

CE4001 and CZ4001 – Virtual and Augmented Reality

Course Code	CE/CZ4001							
Course Title	Virtual and Augmented Reality							
Pre-requisites	CZ2003 Computer Graphics and Visualization							
Pre-requisite for	NIL							
No of AUs	3							
Contact Hours	Lectures	24	TEL	0	Tutorials	12	Student presentations	3

Course Aims

Virtual and augmented reality is becoming a powerful technology for engineers to design and implement applications ranging from manufacturing and medical to media and entertainment. Virtual reality refers to techniques that build imaginary worlds in computers. Augmented reality adds cues by overlaying computer-generated images onto the real world. An understanding of the hardware, software and algorithms for virtual and augmented reality allows engineers like you to push the limits of the technology and develop useful applications.

The prerequisite of this course is CZ2003 Computer Graphics and Visualization, which covers fundamentals of 3D modelling and animation.

Intended Learning Outcomes (ILO)

Each lecture module contains the motivation, fundamentals and mathematical background, hardware, software and algorithms in virtual and augmented reality. Practical problems with their solutions will be studied in tutorials. You will gain hands-on experiences through the laboratory assignments. Upon the successful completion of this course, you shall be able to:

1. Explain what is virtual and augmented reality and how it can simulate and interact with the real-world;
2. Identify typical problems associated with virtual and augmented reality;
3. Describe some examples of real-world applications;
4. Design and implement a working system using available tools based on the concepts and mathematics learnt in this course

CE4003 and CZ4003 – Computer Vision

Course Code	CE/CZ4003							
Course Title	Computer Vision							
Pre-requisites	NIL							
Pre-requisite for	NIL							
No of AUs	3							
Contact Hours	Lectures	26	TEL	0	Tutorials	13	Laboratories	-

Course Aims

This course aims to introduce you basic concepts and technologies of computer vision, and develop skills to implement widely used algorithms to process real vision tasks. This course presents you with digital image acquisition, representation, processing, recognition, and 3D reconstruction, to gain understanding of algorithm/system design, analytical tools, and practical implementations of various computer vision applications. You will be equipped with fundamental knowledge, practical skills and the insights for future development in this area.

Intended Learning Outcomes (ILO)

Upon the successful completion of this course, you shall be able to:

1. Describe the fundamental computer vision concepts;
2. Explain the advantages and disadvantages of the common computer vision techniques;
3. Implement the basic computer vision algorithms;
4. Apply computer vision techniques to solve simple real problems.

CE4041 and CZ4041 – Machine Learning

Course Code	CE/CZ 4041							
Course Title	Machine Learning							
Pre-requisites	CE/CZ1011: Engineering Mathematics I CE/CZ1007: Data Structures							
No of AUs	3							
Contact Hours	Lectures	22	TEL	0	Tutorials	10	Student presentations	6

Course Aims

This course provides an introductory but broad perspective of machine learning fundamental algorithms, and is relevant for anyone pursuing a career in AI or Data Science. It aims to provide you with the essential concepts and principles of algorithms in machine learning so that you can use various machine learning techniques to solve real-world application problems.

Intended Learning Outcomes (ILO)

This course introduces machine learning at an elementary level. Upon the successful completion of this course, you shall be able to:

1. Explain the motivations and principles behind various machine learning algorithms;
2. Apply or even design specific machine learning algorithms to solve real-world application problems;
3. Identify some state-of-the-art machine learning techniques.
4. Conduct research on machine learning.

CE4042 and CZ4042 – Neural Networks & Deep Learning

Course Code	CE/CZ4042							
Course Title	Neural Networks & Deep Learning							
Pre-requisites	CE/CZ1003 Introduction to computational thinking; CE/CZ1007 Data Structures; CE/CZ1011 Engineering Mathematics I; CE/CZ1012 Engineering Mathematics II							
Pre-requisite for	NIL							
No of AUs	3							
Contact Hours	Lectures	26	TEL	0	Tutorials	12	Student presentations	0

Course Aims

This course aims to provide you with a basic but comprehensive foundation of neural networks and deep learning, including underlying principles, architectures, and learning algorithms of various types of deep neural networks that are essential for future applications of artificial intelligence and data science.

Intended Learning Outcomes (ILO)

Upon the successful completion of this course, you shall be able to:

1. Interpret artificial neuron as an abstraction of biological neuron and explain how it can be used to build deep neural networks that are trained to perform various tasks such as regression and classification;
2. Identify the underlying principles, architectures, and learning algorithms of various types of neural networks;
3. Select and design a suitable neural network for a given application;
4. Implement deep neural networks that can efficiently run on computing machines.

CE4045 and CZ4045 – Natural Language Processing

Course Code	CE/CZ4045					
Course Title	Natural Language Processing					
Pre-requisites	CE/CZ2001 Algorithms					
Pre-requisite for	NIL					
No of AUs	3					
Contact Hours	Lectures	26	TEL	0	Tutorials/Example classes	13

Course Aims

Natural language processing is becoming a very hot topic in both industrial practices and academic research. It finds many real-world applications such as information extraction, sentiment analysis, machine translation, question answering, and summarization. Hence, it is an important subject to prepare you to cope with the huge amount of unstructured information in text, for example, in web pages and business documents. This subject covers the basic concepts and computational methods for natural language processing. Techniques covered should be biased toward those generally accepted established traditional practices recommended by practitioners.

This course will equip you with the basic concepts and techniques in natural language processing on different levels including words, syntax, and semantics. You will be able to apply the techniques to real-world problems and conduct evaluations of your solutions.

Intended Learning Outcomes (ILO)

You will learn natural language processing at a basic level, establishing a solid understanding on the theory of morphological, syntactic, and semantic analysis. With that, you will gain skills to apply the NLP techniques to real-world problems by using NLP packages and toolkits.

Upon completion of the course, you should be able to:

1. Identify and analyse the linguistic characteristics of written English
2. Design and develop a NLP system to analyze and process a general corpus
3. Troubleshoot for domain-specific NLP applications

CE4046 and CZ4046 – Intelligent Agents

Course Code	CE/CZ4046							
Course Title	Intelligent Agents							
Pre-requisites	CE/CZ1007 Data Structures; CE/CZ1011 Engineering Mathematics I							
Pre-requisite for	NIL							
No of AUs	3							
Contact Hours	Lectures	26	TEL	0	Tutorials	13	Student presentations	0

Course Aims

Intelligent agents are a new paradigm for developing software applications and the focus of intense interest as a sub-field of Computer Science and Artificial Intelligence. Multi-agent systems arise when these agents co-exist, interact and cooperate with each other. Agents and multi-agent systems are being used in an increasingly wide variety of applications, such as personal assistants, e-commerce, traffic control, workflow and business process management systems, etc. This course will equip you with the skills and knowledge on the design and implementation of intelligent agents and multi-agent systems to solve large-scale, complex, and dynamic real-world problems.

Intended Learning Outcomes (ILO)

Upon the successful completion of the course, you should be able to:

1. Describe the variety of connotations that agent-based computation implies and describe how the field fits into Artificial Intelligence and more broadly, Computer Science.
2. Identify the typical problems associated with intelligent agents and multi-agent systems.
3. Describe and debate the ways for solving problems related to intelligent agents and multi-agent systems.
4. Analyse real world and (possibly) new problems related to intelligent agents and multi-agent systems, and propose and evaluate possible mitigations.