# Indira Gandhi University Meerpur (Rewari)

**(Department of Computer Science & Engineering)**

**Proposed Syllabus of Course Work for Ph.D. in Computer Science w.e.f. 2020-21**

**Instructions:-**

1. Duration of course work will be one semester or six months.
2. The minimum pass marks shall be 50% marks in each theory paper/practical and internal assessment separately.
3. The internal assessment in each paper shall be based on two assignments and one seminar by each candidate by each candidate and their participation in seminar.
4. Ph.D. Course Work programme shall be an essential part of the Ph.D. programme. Only on successful completion of it the candidate shall be eligible to apply for registration in Ph.D. Programme.
5. On successful completion of Ph.D. course work only the marks statement of Ph.D. course work will be awarded to candidate and no seprate certidicate / diploma / degree will be awarded for course work.
6. The Scheme of Examination of Ph.D. Course Work in Computer Science is as follow:-

| **Sr. No.** | **Paper Code** | **Title of Paper** | **Evaluation Scheme** | | | | **Credit** |
|---|---|---|---|---|---|---|---|
| | | | **External** | | **Internal** | **Total Marks** | |
| | | | **Theory** | **Practical** | | | |
| 1. | PPC-1 | Research Methodology in Computer Science | 80 | -- | 20 | 100 | 4 |
| 2 | PPC-2 | Subject Specific Paper-1 (Elective*) | 80 | -- | 20 | 100 | 4 |
| 3 | PPC-3 | Subject Specific Paper-2 (Elective*) | 80 | -- | 20 | 100 | 4 |
| 4 | PPC-4 | Research Ethics | 25 | 25 | - | 50 | 2 |
| 5 | PPC-5 | Review of Literature and Seminar (in Relevant Research Area) | -- | 40 | 10 | 50 | 2 |

## *List of Subject Specific Papers (**SELECT ANY TWO**)

**Note: The choice of subjects will be availability of experts in the department.**

1. PPC- (i): Social Networking Technologies
2. PPC- (ii): Advanced Cloud Computing
3. PPC- (iii): Distributed Database Systems
4. PPC- (iv): Human Computer Interaction
5. PPC- (v): Ad Hoc Wireless Network
6. PPC- (vi): Web Services and GIS
7. PPC- (vii): Wireless Sensor Networks
8. PPC- (viiii): Advanced Design and Analysis of Algorithims
9. PPC- (ix): Big Data analytics

10. PPC- (x): Advanced Information Security Systems
11. PPC- (xi): Digital Image Processing
12. PPC- (xii): Neural Networks
13. PPC- (xiii): Advanced Database Management Systems
14. PPC- (xiv): Performance Modeling
15. PPC- (xv): Data Warehousing and Mining
16. PPC- (xvi): Software Testing and Quality Assurance
17. PPC- (xvii): Embedded Systems
18. PPC- (xviii): Advanced Wireless Networks
19. PPC- (xix): Genetic Algorithms
20. PPC- (xx): Grid Computing
21. PPC- (xxi): Mobile Computing
22. PPC- (xxii): Advanced Multimedia Technology
23. PPC- (xxiii): Parallel Computing
24. PPC- (xxiv): Web Engineering
25. PPC- (xxv): Fuzzy Logic
26. PPC- (xxvi): Advanced Networking and Protocols
27. PPC- (xxvii): Intelligent Systems
28. PPC- (xxviii): Information Processing and E-commerce
29. PPC- (xxix): Information Hiding Techniques
30. PPC- (xxx): Data Modeling and Design
31. PPC- (xxxi): Structured Systems Analysis, Design and Testing
32. PPC- (xxxii): Information Theory and Coding
33. PPC- (xxxiii): Fault Tolerant System
34. PPC- (xxxiv): Search Engines and Information Retrieval
35. PPC- (xxxv): Bio-inspired Computing
36. PPC- (xxxvi): Quantum Computing
37. PPC- (xxxvii): Advanced Oprating System
38. PPC- (xxxviii): Human Computer Interaction
39. PPC- (xxxix): Natural Language Processing

# Paper: PPC-1
# Research Methodology in Computer Science

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**Unit I: Fundamental of Research**

Definition and meaning of research, importance of research, characteristics of research, steps in research, types of research, research paradigms, process & approaches, research methods versus methodology. Research problems, sources, charactristics, selection and formulation of research problems / research design. Meaning needs and features of a good research problem / design. Hypothesis formulation and criterion of good research. Significance and status of Research in Computer Science, recent trends in computer science research.

**Unit II: Litrature Survey and computer applications in research**

What is literature survey, function of literature survey, purpose of litrature review. Developing a bibliography, online tools- Google, cite seer, ACM Digital library, survey papers. Finding out about your research area, Literature search strategy, Writing critical reviews, Identifying venues for publishing your research. Critique, Survey & Peer review process. Use of internet networks in research activities in searching material, paper downloading, submission of papers, relevant websites for journals and related research work. Impact factor, indexing, ISSN / ISBN number and proceeding of conference / seminar. Introduction to Patent laws etc., process of patenting a research finding, Copy right, Cyber laws.

**Unit III: Research Data and Statistics**

Sources, types, acquisition and interpretation of data. Collection, processing and analysis of data. Quantitative and qualitative data, graphical representation and mapping of data. Measurement and scaling techniques. Sampling fundamental and testing of hypothesis. Sampling theory, test of significance- `t' test, Z test, one & two way ANOVA, Chi-square test, simple & partial correlation and multiple regressions.

**Unit IV: Research Report**

Writing a Research Report, precautions for writing a research report. Significance of report writing. Types, style, steps, mechanism and layout of research report, editing the final draft and oral presentation. Art of scientific writing, flow method, organization of material,

drawing figures, graphs, tables, footnotes, endnotes references etc. in a research paper. Use of computer and internet for report writing. Tools and techniques in MS-word, excel and power point for designing and presentation of report / paper. Planning the thesis, writing the thesis, thesis structure, writing up schedule, oral examination and viva voce.

***Refrence Books:***


1. Kothari, C.R., Research Methodology (Methods and Techniques), New Age Publisher
2. Research Methodology: a step-by-step guide for beginners, Kumar, Pearson Education.
3. Research Methods By Ram Ahuja, Rawat Publications
4. Research Methodology, Sharma, N. K., KSK Publishers, New Delhi.
5. Basic of Qualitative Research (3rd Edition) By Juliet Corbin & Anselm Strauss, Sage Publications
6. Fundamentals of modern statistical methods By Rand R. Wilcox
7. Operational research by Dr. S.D.Sharma, Kedarath, Ramnath & Co.
8. Internet Research skill by Niall O Dochartaigh, SAGE publication

# Paper: PPC-4
## RESEARCH AND PUBLICATION ETHICS

### COURSE CODE : RPE – 2020

**Maximum Marks: 50** **Credit - 02** **Theory Marks: 25**

**Time: 2 Hrs.** **Practical and viva voce Marks: 25**

Note: The question paper shall have total eight questions of five marks each covering Unit 1, 2 and 3. The students shall be asked to attempt total five questions in all.

Practical and viva voce examination will be of 25 marks from Unit number 4, 5 and 6 and shall be conducted by two internal examiners appointed by the Vice-Chancellor.

**Course Objective:**

1. To understand the philosophy of science and ethics, research integrity and publication ethics.
2. To identify research misconduct and predatory publications.
3. To understand indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.)
4. To understand the usage of various plagiarism tools.

**Course Outcomes:**

At the end of the course, the student will have awareness about the publication ethics and publication misconducts.

Note: Unit 1, 2, 3 are to be covered via Theory mode and Unit 4, 5, 6 are to be covered via practice mode.

**OVERVIEW**

This course has total 6 units focusing on basics of Philosophy of science and ethics, research integrity, publication ethics. Hands on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

**Pedagogy:**

Class room teaching, Guest Lectures, group discussions and practical sessions. Total teaching hours shall be 30 hours.

**Evaluation**

Continuous assessment will be done through tutorials, assignments, quizzes and group discussions. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

**SYLLABUS IN DETAIL**

**Theory**

**RPE 01: PHILOSOPHY AND ETHICS (3hrs.)**

1. Introduction to Philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgment and reactions

**RPE 02: SCIENTIFIC CONDUCT (5hrs.)**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FPP)
4. Redundant publications: duplicate and over lapping publications, salami slicing
5. Selective reporting and misrepresentation of data

**RPE 03: PUBLICATIUON ETHICS (7hrs.)**

1. Publication ethics: definition, introduction and importance
2. Best practices / standard setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation and publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

**Practice**

**RPE 04: OPEN ACCESS PUBLISHING (4hrs.)**

1. Open access publications and initiatives
2. SHERPA/RoMEO online recourse to check publisher copyright & self archiving policies
3. Software tool of identify predatory publications developed by SPPU
4. Journals finder/journals suggestion tools viz. JANE, Elsevier Journals Finder, Springer Journals Suggester, etc.

**RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

**A. Group Discussions (2hrs.)**

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

**B. Software tools (1hrs.)**

1. Use of plagiarism software like Turnitin, Urkund and other open source software tools

**RPE 06: DATABASE AND RESEARCH METRICS (7hrs.)**

**A. Database (4hrs.)**

1. Indexing databases
2. Citation databases: Web of Sciences, Scopus, etc.

**B. Research Metrics (3hrs.)**

1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i 10 index, altmetrics

**Suggested Reading**


- Nicolas H. Steneck. Introduction to the Responsible Conduct of Research. Office of Research Integrity, 2007. Available at: http://ori.hhs.gov/sites/default/files/rcrintro.pdf
- The student's Guide to Research Ethics By Paul Oliver Open University Press, 2003.
- Responsible Conduct of Research By Adil E. Shamoo; David B. Resnik Oxford University Press, 2003.
- Ethics in Science Education, Research and Governance Edited by Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi. Indian National Science Academy, 2019. ISBN: 978-81-939482-1-7. http:www.insaindia.res.in/pdf/Ethics_Book.pdf
- Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing, Wiley Eastern 1997.
- Bijorn Gustavii: How to write and illustrate scientific papers? Cambridge University Press.
- Bordens K.S. and Abbott, B.b.: Research Design and Methods, Mc Graw Hill, 2008.
- Graziano, A., M., and Raulin, M.,L.: Research Methods – A process of Inquiry, Sixth Edition, Pearson, 2007.
- Bird, A. (2006). Philosophy of Science. Routledge.
- MacIntyre, Alasdair (1967) A Short History of Ethics. London.
- P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865.
- National Academy of Sciences, National Academy of Engineering and Institute of Medicine (2009). On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
- Resnik, D.B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm
- Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179.
- https://doi.org/10.1038/489179a

# Paper: PPC-5

## REVIEW OF LITERATURE
## (in Relevant Research Area)

**External Marks: 40**
**Internal Marks: 10**
**Total Marks: 50**
**Duration of Exam: As per requirement**
**Workload: 2 Lectures per week**

1. The research student is required to prepare a concept paper/working, paper/review paper by reviewing at least 50 research papers / references books / unpublished doctoral dissertations / other reports etc.
2. To qualify the paper the research student is required either to present the prepared paper in an International Conference/ Seminar/ Workshop or publish the same in a UGC Care research journal. Communicated/Acceptance for publication or presentation in conference will be considered during presentation.
3. A duly constituted committee of three teachers of the department by the Director/Chairperson shall evaluate the completion of the paper.

# Paper: PPC-3 (i)
# Social Networking Technologies

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Social Media, culture and society, origins and structures of the networked age. Framing the debate about the socail networks, networked media, information and democratic discussion. Legal contexts of digital media and internet governance, intellectual property and challenges in digitaly-networked society

**UNIT-II**

Security and privacy in a networked age, social and technical contexts of privacy. Organisation in digital age and the rise of new intermediaries, old organizations in new information environments.

**UNIT-III**

Networked media and social movements, organizing activism. Democartic process in digital age, Socila media journalism and its problem, The digital dynamics of the news media, politics in cyber age

**UNIT-IV**

Networked social life, digital natives, social life and relations in internet age, human behavour and phychology in social media. Socail networking sites as new research tools. Economics model of social media, big data in refrence to social networking sites. Case study of social networking sites- whatsapp, face book, twitter and linkedin etc.

**Refrence:**


1. Jonathan Zittrain, The Future of the Internet and How to Stop It. Yale University Press, 2009.
2. Sherry Turkle, Alone Together: Why We Expect More from Technology and Less from Each Other. Basic Books, 2012.
3. John Palfrey and Urs Gasser, Born Digital: Understanding the First Generation of Digital Natives. Basic Books, 2008.
4. Bruce Bimber, Andrew Flanagin, Cynthia Stohl, Collective Action in Organizations: Interaction and Engagement in an Era of Technological Change. Cambridge University Press, 2012.

# Paper: PPC-3 (ii)
# Advanced Cloud Computing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-1**

Cloud Computing : Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of the Cloud Computing, security concerns and regulatory issues, over view of different cloud computing applications which are implemented, Business case for implementing a Cloud. Cloud Computing Technologies: Hardware and Infrastructure: Clients, Security, Network, services

**UNIT-II**

Accessing the Clouds: Platforms, WEB applications, WEB APIS, WB Browsers Cloud Storage: Overview, Storage provides, Cloud Standards: Applications, Client, Infrastructure, Services

**UNIT-III**

Cloud Computing Mechanisms: Software as a service: Overview, Driving Forces, Company offerings, Industries, Software and services: Overview, Mobile Device Integration, Providers, Microsoft Online Application development: Google, Microsoft, Intuit Quick base, Cast Iron Cloud, Bungee Connect, Development Platforms: Google, Sales Force, Azure, Trouble shooting, Application management. Local Clouds: Virtualization, server solutions, Thin Clients Migrating to the clouds: Cloud services for individuals, Mid-market, and Enterprise wide, Migration, best practices, analyzing the service

**UNIT-IV**

Using Cloud Services: Collaborating on Calendars, Schedules, and Task Management, Collaborating on Event management, Collaborating on Contact management, collaborating on Project Management, Collaborating on Word Processing, Collaborating on Spread sheets, Collaborating on Databases, Collaborating on presentations, Storing and sharing Files and other online content, sharing Digital Photographs, controlling the collaborations with Web-Based Desktops

**Refrences:**


1. Cloud Computing a practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-HILL,2010 Edition
2. Cloud Computing-web Based application that change the way you work and collaborate online, Michael Miller, Pearson Eduction,2009 Edition
3. “Cloud Computing for Dummies” by Judith Hurwitz , Bloor Robin, Marcia Kaufman & Fern Halper, November 2009.

# Paper: PPC-3 (iii)
# Distributed Database Systems

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT I**

Introduction: Distributed Data Processing, Distributed Database System, Promises of DDBSs, Complicating Factors, Problem Areas Distributed DBMS Architecture DBMS Standardization, Architectural Models for Distributed DBMSs, Distributed DBMS Architecture, Global Directory Issues. Distributed Database Design: Alternative Design Strategies, Distribution Design Issues, Fragmentation, Allocation. Semantic Data Control: View Management, Data Security, Semantic Integrity Control.

**UNIT II**

Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processing, Layers of Query Processing, Query Decomposition and Data Localization: Query Decomposition, Localization of Distributed Data Optimization of Distributed Queries Query Optimization, Centralized Query Optimization, Join Ordering in Fragment Queries, Distributed Query Optimization Algorithms

**UNIT III**

Introduction to Transaction Management: Definition of a Transaction, Properties of Transactions, Types of Transactions, Architecture Revisited, Distributed Concurrency Control Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Locking-Based Concurrency Control Algorithms, Timestamp based Concurrency Control algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management, Relaxed Concurrency Control

**UNIT IV**

Distributed DBMS Reliability Reliability Concepts and Measures, Failures and Fault Tolerance ion Distributed Systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols, Dealing with site failures, Network Partitioning, Architectural Considerations Parallel Database Systems Database Servers, Parallel Architectures, Parallel DBMS Techniques, Parallel Execution Problems

**Refrences:**


1. Textbook: Principles of Distributed Database Systems, Second Edition, M.Tamer Ozsu, Patrick Valduriez, Pearson Education, 1999
2. Distributed Database Management Systems: A Practical Approach Saeed K. Rahimi, Frank S. Haug , Wiely,2010

# Paper: PPC-3 (iv)
# Human Computer Interaction

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Introduction, The Human and The Computer, Input-Output Channels , Thinking, Reasoning and problem solving, Psychology and Design of Interactive Systems, Text entry devices, positioning, pointing and drawing and display devices, Physical controls, Sensors and Special Device.

**UNIT -II**

Interaction, Models of interaction, Frameworks and HCI, Ergonomics, interaction styles, Elements of WIMP, Interface, Interactivity, The context of interaction, paradigms for interaction.

**UNIT-III**

Interaction design basics, user focus, scenarios, Navigation design, Screen Design, and layout, iteration and prototyping. HCI in the software process, Software Life Cycle, Usability Engineering, Iterative design and prototyping, Design Rationale

**UNIT-IV**

Design Rules, Principles to support usability, Standards, Guidelines, Golden Rules HCI Patterns, Elements of windowing systems, Evaluation Techniques, Goals of Evaluation, Evaluation through experts, Evaluation through user participation, Choosing an evaluation method. User Support , Requirements of User Support, approaches to User Support, Adaptive help systems,Dialog design notations,Diagrammtic notations.

**Refrences:**


1. Alan Dix, Janet Finlay, Gregory d Abowd, Russel Beale Human Computer Interaction, 3rd edition, pearson education 2008.
2. Dan R Oslen jr., 'Human Computer Interaction' Cenage Learning 2010

# Paper: PPC-3 (v)
# Ad Hoc Wireless Network

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Wireless Evolution, Characteristics of Manet,Ad Hoc Network Applications, Importance of QoS and Energy Efficiency in MANETs, MANET Fundamentals, Performance Metrics, The Layered Communication Network. The Channel, Physical Layer,Data Link Layer4 Medium Access Control,Network Layer,Transport Layer. Application Layer. Cross-layer Design,Mobility. Fixed Assignment MAC Protocols, Random Access MAC Protocols, Centralized MAC Protocols, Distributed MAC Protocols, TCP-MAC Interaction in Multi-hop Ad-hoc Networks, IEEE 802.11 challenges, 2.1 Medium contention and spatial reuse, TCP-MAC interaction in multi-hop ad-hoc networks,.1 Impact of hidden terminal and exposed terminal problem, Impact of TCP transmission rate, TCP redundant ACKs, 4. TCP modifications over MAC layer in ad-hoc networks,4.1 Limiting TCP's packet output

**UNIT-II**

Organization, Background, Routing Protocols,Expected Properties of Manet Routing Protocols, Categorizing the Routing Protocols for Manet, Proactive Routing Protocols,Reactive Routing Protocols,Hybrid Routing, Major Features Proactive Routing Protocols: Dynamic Destination-Sequenced Distance-Vector Routing Protocols, Wireless Routing Protocol, Cluster Gateway Switch Routing, Global State Routing, FishEye State Routing, Hierarchical State Routing, Zone-Based Hierarchical Link State Routing Protocol, Landmark Ad Hoc Routing, Optimised Link State Routing, Major Features Reactive Routing Protocols: Associativity-Based Routing, Signal Stability-Based Adaptive Routing Protocol, Temporarily Ordered Routing Algorithm, Cluster Based Routing Protocol, Dynamic Source Routing, Ad hoc On-Demand Distance Vector Routing, Major Features Hybrid Routing Protocols: Dual-Hybrid Adaptive Routing, Adaptive Distance Routing, Zone Routing Protocol, Sharp Hybrid Adaptive, Neighbor-Aware Multicast Routing Protocol, Criteria for Performance Evaluation of Manet Routing Protocols:Mobility Factors, Wireless Communication Factors, Security Issues.

**UNIT-III**

Admission Control , Resource Reservation , Buffer Management , Classifying and Scheduling , End-to-End Delay , Packet Jitter , QoS – Hard vs Soft State, Challenges of QoS Provisioning in WANET, Factors Affecting QoS Protocol Performance , QoS Signalling – INSIGNIA , QoS MAC Protocol , QoS Routing Mechanism, Classification Based on MAC Layer Interaction : Protocols Relying on Contention-Free MAC , Protocols Based on Contended MAC Protocols Independent of the Type of MAC , Classification Based on Routing Protocol: the QoS Provisioning Mechanism Interaction, Classification Based on the Routing Information Update Mechanism Employed

## UNIT-IV

Key Management in Wireless Networks ,Symmetric Key Management, Public Key Management, Broadcast Packet Authentication,Assumptions, Network Model, Attacker Model, Authentication Primitives: Public Key Cryptography, Symmetric. Keys, One-way Hash Function, Classification of Broadcast Authentication Protocols. Public Key Management with Resource Constraints. Organisation, Background, Taxonomy of Ad Hoc Network Routing Attacks: Elements of Attack Behavior, Attack Behavior, Attack Scenarios: Black Hole Attack, Wormhole, Network Partitioning, Cache Poisoning, Selfishness, Sleep Deprivation Security Threat Analysis:OLSR Fundamentals, Protocol Analysis:Local Resources, Propagation Analysis , Casual Relations-Effects and Behavior: States of Network Connectivity, Effects of Attacks (Malicious Behavior), Risk Estimation, Inference, Intrusion Detection in mobile and adhoc, Trust management

**References:**


1. Mobile Ad Hoc Networks Energy-Efficient Real-Time Data Communications by BULENT TAVLI University of Rochester, NY, U.S.A. And WENDI HEINZELMAN University of Rochester, NY, U.S.A.
2. Guide to Wireless Ad Hoc Networks by Sudip Misra Isaac Woungang Subhas Chandra Misra (Published by Springer-Verlag London Limited 2009.
3. AD HOC NETWORKS Technologies and ProtocolsEdited by PRASANT MOHAPATRA University of California, Davis SRIKANTH V. KRISHNAMURTHY University of California, Riverside
4. Guide to Wireless Ad Hoc Networks by Sudip Misra Isaac Woungang Subhas Chandra Misra (Published by Springer-Verlag London Limited 2009.
5. Security in Wireless Ad Hoc and Sensor Networks Erdal Çayırcı NATO Joint Warfare Centre, Norway, Chunming Rong University of Stavanger, Norway Print 2009 John Wiley & Sons Ltd.

# Paper: PPC-3 (vi)
# Web Services and GIS

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT –I**

Introduction to web services: Fundamentals of XML, XML Syntax, XML Document Structure, Schema languages-DTD,XML Schema, Presentation technologies – XSL – XFORMS – XHTML –Transformation – XSLT – XLINK – XPATH – Xquery. Developing Web services-Objectives, Web service standards ,SOAP-The Processing model, Faults, Data representation and RPC, Protocol binding, WSDL-Interface Descriptions, Binding description, service description, UDDI-Descriptions,Discovery. Semantic Web-Architecture of Semantic Web-Components of Semantic Web stack –Resource Description Framework-RDF Schema-Web Ontology language-Rule Interchange Format-Semantic web Rule Language-SPARQL-Knowledge representation and reasoning –Ontology-Ontology components.

**UNIT-II**

Vectors-Raw materials-Raster Data-Vector Data-Types of Vector Data-know your file formats-Anatomy of a shape file-Downloading a viewer-Styling your layers-saving your map in ArcExplorer-Projections-The Round Earth-Cartesian Planes-Coordinate Reference systems-Reprojection utilities-Rasters-Mosaics and Tessellation-Temporal analysis-Panchromatic Vs multispectral-Scale and Resolution-Orthorectification-Downloading Free Rasters.

**UNIT-III**

Spatial Databases-Why bother with a spatial Database-Installing Postgre SQL and PostGIS-Adding spatial Fields-Inserting spatial Data-Querying spatial Data-Introspection of spatial Data-Importing spatial Data-Manipulating Data-Exporting Data-Indexing Data-Spatial Queries-Visualising Data

**UNIT-IV**

Creating OGC Webservices-Sharing the wealth-OGC SOA for GIS-Installing Geoserver-Adding shapefiles Using the GUI-Adding Shapefiles manually-Adding PostGIS Layers-Styling with SLD-Using OGC Web services-Understanding WMS-WMS Get Capabilities-WMS Get MAP-Understanding WFS-WFS GetCapabilities-WFS DescribeFeatureType-Filtering WFS GetFeature Requests.

**Refrences:**


1. Xml and Webservices Unleashed,Ron Schmelzer,Travis Vandersypen,Madhu siddalingaiah,Diane kennedy,Pearson Edition,2011
2. GIS For WebDevelopers by Scott Davis
3. Foundations of the Semantic Web: XML, RDF & Ontology by Rajendra Akerkar
4. An Introduction to XML and Web Technologies by Anders Moller,Michael Schwartzbach,Pearson Edition

# Paper: PPC-3 (vii)
# Wireless Sensor Networks

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT I**

Basics of Wireless Sensors and Applications, The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks, Classification of WSNs.

**UNIT II**

MAC Layer, Routing Layer, High-Level Application Layer Support, Adapting to the Inherent Dynamic Nature of WSNs. Sensor Network Platforms and Tools, Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms

**UNIT III**

Operating System: TinyOS, Imperative Language: nesC, Dataflow Style Language: TinyGALS, Node-Level Simulators, ns-2 and its Sensor Network Extension, TOSSIM.

**UNIT IV**

Sensor Network Databases : Challenges ,Query Interfaces, High level Database Organization, In-Network Aggregation, Data-centric Storage, Temporal Data.

**Refrences:**


1. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science Imprint, Morgan Kauffman Publishers, 2005.
2. Adhoc Wireless Networks: Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004
3. Wireless Sensor Networks: Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach Book, CRC Press, Taylor & Francis Group, 2010
4. Wireless Ad hoc Mobile Wireless Networks: Principles, Protocols and Applications, Subir Kumar Sarkar et al., Auerbach Publications, Taylor & Francis Group, 2008.
5. Wireless Sensor Networks: Signal Processing and Communications Perspectives, Ananthram Swami et al., Wiley India, 2007.

# Paper: PPC-3 (viii)
# Advanced Design and Analysis of Algorithims

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Introduction: The role of Algorithms in Computing, Insertion Sort, Analyzing algorithms, Designing algorithms, Asymptotic notations, Divide and Conquer Technique: The substitution method for solving recurrences The recursion tree method for solving recurrences, The master method for solving recurrences.

**UNIT-II**

Heapsort: Heaps, Maintaining the heap property, Building a heap, The heapsort algorithm, Priority queues, Red-Black Trees: Properties of red – black trees, Rotations, Insertion, Deletion, Dynamic Programming: Matrix-chain multiplication, Longest common subsequences.

**UNIT-III**

Greedy Technique: An activity selection problem, Elements of greedy strategy, Huffman codes, Single –Source Shortest Paths: The Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra's algorithm.

**UNIT-IV**

String Matching: The naïve string matching algorithm, The Rabin Karp algorithm, NP-Completeness and the P & NP Classes: Introduction, Polynomial Time & Verification, NP-Completeness and Reducibility, The Traveling Salesman Problem

**Refrences:**


1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithm", PHI.
2. Parag Dave & Himanshu Dave, "Design and Analysis of Algorithms", Pearson Education.
3. Michel Goodrich, Roberto Tamassia, "Algorithm design-foundation, analysis & internet examples", Wiley.
4. A V Aho, J E Hopcroft, J D Ullman, "Design and Analysis of Algorithms", Addison-Wesley Publishing.
5. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithm", PHI.
6. Michel Goodrich, Roberto Tamassia, "Algorithm design-foundation, analysis & internet examples", Wiley.
7. A V Aho, J E Hopcroft, J D Ullman, "Design and Analysis of Algorithms", Addison-Wesley Publishing.

# Paper: PPC-3 (ix)
# Big Data analytics

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Statistical Analysis with R and R Studio. Visualization with R, Data Cleanup and Standardization, An Introduction to Hadoop, Batch Processing, HBase a Low Latency NoSQL

**UNIT-II**

Near Real Time Analytics and Search with Impala and Flume. Cloudera Impala enables high speed, in-line, queries with access to in-memory data, data on HDFS, HBase or any other structure on a Hadoop cluster.

**UNIT-III**

Stream Computing is a technology oriented towards data that is continuously flowing or streaming and requires inflight processing. Predictive Analytics encompasses a variety of techniques from statistics, modeling, machine learning, and data mining that analyze current and historical facts to make predictions about future events.

**UNIT-IV**

Visualizing Large Data Sets with D3, Big Data in E-Commerce and IT, Big Data in Energy Consumption, Social and Health Science.

**Refrences:**


1. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses by Michael Minelli, Michele Chambers, Ambiga Dhiraj (Wiley CIO, 2013).
2. Big Data: A Revolution That Will Transform How We Live, Work, and Think by by Viktor Mayer-Schönberger, Kenneth Cukier.

# Paper: PPC-3 (x)
# Advanced Information Security Systems

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Basic Concepts, Cryptosystems, Crypto-Analysis, Ciphers & Cipher Modes, DES, AES, RSA algorithm, Key Management Protocols, Diffie Hellmann Algorithm, Digital Signatures, Message Digest, Secure Hash Algorithms, Public Key Infrastructure.

**UNIT II**

Basic of Probability & Statistics, Shannon Characteristics, Perfect Secrecy, Confusion and Diffusion, Information Theoretic Tests, Unicity Distance, Entropy, Floating Frequency, Histogram, Autocorrelation, Periodicity, Random Analysis Tests, Zero Knowledge Technique.

**UNIT III**

Basic Number Theory, Congruence, Chinese Remainder Theorem. Finite Fields, Discrete Logarithm, Bit Commitment, Random Number Generation, Inverses, Primes, Greatest Common Divisor, Euclidean Algorithm, Modular Arithmetic, Properties of Modular Arithmetic, Computing the inverse, Fermat's Theorem, Algorithm for Computing Inverses, NP-Complete Problems, Characteristics of NPComplete Problems, Meaning of NP-Completeness, NP-Completeness and Cryptography.

**UNIT IV**

Network Threats, Authentication & Access Control Mechanism, Secured Communication Mechanisms, Biometric, Secured Design for LAN, Firewall, Intrusion Detection System, Virtual Private Network, Email and Web Security. WEP, Access Controls, Secure Socket Layer, IPSEC, WAP Security, Security Issues, Challenges & Defense Mechanisms for Bluetooth, GSM, CDMA, GPRS, Wi-Fi, Wi-Max & IEEE Standards.

**References**


1. Security in Computing, Charles P. Pfleeger, Prentice- Hall International, Inc.,
2. Applied Cryptography Protocols, Algorithms, and Source Code in C, Bruce Schneier, John Wiley & Sons, Inc., 1995.
3. Digital Certificates Applied Internet Security", Jalal Feghhi, Jalli Feghhi and Peter
4. Williams, Addison Wesley Longman.
5. Introduction to Cryptography with Coding Theory, Wade Trppe, Lawrence C., Washington, Pearson Education.
6. Network Security, Compete Reference, Tata Mc-Graw Hill.
7. Fundamental of Computer Security, Piepryzyk, Hardjono, Seberry, Universities Press (India) Pvt. Ltd.

# Paper: PPC-3 (xi)
# Digital Image Processing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT I**

The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Components of an Image Processing Systems, Image Acquisition, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

**UNIT 1I**

Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Introduction to Fourier Transform and the frequency Domain, Properties of 2-D Fourier Transform, Smoothing and Sharpening Frequency Domain Filters,

**UNIT III**

A model of The Image Degradation / Restoration Process, Noise Models, Mean Filters, Order-Statistics Filters, Adaptive Filters, Bandreject Filters, Bandpass Filters, Notch Filters, Minimum Mean Square Error ( Wiener) Filtering, geometric mean Filter, Inverse Filtering, Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free compression, Lossy compression, Image compression standards.

**UNIT 1V**

Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation. Patterns and Pattern Classes, Minimum Distance Classifier, matching by Correlation, bayes Classifier.

**Refrences:**


1. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, 2nd edition, Pearson Education, 2004.
2. A.K. Jain, “Fundamental of Digital Image Processing”, PHI, 2003.
3. Rosefield Kak, “Digital Picture Processing”, 1999

# Paper: PPC-3 (xii)
# Neural Networks

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Objective, History, Applications, biological inspiration, Neuron Model, Transfer Functions, Network Architectures.

**UNIT-II**

Perception Learning: Learning Rules, Perceptron Architecture, Perceptron Learning Rule, Training Multiple Neuron Perceptrons. Unsupervised Learning. Supervised Hebbian Learning: The Hebb Rule, Performance Analysis, Application, Variations of Hebbian Learning.

**UNIT III**

Linear Vector Spaces, Spanning a Space, Inner Product, Norm, Orthogonality, Vector Expansions, Linear Transformations, Matrix Representations, Change of Basis, Eigenvalue and Eigenvectors. Performance surfaces and Optimization: Taylor Series, Directional Derivatives, Necessary Condition for Optimality, Quadratic Functions, Optimization Techniques; Steepest Descent, Newton's method, Conjugate Gradient Method.

**UNIT 1V**

The Backpropagation Algorithm; Performance Index, Chain Rule, Example, Drawbacks of Backpropagation, Heuristic Modifications; Momentum, Conjugate Gradient, Levenberg-Marquardt Algorithm. Associative Learning and Competitive Networks: Simple Associative Network, Unsupervised Hebb Rule, Kohonen Rule, Competitive Learning Rule, Self Organizing Feature Maps.

**References:**


1. M.T.Hagan, H.B.Demuth and M.Beale, "Neural Network Design" Thomson Learning,2002
2. Simon Haykin, "Neural Networks – A Comprehensive Foundation," 2nd Edition, Pearson Education, 1999.

# Paper: PPC-3 (xiii)
# Advanced Database Management Systems

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT I**

Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-trees and B+-trees.

**UNIT II**

Locking Techniques for Concurrency Control, Concurrency Control Techniques Based on Timestamp Ordering.

**UNIT III**

Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Schedules and Recoverability, Serializability of Schedules.

**UNIT 1V**

Introduction, I/O parallelism, inter-query parallelism, intra-query parallelism, interoperation parallelism, Design of parallel systems. Distributed data storage, Network transparency, Distributed query processing, Distributed transaction model, commit protocols, coordinator selection, concurrency control, deadlock handling.

**Refrences:**


1. Database System Concepts by A. Silberschatz, H.F.Korth and S.Sudarshan, 3rd edition, 1997, McGraw-Hill and International Edition.
2. Fundamentals of Database Systems by R.Elmasri and S.B.Navathe, 3rd edition.
3. An Introduction to Database Systems by C.J.Date, 7th edition, Addison-Wesley, Low Priced Edition, 2000.
4. Database Management and Design by G.W Hansen, 2nd edition, 1999, Prentice-Hall of India, Eastern Economy Edition.
5. Database Management Systems by A,.K.Majumdar and P.Bhattacharyya.5th edition, 1999, Tata McGraw-Hill Publishing.

# Paper: PPC-3 (xiv)
# Performance Modeling

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT I**

Review of Probability, Random variables and Distributions; Generating functions and transforms; Poisson, Markov and semi-Markov processes.

**UNIT II**

Characteristics of queueing systems; Little's formula; Markovian and non-Markovian queueing systems; embedded Markov chain applications to M/G/1, G/M/1, and related queueing systems.

**UNIT III**

Networks of queues; open and closed queueing networks, algorithms to compute the performance metrics. Simulation techniques for queues and queueing networks.

**UNIT IV**

Advanced topics like queues with vacations, priority queues, queues with modulated arrival process, and discrete time queues; introduction to matrix-geometric methods; applications of the theory to the performance modelling of computer and communication networks.

**Refrences:**


1. D. Gross and C. Harris, Fundamentals of Queueing Theory, 3rd Edition, Wiley, 1998.
2. R.B. Cooper, Introduction to Queueing Theory, 2nd Edition, North-Holland, 1981.
3. L. Kleinrock, Queueing Systems, Vol. 1: Theory, Wiley, 1975; Vol. 2: Computer Applications, Wiley, 1976.
4. R. Nelson, Probability, Stochastic Processes, and Queueing Theory: The Mathematics of Computer Performance Modelling, Springer, 1995.
5. E. Gelenbe and G. Pujolle, Introduction to Queueing Networks, 2nd Edition,Wiley, 1998.
6. T.G. Robertazzi, Computer Networks and Systems: Queueing Theory and Performance Evaluation, 3rd Edition, Springer, 2000.

# Paper: PPC-3 (xv)
# Data Warehousing and Mining

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-II**

Introduction to Data Warehousing: Evolution of Data Warehousing, Data Warehousing concepts, Benefits of Data Warehousing, Comparison of OLTP and Data Warehousing, Problems of Data Warehousing. Architecture: Operational Data and Datastore, Load Manager, Warehouse Manager, Query Manager, Detailed Data, Lightly and Highly summarised Data, Archive/Backup Data, Meta-Data, architecture model, 2-tier, 3-tier and 4-tier data warehouse, end user Access tools.

**UNIT-II**

Tools and Technologies: Extraction, cleaning and Transformation tools, Data Warehouse DBMS, Data Warehouse Meta-Data, Administration and management tools, operational vs. information systems.OLAP & DSS support in data warehouse.

**UNIT-III**

Types of Distributed Data Warehouses, Nature of development Efforts, Distributed Data Warehouse Development, Building the Warehouse on multiple levels. Knowledge discovery through statistical techniques, Knowledge discovery through neural networks, Fuzzy technology & genetic algorithms.

**UNIT-IV**

Host based, single stage, LAN based, Multistage, stationary distributed & virtual datawarehouses. Data warehousing Design: Designing Data warehouse Database, Database Design Methodology for Data Warehouses, Data Warehousing design Using Oracle, OLAP and data mining: Online Analytical processing, Data mining.

**Refrences:**


1. Building the Data Warehouse, W.H.Inmon, 3rd Edition, John Wiley & Sons.
2. Developing the Data Warehouse, W.H.Inmon, C.Kelly, John Wiley & Sons.
3. W.H.Inmon, C.L.Gassey, “Managing the Data Warehouse”, John Wiley & Sons.
4. Fayyad, Usama M. et. al., “Advances in knowledge discovery & Data Mining”,MIT Press.

# Paper: PPC-3 (xvi)
# Software Testing and Quality Assurance

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

A perspective on Testing, STLC, Functional testing: Boundary value testing, Equivalence – class testing, Decision Table Testing etc., Retrospective on Functional Testing; Structural testing: path testing, data flow testing, mutation testing, etc. Retrospective testing, Levels of testing: Integration testing, system testing, acceptance testing,

**UNIT-II**

Object-oriented Testing, Interaction testing, testing of Web Applications, Testing metrics, Testing Paradigms: Scripted testing, Exploratory testing, Test planning, Supporting Technologies: Defect taxonomies, Testing tools and standards, Case studies.

**UNIT-III**

Introduction to Software Quality, Quality Models: McCall's Model, Hierarchical model FCMM , Measuring Software Quality, Quality Metrics: Process, Product, Quality Control Tools, Quality assurance concept, importance, Requirements for SQA works,

**UNIT-IV**

Pareto Principle to SQA, Costs of Software Quality, SQA metrics, Audit Review, Walk through, Inspection techniques, SQA plan., Quality standards: SEI-CMM, ISO 9000 series, comparison between SEI CMM and ISO 9000.

**References:**


1. Software Testing – A Craft's man Approach, Paul C. Jorgensen , A CRC Press LLC.
2. Software Quality Theory and Management by Alan C. Gillies, Chapman & Hall.
3. Software Quality by Galrry S. Marliss , Thomson.
4. Metrics and Models in Software Quality Engineering by Stephen H. Kan , Pearson Education.
5. Handbook of Software Quality Assurance by G. Gordon Sculmeyer, Artech House Publishers, Boston –London
6. Introducing Software Testing by Louise Tamres; Pearson Education, 2006

# Paper: PPC-3 (xvii)
# Embedded Systems

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

The concepts of embedded system design, embedded microcontroller cores, embedded memories, examples of embedded systems. Technological aspects of embedded system: interfacing between analog and digital blocks, signal conditioning, Digital signal processing, subsystem interfacing, interfacing with external systems, user interfacing, Design tradeoffs due to process compatibility, Thermal consideration etc. Software aspects of embedded systems: real time programming languages and operating systems.

**UNIT-II**

Introduction, CPU architecture, registers, instruction sets addressing modes Loop timing, timers, Interrupts; Interrupt timing, I/o Expansion, I2C Bus Operation Serial EEPROM, Analog to digital converter, UART Baud Rate-Data Handling-Initialization, Special Features - serial Programming-Parallel Slave Port.

**UNIT-III**

Motorola MC68H11 Family Architecture Registers, Addressing modes Programs. Interfacing methods parallel I/o interface, Parallel Port interfaces, Memory Interfacing, High Speed I/o Interfacing, Interrupts-interrupt service routine-features of interrupts-Interrupt vector and Priority, timing generation and measurements, Input capture, Output compare, Frequency Measurement, Serial I/o devices RS.232, RS.485. Analog Interfacing, Applications. ARM processors.

**UNIT-IV**

Embedded system development, Embedded system evolution trends. Round - Robin, robin with Interrupts, function-One-Scheduling Architecture, Algorithms. Introduction to-assembler-compiler-cross compilers and Integrated Development Environment (IDE). Object Oriented Interfacing, Recursion, Debugging strategies, Simulators.

**Refrences:**


1. David E Simon, " An embedded software primer ", Pearson education Asia, 2001.
2. John B Peat man " Design with Microcontroller ", Pearson education Asia, 1998.
3. Jonartthan W. Valvano Brooks/cole " Embedded Micro computer Systems. Real time Interfacing ", Thomson learning 2001.
4. Raymond J.A. Bhur and Donald L.Bialey, " An Introduction to real time systems: Design to networking with C/C++ ", Prentice Hall Inc. New Jersey, 1999.
5. Heath, Steve, " Embedded Systems Design ", Newnes 1997

# Paper: PPC-3 (xviii)
# Advanced Wireless Networks

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Analog and Digital Data; Transmission fundamentals, Channel Capacity. Transmission Media. Multiplexing. LANs, MANs, and WANs. Switching Techniques; Circuit-Switching. Packet Switching. Asynchronous Transfer Mode- ATM. The Concept of Spread Spectrum. Frequency Hopping Spread Spectrum. Direct Sequence Spread Spectrum. Code-Division Multiple Access. Generation of Spreading Sequences.

**UNIT-II**

Cellular Network Concept, First Generation (1G) Analog, Second Generation (2G) Digital TDMA. GSM and mobility management in GSM, Third Generation Systems (3G) CDMA and 4 G Technology overview. Principles of Wideband CDMA (WCDMA), CDMAOne and CDMA2000, Universal Mobile Telecommunications System (UMTS), Evolution of Mobile Communication Networks, Call Controls and Mobility Management in CDMA.Quality of Service (QoS) in 3G Systems, CDMA network planning, design and applications

**UNIT-III**

Radio Specifications. Base band Specification. Link Manager Specification. Logical Link Control and Adaptation Protocol. IEEE 802 Protocol Architecture. IEEE 802.11 Architecture and Services. IEEE 802.11 Medium Access Control. IEEE 802.11x Standards.

**UNIT-IV**

The Wireless Application Protocol application environment, wireless application protocol client software, wireless application protocol gateways, implementing enterprise wireless application protocol strategy and Security Issues in Wireless LAN. Wireless network management, GPRS, and VOIP services.

**References:**


1. William Stalling, Wireless Communications and Networks. Prentice Hall 2002
2. Yi-Bing Lin, Imrich Chlamtac, Wireless and Mobile Network Architecture, John Wiley-2001.
3. M. R. Karim, Mohsen Sarraf, W-CDMA and cdma2000 for 3G Mobile Networks, McGraw-Hill Professional, 2002

# Paper: PPC-3 (xix)
# Genetic Algorithms

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

A brief history of evolutionary computation, Elements of Genetic Algorithms, A simple genetic algorithm, Applications of genetic algorithms, Evolving computer programs, data analysis & prediction, evolving neural networks, Modeling interaction between learning & evolution, modeling sexual selection, measuring evolutionary activity.

**UNIT-II**

Schemas & Two-Armed and k-armed problem, royal roads, exact mathematical models of simple genetic algorithms, Statistical- Mechanics Approaches. Data structures, Reproduction, crossover & mutation, mapping objective functions to fitness form, fitness scaling, coding, a multiparameter, mapped, fixed point coding, discretization and constraints.

**UNIT-III**

The risk of genetic algorithms, De Jong & function optimization, Improvement in basic techniques, current application of genetic algorithms

**UNIT-IV**

Dominance, duplicity, & abeyance, inversion & other reordering operators. Other micro operators, Niche & speciation, multiobjective optimization, knowledge based techniques, genetic algorithms & parallel processors.

**Refrences:**


1. David E. Goldberg, "Genetic algorithms insearch, optimization & Machine Learning" Addison Wesley, 1989.
2. Melanle Mitchell, "An introduction to genetic algorithms" MIT press, 2000.
3. Masatoshi Sakawa, "Genetic Algorithms & Fuzzy Multiobjective Optimization", Kluwer Academic Publisher, 2001.
4. D. Quagliarella, J Periaux, C Poloni & G Winter, "Genetic Algorithms in Engineering & Computer science", John Wiley & Sons, First edition, 1997.

# Paper: PPC-3 (xx)
# Grid Computing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Grid Computing & Key Issues – Applications – Other Approaches – Grid Computing Standards – Pragmatic Course of Investigation.

**UNIT-II**

Motivations – History of Computing, Communications an Grid Computing – Grid Prime Time – Suppliers and Vendors – Economic Value- Challenges.

**UNIT-III**

Components of Grid Computing Systems and Architectures: Basic Constituent Elements – A Functional View – A Physical View – Service View.

**UNIT-IV**

Grid Computing Standards – OGSI: Standardization – Architectural Constructs – Practical View – OGSA/OGSI Service Elements and Layered Model – More Detailed view.

**Refrences:**


1. A Network Approach to Grid Computing, Daniel Minoli, Wiley Publication.
2. Grid Computing – A Practical Guide to Technology and Applications, Ahmar Abbas, Charles Media Publication.

# Paper: PPC-3 (xxi)
# Mobile Computing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Concept of Multimedia, Media & data stream, main properties of multimedia system, Data stream characteristics &for continuous media Multimedia Applications, Hardware Software requirements, Storage Technologies: RAID, Optical Media.

**UNIT-II**

Text, Basic sound concepts , MIDI , Speech ,Basic concept of Images, Graphics format ,Basic concepts of Video & animation, Conventional system, Computer based animation, Authoring Tools, Categories of Authoring Tools. Compression Techniques: Lossless and Lossy compression, Run length coding, Statistical Coding, Transform Coding, JPEG, MPEG, Text compression using static Huffmann technique, Dynamic Huffman Technique, Arithmetic Technique.

**UNIT-III**

Introduction, Basic Terminology techniques, tweaning & morphing, Motion Graphics 2D & 3D animation. Animation: Key frame animation, reactive animation, path animation, Skelton animation etc., deformers..

**UNIT-IV**

Dynamics: soft bodies, Rigid bodies and its usages in the scene etc.,Rendering: soft, Hard rendering. IPR rendering, Line and box rendering etc.,Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.Working with MEL: Basics & Programming

**Refrences:**


1. David Hillman, “Multimedia Technology & Applications”, Galgotia Publications, 2000
2. Nigel Chapman & Jenny Chapman, “Digital Multimedia”, Wiley Publications, 2000
3. D.P. Mukherjee, “Fundamentals of Computer Graphics and Multimedia”, PHI, 2001

# Paper: PPC-3 (xxii)
# Advanced Multimedia Technology

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Concept of Multimedia, Media & data stream, main properties of multimedia system, Data stream characteristics &for continuous media Multimedia Applications, Hardware Software requirements, Storage Technologies: RAID, Optical Media.

**UNIT-II**

Text, Basic sound concepts , MIDI , Speech ,Basic concept of Images, Graphics format ,Basic concepts of Video & animation, Conventional system, Computer based animation, Authoring Tools, Categories of Authoring Tools. Compression Techniques: Lossless and Lossy compression, Run length coding, Statistical Coding, Transform Coding, JPEG, MPEG, Text compression using static Huffmann technique, Dynamic Huffman Technique, Arithmetic Technique.

**UNIT-III**

Introduction, Basic Terminology techniques, tweaning & morphing, Motion Graphics 2D & 3D animation. Animation: Key frame animation, reactive animation, path animation, Skelton animation etc., deformers..

**UNIT-IV**

Dynamics: soft bodies, Rigid bodies and its usages in the scene etc. Rendering: soft, Hard rendering. IPR rendering, Line and box rendering etc.Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.Working with MEL: Basics & Programming.

**Refrences:**


1. David Hillman, “Multimedia Technology & Applications”, Galgotia Publications, 2000
2. Nigel Chapman & Jenny Chapman, “Digital Multimedia”, Wiley Publications, 2000
3. D.P. Mukherjee, “Fundamentals of Computer Graphics and Multimedia”, PHI, 2001

# Paper: PPC-3 (xxiii)
# Parallel Computing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

The state of computing, multiprocessors and multicomputers, multivector and SIMD computers, architectural development tracks. Program and Network Properties: Conditions of parallelism, program partitioning and scheduling, program flow mechanisms. System Interconnect Architectures. Network properties and routing, static interconnection networks and dynamic interconnection networks, MPI and PVM architecture.

**UNIT-II**

Advanced processor technology- CISC, RISC, Superscalar, Vector, VLIW and symbolic processors, Memory hierarchy technology, Virtual memory technology (Virtual memory models, TLB, paging and segmentation). Cache memory organization, shared memory organization, sequential and weak consistency models

**UNIT-III**

Linear Pipeline Processors, Nonlinear Pipeline processors, Instruction Pipeline Design, Arithmetic Pipeline Design.

**UNIT-IV**

Multiprocessors System Interconnects, Cache Coherence and Synchronization Mechanisms, Vector Processing Principles, Multivector Multiprocessors and Data Flow Architecture.

**References:**


1. Kai Hwang “Advanced Computer Architecture”, McGraw Hill.
2. J.P.Hayes “Computer Architecture and Organization”, McGraw Hill.
3. Harvey G. Cragon, “Memory Systems and Pipelined Processors”, Narosa Publication.
4. V. Rajaranam & C.S.R. Murthy, “Parallel Computers”, PHI.
5. R. K. Ghose, Rajan Moona & Phalguni Gupta, “Foundation of Parallel Processing”, Narosa Publications.
6. Stalling W., “Computer Organization & Architecture”, PHI.

# Paper: PPC-3 (xxiv)
# Web Engineering

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

## UNIT-I

The role of the Information Architect, Collaboration and Communication, Organizing Information, Organizational Challenges, Organizing Web sites and Intranets, Creating Cohesive Organization Systems Designing Navigation Systems, Types of Navigation systems, Integrated Navigation Elements, Remote Navigation Elements, Designing Elegant Navigation Systems, Searching Systems, Searching your Web Site, Designing the Search Interface, Indexing the Right Stuff, To search or Not To Search, Grouping Content, Conceptual Design, High-Level Architecture Blueprints, Architectural Page Mockups, Design Sketches.

## UNIT-II

HTML Basic Concepts, Good Web Design, Process of Web Publishing, Phases of Web Site development, Structure of HTML documents, HTML Elements-Core attributes, Language attributes, Core Events, Block Level Events, Text Level Events, Linking Basics, Linking in HTML, Images and Anchors, Anchor Attributes, Image maps, Semantic Linking Meta Information, Image Preliminaries, Image Download Issues, Image as Buttons, Introduction to Layout: Backgrounds, Colors and Text, Fonts, Layout with Tables. Advanced Layout: Frames and Layers, HTML and other media types. Audio Support in Browsers, Video Support, Other binary Formats. Style Sheets, Positioning with Style sheets. Basic Interactivity and HTML: FORMS, Form Control, New and emerging Form elements.

## UNIT-III

Basics, Integrating Script, JSP/ASP Objects and Components, configuring and troubleshooting,: Request and response objects, Retrieving the contents of a an HTML form, Retrieving a Query String, Cookies, Creating and Reading Cookies. Using application Objects and Events.

## UNIT-IV

Basics, Integrating Script, Objects and Components, Configuring and troubleshooting, advanced features & their creation and applications, embedding XML with other tools.

**Refrences:**


1. HTML The complete Reference, TMH
2. CGI Programming with Perl 2/e, Scott Guelich, Shishir Gundavaram, Gunther
3. Birzniek; O'Reilly
4. Doug Tidwell, James Snell, Pavel Kulchenko; Programming Web Services with
5. SOAP, O' Reilly

# Paper: PPC-3 (xxv)
# Fuzzy Logic

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Fuzzy Systems: Introduction, Fundamentals of Fuzzy Sets, Fuzzy set, Fuzzy Set Relations, Basic Fuzzy set Operations and Their Properties, Operations Unique to Fuzzy sets, Fuzzy Relations, Ordinary (crisp) Relations, Fuzzy Relations Defined on Ordinary Sets, Fuzzy Relations Derived from Fuzzy Sets, Fuzzy Logic, Fuzzy Logic Fundamentals, Fuzzy Control, Fuzzy Control Basics, Case Studies: Extended Fuzzy if-then Rules Tables, Fuzzy Control Expert Systems, Hybrid Systems.

**UNIT-II**

Fuzzy Numbers, Alpha-Cuts, Inequalities,. Fuzzy Arithmetic: Extension Principle, Interval Arithmetic, Fuzzy Arithmetic. Fuzzy Functions: Extension Principle, Alpha-Cuts and Interval Arithmetic, Differences.

**UNIT-III**

Ordering/ Ranking Fuzzy Numbers, Optimization, Discrete Versus Continuous. Fuzzy Estimation: Introduction, Fuzzy Probabilities , Fuzzy Numbers from Confidence Intervals, Fuzzy Arrival/Service Rates , Fuzzy Arrival Rate , Fuzzy Service Rate , Fuzzy Probability Distributions , Fuzzy Binomial, Fuzzy Estimator of $\mu$ in the Normal, Fuzzy Estimator of $\sigma 2$ in the Normal, Fuzzy Exponential, Fuzzy Uniform ,

**UNIT-IV**

Fuzzy Probability Theory: Introduction, Fuzzy Binomial , Fuzzy Poisson, Fuzzy Normal, Fuzzy Exponential, Fuzzy Uniform , Fuzzy Systems Theory: Fuzzy System, Computing Fuzzy Measures of Performance.

**References:**


1. Fundamentals of the New Artificial Intelligence Neural, Evolutionary, Fuzzy and More (Second Edition) By Toshinori Munakata, Springer-Verlag London Limited (2008).
2. Artificial Intelligence (Second Edition) By Elaine Rich, Kevin Knight, Tata McGraw-Hill (2000).
3. Artificial Intelligence A Modern Approach (Second Edition) By Stuart Russell, Peter Norving, Prentice-Hall of India (2000).
4. Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering By Nikola K. Kasabov MIT Press (1998).
5. Simulating Fuzzy Systems by James J. Buckley, Springer- Verlag (2005)

# Paper: PPC-3 (xxvi)
# Advanced Networking and Protocols

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Network Architecture- Protocol Hierarchies, Layered model, Services, Interface, Reference Models,Underlying Technologies, LAN's (Ethernet, Token Ring, Wireless), Point-to-Point WAN's, Switched WAN's (X.25, Frame Relay, ATM)

**UNIT-II**

IP- Datagram, fragmentation and reassembly, ICP, ICMP Interior and Exterior Routing-RIP, OSPF, BGP, Multicast Routing- Unicast, Multicast and Broadcast, Multicasting

**UNIT-III**

The transport service-Services provided, Service primitives, Sockets, Elements of transport protocols-addressing, connection establishment, connection release, flow control and buffering, multiplexing, crash recovery, UDP-Introduction, Remote Procedure Call, TCP-Service model, Protocol, frame format, connection establishment release, connection management

**UNIT-IV**

DNS, Telnet and Rlogin, FTP,TFTP,SNMP, SMTP, World Wide Web(Client and Server Side, cookies, wireless web), Java and the Internet, Multimedia (streaming audio, Internet Radio, voice over IP-RTP, video standards) Real time traffic over the internet.

**References:**


1. Behrouz Forouzan, TCP/IP Protocol Suite, Second Edition, Tata McGraw Hill
2. Andrew S Tanenbaum, Computer Networks, Fourth Ecition, Pretice Hall
3. Douglas E. Comer, Internetworking with TCP/IP,Vol. 1, Principles, Protocols and Architecture Fifth Edition, Prentice Hall, 2000, ISBN o-13-018380-6.
4. William Stallings, Data and Computer Communications, Seventh Edition, Pearson Education

# Paper: PPC-3 (xxvii)
# Intelligent Systems

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Intelligent Agents – Agents and environments – Good behavior – The nature of environments – structure of agents – Problem Solving – problem solving agents – example problems – searching for solutions – uniformed search strategies –avoiding repeated states – searching with partial information.

**UNIT-II**

Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments – Constraint satisfaction problems (CSP) –Backtracking search and Local search – Structure of problems – Adversarial Search

**UNIT-III**

First order logic - syntax and semantics – Using first order logic – Knowledge engineering – Inference – propositional versus first order logic – unification and lifting –forward chaining – backward chaining – Resolution – Knowledge representation

**UNIT-IV**

Learning from observations – forms of learning – Inductive learning – Learning decision trees – Ensemble learning – Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods – Learning with complete data – Learning with hidden variable – EM algorithm – Instance based learning.

**Refrencess:**


1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education / Prentice Hall of India, 2004.
2. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Second Edition, Tata McGraw Hill, 2003.
4. George F. Luger, “Artificial Intelligence-Structures And Strategies For Complex Problem Solving”, Pearson Education / PHI, 2002.

# Paper: PPC-3 (xxviii)
# Information Processing and E-commerce

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Compression & Decompression Techniques – Loosy & Loose less Techniques, Different formats of multimedia files such as images, videos and audios will be studied

**UNIT-II**

Elementary data Structures and their operations, Basic search and traversal techniques, Divide-Conquer techniques, Greedy method, Branch bound.

**UNIT-III**

Cloud Computing: Introduction, Iaas, Paas, Saas, Baas, Internetworking between Clouds. Search Engine Strategies: Functioning, Making information accessible on net, Getting better rating and preference in search engines

**UNIT-IV**

Overview of E-Commerce, Benefits of E-Commerce, Impact of E-Commerce, Applications of E-Commerce, Business Models of E-Commerce. Electronic Payment System: Introduction to Payment System, Online Payment System, Pre-paid and Postpaid Payment System. Security in E-Commerce: Transaction Security, Cryptology, Authentication Protocol, Digital Signature.

**References:**


1. "Security Technologies for World Wide Web", Rolf Oppliger, Artech House: Inc.
2. "Introduction to Cryptography with Coding Theory", Wade Trappe, Lawrence C. Washington, Pearson Education.
3. "Network Security: Complete Reference", TMH
4. Fundamentals of computer algorithms by Horowitz, Ellis; Sahni, Sartaj & Rajasekaran, university Press.
5. Cloud Computing: Web-Based Applications that change the way you work and collaborate By Michael miller.

# Paper: PPC-3 (xxix)
# Information Hiding Techniques

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT- I**

Introduction to Information Hiding: Types of Information Hiding, Applications, Importance & Significances. Differences between cryptography and steganography, Wisdom from Cryptography, types of steganography their application and significances. Past present and future of steganography

**UNIT- II**

Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data, Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text, Steganographic system, Study of Different methods of insertion and retrieval of message using image steganography, Study of histrogram analysis using MATLAB of original image and stego image

**UNIT- III**

Basics of watermarking, Watermarking process, Watermarking applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking, Bit plane of an Image, study of noises in stego images and their comparisons, Robustness of watermarking schemes on different attacks like blurring, cropping , compression of the image. PSNR calculation of the images.

**UNIT IV**

Use of image steganography in biometric sciences, Study of security enhancement of biometric template using steganographic Frame proof codes:-Definition, Introduction of frame proof codes, Methods to obtain 2- frame proof codes using mutually orthogonal latin squares. Use of frame proof codes in ownership and software piracy.

**Refrences:**


1. Recent Advances in Information Hiding and Applications, Pan, J.-S., Huang, H.-C., Jain, L.C., Zhao, Y., Springer (2013).
2. Information Hiding Techniques for Steganography and Digital Watermarking, Stefan Katzenbeisser, Fabien A. P. Petitcolas, Artech House, 2000.

# Paper: PPC-3 (xxx)
# Data Modeling and Design

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Conceptualization and 100% principles, ER, SHM, SHM+Conversion of conceptual schemas to relational models High and Low CASE tools

**UNIT-II**

Functional modeling, dynamic modeling, and object modeling, Representation of these in UML Principles of class design: Open closed principle, Liskov's substitution principle, dependency inversion principle Principles of package design: package cohesion principle, common-reuse principle, common-closure principle, package coupling, stable dependencies principle.

**UNIT-III**

Facts, dimension, aggregate, star schema, snowflake schema, constellation. Conversion of ER to star schema, Star schema to relational schema, using multidimensional data structures

**UNIT-IV**

Statement of purpose, context diagram, developing process hierarchy. Use cases XML, XML schema, XML query.

**Refrences:**


1. Database Modeling and Design, Fifth Edition: Logical Design (The Morgan Kaufmann Series in Data Management Systems), Steve Hoberman
2. Data Modeling Made Simple: A Practical Guide for Business and IT Professionals, 2nd Edition Paperback – September 15, 2009 by Steve Hoberman

# Paper: PPC-3 (xxxi)
# Structured Systems Analysis, Design and Testing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Structuring definition, application to real world phenomena, Data Flow Diagrams, principles of module design, cohesion, coupling

**UNIT-II**

Data structuring: need, definition, evolution of data structuring in Fortran, COBOL, Pascal, C Control structuring: need, definition, control structuring in Fortran, COBOL, Pascal, C program structuring: need, side effects, calling conventions and their applications in program structuring.

**UNIT-III**

Testing life cycle, Notion of a test case, White box testing: statement testing, branch testing, condition testing, basis path, cyclomatic complexity, loop testing, testing recursive programs Integration testing: top down and bottom up testing, stubs and drivers Black box testing: domain testing, equivalence class testing, boundary value testing and its different forms, Cause-effect graphs.

**UNIT-IV**

Statement of purpose, context diagram, developing process hierarchy. Use cases.

**Refrences:**


1. "Analysis and Design of Information Systems" : Senn, TMH.
2. System Analysis and Design : Howryskiewycz, PHI.
3. "System Analysis and Design" : Awad.
4. "Software Engineering A practitioners Approach" : Roger S. Pressman TMH.
5. "System Analysis and Design Methods : "Whitten, Bentley.
6. "Analysis and Design of Information Systems" : Rajaraman, PHI.

# Paper: PPC-3 (xxxii)
# Information Theory and Coding

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Marginal, joint and conditional entropy, information rate, mutual information, channel capacity of various channels, cascaded channels, repetition of signals

**UNIT-II**

Shannon Hartley theorem, bandwidth- S/N ratio tradeoff, continuous channel, negative entropy

**UNIT-III**

Irreducibility, separatibility, coding efficiency, source encoding, Shannon Fano code, Huffman code, and data compression

**UNIT-IV**

Minimum distance, error detection and correction, FEC and ARQ, block code, convolution codes, and cyclic codes, signal error correction, multiple error correction, burst error correction, Cryptography, Encryption and decryption

**References**:


1. Information Theory; F.M Reza; McGraw Hills
2. Digital and Analog Communication Systems; K Sam Shanmugam; John Wiley
3. Communication Systems: Analog and digital; Singh and Sapre; TMH 1995

# Paper: PPC-3 (xxxiii)
# Fault Tolerant System

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

## UNIT-I

Top challenges facing the practice of fault-tolerances. Definitions, Dependability, Maintainability, Fault-Error-Failure. Redundancy, Error Detection, Damage Confinement, Error Recovery, Fault Treatment, Passive HW Redundancy, Voting. Fault Prevention –Fault tolerance – anticipated and unanticipated Faults- Test generation for digital systems- Combinational logic.

## UNIT-II

General coding scheme – Parity checking code- arithmetic code – code for computer memories –checking errors in logical operation – communication coding. Error detection techniques: Watchdog processors, Heartbeats, consistency and capability checking, Data audits, Assertions, Control-flow checking, Error control coding. Application: DHCP Fault tolerance: Coding technique-fault tolerant self checking and fail safe circuits-fault tolerance in combinatorial and sequential circuits- synchronous and asynchronous fail safe circuits. Software fault tolerance: Process pairs, Robust data structures, N version programming, Recovery blocks, Replica consistency & reintegration, Multithreaded programs Application: VAX

## UNIT-III

Network fault tolerance: Reliable communication protocols, Agreement protocols, Database commit protocols -Application: Distributed SQL server Check pointing & Recovery - Application: Micro check pointing, IRIX Checkpoints Experimental Evaluation: Modeling and simulation based, Fault injection based - Application: NFTAPE fault injector Modeling for performance, dependability and performability: dependability-specific methods (fault trees, reliability block diagrams), queues, stochastic Petri nets and stochastic activity networks - Application: UltraSAN

## UNIT-IV

Application: Ad-hoc wireless network- Application: NASA Remote Exploration & Experimentation System, Architecture: Fault tolerant computers - general purpose commercial systems-fault tolerant multiprocessor and VLSI based communication architecture. Fault tolerant software: Design-N-version programming recovery block - acceptance tests-fault trees- validation of fault tolerant systems.

**Refrences:**


1. K.K.Pradhan, “Fault Tolerant computing theory and techniques” P Hall, 1989.
2. Anderson and Lee, “Fault Tolerant principles and practice”,PHI 1989.
3. N. N. Biswas, “Logic Design theory”, PHI 1990.
4. Shem , toy Levei , Ashok K.Agarwala , “Fault Tolerant System design”, Tata MG Hill, 1994

# Paper: PPC-3 (xxxiv)
# Search Engines and Information Retrieval

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**Unit-I**

Introduction: History of IR - Components of IR - Issues – Open source Search engine Frameworks - The impact of the web on IR - The role of artificial intelligence (AI) in IR – IR Versus Web Search - Components of a Search engine - Characterizing the web.

**Unit-II**

**INFORMATION RETRIEVAL:** Boolean and vector-space retrieval models - Term weighting - TF-IDF weighting - cosine similarity – Preprocessing - Inverted indices - efficient processing with sparse vectors – Language Model based IR - Probabilistic IR – Latent Semantic Indexing - Relevance feedback and query expansi

**Unit-III**

**WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING** : Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement - search engine optimization/spam – Web Search Architectures - crawling - meta-crawlers- Focused Crawling - web indexes –- Near-duplicate detection - Index Compression – XML retrieval

**Unit-IV**

**WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH:** Link Analysis – hubs and authorities – Page Rank and HITS algorithms - Searching and Ranking – Relevance Scoring and ranking for Web – Similarity - Hadoop & Map Reduce - Evaluation - Personalized search - Collaborative filtering and content-based recommendation of documents and products – handling "invisible" Web - Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval

**TEXT BOOKS:**


1. C. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Berthier Ribeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

# Paper: PPC-3 (xxxv)
# Bio-inspired Computing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

## UNIT I

What is Life? - Life and Information - The Logical Mechanisms of Life - What is Computation? Universal Computation and Computability - Computational Beauty of Nature (fractals, L-systems, Chaos) - Bio-inspired computing - Natural computing -Biology through the lens of computer science

## UNIT II

Complex Systems and Artificial Life - Complex Networks - Self-Organization and Emergent Complex Behavior - Cellular Automata - Boolean Networks - Development and Morphogenesis - Open-ended evolution

## UNIT III

Biological Neural Networks- Artificial Neural Nets and Learning - pattern classification & linear separability - single and multilayer perceptrons, backpropagation - associative memory - Hebbian learning - Hopfield networks - Stochastic Networks – Unsupervised learning

## UNIT IV

Evolutionary Programming: biological adaptation & evolution - Autonomous Agents and Self-Organization: termites, ants, nest builiding,flocks, herds, and schools.Genetic algorithms:Schema theorem - Reproduction-Crossover-Mutation operators. Collective Behavior and Swarm Intelligence - Social Insects - Stigmergy and Swarm Intelligence; Competition and Cooperation - zero- and nonzero-sum games - iterated prisoner’s dilemma - stable strategies - ecological & spatial models - Communication and Multi-Agent simulation – Immunocomputing.

# Paper: PPC-3 (xxxvi)
# Quantum Computing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Introducing quantum mechanics. Quantum kinematics, quantum dynamics, quantum measurements.Single qubit, multiqubits, gates. Density operators, pure and mixed states, quantum operations, environmental effect, decoherence. Quantum no-cloning, quantum teleportation.Quantum Cryptography: Cryptography, classical cryptography, introduction to quantum cryptography. BB84, B92 protocols. Introduction to security proofs for these protocols.

**UNIT-II**

Quantum Algorithm: Introduction to quantum algorithms. Deutsch-Jozsa algorithm, Grover's quantum search algorithm, Simon's algorithm. Shor's quantum factorization algorithm. Error Correction: Errors and correction for errors. Simple examples of error correcting codes in classical computation. Linear codes. Quantum error correction and simple examples. Shor code.

**UNIT-III**

Quantum Entanglement:Quantum correlations, Bell's inequalities, EPR paradox. Theory of quantum entanglement. Entanglement of pure bipartite states. Entanglement of mixed states. Peres partial transpose criterion. NPT and PPT states, bound entanglement, entanglement witnesses.

**UNIT-IV**

Implementations: Different implementations of quantum computers. NMR and ensemble quantum computing, Ion trap implementations. Optical implementations.

**Refrences:**

1. Quantum Computation and Quantum Information, M.A. Nielsen and I.L.Chuang, Cambridge University Press 2000.

# Paper: PPC-3 (xxxvii)
# Advanced Oprating System

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Introduction: Overview of advanced operating systems: motivation for their design, and various types of advanced operating systems. Process Management: Process overview, process states and state transition, multiprogramming, multi-tasking, levels of schedulers and scheduling algorithms. Interprocess Communication and Synchronization: Classical problems in concurrent programming, Critical section and mutual exclusion problem, Semaphores, Monitors, Deadlock Prevention.

**UNIT-II**

Memory Management: Classical memory management techniques, paging, segmentation, virtual memory, Demand Paging, Thrashing. Real time Operating System: Real time applications, Reference model, Real time scheduling, Real time communication. Network Storage OS: Storage Area Networks and cluster services, Architecture of Storage area networks.

**UNIT-III**

Distributed Systems: Architecture of distributed systems, deadlock detection/resolution, Distributed Scheduling- introduction, issues in load distribution, components of load distributing algorithm, selecting a suitable load sharing algorithm, requirements for load distribution.

**UNIT-IV**

Operating Systems for Multiprocessors:Grid Computing: Technology and Architecture, Web services and SOA, Grid and Database. Cluster Computing: Architecture, Networking, Protocols and I/O for clusters, Setting up and Administering a cluster, Scheduling jobs in cluster, Load sharing and Load Balancing. Parallel Computing: Architecture of parallel computer, Parallel algorithms, OS for parallel computers, Performance evaluation of parallel computers.

**Refrences:**


1. Silbersachatz and Galvin, “Operating System Concepts”, John Wiley, 8th Ed., 2009.
2. A.S. Tanenbaum, “Modern Operating Systems (3rd ed.)”, Prentice-Hall of India, 2008.
3. D.M. Dhamdhere, “Operating Systems: A Concept Based Approach (2nd ed.)”, Tata McGraw-Hill, 2007.
4. C.S.R. Prabhu, “Grid and Cluster Computing”, PHI, 2009.
5. Raj Kumar Buyya, “High Performance Cluster Computing”, Pearson Education, 2008.
6. Jane W.S.Liu, “Real Time Systems”, Pearson Education, 2008.
7. V.Rajaraman and C.SivaRam Murthy, “Parallel Computers, Architecture and Programming”, PHI.

# Paper: PPC-3 (xxxviii)
# Human Computer Interaction

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Introduction to Human-Computer Interaction.Task-centred system design: task-centered process, development of task examples, evaluation of designs through a task-centered walk-throughUser-centred design and prototyping: assumptions, participatory design, methods for involving the user, prototyping, low fidelity prototypes, medium fidelity prototypes, wizard of Oz examples

**UNIT-II**

Methods for evaluation of interfaces with users: goals of evaluation, approaches, ethics, introspection, extracting the conceptual model, direct observation, constructive interaction, interviews and questionnaires, continuous evaluation via user feedback and field studies, choosing an evaluation method, Psychology of everyday things: psychopathology of everyday things, examples, concepts for designing everyday things

**UNIT-III**

Beyond screen design: characteristics of good representations, information visualization, Tufte's guidelines, visual variables, metaphors, direct manipulation, Graphical screen design: graphical design concepts, components of visible language, graphical design by grids

**UNIT-IV**

Design principles and usability heuristics: design principles, principles to support usability, golden rules and heuristics, process-oriented standards, product-oriented standards

**Refrences:**


1. Dix A. et al., Human-Computer Interaction. Harlow, England: Prentice Hall, 2004, ISBN-10: 0130461091.
2. Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: Beyond Human Computer Interaction, 3rd Edition, Wiley, 2011, ISBN-10: 0470665769.

# Paper: PPC-3 (xxxvix)
# Natural Language Processing

**External Marks: 80**
**Internal Marks : 20**
**Total Marks: 100**
**Duration of Exam: 03 Hours**
**Workload: 4 Lectures per week**

**Note:** There will be nine questions in paper. All questions carry equal marks. Question no. 1 will comprise of eight parts each of two marks and all parts are compulsory. For remaining part, two questions will be set from each unit and students have to attempt four questions selecting one question from each unit. Each question carries equal marks.

**UNIT-I**

Introduction to Natural Language Processing, Finite-state automata and transducers, Computational morphology.

**UNIT-II**

N-gram language models; smoothing; interpolation; backoff, Part-of-speech tagging, Syntactic parsing: rule-based parsing; CYK algorithm; Earley's algorithm.

**UNIT-III**

Computational semantics and lexical semantics, Computational lexicons: WordNet, Word Sense Disambiguation and Induction.

**UNIT-IV**

Roles and frames: FrameNet, Semantic Role Labeling, Discourse and dialogue, Statistical Machine Translation.

**Refrences:**


1. Manning, C. D. and H. Schütze: Foundations of Statistical Natural Language Processing. The MIT Press. 1999. ISBN 0-262-13360-1.
2. Jurafsky, D. and J. H. Martin: Speech and Language Processing. Prentice-Hall. 2000. ISBN 0-13-095069-6.
3. Wall, L., Christiansen, T. and R. L. Schwartz: Programming PERL, 3rd ed.. O'Reilly. 1996. ISBN 0-596-00027-8.