Size – ANOVA..

UNIT-III Clustering – K Means – Use Cases – Overview – Determining number of clusters – Diagnostics – Reasons to choose and cautions – Additional Algorithms - Association Rules : A Priori Algorithm – Evaluation of Candidate Rules – Applications of Association Rules – Validation and Testing – Diagnostics. Regression : Linear Regrression and Logistic Regression :– Use cases – Model Description – Diagnostics - Additional Regression Models.

UNIT- IV Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Na'ive Bayes – Bayes Theorem – Naïve Bayes Clasifier – Smoothing – Diagnostics – Naïve Bayes in R – Diagnostics of Classifiers – Additional Classification Methods - Time Series Analysis : : Overview – Box – Jenkins Methodology – ARIMA Model – Autocorrelation Function – Autoregressive Models – Moving Average Models – ARMA and ARIMA Models – Building and Evaluating and ARIMA Model - Text Analysis : Text Analysis Steps.

UNIT- V MapReduce and Hadoop : Analytics for Unstructured Data .- *UseCases* - *MapReduce* - Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase – Manout – NoSQL - Tools in Database Analytics : SQL Essentials – Joins – Set operations – Grouping Extensions – In Database Text Analysis - Advanced SQL – Windows Functions – User Defined Functions and Aggregates – ordered aggregates- MADiib - Analytics

Reports Consolidation – Communicating and operationalizing and Analytics Project – Creating the Final Deliverables : Developing Core Material for Multiple Audiences – Project Goals – Main Findings – Approach Model Description – Key points support with Data - Model details – Recommendations – Data Visualization

Text Book :

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services Published by John Wiley & Sons, Inc. 2015

Reference Books :

1. Noreen Burlingame , "The little book on Big Data", New Street publishers, 2012.
2. Anil Maheshwari, " Data Analytics", McGraw Hill Education, 2017.
3. Sandip Rakshit, "R for Beginners", McGraw Hill Education, 2017
4. http://www.johndcook.com/R_language_for_programmers.html.
5. http://bigdatauniversity.com/.
6. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction.

ELECTIVE III - CRYPTOGRAPHY AND NETWORK SECURITY

Objectives:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- To know about the malicious software & firewalls.

UNIT- I

Security trends – Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT- II

Symmetric Encryption and Message Confidentiality - Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4 , Chipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. Public-key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures, Key Management.

UNIT- III

Authentication Applications - Kerberos, x.509 Authentication Service, Public-Key Infrastructure. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.

UNIT- IV

IP Security - IP Security Over view, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations. Web Security: Web Security Considerations, Secure Socket Layer(SSL) and Transport Layer Security(TLS), Secure Electronic Transaction(SET).Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3.

UNIT- V

Intruders - Intruders, Intrusion Detection, Password Management. **Malicious Software:** Virus and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. **Firewalls:** Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

Text books:

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007, Reprint 2015.
2. Stallings William, “Cryptography and Network Security - Principles and Practice” 2017.

References Books:

1. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms And Protocols”, Wiley Publications, 2003.
2. Charles Pfleeger, “Security In Computing”, 4th Edition, Prentice Hall Of India, 2006.
3. Ulysess Black, “Internet Security Protocols”, Pearson Education Asia, 2000.
4. Charlie Kaufman And Radia Perlman, Mike Speciner, “Network Security, Second Edition, Private Communication In Public World”, PHI 2002.
5. Douglas R Simson “Cryptography – Theory And Practice”, First Edition, CRC Press, 1995.
6. Http://Nptel.Ac.In/.

ELECTIVE III MOBILE COMPUTING

Objectives

- Understand the basic concepts of mobile
- Be familiar with GPRS Technology
- system Be exposed to Ad-Hoc networks
- Gain knowledge about different mobile platforms and application development

UNIT - I

Wireless Communications, Frequency of Radio Transmission, Signals ,Antennas ,Signal Propagation, Multipath propagation, Multiplexing :Space Division Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing-Modulation-Spread Spectrum.

UNIT –II

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.
Telecommunications Systems : GSM –Mobile Service, System Architecture.

UNIT-III

Advantage of Wireless LAN-Setting for WLAN-WLAN Technologies-IEEE 802.11 : System Architecture-HIPERLAN-Bluetooth.

UNIT-IV

IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP-Adhoc Networks-Routing Algorithms: DSDV-DSR.

UNIT – V

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. WAP: Reasons ,goals and architecture of WAP.

Text Books:

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007, ISBN: 0195686772

References:

1. C.Siva Ram Murthy, B.S. Manoj, ”Ad Hoc Wireless Networks – Architectures and Protocols”, 2nd Edition, Pearson Education. 2004
2. Ashok K Talukder, Roopa R Yavagal, “Mobile Computing”, Tata McGraw Hill, 2005.
3. William Stallings,”Wireless Communications & Networks”, Pearson Education, 2009.

ELECTIVE III - EMBEDDED SYSTEMS

Objectives:

This course will enable students to:

- Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Learn the development life cycle of embedded system

UNIT- I

Introduction to Embedded system - Embedded system vs General computing systems - History - Classification - Major Application Areas - Purpose of Embedded systems - Smart running shoes: The innovative bonding of lifestyle with embedded technology. Characteristics and Quality Attributes of Embedded systems

UNIT- II

Elements of an Embedded system - core of the embedded system: General purpose and domain specific processors, ASICs, PLDs, COTS - Memory - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces - Embedded Firmware - Reset circuit, Brown-out protection circuit, Oscillator unit, Real-time clock, and Watchdog timer - PCB and Passive Components

UNIT- III

Embedded Systems - Washing machine: Application-specific - Automotive: Domain specific.
Hardware Software Co-Design - Computational Models - Embedded Firmware Design Approaches - Embedded Firmware Development Languages - Integration and testing of Embedded Hardware and firmware.

UNIT-IV

RTOS based Embedded System Design: Operating System Basics - Types of operating Systems - Tasks, process and Threads - Multiprocessing and Multitasking - Task Scheduling- Task Communication - Task Synchronisation - Device Drivers - choosing an RTOS.

UNIT- V

Components in embedded system development environment, Files generated during compilation, simulators, emulators and debugging - Objectives of Embedded product Development Life Cycle - Different Phases of EDLC - EDLC Approaches - Trends in Embedded Industry - Case Study: Digital Clock.

Text Book:

1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 2009.

Reference Books:

1. Raj Kamal, “Embedded Systems: Architecture, Programming and Design”, TMH. Second Edition 2009
2. Frank Vahid, Tony Givargis, “Embedded System Design”, John Wiley. Third Edition 2006
3. Cliff Young, Faraboschi Paolo, and Joseph A. Fisher, "Embedded Computing: A VLIW Approach to Architecture, Compilers and Tools", Morgan Kaufmann Publishers, An imprint of Elsevier, 2005.

Extra-Disciplinary Subject – I - (to be offered to the other Departments as EDC)
ADVANCED COMPUTING SKILLS

Objectives :
The paper introduce the basis of office automation software and information management

UNIT - I WORD PROCESSING WITH WORD

Word Basics - Formatting Text – Working with Headers, Footers and Footnotes – Tabs, Tables and Sorting – Working with Graphics - Templates and Wizards –Introduction to Mail Merge.

UNIT - II WORKING WITH EXCEL

Excel Basics – Rearranging Worksheets – Excel Formatting Tips and Techniques -Functions – Chart Features – Using Worksheets as Databases.

UNIT - III PRESENTING WITH POWERPOINT

PowerPoint Basics – Creating Presentations – Working with Text in PowerPoint – Importing Images and Inserting Photos, Videos and Sound in PowerPoint Presentation – Slide Show: Showing, Deleting, Printing and Sharing Presentations.

UNIT - IV MANAGING DATABASES WITH ACCESS

Introduction to Access – Creating a Simple Database and Tables – Forms – Entering and Editing Data – Finding, Sorting and Displaying Data – Printing Reports and Forms.

UNIT - V INFORMATION MANAGEMENT

Microsoft Mail and Office Applications: Word Documents and E-Mail – Excel and Mail – PowerPoint and Mail – Overview of Object Linking and Embedding – Linking : To Link an Existing Object – Breaking Links – Locking and Unlocking Links – Troubleshooting Links – Embedding.

Note : All units need an approach through practical exposure.

TEXT BOOKS

1. Ron Mansfield ,"Working in Microsoft Office", Tata McGraw-Hill, 2008.

REFERENCE BOOKS

1. Stephen L. Nelson and Julia Kelly, "Office XP: The Complete Reference", Tata McGraw-Hill, 2006.
2. ISRD Group, "Introduction to Database Management Systems", Tata McGraw-Hill, 2008.

CORE COURSE – 10 - DIGITAL IMAGE PROCESSING

Objectives:

To provide complete knowledge on DIP methods, such as image processing methods in Spatial domain and Frequency domain, Edge detection, Compression, Segmentation.

UNIT–I

Fundamentals: Image Sensing and Acquisition, Image Sampling and Quantization, relationship between Pixels; Image processing models: Causal, Semi-causal, Non-causal models.

Color Models: Color Fundamentals, Color Models, Pseudo-color Image Processing, Full Color Image Processing, Color Transformation, Noise in Color Images.

UNIT–II

Spatial Domain: Enhancement in spatial domain: Point processing; Mask processing; Smoothing Spatial Filters; Sharpening Spatial Filters.

Frequency Domain: Image transforms: FFT, DCT, Karhunen -Loeve transform, Hotlling's T^2 transform, Wavelet transforms and their properties. Image filtering in frequency domain.

UNIT–III

Edge Detection: Types of edges; threshold; zero-crossing; Gradient operators: Roberts, Prewitt, and Sobel operators; residual analysis based technique; Canny edge detection. Edge features and their applications.

UNIT–IV

Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory. Error Free Compression: Huff-man coding; Arithmetic coding; Wavelet transform basedcoding; Lossy Compression: FFT; DPCM; MRFM based compression; Wavelet transform based; Image Compression standards.

UNIT–V

Image Segmentation: Detection and Discontinuities: Edge Linking and Boundary Deduction; Threshold; Region-Based Segmentation. Segmentation by Morphological watersheds. The use of motion in segmentation, Image Segmentation based on Color.

Text Books:

1. Rafael Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, PHI/Pearson Education, 2013.
2. A. K. Jain, Fundamentals of Image Processing, Second Ed., PHI, New Delhi, 2015.

References Books:

1. B. Chan la, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.
2. Nick Elford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.
3. L.Prasad, S.S.Iyengar, "Wavelet Analysis with Applications to Image Processing", CRC Press, 2015.

CORE COURSE – 11 - INTERNET OF THINGS

Objective:

In order to gain knowledge on bases of Internet of Things (IoT), IoT Architecture, and the Protocols related to IoT.

UNIT- I

Introduction: Physical Design of IoT- Logical Design of IoT- IoT Enabling Technologies - IoT Levels & Deployment Templates. IoT Architecture: M2M (Machine to Machine) high-level architecture - IETF architecture for IoT - Open Geospatial Consortium (OGC) Architecture.

UNIT - II

IoT and M2M: Introduction to M2M – Differences between IoT and M2M - SDN and NFV for IoT. Need for IoT System Management – SNMP - Network operator requirements- NETCONF-YANG. Basic IoT Protocols: M2M, WSN, SCADA, RFID, IEEE 802.15.4 and Security.

UNIT - III

IoT Platforms Design Methodology IoT: Ten steps in IoT design methodology - IoT Physical Devices & Endpoints: RASPERRY PI - Raspberry Pi Interfaces - Programming Raspberry Pi with Python.

UNIT- IV

Data Analytics for IoT – Software & Management Tools - Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

UNIT - V

Case Studies and Real-World Applications: Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation and Smart cities.

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.

Reference Books:

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
2. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
3. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

CORE COURSE – 12 - MACHINE LEARNING

Objectives:

- To Learn about Machine Intelligence and Machine Learning applications
- To implement and apply machine learning algorithms to real-world applications.

UNIT I

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II

NEURAL NETWORKS AND GENETIC ALGORITHMS **:**Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III

BAYESIAN AND COMPUTATIONAL LEARNING **:** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV

INSTANT BASED LEARNING **:** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT V:

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

Text Book:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

References Books:

1. EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, "Genetic Algorithms and Genetic Programming", CRC Press Taylor and Francis Group.

CORE COURSE 13- PRACTICAL IV -MACHINE LEARNING USING PYTHON LAB

Objectives:

- To implement the Machine Learning applications using Python

1. Simple Programs

2. Demonstrate Scipy library

3. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file

4. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample

6. Bayesian Theorem

7. Naive Bayesian

8. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

9. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

10. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

11. Locally weighted Regression Algorithm.

ELECIVE IV – SOFTWARE PROJECT MANAGEMENT

Objectives:

This course will enable students to:

- Understand the framework of project management
- Learn to monitor and control the project and know the sound knowledge in Agile method

UNIT – I

Introduction to software project management : What is project – The project as a system – what is management – problems with software projects – Management control – Stakeholders – Requirement specification – Information and control in organizations – Overview of project planning – Stepwise project planning – Project evaluation.

UNIT – II

Selection of an appropriate project approach : – Introduction – Choosing technologies – Technical plan contents list – choice of process models – structured methods – Rapid application development – waterfall model – process model- V process model – the spiral model - software effect estimation: problems with over and under estimates – The basis for software estimating – software effort estimation techniques – expert judgment – estimating by analogy – Albrecht function point analysis – function points Mark II – Object points – A procedural code oriented approach – COCOMO : a parametric model – Activity planning.

UNIT – III

Risk management – The nature of risk – Managing risk – Risk identification – Risk analysis – reducing the risks – Evaluating risks to the schedule – calculating the Z values – Resource allocation : Scheduling – Cost schedules – Scheduling sequence.

UNIT – IV

Monitoring and control – Managing contracts – Introduction – Types of contracts-Stages in contract placement – Typical terms of a contract – Contract management – Acceptance – Managing people and organizing terms.

Unit – V

Software quality - Importance – ISO 9126 – External standard – Techniques to enhance s/w quality – Prince 2 – An overview.

Text Books:

1. Bob Hughes and Mike Cotterell – *Software Project Management* – Tata McGraw Hill

Reference Books:

1. Walker Royee – *Software Project Management* – A unified framework – Pearson Education

ELECTIVE IV - OBJECT ORIENTED SYSTEMS DEVELOPMENT

Objectives:

- Introduce the concept of Object-oriented design and understand the fundamentals of OOSD life cycle.
- Practice UML in order to express the design of software projects.

UNIT - I

Fundamentals of OOSD - Overview of Object Oriented Systems Development : Two orthogonal view of the software - OOSD methodology - Why an object Object orientation. Object basics: Object Oriented Philosophy- Objects – Attributes – Object respond to messages – Encapsulation and information hiding – class hierarchy – Polymorphism – Object relationship and associations. OOSD life cycle : Software development process – OOSD Use case Driven Approach – Reusability.

UNIT – II

Methodology, Modeling and UML - Object Oriented Methodologies: Rumbaugh et al.'s object modeling technique – The Booch methodology – The Jacobson et al. methodology – Patterns – Frameworks - The Unified approach. Unified Modeling Language : Static and dynamic models – Why modeling - UML diagrams – UML class diagram – Use case diagram

UNIT – III

Object Oriented Analysis - Object Oriented Analysis process : Business Object Analysis - Use case driven object oriented analysis – Business process modeling – Use-Case model – Developing effective documentation . Classification : Classifications theory – Approaches for identifying classes – Noun phrase approach – Common class patterns approach – Use-Case Driven approach – Classes, Responsibilities, and Collaborators - Naming classes. Identifying object relationships, attributes, and methods : Association – Super-Sub class relationship – Aggregation – Class responsibility – Object responsibility.

UNIT – IV

Object Oriented Design - Object Oriented Design Process and Design Axioms - OOD process- OOD axioms – Corollaries – Design patterns. Designing classes : Designing classes – Class visibility – Refining attributes – Designing methods and protocols – Packages and managing classes. Access layer: Object Store and persistence Designing Access layer classes. View Layer : Designing view layer classes – Macro level process – Micro level process – The purpose of view layer interface – Prototyping the user interface.

UNIT – V

Software Quality - Software Quality Assurance : Quality assurance tests – Testing strategies – Impact of Object Orientation on Testing - Test Cases- Test Plan – Continuous testing. System Usability and Measuring User satisfaction: Usability Testing – User satisfaction test – A tool for analyzing user satisfaction. System Usability and Measuring User satisfaction : Introduction – Usability Testing.

Text Book:

1. Ali Bahrami, "Object Oriented Systems Development using UML", McGraw-Hill, 2008

References Books:

1. Mahesh P.Matha, "Object-Oriented Analysis and Design Using UML", PHI Learning Private Limited, 2012.
2. Rachita Misra, Chhabi Rani Panigrahi, Bijayalaxmi Panda, "Principles of Software Engineering and System Design", Yesdee Publishing 2019.

ELECTIVE – IV SOFT COMPUTING

Objectives:

- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- Introduce students to artificial neural networks and fuzzy theory from an engineering perspective.

UNIT I

Introduction: Soft Computing Constituents – Soft Computing Vs Hard Computing – Characteristics - Applications - Artificial Neural Network (ANN): Fundamental Concept – Application Scope - Basic Terminologies – Neural Network Architecture – Learning Process – Basic Models of ANN: McCulloch-Pitts Model – Hebb Network – Linear Separability.

UNIT II

Supervised Learning Networks: Perceptron Networks – Adaline and Madaline Networks – Back Propagation Network – Radial Basis Function Network. Associative Memory Networks – BAM - Hopfield Network - Boltzmann Machine. Unsupervised Learning Networks: Kohonen Self Organizing Network – Counter Propagation Network – ART Network.

UNIT III

Fuzzy Sets: Basic Concept – Crisp Set Vs Fuzzy Set - Operations on Fuzzy Set – Properties of Fuzzy Sets – Fuzzy Relations: Concept – Fuzzy Composition – Fuzzy Equivalence and Tolerance Relation - Membership Functions: Features – Fuzzification – Methods of Membership value assignments – Defuzzification – Methods.

UNIT IV

Fuzzy Arithmetic – Extension Principle – Fuzzy Measures – Fuzzy Rules and Fuzzy Reasoning: Fuzzy Propositions – Formation of Rules – Decomposition of Rules – Aggregation of Rules – Approximate Reasoning – Fuzzy Inference and Expert Systems – Fuzzy Decision Making – Fuzzy Logic Control Systems.

UNIT V

Genetic Algorithm: Fundamental Concept – Basic Terminologies – Traditional Vs Genetic Algorithm - Elements of GA - Encoding - Fitness Function – Genetic Operators: Selection – Cross Over - Inversion and Deletion - Mutation – Simple and General GA – The Schema Theorem - Classification of Genetic Algorithm – Genetic Programming – Applications of GA.

Text Book:

1. S.N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, Wiley India, 2007.

Reference Book

S. Rajasekaran, G.A.V. Pai, “Neural Networks, Fuzzy Logic, Genetic Algorithms”, Prentice Hall India, 2004.

Extra-Disciplinary Subject – II - (to be offered to the other Departments as EDC)

INTERNET PROGRAMMING

COURSE OBJECTIVES

- To understand different Internet Technologies.
- To learn Java-specific web services architecture

UNIT I

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World Wide Web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers.

UNIT II

Introduction of HTML: Structure of HTML – Headings – Paragraphs – Lists – Text formatting – Colors – Backgrounds - Fonts – Links and Addressing – Images – Tables -Publishing HTML on web.

UNIT III

Style Sheets: Style sheet basics – Adding style to a document – CSS and HTML elements – Font properties – Text properties – Color properties.

UNIT IV

JavaScript: Purpose of Scripting – Including script in HTML document – JavaScript Language overview – Basic Validation.

UNIT V

Introduction to XML: XML Basics – Displaying XML using XSL – Displaying XML using Style Sheets.

Text Books:

1. Deitel and Deitel and Nieto, "Internet and World Wide Web – How to Program‖, Prentice"Hall, 5th Edition, 2011.
2. "The Complete Reference HTML" Thomas A. Powell, TMH.

References Books:

1. Stephen Wynkoop and John Burke ―Running a Perfect Website‖, QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, ―Web Technologies A Computer Science Perspective‖, Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., ―Web Technology, Prentice Hall of India, 2011.

INTERNSHIP

Internship is on-the-job training offered by a company/firm to the students to work at a firm for a limited period of time (during summer vacation of I year) as part of degree course.

To receive a satisfactory grade (S) for an internship course, a student must submit a report that satisfies the following criteria:
The report must be of professional quality, typed, and at least eight full, single-spaced pages in length. Title pages, employer letters, and bibliography pages will not be counted toward the page requirements. The report must contain, suggestions for content include general discussion of projects technical specifications of projects, what the intern learned, mistakes the intern made, activities the company provided for interns, and interactions with other employees and supervisors.
The report should accurately reflect the student's activity with the firm and contains no proprietary information or breach of confidentiality concerning the firm's products, procedures, etc.
The report will not be accepted unless it is accompanied by the employer's letter. The letter should be bound into the report in a report folder, and the folder should be submitted.

II YEAR - IV SEMESTER

CC XIV : PROJECT WORK

Each student will develop and implement individually a Project work which is an application (software or hardware or both) based on any emerging latest technologies. The Project work is to be carried out either in an R & D section of any Industry or Research Institute or University or in the Institute itself (i.e., in which the candidate is studying) within the duration of IV Semester. The Project work report shell be submitted through the Guides / Supervisors to the Head of the Department and then to this College not later than 20th April.

SOFT SKILL PAPERS

SS I : EMPLOYABILITY SKILLS

Objectives:

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations

UNIT - I

Making presentations – introducing oneself – introducing a topic – answering questions – individual presentation practice

Creating effective PPTs – presenting the visuals effectively

UNIT - II

Using appropriate body language in professional contexts – gestures, facial expressions, etc.

Preparing job applications - writing covering letter and résumé

UNIT - III

Applying for jobs online - email – job portals

Participating in group discussions – understanding group dynamics - brainstorming the topic

UNIT - IV

Training in soft skills - persuasive skills – People skills - questioning and clarifying skills – mock GD

UNIT - V

Attending job interviews – answering questions confidently

Interview etiquette – dress code – body language – mock interview

Reference Books:

1. Dhanavel, S.P. 2010. English and Soft Skills. Hyderabad: Orient BlackSwan Ltd.
2. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.
3. D'Abreo, Desmond A. Group Discussion and Team Building. Mumbai: Better Yourself Books, 2004.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh. The ACE of Soft Skills. New Delhi: Pearson, 2010.
5. Van Emden, Joan, and Lucinda Becker. Presentation Skills for Students. New York: Palgrave Macmillan, 2004.

Extensive Readers :

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press,1989.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

Web Resources:

1. www.humanresources.about.com
2. www.careerride.com

SSII : LEADERSHIP AND COMMUNICATION SKILLS

Objectives:

- To enhance the leadership quality of students with a special focus on communication skills.

UNIT- I

Leadership – Nature, Characteristics or Features of leadership – Objectives of leadership – Functions or Role of a leader – Qualities of a good leader – skills of a leader – Leader Vs. Manager – Leadership and management.

UNIT-II

Leadership styles – Autocratic leadership – Democratic leadership – Laissez-Faire leadership or Free Rein leadership – Bureaucratic leadership style – Supportive leadership – Charismatic leaders.

UNIT- III

Communication – Elements of Communication – Process of Communication – Essentials of Communication – Functions of Communication – Features of communication – Benefits of Communication – Principles of effective communication

UNIT - IV

Methods or types of communication – Formal communication – merits and demerits – Informal communication or Grapevine – merits and demerits – Rumour – Reasons for spread of remours – Negative impact of remours – Methods to deal with remours – Formal Vs. informal communication

UNIT - V

Oral communication – written communication – downward communication – upward communication – Horizontal communication – Types of communication networks.Barriers to communication – Steps to overcome barriers to communication

Text and Reference books:

1. Y.K.Bhushan, Business Organisation and Management, Sultan Chand & Sons 2012
2. C.B.Gupta, Business Organisation and Management, Mayur Paperbacks 2011
3. S.A.Sherlekar, Modern Business Organisation and Management – A System Approach, Himalaya, 2010.

SSIII : MANAGERIAL SKILLS

Objective:

To develop Leadership qualities, Office Etiquettes, Work Ethics and Conflict Management Skills in the young learners. .

UNIT - I Time Management
Organisational Awareness
Problem Solving
Leadership Qualities

UNIT – II Team work and office functional rule
Being knowledgeable of Hierarchy in Office
Conducting Interviews

UNIT – III Conducting Meetings
Writing Circulars, Agendas, Minutes of meetings and Passing resolutions

UNIT – IV Business Communication
Email
Project Proposals
Contracts
Job Application and CV

UNIT – V Office Etiquette
Dress Code
Communication
Maintaining healthy work relationship
Effective use of technology at workplace

Reference Books:

1. You can win – Shiv Khera
2. The Road to success –Napoleon Hill

SS IV :PERSONALITY DEVELOPMENT

Objectives:
Understanding one's own personality and nurturing it well enables one to be a fine Human Being and an effective Professional and this paper aims at helping the students to acquire the skills that would enable them to achieve the same.

UNIT - I
Personality: Definition – Determinants- Heredity- Environment-Situation-Self Awareness-Benefits of Self-Awareness

UNIT - II
Enhancing Self-Awareness: Self-analysis-Behaviour-Motivation-Modes of thinking- Modes of acting - Modes of interacting

UNIT - III
The "Big Five" Model:-Extroversion- Agreeableness-Emotional Stability- Conscientiousness - Openness to experience- Self-monitoring

UNIT - IV
Traits For Building Positive Personality:-Chief traits for building Personality – Conscious Programming-Subconscious Programming

UNIT - V
Personal Grooming:- Men-Dress – Shirts- trousers – Ties – Socks – Shoes –Belts – Watches – Hairstyles. Women -Dress – Hair – Shoes /Sandal – Bags– Accessories

Reference Books :

1. You Can Win : Shiv Khera
2. Road to Success – Napolean Hill
3. Hurlock, E.B.2006.Personality Development, 28th Reprint. New Delhi: Tata Mc Graw Hill
4. http://vrsiddhartha.ac.in/ece/files/personality%20development%20study%20material.pdf