

Veer Bahadur Singh Purvanchal University, Jaunpur



Pre-Ph.D. Course Work
Computer Science & Engineering
(According to N.E.P. 2020)
Session 2022-23

Veer Bahadur Singh Purvanchal University, Jaunpur

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Pre-Ph.D. Course Work (Ordinance & Syllabus) Computer Science & Engineering (w.e.f. 2022-23)

As per the university ordinance, the research scholars who are provisionally registered for the Ph.D. Program will undergo a Pre-Ph.D. Course work mandatory for all.

Aim of the coursework: The Pre-Ph.D. coursework is designed to develop investigative, evaluative, comprehensive, reasoning, statistical analysis, and writing skill in students to create an in-depth understanding of his/her area of research work.

Course Work Structure: The duration of Pre-Ph.D. course work will be of one semester (six month) in which there will be three compulsory papers. The candidate has to obtain a minimum of 55% marks or equivalent Grades CGPA in aggregate during the course work in order to be eligible to continue in the Ph.D. program and submit the thesis. The minimum attendance required during the course work period is 75% of the total course. This course work is mandatory.

The name of the successful candidates in semester system of Ph.D. course work in Computer Science examination shall be arranged in the following grade system:-

Grade Letter	Description	Limit of Marks	Grade points
O	Outstanding	91-100	10
A+	Excellent	81-90	9
A	Very Good	71-80	8
B+	Good	61-70	7
B	Pass	55-60	6
F	Fail	0-54	0
AB	Absent	Absent	0
Q	Qualified		
NQ	Not Qualified		

Schema of the course (All papers are compulsory)

Paper	Title	Credits
I	Research Methodology	4
II	Fundamentals of Computer Science	6
III	Software Engineering	6

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Paper Setting and Evaluation Pattern (For Paper I, II & III)

Types of Questions	Total No. of Questions	Questions to be attempted	Marks	Time
Objective Type	10	10	10X2=20	3 Hrs.
Short Type	8	5	5X8=40	
Long Type	4	2	2X20=40	
Total Marks				100
Total Credits				16

Note:-

- (1) Language of the course would be either English or Hindi
- (2) In service teachers are allowed to attend their Pre-Ph.D Course Work class either in online or in offline mode. (As per UP Govt. direction)

Syllabus

Paper I

(Maximum Marks-100)

Research Methodology

Unit 1: Introduction to Research

Research Methodology, Scope of the Research, Types of Research Problems, Issues and Challenges in Research

Unit 2: Research Formulation

Identification of the problem, Literature review, National & International status of Technology, Identifying research gaps, defining the Research Problem and the Research Objectives:

Unit 3: Data Collection & Representation

Understanding Data and Data Types, Data Attributes, Qualitative and Quantitative Data, Graphical Techniques, Data Representation, Data Collection Methodologies, Data Collection, Data Samples, Data Summarizing:

Unit 4: Statistics Analysis & Inferencing

Populations and Samples, Probability, Descriptive Statistics, Random Variables, Probability Distribution, Discrete and Continuous Distributions, Univariate and Multivariate Statistics, Hypothesis Testing, Student's t-test, Chi-squared test, Analysis of variance, Regression and Multivariate Analysis.

Unit 5: Technical Report and Thesis Writing using LaTeX

Research Proposal, Synopsis Writing, Project Proposal for Funding, Thesis Writing

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Reference Books:

1. Research Methodology: a step-by-step guide for beginners, Kumar, Pearson Education.
2. Practical Research Methods, Dawson, C., UBSPD Pvt. Ltd.
3. Montgomery, Douglas C. & Runger, George C. (2007) 3^e. Applied Statistics & probability for Engineers (Wiley India)
4. Kothari C.K. (2004) 2^e. Research Methodology – Methods and Techniques (New Age International, New Delhi).
5. Krishnswamy, K.N., Shivkumar, Appa Iyer and Mathiranjani M. (2006) Management Research Methodology: Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)
6. Researching Information System and Computing by Briony J Oates.

Fundamentals of Computer Science

Paper II

(Maximum Marks-100)

Unit 1: Introduction to Computer Organization & Architecture and Operating System:

Review of Basic Organization and Architectural Techniques, Instruction Level Parallelism, Memory Hierarchies, Thread Level Parallelism, Process level Parallelism, Peripheral Devices, Introduction to Operating system, Inter Process Communication, Deadlocks, Memory and Device Management, Distributed Operating Systems.

Unit 2: Advanced Computer Network and security:

Introduction to the Concepts of network Security, Cryptographic Techniques, Modular arithmetic, prime numbers, relative prime numbers, Euler's function, GCD, Computer-based Symmetric Key Cryptographic Algorithms: International Data Encryption Algorithm (IDEA), RC5, Blowfish, AES, Differential and Linear Cryptanalysis, Computer-based Asymmetric Key Cryptography, Public Key Infrastructure, Understanding Session Hijacking, Spoofing, TCP Concepts Sequence numbers, Sniffing, RDDoS, XSS-Attack, WLAN Scanners, Securing Wireless Networks, Anonymous wireless Communication, Jamming and anti-jamming techniques for wireless networks.

Unit 3: Machine Learning and Fuzzy Logic:

Introduction, Decision Tree Learning, Ensemble Learning, Rule Learning, Artificial Neural Networks, Support Vector Machines, Logistic regression, Introduction to fuzzy logic, Fuzzy Intersections, Fuzzy Arithmetic, Crisp versus Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on a Single Set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Ordering Relations, Fuzzy Morphisms, Sup-i Compositions of Fuzzy Relations, Fuzzy Expert Systems, Fuzzy database.

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Unit 4: Bioinformatics

Introduction: biology, physics, Biological hierarchy, Information stages, Physical processes, Methods of gene sequencing: Detailed discussion on Sequences searching methods, Introduction of Gene expression, Current and prospective methods of gene profiling, Data acquisition, Data standardization, Linear approximations of data, DNA chips, Protein targeting, Data normalization, Linear view, Statistics approaches, Probabilistic notions, Multivariate issues, Clustering, Information handling, Experimental and computational methods of structure determination for proteins and nucleic acids, Ontology: Annotation of genes, their products and functions, System biology, evolution, hierarchy, Medical informatics, Software support, Software availability, Software targets, Text parsing, BioPerl, Statistics, R-system, Recent Advances & Applications of Bio-Informatics: Recent trends in Computing with bio-systems.

Unit 5: Software and Tools

MATLAB: The Basics, Root-Finding, Basic Plotting, Vectorization, Fractals and Chaos, Debugging with MATLAB, NS2: Basics of NS2, Wired and Wireless networks, Analyzing traces – Back to traces, AWK and Xgraph, Analyzing parameters in each trace entry, Xgraph parameters, Invoking AWK scripts, Print values to console and files using AWK, Setting values for Xgraph, Invoking Xgraph, Additional Xgraph parameters, Building NS2 from source, Patches in NS2, Energy models in wireless scenarios, Python: Introduction of Python, Installing Python IDEs – Python IDLE and Anaconda, Writing Your First Python Program, Data-types in Python, Variables in Python – Declaration and Use, Typecasting in Python, Operators in Python – Assignment, Logical, Arithmetic etc., Taking User Input (Console), Weka tool and other data mining tools.

Reference Books:

1. David W. Mount, "Bioinformatics, Sequence and Genome Analysis", Cold Spring Harbor Laboratory Press.
2. Mukesh Singhal and Niranjana, "Advanced Concepts in Operating Systems", TMH, 1st Edition, 2001.
3. George J. Klir, Bo Yuan, "Fuzzy Sets and Fuzzy Logic", PHI
4. Witold Pedrycz and Fernando Gomide, "An Introduction to Fuzzy Sets", PHI
5. Machine Learning – Tom M. Mitchell, - MGH
6. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)
7. S. Haykin, "Neural Networks a comprehensive Foundation" second edition, Prentice-Hall India.
8. Cryptography and Network Security by Behrouz A. Forouzan, 2nd Edition TMH.
9. Cryptography and Network Security, W. Stallings, Prentice Hall, 5th Edition, 2010.
10. Hennessey and Patterson, "Computer Architecture: A quantitative Approach", Morgan Kaufman.

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Software Engineering

Paper III

(Maximum Marks-100)

Unit: 1 Software Engineering Fundamentals:

Definition of software product and process. Software Characteristics, Components, Applications, Layered Technologies, Processes and Product, Methods and Tools, Generic View of Software Engineering, Software Crisis, Software development paradigms, Techniques of Process Modeling, Software Process and lifecycle models: Build & Fix Model, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Evolutionary Development Model and Spiral Model, Incremental, and Concurrent Development Model.

Unit: 2 Software Requirements Analysis & Specification:

System specification, Software requirements specification (SRS) standards, Formal specification methods, Specification tools, Requirements validation and management, Problem Recognition, Evaluation and Synthesis, Modeling, Specifications and Review Techniques, Analysis Modeling, Difference between Data and Information, ER Diagram, Dataflow Model, Control Flow Model, Control and Process Specification, Data Dictionary.

Unit: 3 Software Design:

Software architecture, Modular Design-cohesion and coupling, Process-oriented design, Process and Optimization, Data-oriented design, User-interface design, Real-time software design, Architectural Designing, Interface Design, Procedural Design, Object Oriented Design, CASE Tools: Computer-aided software engineering, Introduction to CASE, Building Blocks of CASE, Relevance of CASE tools, High-end and low-end CASE tools, automated support for data dictionaries, DFD, ER diagrams, Integrated Case Environment, CASE workbenches.

Unit: 4 Coding and Testing:

Choice of Programming languages, Coding standards, Introduction to Testing Process, Functional & Structural Testing, Testing Activities like Unit, Integration & System Testing, Testing tools and workbenches, User Interface Design: Concepts of UI, Interface Design Model, Internal and External Design, Evaluation, Interaction and Information Display.

Unit:5 Configuration Management:

Concepts in Configuration Management, The Configuration Management Process: Planning and Setting up Configuration Management, Perform Configuration Control, Status Monitoring and Audits, Software Maintenance: What is software maintenance, Maintenance Process & Models, Reverse Engineering, Software re- engineering, Configuration Management issues and concept, Configuration planning & techniques, Software versions and change control process, Documentation.

Reference Books:

1. R. Pressman, "Software Engineering", 7th Edition, 2002, McGraw-Hill.
2. W.S. Jawadekar, Software Engineering - A Primer, TMH-2008
3. Software Engineering, Yogesh Singh, New Age Publications, Delhi.
4. Shari Pfleeger, "Software Engineering", 2001, Pearson Education.

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