Postgraduate Course in Computer Science
Course Structure

Subjects	Papers	Credits
Hard Core Theory	15	60
Soft Core Theory	3	6
Practical	7	28
Project work	1	8
Open Elective	1	2
Total	**27**	**104**

I Semester – M.Sc Computer Science

Course	Title of the Paper	Hours /Week	Marks IA	Exam	Tot	Credits	Lab
C1	Object Oriented Analysis and Design	4	30	70	100	4	Y
C2	Design and Analysis of Algorithms	4	30	70	100	4	Y
C3	Database Management Systems	4	30	70	100	4	Y
C4	Software Development Process	4	30	70	100	4	Y
C5	Statistics	4	30	70	100	4	N
L1	Design Lab	6	30	70	100	4	Y
L2	DBMS (Database Management Systems) Lab	6	30	70	100	4	Y
S1	Complementary skills - I	2	15	35	50	2	N
				Total Credit	750	30	

II Semester- M.Sc Computer Science

Course	Title of the Paper	Hours /Week	Marks IA	Exam	Tot	Credits	Lab
C6	Software Testing	4	30	70	100	4	N
C7	Data Mining	4	30	70	100	4	Y
C8	Enterprise Application Development	4	30	70	100	4	Y
C9	Operating Systems and Network Programming	4	30	70	100	4	Y
C10	**Elective 1 (one of the following)**	4	30	70	100	4	Y
	Cryptography and Security						
	Artificial Intelligence						
	Advanced Computer Networks						
L3	Enterprise Application and Data mining Lab	6	30	70	100	4	Y
L4	Network Programming Lab	6	30	70	100	4	Y
S2	Complementary skills - II	2	15	35	50	2	N
				Total Credit	750	30	

III Semester M.Sc Computer Science							
Course	**Title of the Paper**	**Hours /Week**	**Marks IA**	**Exam**	**Tot**	**Credits**	**Lab**
C11	Big Data Analytics	4	30	70	100	4	Y
C12	Web Application Development with Android	4	30	70	100	4	Y
C13	**Elective 2 (one of the following)**	4	30	70	100	4	Y
	Machine Learning						
	Embedded Systems						
	User Interface Design						
C14	**Elective 3 (one of the following)**	4	30	70	100	4	Y
	High Performance Computing and Cloud Computing						
	Compiler Design						
	Performance Modelling						
	Social Networks						
L5	Android and User Interface Lab	6	30	70	100	4	Y
L6	Big data Practical Lab	6	30	70	100	4	Y
S3	Complementary skills – III	2	15	35	50	2	N
OE	Open to the students of Other Disciplines	2	15	35	50	2	N
	1. Web Page Design						
				Total Credit	**700**	**28**	

IV Semester - M.Sc Computer Science							
Course	**Title of the Paper**	**Hours /Week**	**Marks IA**	**Exam**	**Tot**	**Credits**	**Lab**
C15	Internet of Things	4	30	70	100	4	Y
L7	Internet of Things Lab	6	30	70	100	4	Y
P1	Project work	16	60	140	200	8	Y
				Total Credit	**400**	**16**	

I Semester M.Sc

C1: OBJECT ORIENTED ANALYSIS AND DESIGN

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks :70**

Unit-I
13 Hours

Introduction:

An overview of object oriented systems development: Introduction, Why an object orientation? Overview of the united approach.

Object basics: Introduction. An object-oriented philosophy. Objects, Classes, Attributes. Object behavior and methods. Encapsulation and Information hiding. Class hierarchy. Polymorphism, Object relationships and associations. Aggregations and object containment. Case study.

Object-oriented systems development life cycle: Introduction. The software development process, Building high-quality software, Object oriented systems development : A use-case drive approach Reusability.

Unit - II
13 Hours

Unified Modeling Language: Introduction. Static and Dynamic models, Why modeling, Introduction to the unified modeling language. UML diagrams. UML class diagram, Use-case diagram UML dynamic modeling, Model management: Packages and model organizations, UML extensibility, UML meta-model.

Unit - III
14 Hours

Object Oriented Analysis:

Object oriented analysis Process: Identifying use cases: Introduction, Business object analysis: Understanding the business layer, Use-case object-oriented analysis: The unified approach, Business documentation. Case study

Object Analysis-classification: Introduction. Classifications theory, Approaches for identifying classes. Noun phase approach, Common class patterns approach Use-case driven approach, identifying classes and behaviors through Sequence/collaboration modeling. Classes, Responsibility and collaborators, Naming classes.

Identifying object relationships, Attributes and methods: Introduction, Associations, Super-sub class relationships, A-part of relationship-aggregation, Case study. Class responsibility: Identifying attributes and methods, Class responsibility: Defining attributes by analyzing use case and other UML diagrams, Defining attributes and Methods and messages for for any case study.

Unit-IV
14 Hours

Object Oriented Design:

The object-oriented design process and design axioms: Introduction. The object-oriented design axioms. Corollaries. Design patterns. Designing classes: Introduction. The Object-oriented design philosophy, UML object constraint language.

Designing classes: The processes. Class visibility: Designing well-defined public. Private and protected protocols. Designing classes: Refining attributes. Refining attributes for the Via Net bank projects. Designing methods and protocols. Designing methods for the Via Net bank objects, Packages and managing classes,

Access layer-Object storage and object interoperability : Introduction. Object store and

persistence: Object-oriented database management systems. Object-relational systems. Multi database systems, Designing access layer classes Case study

View layer :

Designing interface objects: Introduction. User interface design as a creative process, Designing view layer classes. Macro level process. The purpose of a view layer interface. Prototyping the user interface, Case study.

TEXT BOOKS

1. Object oriented systems development, Ali Bahrami [MCGrawHill]- 1998.

REFERENCES BOOKS

1. Object Oriented Design & Analysis by Grady Booch - 3rd Edition.
2. Object Oriented Modeling and Design by James Rumbaugh and others – 2nd Edition.

Note: Use Star UML Or Rational Software Architect as tool in the lab.

C2. DESIGN AND ANALYSIS OF ALGORITHMS

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks : 70**

Unit-I **9 Hours**

Introduction: Algorithm, Study of Algorithms, Analysis of Algorithms, Priori Analysis, Posteriori Analysis, Differences between Analysis and Profiling, Space Complexity, Time Complexity, Operation Counts, Step Counts, Asymptomatic Notations, Big-Oh-Notation, Omega Notation, Theta Notation, Insertion Sort, Horner's Method of Evaluating polynomial at given point.

Unit - II **9 Hours**

Divide And Conquer: Introduction, Control Abstraction for divide and conquer method, Maxmin problem, Linear Search, Binary search, Sorting, Merge Sort, Quick Sort, Multiplication of Two long Intergers, Strassen's Matrix Multiplication.

Unit - III **9 Hours**

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm; Single Source Shortest Paths.

Unit-IV **9 Hours**

Dynamic Programming: The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Single-Source Shortest Paths: General Weights, 0/1 Knapsack, The Traveling Salesperson problem.

Unit-V **9 Hours**

Decrease-And-Conquer Approaches, Space-Time Tradeoffs: Decrease-and-Conquer Approaches: Introduction, Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching.

Unit-VI **9 Hours**

Backtracking: General method, n - Queen's problem, Sum of subsets problem, graph coloring problem, Hamiltonian cycle. Approximation Algorithms for NP-Hard Problems – Traveling Salesperson Problem, Knapsack Problem, Parallel Algorithms for Prefix Computation, List Ranking, and Graph Problems

TEXT BOOKS

1. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2007.

REFERENCES BOOKS

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 3rd Edition, PHI, 2010.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai: Introduction to the Design and Analysis of Algorithms A Strategic Approach, Tata McGraw Hill, 2005.

C3. DATABASE MANAGEMENT SYSTEMS

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks : 70**

Unit-I **4 Hours**

DBMS Architecture

Basics of DBMS, Three-level schema Architecture, Centralized and Client/server Architectures, Data Models-Conceptual, Representational and Physical data models, Data Independence- logical and physical.

Unit - II **8 Hours**

Relational data model

Concept of a Relation Different types of Constraints, Relational algebra concepts. Functional Dependencies, Normalization concepts: First, Second, Third normal forms, Boyce-codd normal form.

SQL: Data Definition Language, Data Manipulation Language, Query-Sub queries, Nested Queries.

Unit - III **8 Hours**

Data Storage, Indexing, query processing and Physical design

Disk storage: Secondary storage devices, buffering of blocks, Primary file organizations, hashing techniques, parallelizing disk access using RAID technology. Indexing: Single Level indexing multilevel indexing. Algorithms: Algorithms for external sorting, select and join operations, project and set operations.

Unit-IV **10 Hours**

Unit4: Transaction Processing Concepts

Introduction, Transaction and processing concepts, desirable properties of transactions, transaction support in SQL. Concurrency Control techniques: Two-phase locking techniques for concurrency control, Recovery concepts, Recovery techniques based on Deferred Update, Recovery techniques based on Immediate Update.

Unit-V **12 Hours**

Query Optimization

Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Choice of Evaluation Plans, Materialized views Advanced Query Optimization: Motivation, Query Processing Phases, and Logical Query Optimization.

Unit-VI **12 Hours**

NoSQL Databases

Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MongoDBBasics: NOSQL Storage architecture, CRUD operations with Mongo DB, Querying, Modifyingand Managing NOSQL Data stores, Indexing and ordering data sets(Mongo DB/Couch DB/Cassandra).Advanced NOSQL ,NOSQL in CLOUD, Parallel Processing with Map Reduce, Big Data with Hive. Working with NOSQL.

TEXT BOOKS

1. Elmasri and Navathe: “Fundamentals of Database Systems”.
2. Database System Concepts 6th Ed., by Silberschatz, Korth and *Sudarshan.*

REFERENCE BOOKS

1. “Professional NOSQL” by ShashankTiwari, 2011, WROX Press The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing ,by Eelco Plugge, Tim Hawkins, Peter MembreyApress 2010.

C4. SOFTWARE DEVELOPMENT PROCESS

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I : Software Development Life cycle **9 Hours**

Waterfall Model, V model, Iterative model (emphasis on RUP), The 4 + 1 view for software development process, Agile software development process

Unit – II: Modeling of system **9 Hours**

a) Requirement engineering, analysis model and design engineering
Requirement engineering tasks, initializing the requirement
Engineering ,Process, requirement analysis, data modeling concepts,
Scenario Based modeling, flow-oriented modeling, class-based modeling
b) Structural aspects (components and connectors)

Unit – III:Use case modeling (behavioral aspects) **9 Hours**

a) Creating Behavioral model
b) Use cases, actors
c) Interaction stories ,Activity diagram

Unit-IV: Structural aspects of software system **9 Hours**

a) Model 2 architecture (a variation of MVC for enterprise systems)
b) Separation of concern
c) Loose coupling

Unit-V: GUI design aspects (The View design) and DAO objects, relation between GUI and DAO objects **9 Hours**

a) Screen navigation diagram
b) Identify input / output parts of screen
c) Identify primary fields (directly from models), calculated fields and calculations and ER diagram for the data

Unit-VI: Design of the Model part of the system and Quality assurance **9 Hours**

a) Realization of DAO in terms of entity objects, identify business logic.
b) Functions and responsibilities.
c) Quality Assurance.

TEXT BOOKS

1. An Integrated approach to Software Engineering by Pankaj Jalote,3rd Edition,Narosa Publishing House,2013.

2. Software Engineering by Roger S.Pressman,A Practitioner's approach,7th Edition,McGraw-HILL Publication,2010.

REFERENCES BOOKS

1. Software Engineering by Ian Sommerville,9th Edition,Pearson Education Ltd,2010 .
2. All About Agile: Management made easy-2012 by Kelly Wates
3. Documents of projects done by students of IIIT Bangalore under K V Dinesha's guidance
4. E-Book

i)http://java.sun.com/blueprints/corej2eepatterns/Patterns/DataAcessObject.html

ii) requirement based testing by Bender RBT,Inc - benderrbt.com

C5: STATISTICS

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks : 70**

Unit-I **10 Hours**

BASIC STATISTICS 1. Notion of Probability, Conditional Probability and Independence, Bayes' Theorem, Rules of Probability, Random Variables, Joint Distributions, Mathematical Expectation, Chebychev's inequality.

Unit - II **10 Hours**

Discrete Distribution: Bernouli, Binomial, Geometric, Negative Binomial, Poisson, Hypergeometric, Multinomial Distributions. Continuous Distributions: Uniform, Exponential, Gamma, Normal, Weibull, Beta, Distribution of function of Random variables.

Unit - III **10 Hours**

Data types, Measurement levels, Continuous and categorical variables. Sampling mean and variance, Sampling distributions based on normal, Estimation, Properties of point estimators, Confidence interval, Maximum likelihood and Bayes estimators, Prediction intervals.

Unit-IV **10 Hours**

Hypothesis testing, Single and multiple sample case, Chi-square tests, Goodness of fit test, non-parametric tests, Wilcoxon rank sum and sign rank tests, Kruskal-Wallis test, Friedman f test, Rank correlation coefficient.

Unit-V **14 Hours**

Introduction to linear modeling, Simple Regression, Correlation, Multiple Regression, Assumptions of Linear Regression – diagnosis and remedies.

TEXT BOOKS

1. Statistics for Management, Levin and Rubin

REFERENCES BOOKS

1. **The Elements of Statistical Learning** written by Trevor Hastie, Robert Tibshirani and Jerome Friedman
2. Introduction to Statistical Thought by Michael Lavine.
3. Using R for Introductory Statistics by John Verzani Publisher: Chapman & Hall
4. Basic Statistical and Modeling Procedures Using SAS (http://www-personal.umich.edu/~kwelch/b600/2015/B600_Statistical_Procedures_2015.pdf)
5. SAS/STAT® 9.1 User's Guide. Cary, NC (https://support.sas.com/documentation/onlinedoc/91pdf/sasdoc_91/stat_ug_7313.pdf)

II Semester M.Sc

C6. SOFTWARE ARCHITECTURE

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks: 70**

Unit-I **13 Hours**

Introduction: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Importance of software architecture; Architectural structures and views, Patterns categories, Pattern description.

Unit - II **13 Hours**

Architectural Patterns: Introduction, from mud to structure: Layers, Pipes and Filters, Blackboard. Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control. Adaptable Systems: Microkernel, Reflection.

Unit - III **14 Hours**

Some Design Patterns: Structural decomposition: Whole – Part; Organization of work: Master – Slave; Access Control: Proxy; Management: Command processor, view handler; Communication: Forwarder – Receiver, client – Dispatcher – Server , Publisher – Subscriber.

Pattern Systems: Introduction, Pattern classification, Pattern selection, Pattern systems as implementation guidelines, Evolution of Pattern Systems.

Unit-IV **14 Hours**

Patterns And Software Architecture: Introduction, Patterns in software architecture, enabling techniques for software architecture, Non functional properties of software architecture.

Pattern Mining: Pattern – Mining, Pattern Organization and Indexing, Methods and Tools, Algorithms, Data Structures and Patterns, Formalizing Patterns.

TEXT BOOKS

Pattern-Oriented Software Architecture A System of Patterns, Volume 1 **-** Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal - 2008.

REFERENCES BOOKS

Design Patterns- Elements of Reusable Object-Oriented Software E. Gamma, R. Helm, R. Johnson, J. Vlissides, Addison-Wesley – 3rd Edition.

C7: Data Mining

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks : 70**

Unit-I **9 Hours**

Introduction to Data Warehousing and Data Mining: Component and Processes, ETL, Data Mart, Decision Support system, Executive Information system. What is Data Mining? Motivating Challenges; The origins of data mining, Data Mining Tasks.

Unit - II **9 Hours**

Data: Types of Data; Data Quality; Data Preprocessing; Measures of Similarity and Dissimilarity. Exploring Data: OLAP, Multidimensional Data Analysis, Data cube model,Visualization.

Unit - III **9 Hours**

Classification: Preliminaries; General approach to solving a classification problem, Decision tree induction,ID3,CD4,CART Algorithms, Rule-based classifier; Nearest-neighbor classifier.

Unit-IV **9 Hours**

Association Analysis: Problem Definition, Frequent Item set generation; Rule Generation , Compact representation of frequent item sets, Alternative methods for generating frequent item sets. FP-Growth algorithm, Evaluation of association patterns, Effect of skewed support distribution, Sequential patterns.

Unit-V **9 Hours**

Cluster Analysis: Overview, K-means, Agglomerative hierarchical clustering, DBSCAN, Overview of Cluster Evaluation.

Unit-VI **9 Hours**

Further Topics in Data Mining: Multidimensional analysis and descriptive mining of complex data objects; Spatial data mining, Multimedia data mining; Text mining. Applications: Data mining applications, Additional themes on Data mining; Social impact of Data mining;Trends in Data mining.

TEXT BOOKS

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining , Pearson Education.
2. Jiawei Han and Micheline Kamber: Data Mining – Concepts and Techniques, 3nd Edition, Morgan Kaufmann.

REFERENCES BOOKS

1. K.P.Soman, Shyam Diwakar, V.Ajay: Insight into Data Mining – Theory and Practice, PHI.

C8. ENTERPRISE APPLICATION DEVELOPMENT

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks: 70**

Unit-I **9 Hours**

CSS: Selectors , Integrating CSS, CSS background, text, CSS fonts, links, lists, tables, CSS box model, CSS border, margin, padding, CSS grouping/Nesting, CSS positioning, CSS floating, CSS pseudo-class & element, CSS image, opacity.

Unit - II **9 Hours**

Java Script: Integrating JavaScript with HTML , JS statements, JS objects, JS operators, JS functions, JS validations, HTML DOM, Dom events, DOM nodes, JS string, JS date, JS RegExp, JS window, JS screen, JS location, JS history, JS navigator, JS pop ups , JS timing, JS cookies.

Unit - III **9 Hours**

Introduction to J2EE and Web Containers: Need for Enterprise Programming, J2EE Advantage, Enterprise Architecture Type, Architecture of J2EE, Introducing J2EE containers, Types of J2EE Technologies.

Understanding the HTTP Protocols, Introducing Web Applications and Web Containers Web Application Life Cycle, Creating a Web Application, EJB Centric Application.

Unit-IV **9 Hours**

Servlet, Sessions and Database Connectivity: Introduction to Servlet, Servlet Life Cycle, Java Servlet API, Servlet Context, Servlet Collaboration, Introduction to Session Management, Session Tracking mechanism, Understanding JDBC ,JDBC architecture , JDBC drivers.

Unit-V **9 Hours**

JSP and JSTL: JSP Introduction, Life Cycle, JSP API, JSP Scripting elements, Implicit Objects, JSP Directive Elements, JSP Exceptions, Action Elements.

Using the JSTL, Getting a JSTL Functional Overview, Tags in JSTL, Core Tag Library, XML Tag Library, SQL Actions, SQL Action Relation to JSTL**.**

Unit-VI **9 Hours**

RMI and Web services: Understanding RMI , RMI Architecture, Stubs and Skeletons.

Web services: Introduction, Architecture, Components-SOAP,WSDL and UDDI, SOAP Web services, RESTful Web services.

TEXT BOOKS

1. Java Server Programming Java EE7(J2EE 1.7) Black Book by Dreamtech.
2. Java 2 Enterprise Edition 1.4 (J2EE 1.4) Bible ,*Wiley* Publishing

REFERENCES BOOKS

1. Professional Java Server Programming, J2EE 1.3 Edition, Cedric Beust etal. (Wrox Press)
2. CodeNotes for J2EE: EJB, JDBC, JSP, and Servlets, Robert McGovern and Stuart

Charlton, edited by Gregory Brill (Random House)

C9. OPERATING SYSTEMS AND NETWORK PROGRAMMING

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks : 70**

Unit-I: INTRODUCTION **9 Hours**

Definition of operating system, system goals, System View and User View, Types of operating systems, components of operating systems, services, system structure-simple and layered approach.

Unit - II : DISTRIBUTED & NETWORK OPERATING SYSTEMS **9 Hours**

Introduction to distributed systems, advantages, Network OS; Remote login; remote file transfer. Distributed OS- data migration, computation migration, process migration, communication, communication protocols.

Unit – III: CASE STUDIES **9 Hours**

Single User System – MS-DOS, Multi User System – Windows, Linux.

Unit-IV: INTERPROCESS COMMUNICATION: Signals, Pipe and Fifo **9 Hours**

Concept of process, fork() function, signals-signal() function, SIGINT, SIG_DFL, SIGQUIT, SIGHUP and SIGALRM parameters, kill() function. Open signals. Pipes-creation of pipes, parent and child communication using pipes, FIFOS-creation, producer consumer example.

Unit-V: INTERPROCESS COMMUNICATION: Message Queues, Semaphores and Shared Memory **9 Hours**

Message queues-creation, information about message queue, sending and receiving message queues, sense of priority, Semaphores-creation, getting and setting semaphore values, semop() function. Shared memory-creation, attaching and detaching shared memory.

Unit-VI: ELEMENTARY SOCKETS **9 Hours**

Introduction to Socket Programming –Introduction to Sockets, Types of sockets Socket address Structures, Byte ordering functions, address conversion functions, Elementary TCP Sockets , socket, connect, bind, listen, accept, read, write, close functions ,Examples.

TEXT BOOKS

1. 1 Operating Systems Concepts Silberschatz , Galvin and Gagne.
2. W. Richard Stevens, Bill Fenner, Andrew M.Rudoff "UNIX NETWORK PROGRAMMING" Vol-I, PHI publications.
3. The C Odyssey Unix by MeetaGandhi, ThilakShattyand, Rajiv Shah (Bbp publications)

REFERENCES BOOKS

1. Beej's Guide to IPC. : (www.ecst.csuchico.edu/~beej/guide/ipc/)
2. Beej's Guide to Network Programming.(www.ecst.csuchico.edu/~beej/guide/net/)

C10. ELECTIVE 1 (Any One of the Following)
C10. CRYPTOGRAPHY AND NETWORK SECURITY

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks : 70**

Unit-I **9 Hours**

Introduction: Security Trends, The OSI Security Architecture ,Security Attacks, Security Services , Security Mechanisms,. A Model for Network Security.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.

Unit - II **9 Hours**

Block Ciphers and the Data Encryption Standard: Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles, Groups, Rings, and Fields, Modular Arithmetic, The Euclidean Algorithm.

Unit-III

Confidentiality Using Symmetric Encryption: Placement of Encryption Function,Traffic Confidentiality, Key Distribution, Random Number Generation.

Unit - IV **9 Hours**

Public-Key Cryptography and RSA:Principles of Public-Key Cryptosystems, The RSA Algorithm.

Digital Signatures and Authentication Protocols : Digital Signatures, Authentication Protocols, Digital Signature Standard.

Unit - V **9 Hours**

9 Hours

Electronic Mail Security - Pretty Good Privacy, S/MIME.

IP Security: IP Security Overview ,IP Security Architecture, . Authentication Header.

Unit-VI **9 Hours**

Web Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

System Security : Intruders, Intrusion Detection, Password Management, Viruses and Related Threats, Firewalls.

REFERENCES BOOKS

1. William Stallings, “Cryptography And Network Security – Principles and Practices”, Prentice Hall of India.
2. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill
3. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc
4. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”,Pearson Education.

C10. ARTIFICIAL INTELLIGENCE

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks: 70**

Unit-I **9 Hours**

Introduction: Definition, A.I Applications, A.I representation, Properties of internal representation, heuristic search techniques, Best-first search, mean and end analysis, A* and AO* algorithms.

Knowledge Representation: Predicate calculus, predicate and arguments, ISA hierarchy, frame notation, resolution, natural deduction, fuzzy logic, structure knowledge representations.

Unit - II **9 Hours**

Planning: Hierarchical Task Networking planning, planning and acting in Non-deterministic domains. Natural Language Processing: Introduction, understanding pragmatics, syntactic, semantic analysis, RTN, ATN, understanding sentences.

Unit - III **9 Hours**

Pattern Recognition: Introduction, the recognition and classification process, learning classification patterns, recognizing and understanding speech.

Unit-IV **9 Hours**

Learning: Learning as induction matching algorithms, learning in general problem solving concept learning.

Unit-V **9 Hours**

Neural Networks: Introduction, perception-qualitative analysis, neural net architecture and application

Unit-VI **9 Hours**

Expert Systems: Utilization and functionality, architecture of expert system, knowledge representation, knowledge acquisition and validation.

TEXT BOOKS

REFERENCES BOOKS

1. Artificial Intelligence, A Modern Approach, Second Edition by Stuart Russell and Peter Norvig .
2. Dan W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems", PHI - 2007.
3. E.Charnaik and Mc Dermott, "Introduction to Artificial Intelligence", Pearson Education – 2nd Edition.

C10. ADVANCED COMPUTER NETWORKS

Lecture Hrs : 54 **Internal Marks : 30** **Exam Marks : 70**

Unit-I: Introduction and Layered Network Architecture **9 Hours**

Introduction to Computer Networks, Classification and Benefits of networks. Basics of Telecommunication: Channels, Analog & Digital signals and lines, Bandwidth & Bit-rate, Distortion & Noise, Transmission error, Synchronization, Multiplexing, PSTN architecture, Modulation, Modems, Switching techniques. Layered Network Architecture: Introduction to layered architecture; Characteristics And benefits, OSI model and TCP/IP model, and their comparison.

Unit – II: Point – to- Point Protocols and Links **9 Hours**

Introduction, The Physical Layer: Channels and Modems, Error Detection and Correction codes: Character parity, CRC, Hamming code, Convolution code, ARQ: Retransmission Strategies, Framing

Unit – III: Multi-Access Communication **9 Hours**

Introduction: Satellite Channels, Multi-drop Telephone Lines, Multi-tapped Bus. Slotted Multi-access and the Aloha System, Splitting Algorithms, Carrier Sensing (Ethernet LAN, IEEE 802.3), Collision-free protocols: Bit-map protocol and Token-ring protocol (IEEE 802.5), Multi-Access Reservations, Packet Radio Networks, Repeaters, Bridges, Switches and Routers

Unit-IV: Routing in Data Networks **9 Hours**

Introduction – Main Issues in Routing, WAN – An Overview, Interconnected Network Routing. Optimal Routing and Topological Design, Characterization of Optimal Routing. Static and Dynamic routing algorithms: Shortest Path Routing, Flooding, Flow-based routing, Distance Vector routing, Link-state routing. Broadcasting and multicasting.

Unit-V: Internet Protocol **9 Hours**

IPv4 addresses: classes, Public and Private addresses, class full address, classless address, IPv6 addresses: address space, structure, Subnetting and Masking, IP Header / Frame,

Unit-VI: Flow Control and Congestion control **9 Hours**

Introduction: Difference between Flow control and Congestion control, measures of Congestion control. Main Objectives of Flow and Congestion Control. Means of Flow Control: Window Flow Control, Rate Control Schemes, Congestion control Algorithms: Leaky bucket algorithm, Token bucket algorithm, Choke packets, Load shedding

TEXT BOOKS

1. Data Networks byDimitriBertsekas and Robert Gallager, Second Edition, PHI publications.
2. Computer Networks by Andrew S. Tanenbaum, 6thEdition , PHI publications.

REFERENCES BOOKS

1. Data Communications and Networking by Behrouz A. Forouzan, Fourth Edition, McGraw-Hill publications

III Semester

C11. INTRODUCTION TO DATA ANALYTICS WITH TOOLS

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I **9 Hours**

Preparatory: Data Science landscape, relevance and importance of data analytics, Data sources: Social data - from organizations like WHO and social sites like face book. Government data - like data.gov.in, Data from own organization, Data formats: Structured, Semi-structured, Unstructured , Excel for presentation and simple visualization of structured data. Raw and Processed Data, Components of Tidy Data, Downloading Files, Reading Local Files, Reading Excel Files, Reading XML, Reading JSON, Reading from MySQL, Reading from HDF5, Reading from The Web, Reading From APIs.

Unit - II **9 Hours**

Data preparation / Munging: Subsetting and Sorting, Summarizing Data, Handling missing values, Creating New Variables, Reshaping Data, Merging Data.

Unit - III **9 Hours**

Data Exploration: Exploratory Graphs

Unit-IV **9 Hours**

Data Modelling: Data grouping, frequency, and aggregation, Handling missing data, Text manipulation and format conversion, Assertions and logical operations

Unit-V **9 Hours**

Analysis: Mathematical functions,Sampling , Relationship between variables, Rank and percentile Time series analysis, Descriptive statistical measures, Confidence level, Analysis of variance, Correlation Covariance, Regression, Moving average

Unit-VI **9 Hours**

Visualization Comparison among items, Comparison over time, Relationship - two variables and three variables, Distribution - histogram, line chart, scatter chart, 3D area chart, Composition - static and changing over time

TEXT BOOKS

1. Jake VanderPlas, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly, 2017
2. W Mckinney, Python for Data Analysis, O'Reilly, 2013

REFERENCES BOOKS

1. Murtaza Haider, Getting Started with Data Science, IBM Press, 2015.
2. Davy Cielen, Introducing Data Science: Big Data, Machine Learning, and More, Manning, 2016.

C12. WEB APPLICATION DEVELOPMENT WITH ANDROID

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I **9 Hours**

Introduction to Android: Scenario before Android- Midlets, Symbian, Android SDK features, OHA, Android Software Stack, Externalized Resources & APK, ADT Plugin, Android Application Architecture.

Unit - II **9 Hours**

Getting Started: Types of Android Application, Android Development Tools, Android Manifest.xml, Components comprising an Android Application

Unit - III **9 Hours**

Application & Activities: Application priority, Activity stack, Application Life Cycle Intents & Broadcast Receivers: Explicit & implicit Intents, Sub Activities, Broadcasting Intents, Broadcast Receivers, Intent Filters & their categories, Intent Resolution, Pending Intents, Permissions.

Unit-IV **9 Hours**

Building User Interface: Fundamental android UI design, Introducing Layouts, Fragments-Landscape, portrait fragments, Fragment Manager, Fragment Lifecycle, Android widget toolbox, Views, Adapter-Array Adapter & SimpleCursor Adapter

Unit-V **9 Hours**

Data Persistence & Shared Preferences: Content Provider, Content Resolver, Cursor, SQLite Database, Shared Preferences.

Unit-VI **9 Hours**

Telephony & Email: SMS , Telephone Manager, Call state Change, Service Change, Data Connectivity, Web Services Introduction: Why Web Services, WS Characteristics, WS Architecture, WS Components, Json Web Services.

TEXT BOOKS

1. Professional Android 4 Application Development by Reto Meier, Wiley India Pvt Ltd.
2. Beginning Android 4 Application Development by Wei-Meng Lee, Wiley India Pvt Ltd

REFERENCES BOOKS

1. Android in Action by W. Frank Ableson , Manning Publications; 3 edition
2. Learning Android 2nd edition by Marko Gargenta , O'Reilly Media

C13. ELECTIVE 2 (Any One of the Following)

C13. MACHINE LEARNING

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I **9 Hours**

Introduction: Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.

Inductive Classification: The concept learning task. Concept learning as search through a hypothesis space. General-to-specific ordering of hypotheses. Finding maximally specific hypotheses. Version spaces and the candidate elimination algorithm. Learning conjunctive concepts. The importance of inductive bias.

Unit - II **9 Hours**

Decision Tree Learning: Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity. Occam's razor. Overfitting, noisy data, and pruning.

Unit - III **9 Hours**

Computational Learning Theory: Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity: quantifying the number of examples needed to PAC learn. Computational complexity of training. Sample complexity for finite hypothesis spaces. PAC results for learning conjunctions, kDNF, and kCNF. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension.

Unit - IV **9 Hours**

Rule Learning- Propositional and First-Order: Translating decision trees into rules. Heuristic rule induction using separate and conquer and information gain. First-order Horn-clause induction (Inductive Logic Programming) and Foil. Learning recursive rules. Inverse resolution, Golem, and Progol.

Unit - V **9 Hours**

Artificial Neural Networks: Neurons and biological motivation. Linear threshold units. Perceptrons: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

Unit-VI **9 Hours**

Support Vector Machines: Maximum margin linear separators. Quadractic programming solution to finding maximum margin separators. Kernels for learning non-linear functions.

Clustering and Unsupervised Learning:Learning from unclassified data. Clustering. Hierarchical Aglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labeled and unlabled data.

Language Learning: Classification problems in language: word-sense disambiguation, sequence labeling. Hidden Markov models (HMM's). Veterbi algorithm for determining most-probable state sequences. Forward-backward EM algorithm for training the parameters of HMM's. Use of HMM's for speech recognition, part-of-speech tagging, and information extraction.

TEXT BOOK

1. Machine Learning Paperback – McGraw Hill Education; First edition (1 July 2017)

REFERENCES BOOKS

1. Christopher M. Bishop (2006) Pattern Recognition and Machine Learning, Springer ISBN 0-387-31073-8.
2. Yoshua Bengio (2009). Learning Deep Architectures for AI.
3. Aharon, M, M Elad, and A Bruckstein. 2006. “K-SVD: An Algorithm for Designing Overcomplete Dictionaries for Sparse Representation.” Signal Processing, IEEE Transactions .

C13. EMBEDDED SYSTEMS

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I **9 Hours**

Introduction To Embedded Systems: Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.

Unit - II **9 Hours**

Devices and Buses For Devices Network: I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.

Unit - III **9 Hours**

Programming Concepts and Embedded Programming In C, C++: Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of EMBEDDED PROGRAMMING in C++ - Objected Oriented Programming – Embedded Programming in C++, 'C' Program compilers – Cross compiler – Optimization of memory codes.

Unit-IV **9 Hours**

Real Time Operating Systems Part – 1: Definitions of process, tasks and threads – Clear cut distinction between functions – ISRs and tasks by their characteristics – Operating System Services- Goals – Structures- Kernel - Process Management – Memory Management – Device Management – File System Organisation .

Unit-V **9 Hours**

Implementation – I/O Subsystems . Interrupt Routines Handling in RTOS, REAL TIME OPERATING SYSTEMS : RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics) Preemptive Scheduling Model strategy by a Scheduler – Critical Section Service by a Preemptive Scheduler – Fixed (Static) Real time scheduling of tasks.

Unit-VI **9 Hours**

Real Time Operating Systems Part – 2: Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS – Understanding Case Definition – Multiple Tasks and their functions – Creating a list of tasks – Functions and IPCs – Exemplary Coding Steps.

TEXT BOOKS

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, 2nd Edition 2009

REFERENCES BOOKS

1. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,
2. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
3. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001.
4. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware Software Introduction, John Wiley, 2002.

C13. USER INTERFACE DESIGN

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I: Introduction **9 Hours**

Definition of user interface, GUI,CUI, usability, goals and measures, motivations, universal usability, guidelines and principles.

Unit – II: Interaction Styles **9 Hours**

Direct Manipulation-Introduction and Discussion, Menu Selection, Form fill-in and Dialog boxes.

Unit – III: Interaction Devices **9 Hours**

Interaction Devices-select the proper device based controls-Joystick, Graphics tablet., touch screen, light pen ,mouse, keyboard ,guidelines for selecting proper device based controls.

Unit – IV: Creating Meaningful Icons and Images **9 Hours**

Icons-kinds of Icons, characteristics of Icons, choosing Icons, choosing and creating Images, Drawing Images.

Unit-V: Color Models and Choosing the proper colors **9 Hours**

Color- color Models, Color Uses, possible problems with color, choosing color, Choosing the color for textual graphics screen.

Unit-VI: Usability Testing **9 Hours**

The purpose of usability testing, Importance, Prototypes, Kinds of tests, Developing and conducting the Test.

TEXT BOOKS

1. Designing the User Interface – Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs Fifth Edition (Pearson publication).
2. Essential Guide to User Interface Design- Wilbert. O. Galitz 3rd Revised edition (Wiley publication)

REFERENCES BOOKS

1. Usability Engineering by Jacob Nielsen
2. The Design of Everyday Things by Donald Norman
3. About Face 2.0 The Essentials of Interaction Design by Cooper Reimann.

C14. ELECTIVE 3 (Any One of the Following)

C14.HIGH PERFORMANCE COMPUTING AND CLOUD COMPUTING

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I **09 Hours**

HPC Introduction: The forms of HPC, Who Uses HPC Today? , Who Should Be Using HPC? Enter the Commodity Cluster, It's About Choice, What Does a Cluster Look Like? If You Need Speed, Of Cores, Threads, and Nodes, What about the Data? Choosing Cluster Hardware, Crunching numbers: Processors and nodes, Co-processors, The communication: Interconnects , Remembering the storage , Racking and stacking, Power and cooling, Finding Cluster Software, Operating systems, HPC glue: Cluster software, File systems, HPC resource schedulers, Ready to run application software , Provisioning: Creating the cluster, Cluster Tool Kits.

Unit - II **09 Hours**

Concept of Parallel Computing: Introduction to parallel Computing, Shared memory multiprocessing architecture model, Distributed memory multiprocessing and its importance, Hybrid distributed shared memory model, Parallelism in Sequential machines, Abstract model of Parallel Computer, Basics of message passing Programming, Pipelined Computations, Synchronous Computations, Algorithms and Applications, Parallel Programming Languages, Scalar vs. Vector pipelining.

Unit - III **09 Hours**

Cloud Computing Basics: Network computing and grid computing concepts. SOA architecture, Understanding, Scale and elasticity, Self-service provisioning, Using Web services interfaces, Monitoring and measuring performance, Providing security to customers, Everything as a Service, Business Drivers for Cloud, A Simple Model of the Cloud, Infrastructure as a Service, Platform as a Service, Software as a Service, Massively Scaled Software as a Service, Economies of scale, Business Process as a Service, Managing the Cloud.

Unit-IV **09 Hours**

Server and Storage Virtualization: Introduction to Virtualization, Need of Virtualization in cloud computing, Hypervisor based Virtualization, Technique of Hypervisors, Hardware support for Virtualization architecture, Virtualization software, VMware Virtualization, Xenserver Virtualization, Storage Virtualization – Basic approach, Types of Virtualization, File Virtualization, Block Virtualization.

Unit-V **09 Hours**

Hadoop: Data!, Data Storage and Analysis, Comparison with Other Systems, RDBMS, Grid Computing, Volunteer Computing, , A Brief History of Hadoop, The Apache Hadoop Project, Map Reduce, A Weather Dataset, Data Format , Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Compiling and Running, The Hadoop Distributed File system, The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, The Command-Line Interface, Basic File system Operations, Hadoop File systems Interfaces, Job Completion, Failures, Task Failure,

Task tracker Failure, Job tracker Failure Job Scheduling and Speculative Execution.

Unit-VI **09 Hours**

Map Reduce Types and Formats: MapReduce Types and Formats, MapReduce Types, The Default MapReduce Job, Input Formats, Input Splits and Records, Text Input, Binary Input, Multiple Inputs, Database Input (and Output) , Formats, Text, Binary, Multiple, Database, MapReduce Features.

TEXT BOOKS

1. Introduction to High Performance Scientific Computing by Victor Eijkhout 2014 Edition
2. Cloud computing from beginning to end by Ray Rafaels, CreateSpace Independent Publishing Platform, 2015
3. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things1st , Kindle Edition by Kai Hwang, Jack Dongarra, Geoffrey C. Fox Morgan Kaufmann; 1 edition (18 December 2013)

REFERENCES BOOKS

1. Introduction to High Performance Computing for Scientists and Engineers (Chapman & Hall/CRC Computational Science) by Georg Hager and Gerhard Wellein CRC Press Special Indian Edition 2016

C14. COMPILER DESIGN

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I **9 Hours**

Introduction to Compilers: Overview, Structure, implementation. Programming Language Grammars: Inter Language grammars, derivation, reduction, syntax tree, ambiguity, regular grammars & expressions.

Unit-II **9 Hours**

Scanning and Parsing Techniques: The Scanner, parser, translation, elementary symbol table organization, structures.

Unit - III **9 Hours**

Memory Allocation: Static and dynamic memory allocation, array allocation and access, allocation for strings, structure allocation, common & equivalence allocation. Introduction to Compilation of expressions.

Unit - IV **9 Hours**

Compilation of Control Structures: Control transfers, procedural calls, conditional execution, iteration control constructs. Error detection, indication & recovery.

Unit-V **9Hours**

Compilation of I/O Statements: Compilation of I/O list, compilation of FORMAT list, IOSUB, file control.

Unit-VI **9 Hours**

Code Optimization: Major issues, optimizing transformations, local optimizations, program flow analysis, Global Optimization, writing compilers.

REFERENCES BOOKS

1. Compiler Construction - D.M.Dhandhere (M)
2. Compiler Writing - Tremble-Sorenson (TMH)
3. Computers : Princ, Techniques cools by Aho - Person.
4. The Essence of Compilers by Hanter - Pearson.

C14. PERFORMANCE MODELING

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I Introduction to Queueing: **9 Hours**

Queueing Theory Terminology, The Single-Server Network, Classification of Queueing Networks, Open Networks, Closed Networks, Sample Space and Events, Probability Defined on Events, Conditional Probabilities on Events, Independent Events and Conditionally Independent Events, Law of Total Probability Bayes Law, Discrete versus Continuous Random Variables, Expectation and Variance, 0 Joint Probabilities and Independence, Conditional Probabilities and Expectations, 2 Probabilities and Expectations via Conditioning, Linearity of Expectation, Normal Distribution, Sum of a Random Number of Random Variables.

Unit - II Generating Random Variables for Simulation: **9 Hours**

Inverse-Transform Method , The Continuous Case , The Discrete Case , Accept-Reject Method , Discrete Case , Continuous Case , Some Harder Problems, Convergence , Strong and Weak Laws of Large Numbers , Time Average versus Ensemble Average , Motivation , Definition , Interpretation , Equivalence , Simulation , Average Time in System.

Unit III The Predictive Power of Simple Operational Laws: **9 Hours**

Little's Law and Other Operational Laws , Little's Law for Open Systems , Intuitions , Little's Law for Closed Systems , Proof of Little's Law for Open Systems , Statement via Time Averages , Proof , Corollaries , Proof of Little's Law for Closed Systems , Statement via Time Averages , Proof , Generalized Little's Law, Examples Applying Little's Law, More Operational Laws: The Forced Flow Law, Combining Operational Laws, Device Demands, Readings and Further Topics Related to Little's Law, Modification Analysis: "What-If" for Closed Systems, Review , Asymptotic Bounds for Closed Systems , Modification Analysis for Closed Systems , More Modification Analysis Examples , Comparison of Closed and Open Networks

Unit-IV From Markov Chains to Simple Queues: **9 Hours**

Discrete-Time Markov Chains , Discrete-Time versus Continuous-Time Markov Chains , Definition of a DTMC , Examples of Finite-State DTMCs , Repair Facility Problem , Umbrella Problem , Program Analysis Problem , Powers of P: n-Step Transition Probabilities , Stationary Equations 135 8.6 The Stationary Distribution Equals the Limiting Distribution , Examples of Solving Stationary Equations , Repair Facility Problem with Cost , Umbrella Problem , Infinite-State DTMCs , Infinite-State Stationarity Result , Solving Stationary Equations in Infinite-State DTMCs , Exercises , Ergodicity Theory 148 9.1 Ergodicity Questions , Finite-State DTMCs , Existence of the Limiting Distribution , Mean Time between Visits to a State , Time Averages , Infinite-State Markov Chains , Recurrent versus Transient , Infinite Random Walk Example , Positive Recurrent versus Null Recurrent ,

Ergodic Theorem of Markov Chains Designing view layer classes. Macro level process. The purpose of a view layer interface. Prototyping the user interface, Case study.

Unit-V Real-World Examples: Google, Aloha, and Harder Chains **9 Hours**

Google's PageRank Algorithm ,Google's DTMC Algorithm , Problems with Real Web Graphs , Google's Solution to Dead Ends and Spider Traps , Evaluation of the PageRank Algorithm Practical Implementation Considerations Aloha Protocol Analysis The Slotted Aloha Protocol ,The Aloha Markov Chain , Properties of the Aloha Markov Chain , Improving the Aloha Protocol , Generating Functions for Harder Markov Chains ,The z-Transform , Solving the Chain , Readings and Summary , Exercises , Exponential Distribution and the Poisson Process , Definition of the Exponential Distribution , Memory less Property of the Exponential , Relating Exponential to Geometric via δ-Steps , More Properties of the Exponential , The Celebrated Poisson Process , Merging Independent Poisson Processes , Poisson Splitting , Uniformity , Exercises , Transition to Continuous-Time Markov Chains , Defining CTMCs , Solving CTMCs , Generalization and Interpretation , Interpreting the Balance Equations for the CTMC , Summary Theorem for CTMCs .

Unit-VI Server Farms and Networks: Multi-server, Multi-queue Systems **9 Hours**

Server Farms: M/M/k and M/M/k/k ,Time-Reversibility for CTMCs M/M/k/k Loss System , M/M/k , Comparison of Three Server Organizations , Readings , Capacity Provisioning for Server Farms , Time-Reversibility and Burke's Theorem , More Examples of Finite-State CTMCs , Networks with Finite Buffer Space , Batch System with M/M/2 I/O , The Reverse Chain , Burke's Theorem , An Alternative (Partial) Proof of Burke's Theorem 290 16.5 Application: Tandem Servers 291 16.6 General Acyclic Networks with Probabilistic Routing , Jackson Network , Performance Modeling and Design of Computer Systems: Queueing Theory in Action Mor Harchol-Balter Frontmatter , Connection-Oriented ATM Network Example ,Closed Networks of Queues , VI Real-World Workloads: High Variability and Heavy Tails .

TEXT BOOKS

1. Performance Modeling and Design of Computer Systems by Mor Harchol-Balter, Cambridge University Press 2013

REFERENCES BOOKS

1. Fundamentals Of Performance Modeling Michael K. Molloy. Michael K. Molloy. Published by Prentice Hall (1988)
2. Foundations of Software and System Performance Engineering: Process, ... Book by André B. Bondi, ©2015 |Addison-Wesley Professional

C14. SOCIAL NETWORKS

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I **9 Hours**

Mathematical Foundations: This The fundamental concepts of graph theory and (elements of) matrix algebra, both of which are foundation fields for social networks. Software and Visualization: Introduced to the software, and learn how to visualize network data. Whole networks: This module is about characterizing the shape and structure of whole networks.

Unit - II **9 Hours**

Ego-network Analysis: An introduction to ego-network analysis, including both data collection and analysis. We also discuss the concept of individual-level social capital. Advanced ego-network techniques, including longitudinal analysis.

Unit -III **9 Hours**

Centrality: Introduction to the concepts and measurement of node centrality, including degree, closeness, betweenness and eigenvector centrality. Advanced measures of centrality including walk-based measures of centrality, induced centralities and group centralities. Centrality is contrasted with power.

Unit - IV **9 Hours**

Cohesive Subgroups: Techniques for clustering networks to find communities and subgroups. Equivalence: Concepts of structural, automorphic and regular equivalence are discussed, along with the general enterprise of finding structural roles.

Unit - V **9 Hours**

Statistical Methods:An introduction to the special statistical methods used in network analysis to overcome autocorrelation and other challenges to classical statistical methods.

Unit-VI **9 Hours**

Network Dynamics: A series of techniques for analyzing changes in social networks over time.

Survey Data Collection: A discussion of the special issues involved in collecting network data.

REFERENCES BOOKS

1. Unleash the Power of the Web and Social Networking to Get Hired by Paul Hill
2. Social Networking for Career Success by Miriam Salpeter
3. Social Networking Strategies by Camille Cole

S3. COMPLEMENTARY SKILLS FOR SOFTWARE PROFESSIONALS

Lecture Hrs : 54 Internal Marks : 15 Exam Marks : 35

1. Systems Thinking and Critical Thinking
2. Conflict Management and Negotiation Skills
3. Leadership
4. Work Ethics
5. Meeting Skills
    a. Preparing agenda
    b. Preparing for the meeting
    c. Participating
    d. Minutes of meeting
    e. Action points and follow-up
    f. Six thinking hats
6. Social Skills
    a. Etiquettes and cultural sensitivity
    b. International sensitivity
7. Interview Skills
8. Adapting to a New Work Culture

OE. WEB PAGE DESIGNING

Lecture Hrs : 27 Internal Marks : 15 Exam Marks : 35

Unit I: Introduction to CMS and Wordpress **10 Hours**

Motivation, Definitions (Content, ECM, CMS) , When to Consider a CMS , Content Management & Life Cycle , Types of CMS, Open Source & CMS ƒ, Overview of necessary skills, Components of a CMS, Benefits, Comparison of different OS CMS, Web Content Management (WCM) - Dynamic vs. Static Websites, WordPress as a CMS , necessity of WordPress, Assembling Pages, Content Management in WordPress, Planning WordPress Site: Organizing Categories, Site Layout and Design, Installation Process: Remote and Local Installing and Upgrading WordPress. Admin Area: Logging In, The Dashboard, Customizing Admin Screens, Basic Admin Settings- Tagline, WordPress Address (URL), Blog Address (URL), E-mail Address, Timezone, Personal Profile, Working with content: Post, Text Editor, Page, Media Content- Images and Galleries, Video, Audio, Other File Types, The Media Library, Links, Importing Content.

Unit II: Basic Theme Development **7 Hours**

Widgets, Menus, Multiple Menus, Sidebars, Pagination, Header and Background Images, Turning HTML into a Theme-Header , Body, Footer ,Template Tags ,Theme Files, Listing Comments, Including Additional Files, Navigation Menus-Custom Navigation Tag, Page Lists and Menus, Category Lists, Theme Functions : Enabling Widgets and Menus , Enabling Featured Images, Custom Backgrounds and Headers, Short codes in Text Widgets, Child Themes ,Troubleshooting Themes.

Unit III: Advanced Theme Development **10 Hours**

Loops, Multiple Loops , Accessing Post Information Outside the Loop, Adding Scripts and Style sheets, Theme Options and Frameworks, Distributing Themes, Creating Widgets and Plugins, Creating a Template Tag, Hooks: Filters and Actions, Custom Content Types, Taxonomies, and Fields, Real World Skills: Admin Panel Customization, Moving to a new host, Automating backups.

REFERENCES BOOKS

1. Professional WordPress: Design and Development by Hal Stern, David Damstra, Brad Williams, Worx publications, Second edition.
2. Smashing WordPress: Beyond the Blog by Thord Daniel Hedengren, Wiley publications, Fourth edition.

IV Semester

C15. Internet of Things

Lecture Hrs : 54 Internal Marks : 30 Exam Marks : 70

Unit-I: Unit-I Introduction to Sensor of IOT **9 Hours**

Preparing Raspberry Pi,Clayster libraries, Hardware, Interacting with our hardware Interfacing the hardware, Internal representation of sensor values, Persisting data External representation of sensor values, Exporting sensor data

Unit – II: **THE HTTP PROTOCOL**: **9 Hours**

Adding HTTP support to the sensor Setting up an HTTP server on the sensor, Setting up an HTTPS server, on the sensor, Adding a root menu, Displaying measured information , in an HTML page, Generating graphics dynamically, Creating sensor data resources, Interpreting the readout request, Testing our data export, User authentication, Adding events for enhanced network performance

Unit – III Introducing UPnP **9 Hours**

Providing a service architecture, Documenting device and service capabilities, Choosing a device type, Being friendly, Providing the device with an identity, Adding icons, Adding references to services, Topping off with a URL to a web presentation page, Adding actions, Adding state variables, Adding a unique device name, Providing a web interface

Unit-IV The CoAP Protocol **9 Hours**

Defining our first CoAP resources, Manually triggering an event notification, Registering data readout resources, Returning XML, Returning JSON, Returning plain text, Discovering CoAP resources, Testing our CoAP resources, Defining simple control resources, Parsing the URL in CoAP, Controlling the output using CoAP, Monitoring observable resources, Receiving notifications, Performing control actions

Unit-V The MQTT Protocol **9 Hours**

The MQTT Protocol, Publishing and subscribing, Adding MQTT support to the sensorControlling the thread life cycle, Flagging significant events, Connecting to the MQTT server, Publishing the content, Adding MQTT support to the actuator, Initializing the topic content, Subscribing to topics, Receiving the published content, Decoding and parsing content, Adding MQTT support to the controller, Handling events from the sensor, Decoding and parsing sensor values, Subscribing to sensor events, Controlling the actuator, Controlling the LED output, Controlling the alarm output

Unit-VI : **The XMPP Protocol** **9 Hours**

XMPP basics, Federating for global scalability, Providing a global identity, Authorizing communication, Sensing online presence, Using XML, Communication patterns, Extending XMPP, Connecting to a server, Provisioning for added security, Adding XMPP support to a thing, Connecting to the XMPP network, Monitoring connection state events, Notifying your friends, Handling HTTP requests over XMPP

TEXT BOOKS

1. Learning Internet of Things by Peter Waher 2015 Packt Publishing
2 Internet of Things with Python Publisher: Packt Publishing Limited (20 May 2016)

REFERENCES BOOKS

1. Designing The Internet Of Things, Wiley, Adrian McEwen.

L7 : INTERNET OF THINGS LAB

Exercises and Project work for Lab

Session No.	Exercises
1	Overview of Raspberry Pi
2	Exploring the different components of Raspberry pi
3	Setting up of the board and booting the board
4	Setting up of the board and booting the board
5	Practice sessions on Python
6	Practice sessions on Python with Django
7	Sample application development using Raspberry Pi and Python
8	Sample application development using Raspberry Pi and Python
9	Designing Home Intrusion Detection – A case study
10	Project Work
11	Configuring and setting up the board for Home Intrusion Detection
12	Project Work
13	Programming Home Intrusion Detection
14	Project Work
15	Programming Home Intrusion Detection
16	Project Work
17	Programming Home Intrusion Detection
18	Project Work
19	Designing Weather Monitoring System
20	Project Work
21	Configuring and setting up the board for Weather Monitoring System
22	Project Work
23	Programming Weather Monitoring System
24	Project Work
25	Programming Weather Monitoring System
26	Project Work
27	Programming Weather Monitoring System
28	Project Work