University of Tehran
School of Electrical and Computer Engineering

Course:	**An Introduction to Intelligent Systems**		
Course type:	Elective	EE, CE, and IT*	Credit: 3
Level:	Undergraduate		
Co-requisite(s):	-		
Prerequisite(s):	-		
Prerequisite by topic:	Background knowledge on programming in MATLAB and probabilistic		
Textbook(s):	In this course, the students may be advised to study sections of different books due to the large number of topics we have to cover. [1] T. M. Mitchell, *Machine learning*. Mac GrawHill, 1997. [2] G. J. Klir and B. Yuan, *Fuzzy sets and fuzzy logic: theory and applications*. 1995. Prentice-Hall [3] D. Floreano and C. Mattiussi, *Bio-inspired artificial intelligence: theories, methods, and technologies*. The MIT Press, 2008. [4] H. Duda, P. Hart, and D. G. Stork, Stork, *Pattern Classification*. John Wiley & Sons, 2001. [5] R. S. Sutton and A. G. Barto, *Reinforcement learning: An introduction*, vol. 28. Cambridge Univ Press, 1998.		
Coordinator:	Maryam S. Mirian		
Goals:	The objective of this course is to introduce the methods of creating intelligence and learning ability in artificial systems in different engineering areas including control, computer engineering and IT-with applications ranging from fuzzy controller to face detection, text categorization and so on. In fact, it is planned to present the potentiality of ongoing research in AI and Machine learning department of ECE to undergrad students who are going to decide for graduate level. This course is a soft selection and combination of the following graduate courses of AI and robotics: • Machine learning • Fuzzy • Artificial Neural Networks • Pattern Recognition • Bio-computing		

Outcome:	Upon successful completion of the course, students will be able 1. Design and Train artificial neural networks for their applications 2. Use decision trees to control the sequential decision making process in many applications 3. Employ classification and clustering methods in different engineering application. 4. Utilize Reinforcement learning as a powerful online interactive learning method in applications need such techniques. 5. Employ fuzzy set theory in applications that cannot be handled using crisp conventional methods
Topics:	• Introduce a unified perspective on different topics discussed in this course and the semantic relation among them • Introduce fuzzy set theory, fuzzy relations, fuzzy logic, fuzzy decision making and their applications in fuzzy DB, fuzzy Information Retrieval and Fuzzy Controllers • Classification: problem definition, Basic classifiers such as Bayes, k-NN, and their applications in Medical Diagnosis systems • Artificial Neural Networks: Neuron structure, MLP and its applications in Face Recognition • Clustering: Hierarchical methods, K-means, cluster evaluations and some applications in Recommender systems • Reinforcement Learning: Introduction, basic concepts and some applications in Robotics
Computer usage:	The students in this course will program their computer assignments using different environments specifically using MATLAB.
Assignments:	In this course it is required for the students to work out on some analytical paper assignments for the topics on fuzzy theory, Bayesian network and classification and to do some computer assignments on NN and Decision Tree topics.
Projects:	In order to practically understand the ideas in this course, students need to select an application –according to their field- and employ the ideas learned in that application. Then they have to present the results and studies in a short talk for the class.
Grading:	Assignment and projects %40 Midterm exams: %20 Final exam: %40
Further readings:	[1] N. Bessis and F. Xhafa, *Next Generation Data Technologies for Collective Computational Intelligence*, vol. 352. Springer-Verlag New York Inc, 2011. [2] E. S. Olivas, *Handbook of research on machine learning applications and trends: algorithms, methods, and techniques*, vol. 2. Information Science Reference, 2010. [3] S. Ventura, *Handbook of educational data mining*. CRC, 2010. [4] C.M. Bishop, *Neural Networks for Pattern Recognition*, Oxford university press, 1995 [5] H. W. Ian and F. Eibe, *Data Mining: Practical machine learning*

	tools and techniques, Morgan Kaufmann, San Francisco, 2005. [6] A.Konar, *Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain*, vol. 1. CRC, 2000.
Prepared by:	Maryam S. Mirian
Date:	October 18, 2011

*EE: Electrical Engineering CE: Computer Engineering IT: Information Technology