MODULE DESCRIPTION FORM

Module Information					
Module Title	**Artificial Intelligence 2**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code					
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	3		**Semester of Delivery**	2	
Administering Department	Computer Science		**College**	Science	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	Artificial Intelligence 1	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes, and Indicative Contents	
Module Aims	The course is a research-based course and therefore focuses on leading students to investigate the current state of research in Computational Intelligent areas as well as to gain comprehensive theoretical knowledge from scientific research about the basic concepts and features of CI methodologies and approaches.

Module Learning Outcomes	Provide the student with key vocabulary and help to understand artificial intelligence and Computational intelligence by understand: • Optimization ○ Constrained, unconstrained optimization ○ Parameter space, function space, and fitness space ○ Local and global optima ○ Multi-objective optimization

	• Classification / Learning ○ Classification (Supervised Learning) ○ Clustering (Unsupervised Learning) ○ Reinforcement Learning • Control Systems

Indicative Contents	Indicative content includes the following. Theoretical direction Introduction to Computational Intelligent topics fundamental concepts. [6 hrs] Neural Networks (NNs): A neural network is a method in artificial intelligence that teaches computers to process data in a way that is inspired by the human brain. It is a type of machine learning process, called deep learning that uses interconnected nodes or neurons in a layered structure that resembles the human brain. [9 hrs] Fuzzy Logic (FL): Fuzzy logic is a form of many-valued logic in which the truth value of variables may be any actual number between 0 and 1. It is employed to handle the concept of partial truth, where the truth value may range between entirely true and false. By contrast, in Boolean logic, the truth values of variables may only be the integer values 0 or 1. [9 hrs] Genetic Algorithms (GAs): In computer science and operations research, a genetic algorithm (GA) is a meta-heuristic inspired by the process of natural selection that belongs to the larger class of evolutionary algorithms (EA). Genetic algorithms are commonly used to generate high-quality solutions to optimization and search problems by relying on biologically inspired operators such as mutation, crossover, and selection. Some examples of GA applications include optimizing decision trees for better performance, solving Sudoku puzzles, hyper-parameter optimization, causal inference, etc.. [9 hrs] Swarm Intelligence: Swarm intelligence (SI) is the collective behavior of decentralized, self-organized, natural, or artificial systems. The concept is employed in work on artificial intelligence. SI systems typically consist of a population of simple agents or boids interacting locally with one another and with their environment. The inspiration often comes from nature, especially biological systems. The agents follow straightforward rules, and although there is no centralized control structure dictating how individual agents should behave, local and to a certain degree, random interactions between such agents lead to the emergence of "intelligent" global

	behavior unknown to the individual agents. Examples of swarm intelligence in natural systems include ant colonies, bee colonies, bird flocking, hawks hunting, animal herding, bacterial growth, fish schooling, and microbial intelligence. [9 hrs] Revision problem classes [6 hrs] Part B - Practical direction by Python Introduction to Python for AI . [6 hrs] Applying python of same of NN applications. [9 hrs]. Applying python of same of Fuzzy applications. [9 hrs] Applying python of same of GAs applications. [9 hrs] Applying python of same of Swarm Intelligent applications. [9 hrs] Applying python of same of Hybridization of CI Algorithms applications. [6 hrs]

Learning and Teaching Strategies	
Strategies	The primary strategy adopted in delivering this course is to encourage student participation in the exercises while simultaneously refining and expanding their skills in the artificial intelligence field. This will be achieved through classes and scientific laboratories.

St dent Workload (SWL)			
Structured SWL (h/sem)	75	**Structured SWL (h/w)**	5
Unstructured SWL (h/sem)	100	**Unstructured SWL (h/w)**	6.5
Total SWL (h/sem)	175		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		