Bilingual Programme

หลักสูตรสองภาษา กับ University of Sheffield

เนื่องด้วยในปัจจุบัน ภาษาอังกฤษมีความสำคัญมากขึ้น โดยเฉพาะอย่างยิ่งการที่ประเทศไทยจะเข้าสู่ประชาคมอาเซียน ในวันที่ ๓๑ ธันวาคม ค.ศ. ๒๐๑๕ หรือ พ.ศ. ๒๕๕๘ ที่มีข้อตกลงการเคลื่อนย้ายแรงงานมีฝีมือใน ๗ สาขา และการใช้ ภาษาอังกฤษเป็นภาษากลางในการทำงาน ซึ่งสิ่งที่คาดกันว่าจะเกิดขึ้นคือมีบริษัทต่างชาติมาลงทุนในภูมิภาคอาเซียน โดยใช้ประเทศไทยเป็นศูนย์กลางเชื่อมโยงไปยังประเทศอื่น จะทำให้เป็นโอกาสที่ดีสำหรับผู้ที่จบการศึกษาและมีความรู้ภาษาอังกฤษดี ที่จะสามารถเข้าทำงานกับบริษัทเหล่านี้ รวมทั้งสามารถไปทำงานในประเทศต่างๆ ได้ ทำให้ได้รับเงินเดือนในอัตราที่สูง

อีกประเด็นหนึ่งคือ ในปัจจุบันมีนักเรียนที่ศึกษาอยู่ในหลักสูตรสองภาษาหรือหลักสูตรนานาชาติมากขึ้น แต่เมื่อถึงระดับอุดมศึกษาแล้ว ยังมีหลักสูตรทางด้านวิศวกรรมศาสตร์ที่สอนเป็นภาษาอังกฤษอย่างมีคุณภาพน้อย ทั้งที่ยังมีความต้องการของตลาดอีกมาก บัณฑิตที่จบจะไม่สามารถแข่งขันกับบัณฑิตที่จบจากต่างประเทศหรือประเทศในอาเซียนที่ใช้ภาษาอังกฤษเป็นหลักได้ แต่การไปศึกษาระดับปริญญาตรีในต่างประเทศก็มีปัญหานอกจากค่าใช้จ่ายที่สูงแล้ว ผู้ปกครองเองก็ยังเป็นห่วงกับการที่จะให้บุตรหลานที่จะต้องไปอยู่ในต่างประเทศในขณะอายุน้อย อีกทั้งที่ผ่านมาก็พบว่านักเรียนมีปัญหาในการปรับตัวกับระบบการเรียนในต่างประเทศที่เข้มข้นมาก

มหาวิทยาลัยฯ เห็นถึงปัญหาดังกล่าว จึงได้ตกลงความร่วมมือกับมหาวิทยาลัย Sheffield ประเทศอังกฤษ ซึ่งเป็นมหาวิทยาลัยที่มีคุณภาพ ได้รับการจัดอันดับเป็น University of the year ปี 2011 จัดโดย Time Higher Education โดยได้เปิดหลักสูตรวิศวกรรมศาสตร์ 4 สาขาคือ วิศวกรรมไฟฟ้า วิศวกรรมเคมี วิศวกรรมโยธา และวิศวกรรมเครื่องกล โดยทางมหาวิทยาลัย Sheffield จะส่งอาจารย์มาร่วมสอนในบางเวลา เพื่อให้แน่ใจว่าการสอนมีเนื้อหาครบถ้วน ตามหลักสูตรของมหาวิทยาลัย Sheffield รวมทั้งการพิจารณาข้อสอบในทุกวิชา ระบบการสอนจะเหมือนกับที่ Sheffield มีอาจารย์ที่ปรึกษาเพื่อเตรียมความพร้อม เมื่อนักศึกษาจบชั้นปีที่ 2 และมีผลการสอบภาษาอังกฤษ IELT ตั้งแต่ 6.5 ขึ้นไป และมีเกรดเฉลี่ยเกิน 2.75 จะสามารถโอนย้ายหน่วยกิต ทั้งหมดไปที่มหาวิทยาลัย Sheffield เพื่อเรียนต่ออีก 2 ปีก็จะได้รับปริญญาของทาง Sheffield การเรียน 2 ปีแรกในประเทศไทยจะช่วยลดค่าใช้จ่าย ของผู้ปกครองแต่ยังคงมาตรฐานที่มหาวิทยาลัย Sheffield ยอมรับ และเมื่อไปศึกษาต่อในชั้นปีที่ 3 และ 4 นักศึกษาจะมีวุฒิภาวะพอที่จะสามารถดูแลตัวเองได้เป็นอย่างดีแล้ว เพื่อความสบายใจของผู้ปกครอง ค่าเล่าเรียนก็จ่ายโดยตรงตามระเบียบกับทางมหาวิทยาลัย Sheffield โดยไม่ผ่านมหาวิทยาลัยเทคโนโลยีมหานคร ทั้งนี้ทาง University of Sheffield กำลังพิจารณาในเรื่องการลดค่าเล่าเรียนสำหรับนักศึกษาจากมหาวิทยาลัยเทคโนโลยีมหานครในโครงการนี้

สำหรับนักศึกษาที่ไม่ต้องการไปต่อที่มหาวิทยาลัย Sheffield ก็สามารถศึกษาต่อในชั้นปีที่ 3 และ 4 ที่มหาวิทยาลัยเทคโนโลยีมหานคร ได้จนจบการศึกษา

Electronic and Electrical Engineering

Electronic and communications Engineering – B.Eng
Qualification : B.Eng (Bachelor of Engineering)
Duration : 4 years (2 years at Mahanakorn University of Technology and 2 years at The University of Sheffield)

Course description:
Our courses are flexible. You choose your own degree through a blend of core and optional modules and a major project. Levels one and two are the same for all courses, after which you'll specialise based on your interests. You're generally not tied to the degree you originally registered for. This degree will give you a solid background in the basics of electronic communications engineering, which underpins many everyday technologies from TV and radio to text messaging and air travel. You'll also study aspects of current and upcoming technology in this dynamic area.
This MEng degree satisfies the academic criteria for CEng status.

1st & 2nd year modules (Mahanakorn University of Technology)
3rd & 4th year modules (The University of Sheffield/Mahanakorn University of Technology)

Admission Requirements:

- Hold a M6 (Grade 12) certificate or its equivalent issued by the Ministry of Education, or equivalent certificates from local or overseas educational institutes recognized by the Ministry of Education.
- An application may not be suffer from any serious illness, mental disorder, and disability.
- An application must have no record of serious misconduct.
- An application must be proficient in English as determined from credentials and/or examination. The application who have aIELTS score of a least 5.5 or TOEFL score of least 550 PBT are eligible for admission without taking the English examination

1st year modules (Mahanakorn University of Technology)

1. English Communication Skills I (3-0-6)
This course incorporates all four skills in each unit, and follows on from the English learned in high-school. Activities are stimulating and motivating for students, and grammar is of an intermediate level. Speaking is an integral part of each lesson. Students' understanding of English is widened, and their ability to use the language for communicative purposes is extended.

2. Mathematics I (3-2-7)
Algebra: complex numbers; vectors; linear equations; matrices; vector geometry.
Calculus: sets; inequalities; functions; limits; properties of continuous functions; differentiable functions; the mean value theorem and applications; inverse functions; curve sketching; integration; integration techniques; applications of integration; logarithms and exponentials; hyperbolic functions.

3. Introduction to Computer Programming (3-0-6)
Fundamental programming concepts: programming paradigms, C programming and compiler; Programming style: top-down design, program design and organization concepts; Program testing

4. Physics I (3-0-6)
Base units; Fundamental of vectors; One dimensional motion; Constant acceleration; Motion in plane; Forces; Torque; Equilibrium; Newton's laws of motions; Work, Energies; Conservation's law of energies; Momentum; Conservation's law of momentum; Rotational motion; Conservation's law of

5. Physics Lab I (0-2-1)
The experimental topics are as follows; the precision of measurement, Newton's mechanics, centripetal force, truss, moment of inertia, heat, acceleration due to gravity force, Young's modulus, simple harmonic motion, conservation of linear momentum.

6. Introduction to Electrical Engineering 3(3-0-6)
Fundamental electrical quantities; Electric power and energy; Basic electronic engineering: basiccircuit elements, electronic devices, analogue and digital circuits and systems; Basic power engineering: transformers, power sources, electrical machines; Basic telecommunication engineering: frequency, spectra, modulation and telecommunication systems.

7. Electrical Engineering Lab 2(0-4-2)
Introduction to Electrical Engineering Laboratory in 5 majors: Computer engineering, Control and Instrumentation Engineering, Electrical Power Engineering, Electronics Engineering and Telecommunication Engineering.

8. English Communication Skills II (3-0-6)
This course incorporates all four skills in each unit, and continues on directly from ENGL7101. There is more in-depth treatment of grammar, and a systematic vocabulary syllabus. Students' understanding of English is again widened, and their ability to use the language for communicative purposes is extended as accuracy, fluency and correct pronunciation are incorporated. Report writing and oral presentation tasks are also provided.

9. Mathematics II (3-2-7)
Ordinary Differential Equations. Linear Algebra : linear equations and matrices; vector spaces; linear transformations; Gram- Schmidt; least squares; QR factorisation; determinants; eigenvalues; eigenvectors and diagonalisation; symmetric and Hermitian matrices; Jordan forms; matrix exponentials; systems of ordinary differential equations.

10. Physics II (3-0-6)
Electrostatic; Coulomb's law; Gauss's laws; Biot & Savart's law; Ampere's law; Ohm's law; Basic DC circuits; Faraday's law; Maxwell's law; Alternating current; Basic electronics; Light and modern Physics

11. Physics Lab II (0-2-1)
The experimental topics are as follows; speed of light and speed of sound, h and e/m measurement, resonance, charge and capacitor, magnetic field, diffraction and interference of light, spectrum of light, light, terminal velocity, and measurement of electricity.

12. Circuits and Signals (3-0-6)
Basic Circuit Elements: resistor, inductor, capacitor, DC voltage and current sources, dependent sources; Circuit Laws: Kirchoff's law, nodal analysis, series and parallel elements, Thevinin and Norton theorems, superposition; Transient response: first-order circuit, time constant, second-order circuits; Time varying signals: sinusoid, peak amplitude, frequency, RMS and phase; AC circuit analysis: phasor representation, complex impedance and transfer functions; Frequency Response: amplitude and phase responses, Bode plots, bandwidth.

13. Engineering Design
Evolution and history of design; Different facets of design; Problem solving and problem formulation; Design process: concept design, detail design, analysis and manufacturing; Reverse engineering; Impact on environment and society; Hands-on assignments to enhance the learning outcome; Written and oral presentation skills.

2nd year modules (Mahanakorn University of Technology)

1. English for International Communication I (3-0-6)
The aims of this course are to encourage students to analyse the systems of the English language; to expose them to a variety of challenging and interesting texts in the reading activities and to stimulate them to give their own opinions when participating in discussions. IELTS-style reading and writing tasks are also included.

2. Mathematics III (3-2-7)
Several Variable Calculus: vectors and vector calculus; functions of several variables; partial derivatives; gradients; extreme values; differentials; double and triple integrals; line integrals; surface integrals. Complex Analysis: basic topology functions and mappings; limits; continuity and differentiability; analytic and harmonic functions; exponential, trigonometric and hyperbolic functions; principal logarithms and complex exponents; arcs, contour integrals and antiderivatives; Cauchy-Goursat theorem and Cauchy integral formula; Taylor and Laurent series; evaluating integrals; singularities and residues; real improper integrals; trigonometric integrals

3. Analogue Circuit (3-0-6)
Diode Characteristic: physical structure and operation, large and small-signal models; Diode Applications: voltage rectifier, clipping and clamping circuits, voltage regulator using Zener diode; Transistors Characteristics: physical structure and operation of BJT, MOSFET and JFET, large and small-signal models; Amplifiers: idea of amplifications, common emitter, collector, base amplifiers, biasing and coupling, operating point stability, small-signal equivalent circuits; input and output impedances; Operational Amplifier: ideal op amp, op amp with negative feedback; inverting and non-inverting amplifiers, voltage follower, summing amplifiers, integrator, effect of op amp non-ideality; Logic gates and switching circuits: CMOS logic gates, idea of electronic switch, on-state current and power loss, switching inductive loads, bridge switching topologies. Non-linear circuits: relaxation and sinusoidal oscillators, Schmitt trigger, A-D and D-A converter principles.

4. Digital System Design(3-0-6)
Number systems; Introduction to digital logic design: switch logic and basic gates; Combinational logic circuit design: Boolean algebra and K-map; Basic logic synthesis: two-level logic, regular logic structures, multilevel networks and transformations, programmable logic devices, time response; Sequential logic: latches, flip-flops, shift registers; Counters: designed synchronous and asynchronous, finite state machine (FSM); Elements of computers: arithmetic circuits, arithmetic and logic units, register and bus structures, controllers/ sequencers, microprogramming; Computer-aided design tools for logic design: introduction to HDL Practical topics, non-gate logic, asynchronous inputs and metastability; Memories: RAM and ROM; Implementation technologies and mapping problems expressed in words to digital abstractions.

5. Basic Electric Power Engineering (3-0-6)
Magnetic circuits: circuit model, magnetic materials and their properties; Time-varying fields: Faraday's law, self and mutual inductances, voltage-fed and current-fed magnetic devices, effect of circuit resistance, and calculation of phasor relationships; Closely coupled circuits: transformer action and equivalent circuits, types of transformer in terms of performance requirements and main performance criteria; Energy storage and power flow: storage in L and C and dissipation in R under sinusoidal and non-sinusoidal conditions; concepts of instantaneous, average and RMS values, VA, VAR and watts and power factor; Power supply networks: description of power networks, three-phase systems, power measurement, power factor correction, per unit system, safety issues.

6. English for International Communication II (3-0-6)
This course provides comprehensive coverage of the grammatical and lexical systems of English, so that students can express themselves with precision, and with a good command of idioms and collocation.

7. General Statistics (3-0-6)
Probability and Statistics: probabilities and probability rules; conditional probability and Bayes' rule; descriptive statistics; random variables; discrete random variables; mean and variance of discrete random variable; binomial, Poisson, geometric, exponential and normal distributions; sampling distributions; the central limit theorem; inferential statistics; linear regression; analysis of variance.

8. System Engineering (3-0-6)
The systems engineering process, Requirements Analysis, Functional Analysis and Allocation, Design, Verification, Systems Engineering Process Outputs; System analysis and control, Work Breakdown Structure, Configuration Management, Technical Reviews and Audits, Trade Studies, Modeling and Simulation, Metrics, Risk Management; Planning, Organizing, and Managing, Systems Engineering Planning, Product Improvement Strategies, Organizing and Integrating System Development, Contractual Considerations, Management Considerations and Summary.

9. Data Structure and Analysis) (3-0-6)

3rd year modules (The University of Sheffield or Mahanakorn University of Technology)

The University of Sheffield

1. Analogue and Digital Electronics
This module brings together the underlying physical principles of BJT, JFET and MOSFET devices to show how structural decisions in device design affect performance as a circuit element. Basic circuit topologies such as long – tailed pairs, Darlington transistors and current mirrors are described as a precursor to exploring the internal design of a typical op-amp. Common applications of op-amps are discussed. The relationship between device structure and performance in simple CMOS circuits is explored and applied to real digital circuit applications. Digital system design strategies are introduced with examples drawn from everyday embedded digital systems.

2. Communication Electronics
This module introduces the basic structure of a communication system and examines the various circuits and signal engineering strategies that are necessary to make a system work. The idea of spectrum as a limited resource and some of the regulatory framework that allows multiple use of spectrum without conflict between users is introduced. The unit, which aims to form a bridge between communication systems and electronics, will include a number of case studies in order to place ideas in a sensible context.

3. Electrical Energy management and Conversion
An outline of the electrical supply infrastructure, including the plurality of electrical energy generation modalities currently in use, is followed by elementary ideas behind protection, safety and tariff structures. The characteristics of electrical machines are discussed together with the circuit strategies that can be used to control of machine performance. Circuits for more general high efficiency power management are also described. Circuits dealing with power will dissipate energy and that energy must be removed if overheating is to be avoided – elements of thermal management are discussed in the context of audio power amplifiers.

4. Engineering Software Design
This module builds on the C programming learned in year 1 by exploring both the higher level issues of programming, modelling, and embedded programming. The aim is to develop in students the habits of object orientation (e.g. modularity, data hiding, etc.) using C and MATLAB, both commonly used industry standard tools, and writing software for embedded systems. This is done in the belief that these are skills that a `normal¿ Electronic Engineer should possess. Three mini projects using C and MATLAB and drawn from across the department are used as a focus for the various activities and to enable students to demonstrate achievement of the module outcomes.

5. Mathematics II (Electrical)
This module is part of a series of Level Two modules designed for the particular group of engineers shown in brackets in the module title. Each module consolidates previous mathematical knowledge and develops new mathematical techniques relevant to the particular engineering discipline.

6. Engineering – You're Hired
module description not available

4th year modules (The University of Sheffield or Mahanakorn University of Technology)

The University of Sheffield

1. Individual Design Project
To develop and the demonstrate an ability to take responsibility for the organisation, management and technical progress of a project; to demonstrate an ability to apply engineering principles to a practical project; to develop and demonstrate an ability to present, in the form of a substantial project thesis, a concise account of the work carried out and its significance

2. Analogue and Switching Circuit
To develop further understanding of active electronic circuits; to enable students to design specialised circuits.

3. Antennas, Radar and Navigation
This unit is about understanding the fundamentals and common applications of antennas and radar systems. The basic characteristics of some of the commonly used antenna systems will be examined in the context of practical design and application. The radar part of the unit will introduce the basic concepts of radar and examine various types of commercial and military radar system in common use. The application of radar and other methods in airborne navigation and landing systems will be discussed. Throughout the unit emphasis will be placed on 'first-order' analysis techniques in order to reduce the use of advanced mathematics.

4. Computer Architecture
To equip the student with a working and in-depth understanding of microprocessors and associated technology. To introduce a methodical approach to digital design and implementation using programmable technology.

5. Electrical Power Systems
To provide an insight into the main issues concerning the design and performance of a large power network, to develop models and analytical techniques used in the calculation of the characteristics and specification of the main items of equipment involved in the generation, transmission and distribution of electrical power.

6. Engineering Electromagnetics
The module aims to develop understanding of the physical behaviour of electric and magnetic fields; to teach how to apply these ideas in electronic and electrical engineering and to develop skills in calculating fields in a variety of engineering applications.

7. Feedback Systems Design
The course will give students an introduction to the methods available for the analysis and modelling of linear feedback systems, both continuous and discrete.

8. Introduction to Digital Signal Processing
To introduce fundamental ideas of digital signal processing (DSP), its limitations and its advantages; to give the student a working knowledge of basic DSP operations, as well as a solid theoretical understanding of their behaviour; to make the student aware of the options available when constructing a practical DSP system.

9. Principles of Communications
This course considers the theory and techniques used by a wide range of communication systems, particularly the more recent digital and cryptographic systems. The aim is for students to develop a good grasp of the structure of a modern communication system and to understand the basic issues at each stage in the system.