Module Code	CSU44001					
Module Name	Fuzzy Logic and Fuzzy Control Systems					
ECTS Weighting <sup>1</sup>	5 ECTS					
Semester taught	Semester 1					
Module Coordinator/s	Khurshid Ahmad					
<u>Module Learning</u> <u>Outcomes</u>	<ul> <li>On successful completion of this module, students will be able to:</li> <li>LO1. Understanding of uncertainty in data and in modelling</li> <li>LO2. Knowledge of fuzzy sets and system</li> <li>LO3. Skills in building fuzzy knowledge based systems</li> <li>LO4. Competencies in data analytics</li> <li>LO5. Application of quasi-intelligent systems to big data analytics</li> </ul>					
Module Content	This course will introduce you to the exciting new field of fuzzy systems and the related topics in machine learning and the so-called deep learning neural nets. 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. Equally, important is the fact that fuzzy control systems are used in managing financial markets, in operating power plants and transportation systems, and as a basis of systems that will deal help process the and almost every aspect that relies on continuous <i>big data</i> related issue. In short there is a fuzzy systems for monitoring and tuning. complex systems					
	Fuzzy logic has provided a wonderful new basis for how machines can be made to learn much like humans do especially in domains where uncertainty and approximate reasoning are the order of the day. Fuzzy logic is the bridge between the more abstract statistical machine learning and the more complex human knowledge acquisition.					
	Fuzzy logic has been developed by computer scientists, psychologists, statisticians, and control engineers over the last 30 odd years.					
	The course will be delivered in five lecture series:					
	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, 2 tutorials)					
	5. Neuro-fuzzy systems including introduction to neural computing (4 Lectures)					

<sup>&</sup>lt;sup>1</sup> TEP Glossary

Teaching and Learning Methods	Lectures, tutorials, online lecture slides, Lectures are traditionally delivered and copies of the lecture notes covering each of the five key topics are circulated in advance of the lectures. All lectures are available on the TCD Blackboard.							
Assessment Details <sup>2</sup>	Assessment Component Examination	Brief Description 2 hour written examination	Learning Outcomes Addressed . LO1, LO2, LO3, LO4, LO5	% of total 80%	Week set n/a	Week due n/a		
	Report	End of term assignment	LO6	20%	6	8		
Reassessment Details	2 hour writte	n examination (100%)						
Contact Hours and	Contact Hours	(scheduled hours per student o	over full module), k	oroken down	33 ho	33 hours		
Indicative Student Workload	Lectures					28 hours		
	Software consultation/ Assignment Support					5 hours		
	Independent study (outside scheduled contact hours), broken down by:					36 hours		
	(including preparation for examination, if applicable)					25 hours		
	completion of assessments (including examination, if applicable)					11 hours		
	Total Hours				69 ho	urs		
Recommended Reading	Lotfi Zadeh and Rafik A. Aliev (2019). <i>Fuzzy Logic Theory and Applications</i> . Denver:							
List	Negnevitsky, Michael (2002). <i>Artificial Intelligence: A Guide to Intelligent Systems</i> (1 <sup>st</sup> Edition). Harlow:Pearson Education Ltd. (Chapter 4, pp 87-128). (Available at Hamilton Library Open-access Collection)							
	Kruse, Rudolf., Gebhardt, J., and Klawonn, F. (1994). <i>Foundations of Fuzzy</i> <i>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 $\rightarrow$ but have to wait for it to be called from Santry Collection)							
Module Pre-requisites	Prerequisite modules: NONE							
Module Co-requisites	NONE							
Module Website	TCD Blackboard for CS4001 & CS4504							

<sup>2</sup> TEP Guidelines on Workload and Assessment

Last Update

27 July 2019 Khurshid Ahmad