

School of Computer Science and Statistics

B.A. (Mod) Computer Science

ECT Module Descriptor 2011-12

Module Code	CS4001
Module Title	Fuzzy Logic and Control Systems
Pre-requisites	NONE
ECTS	5 ECTS
Chief Examiner	Prof. Khurshid Ahmad
Teaching Staff	Prof. Khurshid Ahmad
Delivery	27 Lectures and 6 tutorials
Aims	<p>This course will introduce you to the exciting new field of fuzzy systems. Fuzzy systems are in almost daily use: your washing machine has fuzzy controls and many of the refrigerators do too. In both cases, the machines can sense the amount of stuff (clothes or food) and adjust their operations accordingly.</p> <p>Fuzzy logic has been developed by computer scientists and control engineers over the last 30 odd years. Fuzzy logic is now being used in a range of critical systems ranging from image processing to the processing of financial time series.</p>
Learning Outcomes	<p>When students have successfully completed this module they should have the knowledge of:</p> <ul style="list-style-type: none">(a) how imprecision in concepts can be captured by fuzzy sets;(b) methods and techniques of building fuzzy control system;(c) how systems learn to capture the fuzziness in large data sets

Syllabus	<p>Specific topics addressed in this module include:</p> <ol style="list-style-type: none">1. Terminology: Uncertainty, Approximations and Vagueness (2 Lectures)2. Fuzzy Sets and Aggregation Operators (5 Lectures)3. Fuzzy Logic and Fuzzy Systems (8 Lectures, 3 tutorials)4. Fuzzy Control (8 Lectures, 3 tutorials)5. Neuro-fuzzy systems including introduction to neural computing (4 Lectures)
Assessment	<p>The strategy relies on lectures, delivered using the conventional format, and on inducing discussion and critical thinking through case studies and coursework project.</p> <p>Assessment is by examination and by project work. Project work attracts a mark of up to 20% of the year end mark, and the examination makes up the remaining 80%.</p> <p>The coursework project is conducted by each student individually. It encourages the design, writing and testing of programs, using MATLAB for example, as a means of appraising the theory and techniques discussed in the course.</p> <p>Examination: 80% Coursework: 20%</p>
Bibliography	<p>Negnevitsky, Michael (2002). <i>Artificial Intelligence: A Guide to Intelligent Systems (1st Edition)</i>. Harlow:Pearson Education Ltd. (Chapter 4, pp 87-128). (Available at Hamilton Library Open-access Collection)</p> <p>Kruse, Rudolf., Gebhardt, J., and Klawonn, F. (1994). <i>Foundations of Fuzzy Systems</i>. New York: John Wiley and Sons. (Chapter 2 for <i>fuzzy sets</i> and Chapter 4 for <i>fuzzy control</i>) (Available through Trinity Library → but have to wait for it to be called from Santry Collection)</p>

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	<p>Yager, Ronald R., and Filev, Dimitar P. (1994). <i>Essentials of Fuzzy Modeling and Control</i>. New York: John Wiley and Sons. (Chapter 4 for <i>fuzzy control</i>).</p> <p>Stanford Encyclopaedia of Philosophy: Fuzzy Logic (Excellent introduction to the subject, readable, entertaining and informative; site visited 8th September 2011)</p>
Website	<p>Lecture Notes on Fuzzy Logic – updated every year in October.</p>