# University of Bahrain
## Quality Assurance and Accreditation Center

# Course Syllabus Form

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|---|---|---|---|---|---|---|---|
| 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, (S-40 -1114) | | | | | |
| 14. | Course coordinator: | Prof. Ebrahim A. Mattar | | | | | |
| 15. | Academic year: | 2025/2026 | | | | | |
| 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.


***Note: Additional information could be added as required by the Instructor, (eg, Policies)***
***Note: Items shown underlined cannot be changed without the department consent.***

| 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 | |
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| ***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 |
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| 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 |

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| Prepared by: | Prof. Ebrahim A. Mattar |
| Date: | September 16, 2025 |