Intelligent Manufacturing Systems 智慧型製造系統

Course Syllabus

Time & Place: Tuesday 14:10-17:00 at 儀器設備大樓 IDC Instrument Building 95405
Instructor: 李家岩 博士 Dr. Chia-Yen Lee
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Objective: The objective of this course is to learn the statistics and optimization methodologies in intelligent manufacturing systems. The students will know how to apply artificial intelligence (AI) and data mining (DM) techniques to solve the real problems in shop-floor level or capacity planning problems.

Course Content: This course will provide students to learn how to apply artificial intelligence (AI) and data mining (DM) techniques to improve the efficiency of manufacturing systems. The models include genetic algorithm, neural network, decision tree, association rule, etc. The course integrates the knowledge domains of the information and engineering, and solves the real problem systematically using the design of meta-heuristic algorithms and statistical machine learning tools.

Announcement: Announcements and other information concerning the course will be updated in class or maintained on e-learning website. In addition, it will be used to distribute homework assignments, lectures, and other material as required during the course. Please check this website regularly. Any information posted on it will be as valid as if it was mentioned in class.

Learning Requirement:
1. Know the intelligent manufacturing techniques
2. Create the prototype model to solve the problem in real setting
3. Develop the research skills and prepare a basic project report

Grading Policy:
- Homework/Midterm Exam 20%
- Literature Review Project 20%
- Final Exam 30%
- Research Project 30%

Course Policies
**Examinations:** All exams will be comprehensive up to a specified topic although emphasis will be on the newer material. The formula sheet will be provided in exam. You are allowed to use calculator. There will be no make-up examinations unless prior arrangements have been made with the instructor. An official written authorized excused is required.

**Literature Review Project:** This is an individual project. The objective of this project is to ask student to develop the research capability in finding the interesting topic with niche and organize the related knowledge so as to solve the real problem. The student should pick up the specific topic and review the related literature (no more than 2 papers). Write a summarized report (around 5 pages) and your review comment if possible.

**Research Project:** This is an individual project. The objective of the project is to apply the tools you learn from class to practical problem. The project should follow the project instruction (delivered to you in class later) and write a basic project report (around 10 pages). The report violating the project instruction is not accepted.

Any disagreements or questions regarding any graded material must be discussed within one week after it was returned. No grade will be changed after one week time limit.

**Course Outline:**

1. *Overview and Computational Intelligence*
2. *Production System*
   2.1 Manufacturing and Service Systems
   2.2 Factory Physics
   2.3 Capacity Management
3. *Meta-Heuristic Algorithms*
   3.1 Tabu Search and Simulated Annealing
   3.2 Genetic Algorithms
   3.3 Neural Networks
   3.4 Particle Swarm and Ant Colony Optimization (if time allowed)
4. *Data Mining*
   4.1 Principal Component Analysis
   4.2 Decision Tree Algorithms
   4.3 Association Rules
   4.4 Clustering
5. *Empirical Studies and Research Topics*
Textbook: No specific textbook.

References:

Manufacturing Systems

Computational Intelligence and Metaheuristics

Statistical Machine Learning and Data Mining

Remarks:
The junior or senior undergraduate students are welcome. 大學部高年級學生歡迎選修