Module Template for New and Revised Modules[1]

Module Code	**EEU44C16**
Module Name	Deep Learning and its Applications
ECTS Weighting[2]	10 ECTS
Semester taught	Semester 1
Module Coordinator/s	Prof. François Pitié
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: L1. Describe the main neural network architectures used in applications today. L2. Describe the parameters used in popular Deep Learning software libraries such as Keras. L3. Implement neural network applications using python 3 and keras. L4. Evaluate the performance of Machine Learning algorithms and analyse the potential pit falls. L5. Design neural network architectures for a particular application. L6. Train and debug neural network models (e.g. detect overfitting and provide a solution to mitigate its effects). L7. Plan and design solutions for industry projects that require neural net technology. L8. Answer typical questions from job interviews on Deep Learning. **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Enhanced
Module Content	This module is an introduction to Machine Learning with a strong focus on Deep Learning. Deep learning is another name for machine learning using artificial neural networks. It is loosely inspired by the structure of the neurons in the cerebral cortex. Deep Learning has recently become a disruptive technology that has been taking over operations of technology companies around the world and is having a profound impact all aspects of society. When you read or hear about AI or machine Learning in the news, it really refers to Deep Learning

[1] An Introduction to Module Design from AISHE provides a great deal of information on designing and re-designing modules.
[2] TEP Glossary

	technology. Learning how to master Deep Learning is increasingly becoming as important as learning how to code. The course starts with an introduction to some essential aspects of Machine Learning, including Least Squares, Logistic Regression and a quick overview of some popular classification techniques such as decision trees and SVMs. The course then dives into the fundamentals of Neural Nets, including Feed Forward Neural Nets, Convolution Neural Nets and Recurrent Neural Nets. Students get introduced to the most modern architectures in the later part of the module. The material is constructed in collaboration with leading industrial practitioners including Google, YouTube and Intel, and students will have guest lectures from these companies. Hands on labs will give you experience with the field and allow you to develop your own Deep Learning applications.
Teaching and Learning Methods	Deep Learning has become so successful partly because it does not require arcane knowledge to practice it. This course aims at popularising Deep Learning mastery to a class of students with diverse technical background (eg. to both computer science and engineering students). The teaching strategy for this module is a mixture of lectures, problem-solving tutorials and laboratories dedicated to implement and solve machine learning problems. Most of the theoretical elements of Machine Learnings and Deep Learning will be covered in the first half of the term. The rest of the term is dedicated to expose the students to more advanced labs and industry related problems. The students will have access to online resources and recorded lecture videos. The teaching strategy includes elements of Mastery Learning, mixed with Flipped Classroom. Labs are automatically accessed, and students are allowed unlimited submissions. Students must also successfully pass a number of questionnaires that checks the mastery of the fundamentals.

Assessment Details[3]
Please include the following:

- **Assessment Component**
- **Assessment description**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Exam	Written exam 2h	All	60%	n/a

[3] TEP Guidelines on Workload and Assessment

• **Learning Outcome(s) addressed** • **% of total** • **Assessment due date**	CA: midterm	In-class MCQ	All	20%	Around W8
	CA: labs	Code submission of 7 labs	All	20%	Throughout the semester

Reassessment Requirements	
Contact Hours and Indicative Student Workload[3]	**Contact hours: 55** **Independent Study (preparation for course and review of materials): 150** **Independent Study (preparation for assessment, incl. completion of assessment): 12**
Recommended Reading List	Supporting references (research publications, press articles, YouTube videos) are included in the handouts. • Deep Learning, Ian Goodfellow et al., (MIT press), [https://www.deeplearningbook.org] • Machine Learning on Cousera, Andrew Ng [https://www.coursera.org/learn/machine-learning] • Neural Networks and Deep Learning, Michael Nielsen [http://neuralnetworksanddeeplearning.com/]
Module Pre-requisite	
Module Co-requisite	
Module Website	https://frcs.github.io/4C16/
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No.
Module Approval Date	
Approved by	
Academic Start Year	
Academic Year of Date	September 2024