Academic Plan & Syllabus

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1. **Title**: Bachelor of Engineering with Honors Electrical and Electronic Engineering
2. **Affiliation**: Department of Electrical and Electronic Engineering
3. **Type of Academic Plan**: Full-Time & In Person
4. **Plan Accreditation**: Inst of Engineering and Techno : Accredited by the Institute of Measurement and Control (InstMC) on behalf of the Engineering Council for the purposes of fully meeting the academic requirements for registration as an Engineering Technician and partially meeting the academic requirement for registration as an Incorporated Engineer.
5. **Learning Out comes:**
   - 5.1 have an understanding of and skills in the practice of Electrical and Electronic Engineering; including laboratory skills, an understanding of the use of technical literature, an awareness of intellectual property and industry codes of practice, an awareness of quality issues and an ability to work with technical uncertainty
   - 5.2 have a knowledge and understanding of the scientific and mathematical principles and methodologies that underpin Electrical and Electronic Engineering and to be proficient in applying these principles and methods to solve engineering problems.
   - 5.3 have a knowledge and understanding of the engineering principles of Electrical and Electronic Engineering and to be able to apply these principles to solve engineering problems; including an ability to describe the performance of components and systems through the use of analysis and modelling techniques.
   - 5.4 have a knowledge and understanding of the economic, social and environmental context of Electrical and Electronic Engineering practice, including an appreciation of sustainability, ethical considerations, legal requirements and business practices
   - 5.5 be able to investigate problems in Electrical and Electronic Engineering including the ability to recognize environmental, safety and cost constraints and risks; including an ability to manage the investigation process to meet expected outcomes

6. **Plan Outline:**

The course is based on that of the same name at Nottingham, however, it will span four years in Ningbo campus rather than three year as is the case at Nottingham.

The first two years will be a Foundation Year (predominantly English language skills) and a Qualifying Year, followed by Part I and Part II years at Ningbo campus. During the Part I year, students have the opportunities to exchange to UK main campus or study abroad for one year in the leading global network of research universities for the 21st century (U21 universities).

In the BEng program, all the lecture modules for the Qualifying Year and Part I are 20

credits, plus a lab-based module of 40 credits, which are all studied over a full year. Individual Project modules in Part II are also studied over a full year.

The overall aim of the Foundation Year curriculum is to help students succeed in their future studies at the University of Nottingham Ningbo, China (UNNC). The program equips students with the language and study skills that they need to manage their studies independently and to meet the demands of their future academic course. The Foundation Year curriculum is organized to help them achieve these goals. The academic English language courses are provided by the Centre for English Language Education (CELE) and the content courses are organized by lecturers from various academic departments within UNNC. The Introduction to English at UNNC module is non-credit bearing and is intended to be an intensive introduction to academic English and studying in an English-speaking environment. All other modules in are credit-bearing and students study a combination of academic English courses and content courses which are designed to develop the specific language and study skills they will need for their future degree course. In later years, the study skills modules will increasingly involve contents relating to science and engineering.

7. **Module Enrolment & Description**

Academic English Training Modules (only 2017-18):

Reading & Writing in Academic Context (RWAC)

Listening & Speaking in Academic Context (LSAC)

English in Specific Academic Context (ESAC)

Academic Oral Presentation (AOP)

All the English Training Modules conducted in fundamental year is aiming to provide solid English capabilities to students from basic daily English use to further specific subject related academic English use including, thesis writing, critical thinking and oral presentation and communication.

Mathematic Modules:

2017-18 Foundation Calculus and Mathematical Techniques

Foundation Algebra for Physical Science and Engineering

Scientific Method

provide fundamental algebra, calculus and statistical probability techniques and tools for higher engineering perspective application.

2018-19 Engineering Analysis

Enhance previous learned techniques application in circuit analysis with advanced ideals and tools, involving preliminary introduction to matrix operation

2019-20 Modelling: Method & Tools

Autumn advanced signal and system analysis techniques including Fourier Transform, Laplace Transform, Z-Transform.

Spring Numerical methods, Multi-variables mathematic techniques, Multi-Coordinator system transform and Differential equations.

2020-21 Advanced Engineering Mathematics (in progress now):

Apply all pre-learned techniques in signal processing area using MATLAB, involving advanced Linear Algebra, Differential Equations, Matrix transform.

Electrical Module:

2018-19 Power and Energy

Provide fundamental circuits analysis concepts and theories, and dive into deeper power and energy world, including three-phase power system, electrical machine operation, transformer analysis, High-Voltage energy distribution and delivery and basic renewable energy theories (mostly wind energy and tidal energy).

2019-2020 Electrical Energy Conditioning and Control

An advanced version of pre-learned module. First Semester: introduction to power electronics theories including forward, fly-back, boost convertor operation and design, which is implemented and instructed in Lab projects simultaneously. Second Semester: further investigation and study of Electrical Machine and Renewable Energy Technology including Electromagnetic theories, rotating systems, control theories. The control theory is applied in Lab projects to maintain stable output of the convertor designed in first semester.

2020-2021 Power Electronics and Control (in progress now)

Enhance previous learned power electronics and control knowledge, including further power electronics application (converter for CPU, half/dual bridge, multilevel converters) and analogue and digital controller (PI, PID and second order structures using root locus and frequency response strategies both in continuous and in discrete domain)

Electronic Module:

2018-19 Information and System: Introduction to electronic and information concepts and theories, including semiconductor devices operation (transistor, operational amplifier), analogue and digital filters, analogue to digital conversion (ADC, sampling theories, Fourier Analysis).

2019-2020 Electronic Processing and Communication (An advanced and fine sorted version of pre-learned module.)

Autumn Semester: s (comparator, AD-DA convertor, oscillator, filters, and transistors), memory circuits in modern memory storage device (SSD, DDR).

Spring Semester: Introduction to modern communication engineering, including Analogue Communication (Frequency Modulation, Amplitude Modulation and Radio Frequency) and digital communication (Shift Keying modulation, Noise and error reduction and Sampling theory with matched filter)

2020-2021 Analogue Electronics (In progress now)

Study advanced working and design principles of transistors, including BJTs and FETs, and their amplifier circuit implementation including common base, common gate and other advanced transistor amplification circuit. The second part of this model contains the basic operation and knowledge of Radio Frequency circuit, including electromagnetism wave transmission, impedance matching, power delivering and RF filter design.

2020-2021 Sensing System and Signal Processing (Spring Semester)

This module covers a selection of topics where information is acquired from sensors and subsequently electronically processed. Applications will typically include, optical, acoustic, non-destructive evaluation, medical and bio-photonics**.**

2020-2021 Integrated Circuits (Spring Semester)

By the end of this module, students should be able to:

Design and analyze circuit schematics from the transistor level to chip level. Describe physical

layout of transistor circuits and associated design issues relating to e.g. design rules or performance. State main issues related to IC manufacture. State the operating principles and underlying physical processes used in electronic semiconductor devices. Relate the performance limitations of semiconductor devices to the underlying physical processes and materials properties.

Project Based Modules

2018-2019 Applied Electrical and Electronic Engineering: Construction Project

-Design Auto colored-path Navigation Function in C/C++ using Respberry Pi and Arduino

-Design Object Detection and Speed Amendment with Integrated Light density and IR sensors

Through this project, students gained the practical experience with basic hands-on circuit building, by using bread board, sensors, and packaged Op-Amps. On the other hand, students have experienced how the electronic circuit components interacts with those pre-packaged sensors, and how these sensors are programmed and controlled. By building the real circuits blocks, students will learn the knowledge of electronic package and the operating principles of corresponding devices

The experience using Arduino reveals the embedded computing operation in a certain MCU, and the Respberry Pi provides the ability for student to using Linux Operating system, and figure out the differences and application trends of these two difference electronic computing modules.

2019-2020 Practical Engineering Design Solutions and Project Development

-Doppler Effect Radar Module Design and Implementation (Part 1)

-Processing transmitted Microwave signal frequency to track speed of a moving object in STM32L

-Programing an assembled FPGA by Verilog to display digits as receiver and computing module

-Applying self-designed filter and linear regulator for stabilization and noise reduction

Through this project, students gain the basic hands-on experience about signal communication and processing in embedded systems. Also, the students have learned the hardware programming language, as a real application and further investigation of digital electronic circuits.

Forward Convertor Conditioning and Control (Part 2)

-Designing and implementing an AC-DC forward convertor to achieve power transmission with a self-designed PCB

-Designing and applying advanced controller strategy for output power stabilization with a given PCB board

Through this power electronics project, student will have further understanding on power electronics switching mode operation, and the voltage/current modulation by PWM. Combining the control strategy and design/implement corresponding typology of controller, guide students in further understanding of control theory and its application in power electronics.

At the same time, students are enabled to design own PCB using KiCAD, which leads them into modern circuits design and printed area.

2020-2021 BSc Graduation Project:

FPGA accelerated Noise Speech Separation (in progress now)

I mainly focus on the FPGA based algorithm acceleration using C/C++ and Xilinx High-Level-Synthesis. Due to the parallel digital circuit architecture on FPGA, with the optimized solution provided by High-Level-Synthesis, a PC-based algorithm can be implemented on FPGA with much higher processing speed.

My major task is to develop an adaptive algorithm to cancel or minimize the effect of background noise when people are speaking. The whole processing scheme contains two major parts. The first part is pre-processing, using conventional FFT and digital filter to block some high frequency noise and reconstruct the signal without losing the speech information. This part is firstly achieved on PC using Python, then will be refactorized by C/C++ for hardware implementation. Theis process is about to take roughly 85 hours (estimated 15 hours per week) starting from learning the fundamental audio speech processing knowledge to successfully implemented. By the end of my first semester, the accelerated performance should be verified.

Reminder: All the enrolled modules can be verified and searched for detailed description using the following link. Please choose "Search for Modules" and using the module codes provided on my provisional transcript.

https://mynottingham.nottingham.ac.uk/psp/psprd/EMPLOYEE/HRMS/c/UN_PROG_AND_MOD_EXTRACT.UN_PAM_CRSE_EXTRCT.GBL?/ningbo/asp/course_search.asp

Please be noted that, all these modules information may not be updated on-time. For module teaching materials review and check, please e-mail slyjh4@nottingham.edu.cn **for further information.**