Course 8: Intelligent Decision Support Systems

Course Objective: The objective of this course is to give students the up-to-date of decision-making concepts, process, strategies, and technologies that are often used to support decision making in real-world issues coupled with agile approach and industry 4.0 specification. Students will know how to analyse, to design, to implement and to validate an Intelligent Decision Support System (IDSS). The integration of Artificial Intelligence models and Statistical models, and the knowledge discovery from data step will be emphasized. The course consists of foundations and developments of IDSS, software tools for IDSS development, IDSS for Digital Manufacturing Systems, and IDSS applications

Learning Outcomes:
The students on the completion of this course would be able to
- Explain concepts of a decision support system in term of an interactive system providing information, tools and models and its effects on Industry 4.0.
- Apply techniques of IDSS (e.g. artificial neural networks, machine learning, rule-based systems, etc.) and validate IDSS techniques to solve a complex industrial problem.
- Identify decision factors, models, and analysis of intelligent decision support systems (IDSS) to support a smart production system.
- Appraise the frameworks of IDSS.
- Design a knowledge-based system for a smart production system.

Prerequisite: None

Course Outline:

Module 1: IDSS Foundation and Development
- The needs of decision support tools
- Modelling of Decision Process
- IDSS Architecture, Analysis, Design, Requirements, and Validation
- Impact of IDSS in Industrial Performance
- Economic Impact of IDSS in industry
- Agile Approach for Smart Production

Module 2: Software Tools for IDSS Development
- The analytic hierarchy process (AHP)
- R-software
- RapidMiner
- WEKA
- Deep Learning for Smart Production

Module 3: IDSS for Digital Manufacturing Systems
- Artificial Intelligence and DSS
- Knowledge Acquisition and Representation
- Predictive Models
- Uncertainty Models
- Industrial Applications
- Knowledge-based Systems for Smart Production

Laboratory Sessions: None

Learning Resources:

Textbook: No designated textbook, but class notes and handouts will be provided

Reference books:

1. Gupta, J.N.D., Forgionne, G.A., and Manuel, M.T., Intelligent Decision-making Support Systems: Foundations, Applications and Challenges, Springer, 2006
2. Iantovics, B., and Kountchev, R., Advanced Intelligent Computational Technologies and Decision Support Systems, Springer, 2014
3. Kumer. K., Zindani, D. and Davim, J.P., Digital Manufacturing and Assembly Systems in Industry 4.0, CRC Press, 2019
4. Tweedale, J.W., Neves-Silva, R., Jain, L.C., Phillips-Wren, G., Watada, J., and Howlett, R.J., Intelligent Decision Technology Support in Practice, Springer, 2016
5. Valencia-Garcia, R, Paredes-Valverde, M.A., Salas-Zarate, M.P. and Alor-Hernandez, Giner., Exploring Intelligent Decision Support Systems, Springer, 2018

Teaching and Learning Method:

The Collaboration is the main idea of teaching. Students are actively participated in the class by talking with each other and listening to other opinions. The learning methods include case study, group discussion, individual assignment, practical exercises, simulation, field class, and group project.

Time Distribution and Study Load:
Lectures: 15 hours
Workshops: 60 hours
Self-study/Group project: 75 hours

Evaluation Scheme: The final grade will be computed according to the following weight distribution: Case Studies 20%, Practical Exercises 10%, Assignments 10%, Portfolio 5%, Peer Assessment 5%, Oral Presentation 10%, Project 20%, and Open Exam 20%. In final grading,

An "A" would be awarded if a student shows a deep understanding of the knowledge learned through assignments, project works, and exam results.
A "B" would be awarded if a student shows an overall understanding of all topics.
A "C" would be given if a student meets below average expectation in understanding and application of basic knowledge.
A "D" would be given if a student does not meet expectations in both understanding and application of the given knowledge.

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