EVOLUTIONARY COMPUTATION FOR SINGLE AND MULTI-OBJECTIVE OPTIMIZATION

PROF. DEEPAK SHARMA

Department of Mechanical Engineering

IIT Guwahati

TYPE OF COURSE : Rerun | Elective | PG

COURSE DURATION : 8 weeks (24 Jan' 22 - 18 Mar' 22)

EXAM DATE : 27 Mar 2022

PRE-REQUISITES : Elementary Mathematics and Programming

INTENDED AUDIENCE : Final and Pre-final year UG students, PG Students and Candidates from Industries

INDUSTRIES APPLICABLE TO : All R&D industries that involve design and optimization of product and system

COURSE OUTLINE :

Evolutionary computation (EC) is a sub-field of computational intelligence that use ideas and get inspiration from natural evolution. It is based on Darwins principle of evolution where the population of individuals iteratively performs search and optimization. EC techniques can be applied to optimization, learning, design and many more. This course will concentrate on the concepts, algorithms, hand-calculations, graphical examples, and applications of EC techniques. Topics will be covered include binary and real-coded genetic algorithms, differential evolution, particle swarm optimization, multi-objective optimization and evolutionary algorithms, and statistical assessment.

ABOUT INSTRUCTOR :

Prof. Deepak Sharma is an Associate Professor in the Department of Mechanical Engineering, Indian Institute of Technology (IIT) Guwahati, India. He obtained his Ph.D. and M.Tech. degrees from IIT Kanpur, India. Prior to joining IIT Guwahati, he has worked with many international research teams at Helsinki School of Economics, Finland; Université de Strasbourg, France; National University of Singapore, Singapore, Karlsruhe Institute of Technology, Germany, and Asian Institute of Technology, Bangkok, Thailand. He was awarded for NVIDIA Innovation Award in 21st IEEE International Conference of High Performance Computing in 2014, DAAD's Research Stays fellowship for summer 2013, best student paper awards in IEEE Congress on Evolutionary Computation (CEC) conferences in 2007 and 2008. He has been constantly involved in many sponsored and consultancy projects from SERB, Ministry of Heavy Industries and Public Enterprises. He has published more than 50 papers in the journals and conferences of high repute. His research interests include Optimization and Soft Computing Techniques for Design and Optimization, Evolutionary Multi-Objective Optimization, and GPU Computing.

COURSE PLAN :

Week 1**:** Introduction and Principles of Evolutionary Computation (EC), Binary-Coded Genetic Algorithm

Week 2**:** Binary-Coded Genetic Algorithm (Cont'd), Real-Coded Genetic Algorithm

Week 3**:** Real-Coded Genetic Algorithm (Cont'd), Other EC Techniques

Week 4**:** Other EC Techniques (Cont'd)

Week 5**:** Constraint Handling Techniques

Week 6**:** Constraint Handling Techniques (Cont'd), Introduction to Multi-Objective Optimization

Week 7**:** Classical Multi-Objective Optimization Methods, Multi-Objective Evolutionary Algorithms

Week 8**:** Multi-Objective Evolutionary Algorithms (Cont'd)