Course Code and Title: GE4000 Scientific writing and communication in English
Module Credits [MC]: 4 MC

Module Description:

This course provides students with the strategies and techniques necessary to write and present scientific research in English. It emphasizes the conventions of academic discourse, the systematic organization of research manuscripts, linguistic clarity and precision, and the design of impactful data visualizations. Through lectures, hands-on workshops, and peer-review sessions, students will learn to produce various forms of scholarly writing and to prepare and deliver oral presentations and posters at international conferences.

Learning Outcomes:

- Demonstrate mastery of English-language academic discourse conventions and the ability to produce clear, coherent research manuscripts—including abstracts, introductions, methods, results, and discussions—with accurate citation and ethical use of sources.
- Design and interpret tables, figures, and graphical abstracts that effectively convey complex data and enhance both written and oral scientific communication.
- Comprehend and critically evaluate spoken academic English in lectures, seminars, and peer presentations, identifying main ideas, supporting details, and rhetorical strategies.
- Prepare, deliver, and engage confidently in oral presentations and poster sessions at international conferences, adapting language, structure, and delivery to diverse scientific audiences.

Module Syllabus (36 Hours):

- Fundamentals of Academic Grammar and Lexis (9h)
- Advanced Academic Writing Techniques (9h)
- Data Visualization and Graphical Representation (6h)
- Academic Listening and Oral Communication (6h)
- Presentation & Poster Skills (6h)

Assessments:

- Class Involvement (20%)
- Essay (20%)
- Presentation (20%)
- Final Project (40%)

CityUHK Course Code and Title: EE4100 Power System and Energy Storage System
Module Credits [MC]: 4 MC

Module Description:
This course offers an in-depth exploration of sustainable energy systems, focusing on the development, integration, and management of renewable energy sources. As the world moves towards a low-carbon future, understanding the principles and technologies behind sustainable energy is crucial. The course covers a broad range of topics, including the fundamentals of sustainability, various renewable energy technologies (such as solar, wind), and energy storage solutions. Additionally, it addresses the integration of renewable energy into existing power grids, the role of smart grids, and the policies and economics that drive the adoption of sustainable energy systems.

Learning Outcomes:
- Demonstrate an in-depth understanding of the core principles of sustainability, including energy efficiency, carbon footprint reduction, and the integration of renewable energy technologies into the broader energy landscape.
- Analyse and evaluate the design, operation, and performance characteristics of various renewable energy technologies, such as photovoltaic systems, wind turbines, hydroelectric power, biomass conversion processes, and geothermal energy extraction methods.
- Assess the technical and operational challenges of integrating renewable energy sources into existing power grids, including the implementation of smart grid technologies, energy storage systems, and advanced grid management techniques to optimize energy distribution and reliability.
- Critically analyse the economic viability, environmental impact, and social implications of sustainable energy systems, and evaluate the effectiveness of policies, regulations, and incentives designed to promote the adoption and integration of renewable energy technologies into national and global energy frameworks.

Module Syllabus (36 Hours)
- Photovoltaic (PV) Systems (9 hours)
- Wind Turbine Technologies (9 hours)
- Grid Integration and Smart Grid Technologies (9 hours)
- Carbon Policy and Carbon Markets (9 hours)

Assessments
Mid-term Test (30%)
Assignment (30%)
Examination (40%)

Course Code and Title: EE4200 RF **Communications**
Module Credits [MC]: 4 MC

Module Description:
This course is designed to provide students with both comprehensive theoretical foundations and hands-on practical skills in radio-frequency (RF) and microwave circuit design. By equipping students with these critical competencies, they will be well-prepared to drive pioneering advancements and foster innovative applications across a spectrum of high-impact fields. These fields include, but are not limited to, wireless communications (such as 5G and beyond, including 6G), biomedicine, the Internet of Things, and satellite technology. Through rigorous coursework and experiential learning, students will gain the expertise necessary to excel in these dynamic and rapidly evolving industries.

Learning Outcomes:
- Able to recognize and understand the critical specifications of basic RF circuits.
- Able to apply S-parameters, transmission line theory and Smith chart for impedance matching.
- Able to measure RF circuits using Network Analyzers and Spectrum Analyzers.
- Able to design RF low noise amplifiers and oscillators using Smith Chart.
- Able to design RF passives and amplifiers using CAD tools and evaluate their performances.

Module syllabus (36 Hours)
- Introduction to microwave communications and applications;
- Transmission lines, telegraph equations, Smith Charts, microwave networks;
- Planar passive components, odd- and even-mode analysis, RF couplers and power dividers, and RF filters;
- Fundamentals of antennas and Radar equations;
- Control devices, analysis and design of PIN diode switches, phase shifters and attenuators;
- Fundamentals of RF amplifiers, Non-linearity and noise of amplifiers, stability analysis, maximum gain amplifier design, constant gain amplifier design, low noise amplifier design;
- RF oscillator specifications, frequency stability, phase noise, 1-port negative resistance design approach by employing two-terminal active solid-state devices, two-port design approach using three-terminal active solid state devices;
- Rectifier, detectors and mixers; theory of rectifiers/detectors/mixers, mixing principles, mixer specifications, single-ended mixers, single-balanced mixers, image frequency suppression.

Assessment mode and percentage of each assessment

Assessment mode	Percentage
Assignments	20%
Mini-Projects	30%
Final Exam	50%

Course Code and Title: EE4300 Computer Vision
Module Credits [MC]: 4 MC

Module Description:
This course aims to provide students with an in-depth critical understanding of Computer Vision's principles, concepts, and advanced techniques. The main objective of this course is to develop students with the fundamental knowledge of how machines understand and process data in the visual world. The outline of this course includes the topics of computer vision from the perspectives of low-level image processing (e.g., image mathematical and physical modelling, image enhancement, image coding, and filtering, edge and contour detection, image statistics analysis) and high-level visual semantic understanding (e.g., image recognition, image segmentation, motion analysis), along with different real-world applications where computer vision techniques have been applied. This course will also provide students with the understanding of cutting-edge technologies, such as foundation models.

Learning Outcomes:
- Apply low-level computer vision techniques to analyze basic image/video properties.
- Apply high-level computer vision algorithms for image/video understanding.
- Apply deep learning algorithms for different computer vision problems.
- Apply and evaluate computer vision algorithms based on the popular software (e.g., Python, MATLAB) for real- world applications.

Module Syllabus
- Part 1: Introduction
- Part 2: Image filtering, color, texture, and resampling.
- Part 3: Image edge detection
- Part 4: Image keypoint, descriptor, transformation and alignment.
- Part 5: Deep Neural Networks
- Part 6: Object detection and Image segmentation
- Part 7: Generative model
- Part 8: Camera model
- Part 9: 3D and Stereo
- Part 10: Motion

Assessments
Mid-term Test (30%)
Assignment (20%)
Examination (50%)

Course Code and Title: EE4400 Modern Power Electronics
Module Credits [MC]: 4 MC

Module Description:
This module aims to enable students to gain an understanding of the principles and industrial applications of modern power electronics, including power transistors, converter circuits, converter transformer and inductor designs, and modern resonant converters. International regulations concerning all modern electronic equipment and the latest technology to meet these regulations will be presented.

Learning Outcomes:
- Identify the practical characteristics of power electronic devices and circuit components.
- Analyse, design and implement switching methods for AC-DC and DC-AC power converters.
- Acquire power conversion concepts to power system applications.
- Describe international regulations related to electromagnetic compatibility and techniques to meet them.

Module Syllabus (36 Hours)
- Steady-State Equivalent Circuit Modeling, Losses, and Efficiency (3 hours)
- Switch Realization and Semiconductor Power Devices (3 hours)
- Converter circuits and Transformer Isolation (4 hours)
- Magnetic Circuits, Inductor Modeling, and Transformer Modeling in Converters (3 hours)
- Filter Inductor Design and Multiple-Winding Magnetics Design (3 hours)
- Transformer Modeling and Design, and AC Inductor Design (3 hours)
- Power and Harmonics in Nonsinusoidal Systems (4 hours)
- Pulse-Width Modulated Rectifiers and Controls (4 hours)
- Resonant Converters with Controlled Switch Network Model (4 hours)
- Soft-Switching Mechanisms of Semiconductor Devices (3 hours)
- Modern DC Fast Charging Technologies for Electric Vehicles (2 hours)

Assessments
Mid-term Test (30%)
Assignment (5%)
Mini-project (15%)
Examination (50%)

Course Code and Title: EE4500 Information, Codes, and Cryptography
Module Credits [MC]: 4 MC

Module Description:
This module explores the fundamental principles of information theory, coding, and cryptography. Students will gain a comprehensive understanding of how information is represented, transmitted, and secured. Topics include the mathematical foundations of coding theory, the design and analysis of encryption algorithms, and the practical applications of coding and cryptographic techniques. Students will develop the skills to analyze and implement practical coding and cryptographic systems through theoretical discussions and hands-on assignments.

Learning Outcomes:
- Compute and manipulate common information measures and describe their relationship
- Apply source coding techniques to achieve data compression
- Apply channel coding techniques to achieve error correction and detection
- Apply cryptographic techniques to achieve data security

Module Syllabus (36 Hours)
- Information measures: Entropy, conditional entropy, mutual information (3 hours)
- Data compression: Entropy bound, Huffman codes (3 hours)
- Number theory: Modular arithmetic, Chinese remainder theorem, finite fields (6 hours)
- Error-correcting codes: Generator and parity-check matrices, syndrome decoding, well-known block codes (6 hours)
- Information-theoretically secure systems: One-time pad, secret sharing, privacy-preserving computation (6 hours)
- Computationally secure systems: symmetric-key cryptography, public-key cryptography, well-known cryptographic protocols (9 hours)
- Introduction to quantum computing and post-quantum cryptography (3 hours)

Assessments
Mid-term Test (30%)
Assignment (20%)
Examination (50%)