

Intensive Course Plan

Engineering Optimization via PSO & DE

Class hours: 20 hours

Instructor: Voratas Kachitvichyanukul
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Asian Institute of Technology, THAILAND

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Short Course

This course discusses two specific techniques: Particle Swarm Optimization (PSO) and Differential Evolution (DE). The course is divided into five parts. Part 1 introduces the basic form of Evolutionary Algorithm with its characteristics and requirements. Part 2 discusses the basic PSO, its strengths and weaknesses, its extensions, and sample applications. Part 3 introduces the software library ET-LIB along with the discussion of swarm dynamic that served as the basis for an adaptive approach for PSO. Part 4 introduces the multiobjective PSO approach that utilizes movement strategies for searching the Pareto front. Part 5 briefly introduces the classical DE with highlights of similarities and differences with other commonly known EA methods such as GA and PSO. Reviews of the successful engineering applications of both PSO and DE algorithms are given that will cover Job Shop Scheduling Problem, Vehicle Routing Problem, Multi-commodity Distribution Network Design Problem, Multi-mode Resource Constrained Project Scheduling Problem.

Course Outline “Adaptive Particle Swarm Optimization”

1. Introduction to Evolutionary Algorithm
2. Basic PSO Algorithm and its variants
3. Performance measures
4. Strengths and weaknesses of PSO
5. Application 1: Job shop scheduling problems
6. Application 2: Vehicle routing problems
7. Software Library (ET-LIB)
8. Swarm dynamic
9. Adaptive Concept
10. Multiobjective PSO via Movement Strategies
11. Basic Differential Evolution Algorithm
12. Comparison of GA, PSO, and DE
13. Application 3: Multidepot VRP with pickup and delivery and multiple requests
14. Application 4: Multimode, resource constrained project scheduling problems
15. Summary

Dr. Voratas Kachitvichyanukul



B.S. Chemical Engineering, National Taiwan University, 1975
M.Eng. Industrial Engineering & Management, AIT, 1976
Ph.D. Industrial Engineering, Purdue University, USA, 1982

Dr. Voratas is currently Professor and Dean of School of Engineering and Technology, Asian Institute of Technology in Thailand. He is also serving as the President of the Asia Pacific Industrial Engineering and Management Society during 2013-2014. He has extensive experiences of over 25 years in simulation modeling of manufacturing systems.

Dr. Voratas started his career as an Assistant Professor in Industrial Engineering at The University of Iowa, USA prior to taking position in industry. His industrial experiences include full time technical positions in FORTUNE 500 Companies such as Compaq Computer Corporation and Motorola Incorporated in the U.S.A. He had also worked as consultant for SEMATECH, USA, in the capacity of technical coordinator of the future factory program for microelectronic industry in early 1990's.

He resumed his academic career at AIT in the late 1990's after several years in industry. Besides his academic activities, he has also been serving in various advisor capacities to companies and government agencies. His notable achievement is that in 2014, his research paper on VRP published in Computers and Operations Research is the top most cited paper since 2009 (extracted from Scopus).

Some of his services to the professional societies are listed below:

Board Member

- Asia Pacific Industrial Engineering and Management Society
- Asia Pacific Division of the International Foundation for Production Research
- International Federation for Logistics and SCM Systems

Editorial Board member

- * International Journal of Applied Decision Sciences, Indersciences.
- * International Journal of Management Science and Engineering Management (UK)
- * Journal of Advances in Management Research, (India)
- * Journal of Advanced Engineering, (Taiwan)
- * International Journal of Reliability and Quality Performance (India)
- * The International Journal of Logistics and SCM Systems (Japan)

Editor

- * Asia-Pacific Editor, International Journal of Simulation and Process Modeling, Indersciences.
- * Area Editor: Computational Intelligence and Optimization, Industrial Engineering and Management Systems.
- * Associate Editor: International Journal of Industrial Engineering: Theory, Applications and Practice
- * Regional Editor, International Journal of Logistic and SCM Systems (Japan)

His teaching and research interests include evolutionary computational techniques, planning and scheduling, simulation, enterprise resource planning, supply chain modeling, high performance computing and applied operations research with special emphasis on industrial systems. He can be reached at email address <voratas@ait.ac.th>