University of Bahrain
Quality Assurance and Accreditation Center

Course Syllabus Form

1.	Course code:	EENG 486	2.	Course title:	Intelligent Control		
3.	College:	Engineering					
4.	Department:	Electrical & Electronics Engineering					
5.	Program:	Electrical and Electronics					
6.	Course credits:	3-1-3					
7.	Course NQF Level : 8						
8.	NQF Credits :	3					
9.	Prerequisite:						
10.	Lectures Timing & Location: MW, 1:00-2:45, Room: 14-140						
11.	Course web page:	Blackboard and https://www.dr-e-mattar-uob.com/					
12.	Course Instructor:	Prof. Ebrahim A. Mattar					
13.	Office Hours and Location:	MTW: 11-1 pm (14-146)					
14.	Course coordinator:	Prof. Ebrahim A. Mattar					
15.	Academic year:	2023/2024					
16.	Semester:	X First		Second		Summer	
17.	Textbook(s):						
	Textbook(s): Kevin M. Passino and Stephen Yurkovich, Fuzzy Control, Addison Wesley Longman, Menlo Park, CA, 1998.						
18.	References:						
	J-S. R. Jang, C-T. Sun, and E. Mizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall, 1997, Modern Control Engineering, Katsuhiko Ogata,Prentice Hall. Control Systems Engineering, Norman S. Nise, John Wiley & Sons						
19.	Other learning resources used (e.g. e-Learning, field visits, periodicals, software, etc.):						
20.	Course description (as per the published):						
	This course is an introductory course on intelligent control. The main goal of the course is to learn a variety of fuzzy control methods, and to understand how they use a diversity of heuristic knowledge to achieve control specifications. Basic components and their roles in general fuzzy systems are explained to understand how fuzzy controllers work. Based on the basic idea of fuzzy control, advanced topics in intelligent control, including fuzzy identification, adaptive/supervisory fuzzy control, neural networks, genetic algorithms, expert systems and fuzzy decision-making systems, are also covered. Comparisons between fuzzy and conventional control techniques are done, and advantages and disadvantages of each technique will be clarified. Through various examples, students will learn how to apply intelligent control techniques to real engineering problems with Matlab.						

21. Course Intended Learning Outcomes (CILOs)											
	Mapping to PILOs										
CILOs	1	2	3	4	5	6	7				
1. Explain fuzzy set and general fuzzy system											
2. Design fuzzy controller			✓		✓	✓					
3. Analyze fuzzy identification and estimation.	✓										
4. Feedback Control Systems Characteristics. Performance of Feedback Control Systems	✓	✓									
5. Classify Neural network and illustrate Adaptive Neural-Fuzzy Inference System (ANFIS)				✓			✓				
6. Design Neural network control application	✓				✓	✓	✓				
7. Explain Genetic algorithm					✓						

22. Course assessment:				
Assessment Type	*Details/ Explanation of Assessment in relation to CILOs*	*Number*	*Weight*	*Date(s)*
Assignments	1,2,3,4,5,6,7	3-4	10%	*Refer to course weekly breakdown below*
Examination-Midterm	3,4	1	30%	*Refer to course weekly breakdown below*
Laboratory/Practical	1,2,6	4-6	10%	*Refer to course weekly breakdown below*
Projects/Case Studies	5,6,7	1	10%	*Refer to course weekly breakdown below*
Final Examination	1,2,5,67	1	40%	*Refer to course weekly breakdown below*
Total			100%	

23. Description of Topics Covered	
Topic Title (e.g. chapter/experiment title)	*Description*
Introduction to IC	Learn a variety of IC and Control Design methods.
Fuzzy System	Understand how they use a diversity of heuristic knowledge to achieve control specifications.
Fuzzy System - ANFIS	Basic idea of fuzzy control, advanced topics in intelligent control, including fuzzy identification.
Neural Net	Adaptive/supervisory fuzzy control, neural networks, genetic algorithms.
Learning ANN	Expert systems and fuzzy decision-making systems, are also covered.
Genetics Programming	Comparisons between fuzzy and conventional control techniques are done, and advantages and disadvantages of each technique.
Design of ANN	Through various examples, students will learn how to apply intelligent control techniques to real engineering problems with Matlab

24. Weekly Schedule

Week	*Date*	*Topics covered*	*CILOs*	*Teaching Method*	*Assessment*
1	Sep. 19-22	Review		Lectures	
2	Sep. 22-26	Fuzzy set and general fuzzy system	1	,,	Self-assessment
3	Sep. 29-Oct 3	Fuzzy control and Fuzzy controller design	1,3	,,	Self-assessment
4	Oct. 6-10	Fuzzy identification and estimation	1,3	Practical work	Self-assessment
5	Oct. 13-17	Fuzzy Model Reference Learning Control	1,3	Practical work	
6	Oct. 20-24	Neural network and Adaptive Neural-Fuzzy Inference System (ANFIS)	1,3	Practical work	Mid-Term
7	Oct. 27-31	Feedback Control Systems Characteristics. Performance of Feedback Control Systems	1,2	Practical work	Mid-Term
8	Nov. 3-7	Mid-semester break			
9	Nov. 10-14	Neural network control application	1,2	Practical work	Self-assessment
10	Nov. 17-21	Genetic algorithm-1	1,3,5,6	Practical work	Self-assessment
11	Nov. 24-28	Genetic algorithm-2	1,3,5,6	Practical work	
12	Dec. 1-5	Applications of IC-1	1,3,5,6	Practical work	Self-assessment
13	Dec. 8-12	Applications of IC-2	1,3,5,6	Practical work	
14	Dec. 15-19	Applications of IC-3	1,3,5,6	Practical work	Self-assessment
15	Dec. 22-26	Review	1,3,5,6	Practical work	Self-assessment
16	Dec. 29- 31	Review	2,6	Practical work	Self-assessment

Academic Integrity Statement
Honesty and integrity are integral components of the academic process. Students are expected to be honest and ethical at all time in their pursuit of academic goals in accordance with Regulations of Professional Conduct Violations for University of Bahrain Students, UOB Plagiarism Policy and UoB Guide to Students Rights and Duties. Any breach of academic integrity will be dealt according to the Regulations for Professional Conduct Violations

Prepared by:	Prof. Ebrahim A. Mattar
Date:	Saturday, September 16, 2023