Department of Computer Science and Application
Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)

Scheme and Syllabus of Pre-Ph.D. Course work in Computer Science

Pre Ph.D. course work will be of minimum six months duration (one semester) comprising three papers of 300 marks. the scheme of the course is as follows.

Paper Code	Title of the Paper	Nature of the Paper	Max. Marks.
CW 01	Research Methodology and Computing	Inter Departmental level (Compulsory for all subjects)	100
CW 02	Soft Computing Techniques	Departmental level (Based on subject concerned)	100
CW 03	Review of literature and presentation	Research proposal level (Based on supervisor concerned)	100

Pattern of question paper for CW 01 and CW 02 and CW 03

1. One question of 20 marks will be compulsory constituting ten short answer types of questions collectively from all the parts of syllabus.

2. Five questions of 16 marks each from all five units (Sections) with internal choice (50%) separately will be in question paper.

Paper – I (Compulsory)

CW 01 : Research Methodology and Computing

Unit – I

Research concept: Introduction of Research methodology, nature, concept, objective and scope of research; Research motivation; Types and method of research; Concepts of abstract, review of literature; Quantitative and qualitative research.

Unit – II

Research problem and design: Research problem- Identification, selection and its formulation; Research design- Components, materials, hypothesis and its importance; Research journals and research articles, Research project, Criteria of good research, Script writing, Challenges and opportunities for good research in India.

Unit – III

Research ethics: Basic concepts and issues, Institutional ethics, Intellectual property rights (IPR), Patents, copy right, Plagiarism, cyber laws, Impact factor, Citation, i10-index, h-index, Reference style, Journal Citation report (JCR), pear review process, referred journal, journal index database, preparation of manuscript.

Unit – IV

Quantitative data analysis: Types and classification of data, Data collection and representation, tabulation, Sampling methods and size of samples, Central tendency, Standard deviation and error, Probability, Normal and Binominal distribution, Test of significance (t-test, F-test and Chi-square test), basic ANOVA, Correlation and regression.

Unit – V

Computer fundamentals: Introduction, Software and Hardware, MS-Word, MS-Excel and MS-Power point, Document preparation system; La-Tex, PDF, Basics of computer Network and Internet, Data analysis and graph/chart designing and preparing using specific software, Search engines Google scholar, online paper submission system like Easy chair, Basic introduction of SPSS and MATLAB.

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Book suggested –

1. Research methodology- Methods and Techniques (3/e): C.K. Kothari (2008), New Age International, New Delhi
2. Research Methodology: R. Panneerselvam (2nd Edition), PHI learning publication, India.
3. Research methodology in Behavior Sciences (English and Hindi), S.K. Mangal, S. Mangal, PHR learning publication, India.
4. Computer Fundamentals architecture and organization by B.Ram and Sanjay Kumar, New Age International Publisher.
5. 2007 Microsoft Office System Step by step by Cox, Joyce etc. all, PHI Learning India.
6. Bio-statistical Analysis (5th/6th Edit): Jerrold H.Zar, Pearson Education.
7. Experimental design: W.G. Cochram and M.G. Cox, John Wiley & Sons Publication, New Delhi.
8. Plagiarism: Why it happens, How to prevent it? –B.Gilmore.
9. Microsoft Office 2010: Introductory concepts and Techniques; G.B. Shelly & T.J. Cashman.
10. Design and analysis of experiments (5/c): Montgomery and Douglas (2007), Wiley Publication.

➢ *Any other books suggested by Course coordinator/Course Teacher/Supervisor concerned may be applied.*

Paper – II
CW 02: Soft Computing Techniques

UNIT–I

Introduction -What is soft computing?. Different tools of soft computing and its comparison, Area of application, Artificial Intelligence: What is AI Fundamental concept, Search techniques, knowledge representation. Machine learning: what is machine learning, Structure. Types of learning: Supervised, unsupervised and reinforcement learning. Relationship in between AI and Machine learning.

UNIT-II

Artificial Neural Network(ANN) : Types of ANN Architecture, Introduction, Evolution of Neural Network, Biological Neural Network Vs ANN, Basic Model of ANN, Different types of ANN, Single layer Perceptron, Perceptron learning, delta learning, Feed-forward and Feedback networks, Multi layer perceptron (MLP), Error Back Propogation Network (EBPN), Logostic regression gradient descent, Stochastic gradient descent, Hopefield Network, Clustering: Kohenen self organizing Map, Recurrent neural network. Introduction to Deep learning and motivation, Early stopping, Dropout regularization, Convolutional neural network (CNN): Architecture, type and variant. Generative Adversarial Networks (GAN) and their variant.

UNIT-III

Fuzzy Logic - Introduction to Classical Sets and Fuzzy Sets, Membership Function, properties and operations of classical set and Fuzzy set, a-cuts, Properties of a-cuts, Linguistic Variables, Membership function, Classical relation and Fuzzy Relation and its properties and operations, Defuzzification and its methods, Fuzzy rule base. Fuzzy logic control: Basics, Architecture and properties. Introduction to Type 2 Fuzzy logic

UNIT–IV

Evolutionary Computing: Overview of evolutionary computing, Genetic Algorithm: What is Optimization?, Introduction, Application. GA operators: selection, crossover and mutation. ,different techniques of selection ,crossover and mutation, different types of chromosomes, Application of GA. Other optimization techniques like Ant colony optimization (ACO): Particle swarm optimization (PSO), Bacterial foraging optimization (BFO).

UNIT-V

Hybrid soft commuting and case study- Design of Neuro-Fuzzy model, ANFIS , Neuro-Genetic, Fuzzy-Genetic Neuro-Fuzzy-Genetic model, Implementing soft computing techniques with python and MATLAB. Case study: Intrusion detection system, Health care data classification, Stock market data prediction, Image classification Robotics, etc. Building other applications for classification, Feature extraction, prediction, object detection, face recognition, image classification, Application of soft computing in IoT and cloud computing domains.

Text/Reference Books:

1. Principles of soft computing , S.N. Shivanandan and S.N Deepa , Wiley publication, Wiley India Edition.
2. Neural network and Learning Machines, Simon Haykins, Pearson Education, 2011. Artificial Neural Networks, Robert J. Scholkoff, Mc Graw Hill Education(India) Pvt. Limited,1997.
3. Neural Networks and Fuzzy Systems, A dynamical Systems Approach to Machine Learning, Bart Kosko, PHI learning private limited.
4. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rakasekaran, G.A. Vijayalakshmi Pai, PHI learning private limited, 14th Edition. 2003.

5. Neural Networks and Fuzzy Logic, K. Vinoth Kumar, R. Saravana Kumar, S. K. Kataraia and Sons publication.
6. Artificial Neural Networks, B.Yegnanarayana Prentice Halll of India (P) Limited.
7. Introduction to Artificial Neural Systems, Jacek M. Zurada, Jaico Publication House.
8. Fuzzy Sets, Uncertainty and Information, G. J. Klir and T.A. Folger, PHI learning private limited .
9. Fuzzy sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, PHI learning private limited .
10. Fuzzy Logic and Fuzzy Decision Making: Concepts and Applications, G. Kannan, Galgotia Publication.
11. Intelligent hybrid System : Neural Network, Fuzzy Logic and Genetic Algorithm by Da Ruan, Kluwer Academics publisher.
    Introduction to Neural Networks using MATLAB 6.0, S.N. Shivanandan, S. Sumathi and S.N Deepa, Mc Graw Hill Education(India) Pvt. Limited, 22nd Edition, 2015.
12. Genetic Algorithms: In search, Optimization and Machine Learning, David E. Goldberg, Pearson education, 15th Edition.
13. Multi Objective Optimization Using Evolutionary Algorithms, Kalyanmoy Deb, Wiley Publication, Wiley student Edition, 2013.

Paper – III (Compulsory)

CW 03 : Review of Literature and Presentation
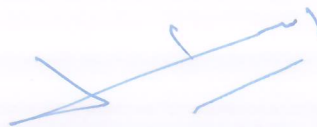
Part – A (50 Marks)

Review of Literature:

Writing of literature in the area of the proposed research work under Ph.D. program

- It should be standard review comprises minimum fifty research articles belonging to peer reviewed journals (National and International).
- Candidate has to submit a report of reviewed literature in printed form to the department concerned at the time of presentation.

Part – B (Marks)

Presentation:

- Seminar based on the review of literature with the help of PPT.

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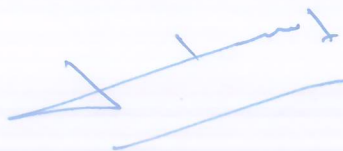
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