SYLLABUS OF Ph.D.(COMPUTER SCIENCE & INFORMATION TECHNOLOGY)

Entrance Test

Computer Organization and Architecture: Representations of Integers, K-MAP, Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Addressing modes, Architectural classification schemes, multiprocessors..

Programming languages: Programming in C: elements of C-Tokens, identifiers, data types in C. Control structure in C. sequence, selection & iteration(s). structure, union, string, and pointers. C++ Programming: Functions parameter passing. Class and objects. Constructors and destructors. Overloading, inheritance, templates, exception handling, Pointers, Virtual Function Late Binding, Friend function, Friend class, Overview of JAVA.

Data Structures: Simple and composite structure, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps, Graph theory. Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching.

Theory of Computation: Regular languages and finite automata, DFA, NDFA Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undesirability. LR Parser, construction of SLR and canonical LR parser table, using ambiguous grammer, creating YACC lexical analyzer with LEX, error recovery in YACC, Chomsky hierarchy of languages, CFG.

Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Belady's anomaly, Memory management and virtual memory, File systems, I/O systems, Protection and security.

Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Modulation Techniques, Flow and error control techniques (error correcting & detecting, CRC), Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), hubs, switches, gateways, and routers. Aloha, S-Aloha, Protocols, Network security - basic concepts of public key and private key cryptography, digital signature, firewalls, B-ISDN, ATM.

Mobile communication: Introduction, Cellular system infrastructure, Registration, Handoff Parameters and Underlying support, Roaming Support Using Backbone to Mobile IP, Functions of Mobile IP, Registration, Tunneling, Dynamic Host configuration protocol. Introduction, Characterisctics and Applications of Mobile Adhoc Network (MANET) Routing, Routing Classification.

Parallel Computing : Parallelism and its types, classification scheme, Multiprocessor and Micro Computer, Memory Module, Pipelining, Collision, RISC, CISC, Calculation of MAL, Multidimensional Array, Dependence Analysis.

Data Warehousing and Data Mining – What is data mining?, Data Mining: On what kind of data?, Data mining functionality, Are all the patterns interesting?, Classification of data mining systems, What is a data warehouse?, A multi-dimensional data model, Data warehouse architecture, Data warehouse implementation, Further development of data cube technology, From data warehousing to data mining. Concept of Transaction, Transactional database, Distributed Database, Commit Protocols.

Pt. Ravishankar Shukla University, Raipur

Course work for Ph.D. in Computer Science

Sr. No	Paper	Name of Papers
1.	Paper-I	Research Methodology, Communication System and Parallel Computing
2.	Paper-II	Review of Research Paper.

PAPER - I
Research Methodology, Communication System and Parallel Computing

Course Outcomes

After the completion of course, Student must be able

- To understand a general definition of research ethics and its design.
- To identify research problem stated in a study, the overall process of designing a research study from its inception to its report.
- To make the students aware about Communication system, its protocol and also about parallel Computing.
- To apprise the students of the concepts of Multiprocessors, Multicomputer, Pipelining etc.
- To open up new areas in the field of research and development in the area of networking and parallel computing.

Syllabus

Unit- I

Research Methodology and Measurement– Introduction, meaning, motivation, approaches, research proposal, research ethics, research problem, research design, sampling design. Measurement in research, sources of errors, error calculation and handling with examples. Uncertainty analysis, Hypothesis, Performance Metrics and evaluation with example.

Unit- II

Communication System- Wired and Unwired Networks, Modulation and Multiplexing, OSI and TCP/IP Models, Switches and Switching, ATM, Network Security. Protocols like Aloha, S-Aloha etc. Header Formats. Interconnection Networks.

Unit- III

Parallel Computing- Types of Parallelism, Classification Schemes, Multiprocessor and Multicomputer, Memory Models and Organizations, Cache Coherence, Pipelining, MAL calculation, Hazard and Collision, Dependence Analysis, Data Flow and Vector Computers, DAG, Multi threading, Case Studies.

Unit- IV

Study and Implementation of Algorithms- Complexity, Routing and Congestion Control algorithms, Parallel Algorithms for sorting, matrix handling etc. Table Driven, Source Initiated on Demand and Hybrid Protocols, Code Optimization.

Unit- V

Modelling and Simulation- Introduction to Modelling, Queuing Analysis, Mathematical Modelling of Communication System, Monte-Carlo Simulation Technique, Simulation of Communication System through C Language, Study of different Simulators. Environment setup and Trace File generation in Network Simulator.

Recommended books –

1. System Simulation with Digital Computer by N.Deo, IIT Kanpur, PHI.
2. Computer Architecture & Parallel Processing by Kai Hwang and F.A. Briggs-Mc Graw Hill.
3. Research Methodology C.R. Kothari, New Age international Publishers
4. Advanced Computer Architecture By Kai Hwang –Mc Graw Hill.
5. Parallel Computing Theory and practice by Michael J. Quinn –Tata Mc-Graw Hill.
6. Computer Network by A.S. Tanenbaum, Pearson Education.
7. Data Communications and Networking by B.A. Forouzan, TMH.

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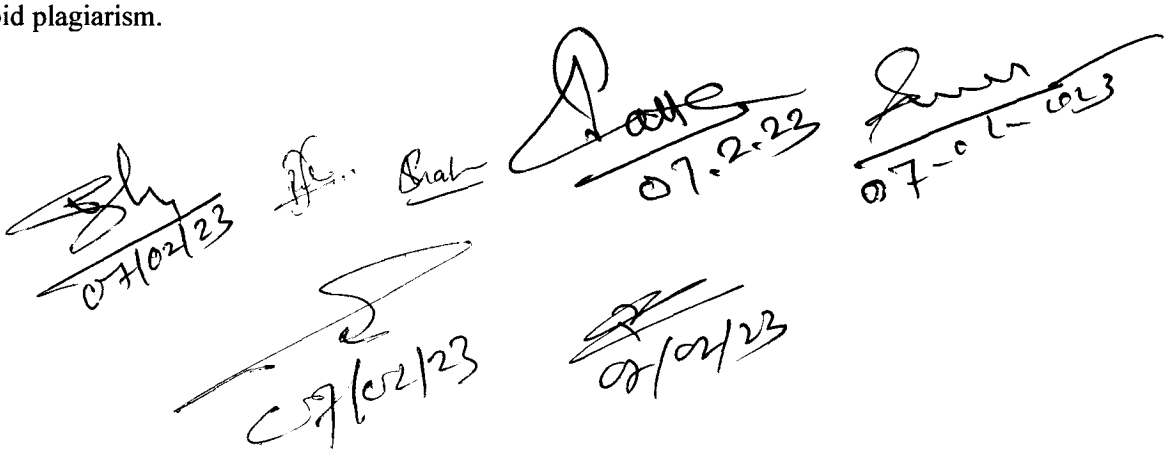
PAPER - II
Review of Research Paper

Course Outcomes

A substantial part of the research paper is the literature review, the importance of which is many. The literature review helps to

- identify variance in previous studies and progress over time and therefore establishes a foundation on which current research can be based.
- collect more information about the current research project.
- evaluate pertinent theoretical framework for the current research project.
- discover relevant research methodology i.e. methods and approaches that have been successful in similar studies; it also assists in the identification of survey instruments for which the psychometric properties have been established.
- validate current arguments based on previous experiential findings.
- differentiate your approach and arguments and demonstrates your thinking on the subject matter
- To find and justify the research gaps that we intend to work on.
- To justify the need of research in the area.
- To avoid plagiarism.



Research and publication Ethics (RPE)

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Course Title:

- **Research and publication Ethics (RPE)** - Course for awareness about the publication ethics and publication misconducts.

Course Level:

- 2 credit course (30 hrs.)

Eligibility:

- M.Phil, Ph.D. students and interested faculty members(it will be made available to post graduate students at later date)

Fees:

- As per university rules

Faculty:

- Interdisciplinary Studies

Qualification of faculty members of the course:

- Ph.D. in relevant subject areas having more than 10 years of teaching experience.

About the course

Course Code: CPE- RPE

Overview

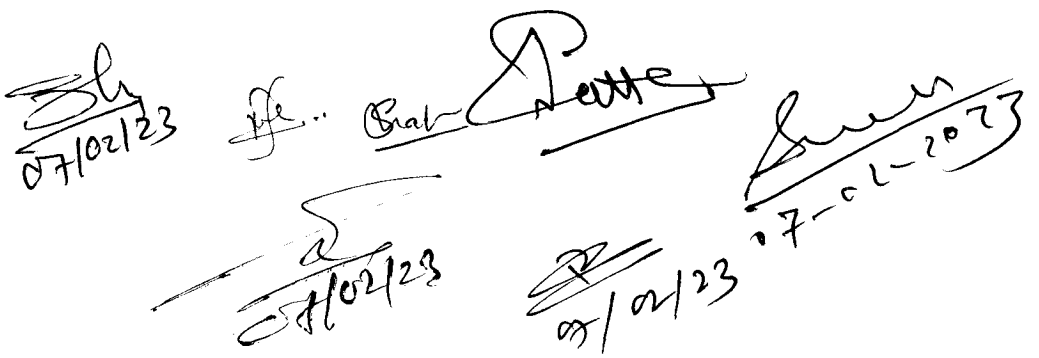
- This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-session are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations,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

Pedagogy:

- Class room teaching, guest lectures, group discussion, and practical session.

Evaluation:

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



Course structure

- The course comprises of six modules listed in table below. Each module has 4 -5 units.

Modules	Unit title	Teaching hours
Theory		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
Practice		
RPE 04	Open Access publishing	4
RPE 05	Publication Misconduct	4
RPE 06	Databases and Research metrics	7
	Total	**30**

Syllabus in detail

THEORY

- **RPE 01: PHILOSOPHY AND ETHICS (4 Hrs.)**
  1. Introduction to philosophy: definition, nature and scope, concept, branches.
  2. **Ethics:** definition, moral philosophy, nature of moral judgments and reactions.

- **RPE 02: SCIENTIFIC CONDUCT (4 Hrs.)**
  1. Ethics with respect to science and research
  2. Intellectual honesty and research integrity
  3. Scientific misconducts: Falsification, fabrication and plagiarism (FFP)
  4. Redundant publications: duplicate and overlapping publication, salami slicing
  5. Selective reporting and misrepresentation of data

- **RPE 03: PUBLICATION ETHICS (7 hrs.)**
  1. Publication ethics: definition, introduction and importance
  2. Best practice / standards 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 of 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 (4 hrs.)**
  1. Open access publication and initiatives
  2. SHERPA/Romeo online resource to check publisher copyright & self-archiving policies.
  3. Software tool to identify predatory publications developed by sppu.
  4. Journal finder/ journal suggestion tools viz. JANE, Elsevier journal finder, Springer journal suggester, etc.

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- **RPE 05: PUBLICAIONS MISCONDUCT (4 hrs.)**

  A. Group Discussions (2 hrs.)

  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 (2 hrs.)

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

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

  A. Databases (4 hrs.)

  1. Indexing databases
  2. Citation database: web of science, Scopus, etc.

  B. Research Metrics (3 hrs.)

  1. Impact factor of journal as per journal citation report, SNIP, SJR,IPP, Cite Score
  2. Metrics: h-index, g index, i10 index, altmetrics.

References:

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 Guid 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://www.nature.com/articles/489179a

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