



List of Revised Courses

Department : **Computer Science & Information Technology**

Program Name : **Pre Ph.D coursework in Computer Science**

**Academic Year : 2018-19**

**List of Revised Courses**

Sr. No.	Course Code	Name of the Course
01.	PHDCS02	Soft Computing Techniques
02.	PHDCS03	Nature Inspired Computing

*Aravind*  
**HEAD  
DEPT OF CSIT  
G.G.V. BILASPUR (C.G.)**



## Minutes of Meetings (MoM) of Board of Studies (BoS)

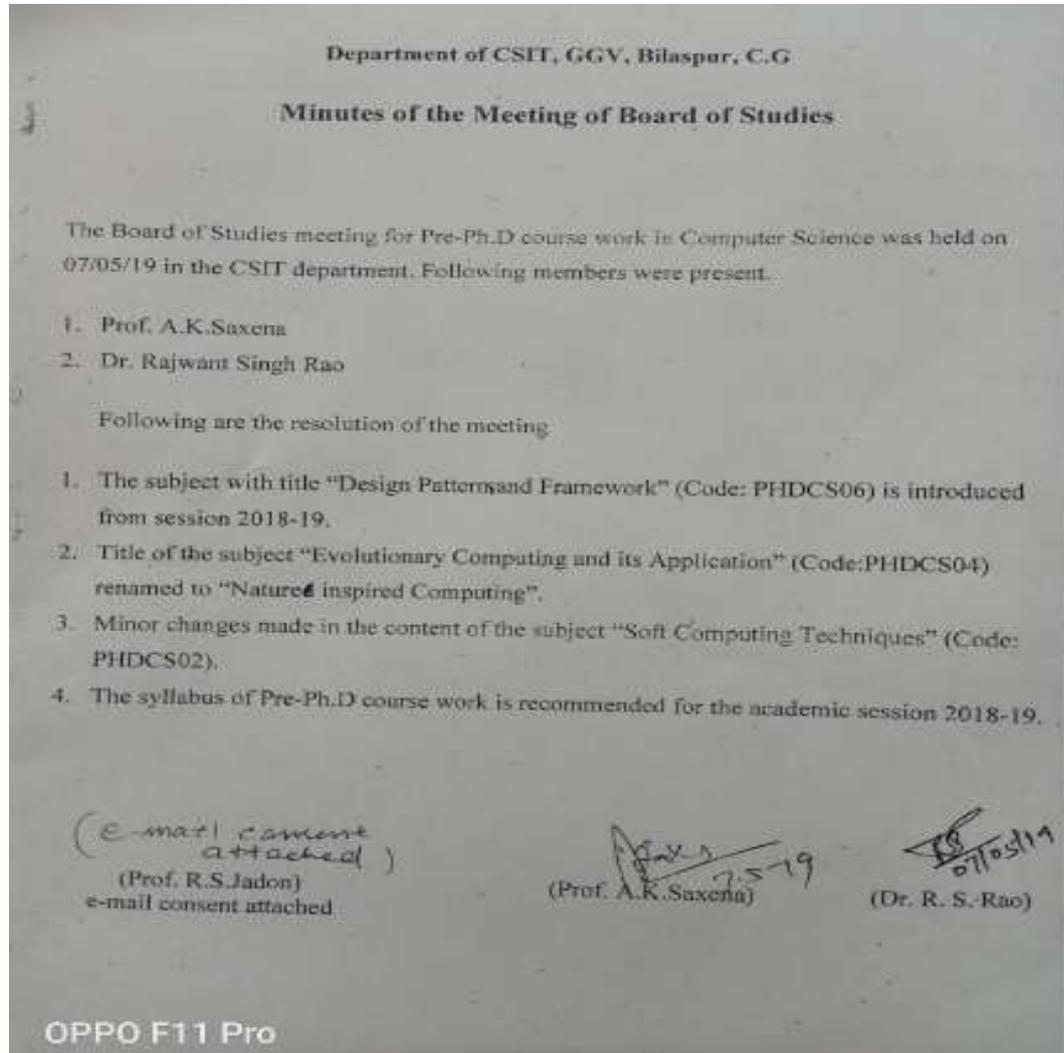
**Academic Year : 2018-19**

**School : School of Mathematical and Computational Sciences**

**Department : Computer Science and Information Technology**

**Date and Time : May 07, 2019 - 11:30 AM**

**Venue : CSIT main LAB**





Faculty of Mathematical and Computational Science  
Dept of Computer Science and Information Technology (CSIT)  
Guru Ghasidas Vishwavidyalaya, Bilaspur

Session 2018-19

Scheme and syllabus for Ph. D. Course Work in Computer Science

Code	Subject	Max Marks	Min Passing Marks
PHDCS01	Fundamentals of Research in Science	100	55
PHDCS02	Soft Computing Techniques	100	55
PHDCS03	Pattern Recognition	100	55
PHDCS04	Nature Inspired Computing	100	55
PHDCS05	Machine Vision	100	55
PHDCS06	Design Patterns and Frameworks	100	55
PHDCS07	Seminar	Open Viva – Qualified / Not Qualified	

**General Instruction**

1. There shall be three theory papers.
2. There shall be an Open Seminar/ Evaluation that will be organized in the University Campus. An Examinee shall be awarded either "Qualified" or "Not Qualified". Marks shall not be allotted for it.
3. Duration of the theory paper shall be three hours.
4. The duration of the course work shall be six months / one Semester.
5. Student has to choose any two subjects from PHDCS02, PHDCS03, PHDCS04 and PHDCS05.



## PHDCS-02:

## Soft Computing Techniques

**Note:** A candidate has to attempt five questions out of eight questions. All questions will carry equal marks. Question No. 01 is Compulsory which will consist of 10 sort answered type questions spread all over the syllabus carrying 2 marks each.

**Introduction** – What is soft computing? Different tools of soft computing and its comparison, area of application.

**Artificial Neural Network and Genetic Algorithm** – Overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back propagation algorithm, Multilayer perceptron model, RBF (Radial basis function) neural network, Recurrent neural network, Self Organizing Map (SOM), Introduction to convolution neural network (CNN) and deep learning.

**Genetic Algorithm(GA):** Basic Terminologies in Genetic Algorithms - Individuals, Genes, Fitness, Populations, Working Principle, Encoding methods, Fitness function, GA Operators- Reproduction; Crossover; Mutation, Convergence of GA.

**Fuzzy Logic** – Type-1 Fuzzy logic: Basic definitions and terminology, Set theoretic operations, Membership function, Fuzzification and Defuzzification methods, Fuzzy inference System, Fuzzy rule Base, Fuzzy control system.

**Hybrid soft computing:** Hybrid Systems, Neuro Fuzzy Hybrid System, Neuro Genetic Hybrid System.

**Experimental Work:** Application of different soft computing tool in different problem domain.

### Reference Books:

1. Uncertain rule-based fuzzy logic systems: Introduction and new directions by Jerry M.Mendel ,Prentice Hall of India .
2. Intelligent hybrid System : Neural Network ,Fuzzy Logic and Genetic Algorithm by Da Ruan ,Kluwer Academics publishers
3. Neural Network ,Fuzzy logic and Genetic Algorithm :Synthesis and application by S. Rajshekhran and G.A. Vijay Laxmi ,PHI publication
4. Fuzzy logic with engineering applications by Timothy J Ross, Wiley Publication
5. Neural network by Simon Haykins: Prentice Hall of India



**PHDCS04: Natured Inspired Computing**

Genetic algorithm: Encoding, fitness function evaluation, selection, crossover, mutation, Real coded GA, Adaptive GA : adaptive crossover probability and adaptive mutation probability. Differential Evolution (DE): Generation of population, mutation, crossover, comparison with GA. Multi-Objective GA(NSGA-II) : Single/multi-objective, domination, non-domination, Pareto front, generation of population, fitness function evaluation, non-dominated sorting, crowding distance, selection, crossover, mutation, flowchart.

Particle swarm optimization(PSO) : Generation of population, fitness function evaluation, updation equations, flowchart of PSO, comparison with GA. Multi-objective PSO(MOPSO) : External repository, archive controller, archive grid, velocity calculation, position update, flow chart. Cat swarm optimization (CSO) : Generation of cat population, seeking mode, tracing mode of cats, algorithm, updation equations.

Ant colony optimization (ACO): Introduction, tabu list, pheromone, symmetrical and unsymmetrical traveling sales man problem. Bacterial foraging optimization (BFO) : Introduction of E coli bacteria, chemotaxis, swarming, reproduction, elimination and dispersal.

Applications: Parameter estimation, channel equalization, prediction of exchange rates and stock market, classification, Portfolio optimization and forecasting scheme.

**Text Books :**

1. Fundamentals of computational swarm intelligence by A. P. Engelbrecht, Wiley Publication, 1st Edition, 2005.
2. Differential Evolution : Fundamentals and applications in electrical engineering by Anyong Qing, IEEE Press, 2009.

References : Research papers

*Agarwal*  
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