

UTTARANCHAL UNIVERSITY

Pre Ph.D. (Chemistry)



Course Structure for
Pre-Ph.D (Computer Science & Engineering)
Course Work (As per CBCS system)
Session 2020-21

Approved by the Academic Council meeting held on

Structure of the Pre-Ph.D (Computer Science & Engineering) Course Work:

The Course Work shall consist of four subjects of total 17(5+5+5+2) Credit with the following scheme pattern

Scheme of Pre-Ph.D. Course Work

S.No	Course Code	Subject	Credits	Evaluation – Scheme							
				Period			Sessional			Examination	
				L	T	P	CT- I	CT-II	Total	ESE	Sub. Total
Courses											
1.	RM-101	Research Methodology & Computer Application	5	4	1	0	20	20	40	60	100
2.	CSE-102	Discipline Specific Electives (Computer Science & Engineering)	5	4	1	0	20	20	40	60	100
3.	RLS-103	Review of Literature&Seminar Presentation	5	0	0	10	20	20	40	60	100
4.	RPE-104	Research & Publication Ethics	2	2	0	0	20	20	40	60	100
		Total	17	10	2	10	80	80	160	240	400

Discipline Specific Electives (DSE):- Any one has to be opted by the scholar or any course from PG level may be opted with the approval of Departmental Research Committee/RDC.

Electives are-

CSE-101 (1)-ADVANCED INFORMATION SECURITY SYSTEMS

CSE-101 (2)-DIGITAL IMAGE PROCESSING

CSE-101 (3)-NEURAL NETWORK

CSE-101 (4)-ADVANCE TOPICS IN DATABASE SYSTEMS

CSE-101 (5)-GENETIC ALGORITHMS

CSE-101 (6)-ARTIFICIAL INTELLIGENCE

CSE-101 (7)-COMPUTING

Detailed Syllabus

RM 101: Research Methodology

Code	Course Name	Credit	L	T	P	CT-1	CT-II	CT-To tal	ESE	G. Total
RM-101	Research Methodology & Computer Application	5	4	1	0	20	20	40	60	100

Course Objective:

The Objectives of the Courses

1. To Equip the Students with the Concept and Methodology of Research.
2. To provide knowledge about type of research, preparation of reports and thesis, designing of Research using Scientific Methods like statistical methods and computer skills.

Contents:

UNIT-I

Introduction to Research: Definition, Nature and significance, Role and Objectives; Types of Research: exploratory, descriptive, experimental and diagnostic research, social and legal research and traditional, analytical, empirical & fundamental research, Doctrinal and non-doctrinal research methods; Various Research Designs; Scientific Research Process: Overview, Problem identification and formulation of research statement.

UNIT-II

Data Collection: sources, primary and secondary methods, significance of Primary and Secondary Data, questionnaire Vs. schedules; Data Processing: Editing, Coding Organization and Presentation; Attitude Measurement and scaling: Measurement Scales, Sources of Errors in Measurement, Techniques of Developing Measurement Tools, Classification and Testing (Reliability, Verification and Validity) Scales, Designing Questionnaires and Interviews.

UNIT-III

Sampling, Sampling Methods, Sampling Plans, Sampling Error, Sampling Distributions: Theory and Design of Sample Survey, Census Vs Sample Enumerations, Objectives and Principles of Sampling, Types of Sampling, Sampling and Non-Sampling Errors.

UNIT-IV

Statistical Tools / Methods for research – Univariate and Bivariate Analysis. Hypothesis and Hypothesis Testing: Parametric & Non-Parametric Tests, Correlation and Regression, U Test, Mean Deviation & Standard Deviation, Concept of Permutation, Combination & Probability, Chi Square Test, T-Test.

UNIT-V

Interpretations and Report Writing: Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Steps in Report Writing, Layout of Report and Precautions in Writing Research Reports. Limitations of RM: Ethics in Research, Philosophical Issues in Research.

Text Readings

1. William G. Zikmund, "Business Research Methods", Orlando: Dryden Press.
2. C. William Emory and Cooper R. Donald, "Business Research Methods", Boston, Irwin.
3. Fred N Kerlinger, "Foundations of Behavioural Research", New Delhi: Surjeet Publications.
4. Naresh Malhotra, Marketing Research : An Applied Orientation, Pearson publication
David
Nachmias and ChavaNachmias, "Research Methods in the Social Sciences", New York:
St.Marlia's Press.
5. C. R. Kothari, "Research Methodology: Methods and techniques", New Delhi: Vishwa
Prakashan.
6. Bhattacharya, D. K. (2004) Research Methodology, New Delhi, Excel Books.
7. Brymann, Alan and Carmer, D. (1995) Qualitative data analysis for social scientist,
New York, Routledge Publication.

Discipline Specific Electives for Computer Science & Engineering (DSE)

Code	Course Name	Credit	L	T	P	CT-1	CT-II	CT-To tal	ESE	G. Total
RM-101	DSE	5	4	1	0	20	20	40	60	100

One to be opted**CSE-101 (1)-ADVANCED INFORMATION SECURITY SYSTEMS****CSE-101 (2)-DIGITAL IMAGE PROCESSING****CSE-101 (3)-NEURAL NETWORK****CSE-101 (4)-ADVANCE TOPICS IN DATABASE SYSTEMS****CSE-101 (5)-GENETIC ALGORITHMS****CSE-101 (6)-ARTIFICIAL INTELLIGENCE****CSE-101 (7)-COMPUTING****CSE-101 (8)-INFORMATION PROCESSING AND E-COMMERCE****CSE 102(i) ADVANCED INFORMATION SECURITY SYSTEMS****UNIT 1: CRYPTOGRAPHY**

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: INFORMATION THEORY

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: MATHEMATICAL SECURITY

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 NP-Complete Problems, Meaning of NP-Completeness, NP-Completeness and Cryptography.

UNIT IV: NETWORK SECURITY

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 PeterWilliams, Addison Wesley Longman.
4. Introduction to Cryptography with Coding heory, Wade Trppe, Lawrence C., Washington, Pearson Education.
5. Network Security, Compete Reference, Tata Mc-Graw Hill.
6. Fundamental of Computer Security, Pieprzyk, Hardjono, Seberry, Universities Press
7. (India) Pvt. Ltd.

CSE 102(ii) DIGITAL IMAGE PROCESSING

UNIT I : Introduction and Fundamentals

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 II: Image Enhancement in Spatial Domain & Frequency Domain

Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothing 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: Image Restoration & Compression

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 IV: Image Segmentation & Object Recognition

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

Text/Reference Books:

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", 199

CSE 102(iii) NEURAL NETWORK

UNIT 1: Neuron Model and Network Architectures

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

UNIT II: Learning Rules

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: Transformations & Optimization

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 IV: Back propagation & Competitive Networks

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.

Text/Reference Books:

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.

CSE 102(iv) ADVANCE TOPICS IN DATABASE SYSTEMS

UNIT 1: Indexing

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

UNIT II: Concurrency control

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

UNIT III: Transactions Processing

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

UNIT III: Parallel & Distributed databases

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.

TEXT BOOKS

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.
6. Data Management & file Structure by Loomis, 1989, PHI

CSE 102(v) GENETIC ALGORITHMS

UNIT-I: Genetic Algorithms in Scientific models

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: Theoretical & Implementation of GA

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: Applications of genetic algorithms

The risk of genetic algorithms, De Jong & function optimization, Improvement in basic techniques, current application of genetic algorithms, Dominance, duplicity, & abeyance, inversion & other reordering operators.

UNIT-IV: Fuzzy Logic

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership

Function, Fuzzy rule generation. Operations on Fuzzy Sets: Complement, Intersection, Union, Combinations of Operations, Aggregation Operations, Fuzzy arithmetic, Uncertainty based information, Fuzzy applications.

Text Books:

1. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Addison Wesley, 1989

References:

1. Melanie Mitchell, "An introduction to genetic algorithms" MIT press, 2000.
2. Masatoshi Sakawa, "Genetic Algorithms & Fuzzy Multiobjective Optimization", Kluwer Academic Publisher, 2001
3. D. Quagliarella, J Periaux, C Poloni & G Winter, "Genetic Algorithms in Engineering & Computer science", John Wiley & Sons, First edition, 1997
4. "An Introduction to Neural Networks", Anderson J.A., PHI, 1999.
5. "Introduction to the Theory of Neural Computation", Hertz J. Krogh, R.G. Palmer, Addison-Wesley, California, 1991.

CSE 102(vi) ARTIFICIAL INTELLIGENCE

UNIT-I: Introduction

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: Searching Techniques

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: Knowledge Representation

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

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.

Text Books:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education / Prentice Hall of India, 2004.

References:

1. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Second Edition, Tata McGraw Hill, 2003.
3. George F. Luger, “Artificial Intelligence-Structures And Strategies For Complex Problem Solving”, Pearson Education / PHI, 2002.

CSE 102(vii) COMPUTING

UNIT-I Grid Computing

Grid Computing & Key Issues , Applications, Other Approaches, Grid Computing Standards , Pragmatic Course of Investigation, Communications and Grid Computing , Grid Prime Time, Suppliers and Vendors, Economic Value, Challenges, Grid Computing Standards, OGSI: Standardization, Architectural Constructs, Practical View , GSA/OGSI Service Elements and Layered Model, Fault Tolerance and Load balancing.

UNIT-II: Cluster Computing

Cluster Computing 1: Cluster setup & its Administration, Performance Models & Simulations; Networking, Protocols I/O, Lightweight Messaging systems, Active Messages, Distributed shared memory, parallel I/O Clusters, Job and Resource management system, scheduling parallel jobs on clusters, Fault tolerance

UNIT-III: Mobile Computing

Mobile Computing and Applications, Mobility management, Mobile services, WAP and Markup scripts, Pervasive Computing concepts & Scenarios, Hardware & Software, Human - machine interface Device connectivity, Java for Pervasive devices, Application examples, Quantum Computing : Introduction to Quantum Computing, Qubits, Quantum Mechanics, Quantum gates, Applications of quantum computing with fault tolerance.

UNIT-IV: Parallel Computing

The state of computing, multiprocessors and multicomputer, Processors and memory Hierarchy, Pipelining and Super scalar techniques Parallel and scalable architecture.

Text Books:

1. A Network Approach to Grid Computing, Daniel Minoli, Wiley Publication.

References:

1. Grid Computing – A Practical Guide to Technology and Applications, Ahmar Abbas, Charles Media Publication.
2. Kai Hwang “Advanced Computer Architecture”, McGraw Hill.
3. Yi Bing Li “Wireless and Mobile Network Architecture”, John Wiley
4. Wrox “The beginning WML and WML script”, Wrox Publication John Schiller

5. Raj Kumar Buyya, High performance cluster computing, PEA.

6. J.Burkhardt et .al, Pervasive computing, PEA

CSE 102(viii) INFORMATION PROCESSING AND E-COMMERCE

Unit-1

Welding Metallurgy: Welding as compared with other fabrication processes, Classification of welding processes; Heat affected zone and its characteristics; Effects of alloying elements on weldability, Weldability of steels, stainless steel, cast iron, and aluminum and titanium alloys, Weld testing standards, Hydrogen embrittlement, Lammellar tearing, residual stresses and its measurement, heat transfer and solidification, Analysis of stresses in welded structures, Pre and post welding heat treatments, Metallurgical aspects of joining, Conditions of soldering, Brazing and welding of materials.

Unit-2

Weld Design & Quality Control: Principles of sound weld design, Welding joint design, Welding defects; Testing of weldament, Material joining characteristics, Welding positions, Allowable strength of welds under steady loads, Weld throat thickness; Weld quality, Discontinuities in welds, their causes and remedies and quality conflicts.

Unit-3

Modern Trends in Welding: Friction welding, Explosive welding, Diffusion bonding, High frequency induction welding, Ultrasonic welding, Electron beam welding, Plasma arc welding, Laser welding, Robotics in welding.

Unit-4

Mechanisation in Welding: Mechanisation of flat/circular joints, Thin/thick sheets (resistance/arc weld), Mechanisation of I beams (arc weld), Longitudinal circumferential SA welding (roller blocks, column booms, flux supports), Circular/spherical welding joints (rotating tables positioners), Manufacture of welding longitudinal welded pipes by induction, TIG, Plasma and SA welding of spiral welded pipes.

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. “Compilers: principles, Techniques and Tools” ,Aho, Lam, Ullman, Pearson Education.
5. P.T. Joseph: E-Commerce - A Managerial Perspective, PHI Publication.
6. Jeffery: Introduction to E-Commerce, TMH.

7. Fundamentals of computer algorithms by Horowitz, Ellis; Sahni, Sartaj & Rajasekaran, university Press.
Cloud Computing: Web-Based Applications that change the way you work and collaborate

By Michael

RLS-103: Review of Literature and Seminar Presentation

Code	Course Name	Credit	L	T	P	CT-1	CT-II	CT-To tal	ESE	G. Total
RLS10 1	Review of Literature and Seminar Presentation	5	0	0	10	20	20	40	60	100

Objective- Main objective of this course is to develop presentation skills in the scholars and knowledge about review of literature so that they can review properly in the concerned field

Review of Literature and Seminar Presentation-Candidate/Research Scholar has to go through the review of literature in the concerned field of research. Review of literature guidelines will be given by the concerned faculty/Dean of Department/School/College. Research Scholar has to give prepare presentation on review of literature in the concerned field/ topic assigned by the department (DRC) periodically during course work. There will be minimum 3 presentations of review of literature during pre-Ph.D course work. Final presentation would be required at the time of end term/sem examination on proposed synopsis. General guidelines would be issued by Dean-Research for seminar presentation.

RPE-104: Research Publication & Ethics

Code	Course Name	Credit	L	T	P	CT-1	CT-II	CT-To tal	ESE	G. Total
RPE-1 04	Research & Publication Ethics	2	2	0	0	20	20	40	60	100

Course Objective- Its objective is to provide knowledge about ethics and code of research publication with concept of plagiarism.

Theory

Unit 1: Philosophy and Ethics (3 hrs)

1. Introduction to philosophy: definition, nature and scope, concept, branches

2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

Unit 2: Scientific conduct (5hrs)

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 publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE 03: Publication Ethics (7 hrs)

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

Practice

Open Access Publishing (4 hrs)

1. Open access publications 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.