

# Academic Highlights

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## Engineering Degrees Offered

The Kulliyah is currently having 6 departments with 5 of them are offering 8 contemporary engineering degree programmes as listed below :

	<b>Degree Programme</b>	<b>Department</b>
1	B.Eng. (Biochemical – Biotechnology) (Hons)	Biotechnology
2	B.Eng. (Communication) (Hons)	Electrical and Computer
3	B.Eng. (Electronics-Computer and Information) (Hons)	Electrical and Computer
4	B.Eng. (Manufacturing) (Hons)	Manufacturing and Materials
5	B.Eng. (Materials) (Hons)	Manufacturing and Materials
6	B.Eng. (Aerospace) (Hons)	Mechanical
7	B.Eng. (Mechanical-Automotive) (Hons)	Mechanical
8	B.Eng. (Mechatronics) (Hons)	Mechatronics

Detailed description on the programmes is provided in the department section. Short descriptions of the programmes are:

- **Bachelor of Engineering (Biochemical-Biotechnology) (Honours)**

Multidisciplinary education concerning the manipulation of biological organisms and their sub-cellular components for the development of techniques or products for industrial, medical and environmental applications.

- **Bachelor of Engineering (Communication) (Honours)**

Competence in the field of telecommunication; optical communication, satellite and microwave communication systems, and also signal processing.

- **Bachelor of Engineering (Electronics-Computer and Information) (Honours)**

Knowledge in the ever expanding field of computer engineering and information technology. Integrate the various areas of design and implementation of computer hardware, software and networking.

- **Bachelor of Engineering (Manufacturing) (Honours)**

Focuses on design, advanced manufacturing technology and processing, computer integrated manufacturing systems and management skills to enhance quality, productivity and flexibility of manufacturing.

- **Bachelor of Engineering (Materials) (Honours)**

Acquire knowledge in properties of materials and their technological applications, gain skills on materials processing (both raw materials and end product) and product design, such as metals, polymer, ceramics, composite and biomaterials.

- **Bachelor of Engineering (Aerospace) (Honours)**

Aims to develop competency in the fundamentals of aerospace engineering which includes aerodynamics, aircraft structures and aircraft design, aircraft and satellite control systems, propulsion and aircraft systems.

- **Bachelor of Engineering (Mechanical-Automotive) (Honours)**

An integrated system design approach to Automotive Engineering. It covers the whole chain from a concept car to the end product. Acquire competency in vehicle dynamics, design of various automotive subsystems, styling, and structural analysis.

- **Bachelor of Engineering (Mechatronics) (Honours)**

Provides an integrated education encompassing electrical, mechanical, electronics and computer engineering, to cater the needs for high-tech industries.

## **Department of Science in Engineering**

This department offers service courses for all engineering programmes i.e. the kulliyah required mathematics courses and the university general courses. It does not offer any engineering degree.

## **Academic System**

### **Course Structure**

Our curriculum is a 4-year degree programme and we adopted a total credit hour system, in which a minimum of credit hours ranges from 138 to 140, depending on the specific degree programme, must be fulfilled prior to receiving the Bachelor of Engineering Degree. The course structure can be categorized as follows :

- **University Required Courses**

For the university required courses, students have to complete 12 credit hours of university general studies courses (UNGS), 7 credit hours of language studies and 3 credit hours of co-curriculum activities. (check this)

- **Kulliyah Required Courses**

As for the Kulliyah required courses, this comprises of mathematics subjects offered by Department of Science in Engineering and management courses offered by Kulliyah of Economics and Managements Sciences

- **Core and Elective Courses**

In each specialized degree, students are required to choose at least 9 credit hours of the elective courses.

All undergraduate students of Kulliyah of Engineering must undergo an industrial training in a relevant industry/company during the short semester before they embark into their final year of studies.

Another feature of our curriculum is that first year courses are common to all students. They will take the specialized programme of study during their second year.

## Grading System

The university adopted the following grading system as shown in Table 1.

Table 1: Grading system for the university

Percentage Score	Letter Grade	Quality Point Equivalent	Remark Credited	Hours Credited	Hours Earned
85 – 100	A	4.00	Excellent	Yes	Yes
75 – 84	A-	3.67	Extremely Good	Yes	Yes
70 – 74	B+	3.33	Very Good	Yes	Yes
65 – 69	B	3.00	Good	Yes	Yes
60 – 64	B-	2.67	Fairly Good	Yes	Yes
55 – 59	C+	2.33	Satisfactory	Yes	Yes
50 – 54	C	2.00	Quite Satisfactory	Yes	Yes
45 – 49	D	1.67	Poor	Yes	No
40 – 44	D-	1.33	Very Poor	Yes	No
35 – 39	E	1.00	Extremely Poor	Yes	No
0 - 34	F	0.00	Fail	Yes	No

Note that the lowest grade for a clear pass is “C” with a quality point equivalent of 2.0. Student who attained grades lower than “C” has therefore concluded to not acquired sufficient knowledge and understanding in a course. If it is a core course, has to repeat the course to satisfy graduation requirement.

The university has also come out with a regulation on the maximum credit hours allowed according to CGPA. This is summarized in Table 2.

## Workload Policy

The total workload that a student may register in a regular semester is determined based on the CGPA system as shown in Table 2:

Table 2: Academic workload by CGPA in a regular semester

Range of CGPA	SPONSORED STUDENTS (MARA, JPA, Petronas, Yayasan, etc.)	SELF-SPONSORED STUDENTS (Including PTPTN recipients.)
$1.7 \leq \text{CGPA} \leq 2.0$	15 cr. hrs.	12 – 15 cr. hrs.
$2.0 \leq \text{CGPA} \leq 2.5$	15 – 16 cr. hrs.	12 – 16 cr. hrs.
$2.5 \leq \text{CGPA} \leq 3.0$	15 – 18 cr. hrs.	12 – 18 cr. hrs.
$3.0 \leq \text{CGPA} \leq 4.0$	15 – 20 cr. hrs.	12 – 20 cr. hrs.

It should be noted that no full-time student is allowed to register less than 12 credit hours of workload unless he is a graduating student.

## **Other Academic Matters**

### ***Programme Majoring***

#### **For direct intake students**

During the 2<sup>nd</sup> regular semester of the 1<sup>st</sup> year of studies, a student may apply for his majoring. On top of that, the student must have at least 12 credit hours and in a good academic standing i.e. CGPA  $\geq 2.0$ . The majoring exercise is normally conducted on the 1<sup>st</sup> half of every regular semester. The kulliyah reserves the right to award the major among the choices made by a student. As some programmes may impose a quota or a minimum CGPA for their programmes, the selection is based on merit. Students are normally given 1 one week from the date of announcement to do their online selection of majoring.

#### **For student from Centre for Foundation Study (CFS)**

Student in CFS are required to do their majoring at the end semester of their studies, before entering Kulliyah of Engineering. Students with CGPA of  $\geq 2.5$  and mathematics as well as physics of B- and above may apply for their majoring. Other terms and condition are as per direct intake students.

### ***Change of Programme***

This option is only allowed to students with second year standing. Each student is allowed to change the programme only once throughout his/her studies. For those having CGPA below 2.5, they must have the permission of the respective academic advisor prior to applying. The kulliyah has the right to approve or reject any application. Besides, the applicant should be aware of the possibility of losing credit hours in changing programme

### **Programme Minorng**

Minorng is just an extra small supplemented degree. Student with minorng will have to take between 10 to 15 extra courses depending on the type of minor chosen. The requirement for minorng is 2.5 CGPA. However, it is recommended only for those above 3.0 CGPA, since minorng is a tie-breaker for those fully-edged students.

### **List of Programme Minorng Options**

So far, we have 11 minor degrees

- 1 Minor in Business Administration
  - 2 Minor in Economics
  - 3 Minor in Communication
  - 4 Minor in History and Civilization
  - 5 Minor in Political Science
  - 6 Minor in Psychology
  - 7 Minor in Sociology and Anthropology
  - 8 Minor in Arabic and Literature
  - 9 Minor in English Linguistics
  - 10 Minor in Islamic Revealed Knowledge
  - 11 Minor in English Literature
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# About Academic Programmes

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## First- Year General Engineering Courses

All first year engineering students will have to undergo the same courses set by the Kulliyah. Subjects listed in table as shown below. Course synopsis is available at chapter 5 of this prospectus for more course description.

### SEMESTER I (17.5 c.h.)

Code	Name	Pre-requisites	Co-requisites	Credit Hours
EECE 1311	Electric Circuits			3
MECH 1301	Statics			3
MANU 1201	Engineering Drawing			2
MATH 1310	Engineering Mathematics I			3
LE 4000	English for Academic Writing			3
LM 1030/31 LM 1040/41	Bahasa Melayu untuk Pelajar Asing/ Bahasa Melayu Nusantara			2
CCXXXX	Co-Curricular			0.5
TQ 1011	Tilawah Al-Quran 1			1

LM1010\* - for international students only (0 credit hours)

### SEMESTER II (16.5 c.h.)

Code	Name	Pre-requisites	Co-requisites	Credit Hours
EECE 1101	Electrical Engineering Lab	EECE 1311	EECE 1312	1
EECE 1312	Electronics	EECE 1311	EECE 1101	3
EECE 1313	Programming for Engineers			3
MECH 1302	Dynamics	MECH 1301		3
MANU 1202	Workshop Technology	MANU 1201		2
MATH 1320	Engineering Mathematics II	MATH 1310		3
TQ 2011	Tilawah Al-Quran 2	TQ 1011		1
CCXXXX	Co-Curricular			0.5

The remaining of this chapter will provide more detail information about each department in the Kulliyah along with description on its programme(s) being offered.

# Description of First-Year General Engineering Courses

## A. MATHEMATICS COURSES

### **MATH 1310 Engineering Mathematics I (3 c.h.)**

Complex numbers, vectors and geometry in space, matrix algebra, eigenvalues and eigenvectors, linear system of equations, differentiation and integration with applications.

### **MATH 1320 Engineering Mathematics II (3 c.h.)**

Parametric equations and polar coordinates, vectors and geometry in space, multivariable functions, partial derivatives and multiple integrals with applications, vector valued functions, vector calculus, infinite and power series, ordinary differential equations, series solution, Bessel's and Legendre's equations, Laplace transformation. (*Pre-requisite : MATH 1310*)

### **MATH 2310 Differential Equations (3 c.h.)**

Complex functions and derivatives, analyticity of function, complex integration, ordinary differential equations and modeling, partial differential equations and modeling, numerical methods to solve ordinary and partial differential equations.

### **MATH 2330 Computational Methods and Statistics (3 c.h.)**

Numerical solution of linear systems, curve fitting and interpolation, numerical differentiation and integration, numerical solutions of ordinary differential equations. Probability, discrete and continuous random variables, estimation, testing hypothesis, simple and multiple linear regressions analysis, experimental design.

## B. CORE COURSES

### **MANU 1201 Engineering Drawing (2 c.h.)**

Introduction, geometrical construction, 3D modelling, orthographic projections, isometric, sectional and auxiliary views, dimensions and tolerances, mechanical and electrical symbols, intersections, development assembly drawing.

### **MANU 1202 WORKSHOP TECHNOLOGY (2 c.h.)**

Engineering workshop practices, industrial safety, health and environment issues, measurement and measuring tools, introduction to theory and practices of manual and NC machining processes: turning, milling, drilling, grinding, introduction to theory and practices of fabrication processes: bench working, woodworking, molding and casting, welding, metal forming, heat-treatment.

### **MECH 1301 Statics (3 c.h.)**

General principles of statics, force vectors, equilibrium, analysis of trusses, frames and machines, forces and moments, centroids and moment of inertia.

**MECH 1302 Dynamics (3 c.h.)**

Kinematics of particles, Kinetics of a particle (force and acceleration), Kinetics of a particle (work and energy), Kinetics of a particle (impulse and momentum), Planar kinematics of a rigid body motion.

**EECE 1101 Electrical Engineering Lab (1 c.h.)**

Experiments on electric/electronic circuits, circuit design techniques: computer assisted analysis, active and passive circuit elements characteristic and applications, basic circuit laws, Thevenin and Norton equivalents, maximum power transfer, AC networks.

**EECE 1311 Electric Circuits (3 c.h.)**

Kirchhoff voltage and current laws; Resistors in series and parallel; Delta-wye and wye-delta conversions; Circuit theorems and analysis for resistive circuits; Maximum power transfer theorem; Inductance and capacitance; Sinusoidal excitation of RLC circuits, phasors and phasor diagrams, AC steady-state circuit analysis using phasors; Average and RMS values of AC signals; Power calculations and power factor.

**EECE 1312 Electronics (3 c.h.)**

The design approach to electronic circuits and systems, basic amplifier concepts, introduction to operational amplifiers and their applications, P-N junction diodes characteristics and applications, bipolar junction transistors characteristics, DC biasing and AC analysis, Operation of Fetes, DC biasing and AC analysis, frequency response and Bode plots.

**EECE 1313 Programming for Engineers (3 c.h.)**

This course is designed to expose the first year engineering students on the development of programming skills in solving engineering problems. It emphasizes on teaching the essential concepts of computer programming that includes steps of problem solving using computer, algorithm and program logic tools, control structures, modular programming using functions, arrays, pointers and files processing. By exposing the students to two programming paradigm: procedural programming and object oriented programming, at the end of the course, the student should be able to plan, analyze, and write computer programs to solve engineering problems.

## Description of Kulliyyah required non-engineering Courses (Language Courses)

**ENGLISH****LE 4000 - English for Academic Writing (3 c.h.)**

This course is designed for students to experience a step-by-step approach in writing an academic research paper through critical reading and thinking. Students are also required to use appropriate techniques in citing sources and present their findings using multimedia presentation.

## **QURANIC**

### **LQ 0108 - Quranic Language I (0 c.h.)**

This is an Arabic language course for absolute beginners. The course focuses on survival skills in communication. It is an integrated course, which highlight vocabulary and grammar items. Dictation is used to help students relate sounds to their written equivalents. At the end of the course, students can use basic Arabic.

### **LQ 0208 - Quranic Language II (0 c.h.)**

This is Arabic language course for the elementary level. It is an integrated course which focuses on vocabulary and grammar items. At the end of the course, students can use Arabic in given situations.

## **BAHASA MELAYU**

### **LM 1030 - Bahasa Melayu I untuk Pelajar Asing (1 c.h.)**

Bahasa Melayu (LM 1030) is compulsory for foreign students except for Bruneian, Singaporean and Indonesian students. The emphasis is on the four language skills i.e. listening, reading, speaking and writing at basic level.

### **LM 1031 - Bahasa Melayu II untuk Pelajar Asing (1 c.h.)**

This course is an extension of LM 1030 (Bahasa Melayu I untuk Pelajar Asing). The emphasis is on the higher communicative skills of listening, speaking, reading and writing.

### **LM 1040 - Bahasa Melayu Nusantara I (1 c.h.)**

This course is designed to equip students from the Nusantara countries i.e. Indonesia, Singapore and Brunei with the speaking and writing skills of bahasa Melayu used in Malaysia.

### **LM 1041 - Bahasa Melayu Nusantara II (1 c.h.)**

This course is intended for Singaporean, Bruneian and Indonesian students and is formulated to train students in the aspects of effective communication skills orally or in writing, with the emphasis on appropriate language style and etiquette. The lessons also aim to prepare the students to be confident in conducting formal business transactions. In addition, Islamic values are also instilled to produce professional Islamic graduates.

### **LM 2026 - Bahasa Melayu Kerjaya (Sains dan Teknologi) (2 c.h.)**

This course is specially formulated to prepare students with the knowledge and practices of scientific skills in bahasa Melayu. The course covers the following topics such as public speaking, technical report, meeting, minute writing, project paper, interview and translation. In addition, this course also enhances self-image.



### **LM 2027 - Penulisan Kreatif (2 c.h.)**

The course is specially designed to acquaint students with the knowledge and practical skills in creative writing. The course focuses on two types of creative writing namely poetry and short story writing. The course emphasizes the techniques and language styles in creative writing. In addition, this course also enhances students' creativity and critical thinking.

### **MANDARIN**

#### **LC 1014 - Elementary Mandarin 1 (2 c.h.)**

This is a Mandarin course for absolute beginners. The course focuses on survival skills in communication primarily on listening and speaking skills, leaving enough room for reading and writing. It connects the students with his surroundings. At the end of the course, students can use Mandarin in daily given situations.

### **JAPANESE**

#### **LJ 1014 - Japanese Language 1 (2 c.h.)**

This is a Japanese Language course for absolute beginners. The course focuses on the communicative skills of speaking and listening.

### **FRENCH**

#### **LF 1014- French Language 1 (2 c.h.)**

This is a French language course for absolute beginners. It is an integrated course which develops students' basic communication skills. At the end of the course, students should be able to use the French language in a number of familiar daily situations.

### **TILAWAH**

#### **TQ 1011 - Tilawah Al-Quran I (1 c.h.)**

This course is designed for all students of the IIUM as a graduation requirement. In this course students are guided through a process of learning and applying the rules of tajwid in the recitation of the Holy Quran based on the narration of *Hafī'An 'Ólim*. Students are assisted in developing their proficiency on reading of the Holy Quran through the following learning strategies: imitating, practicing and memorizing. Students will learn the rules of tajwid from the explanation of the instructors through their recitations. They are required to memorize 13 surahs of juz 'amma and recite them fluently based on tajwid to fulfill *Farīu 'Ayn* as a muslim.

#### **TQ 2011 - Tilawah Al-Quran II (1 c.h.)**

This course is designed for all students of the IIUM as a graduation requirement. In this course students are guided through a process of learning and applying the skills of correct recitation of the Holy Quran based on the narration of Hafs an 'Asim. Students are assisted in developing their proficiency in reciting the Holy Quran through the following learning strategies: imitating, practicing and memorizing. Students will master the basic *TajwÉd* rules

that cover both theory and practice with the guidance of the instructors. They are required to memorize 22 surahs of juz 'amma and recite them fluently based on tajwid to fulfill the *Farlu 'Ayn* requirement as a muslim.

## Description of Kulliyah required non-engineering Courses (IRK Courses)

### **UNGS 2030 The Islamic Worldview (3 c.h.)**

This course focuses on the meanings, characteristics and kinds of worldviews including some selective contemporary ideologies, such as materialism, secularism and post modernism. It presents an overview of Islam and its main characteristics. The course also describes the elements of Islamic worldview and reviews some of the contemporary challenges facing man and society.

### **UNGS 2040 Islam: Knowledge and Civilization (3 c.h.)**

This course deals with the basic issues that lead to a good understanding of theory of knowledge and civilization from Islamic and non-Islamic perspectives. It describes the contribution of Muslim scholars and scientists in different fields of knowledge and science throughout the history of Muslim civilization. The course also reviews some contemporary challenges facing the Muslim *Ummah* and the possible solutions to overcome them with reference to the concept of *Islam Hadhari*.

(Pre-requisite: UNGS 2030)

### **UNGS 2050 The Islamic Worldview (3 c.h.)**

This course focuses on the meanings, characteristics and kinds of worldviews including some selective contemporary ideologies, such as materialism, secularism and post modernism. It presents an overview of Islam and its main characteristics. The course also describes the elements of Islamic worldview and reviews some of the contemporary challenges facing man and society.

(Pre-requisite: UNGS 2040)

## Description of Kulliyah required non-engineering Courses (Management/Economics Courses)

### **MANU 3314 PROJECT AND OPERATIONS MANAGEMENT (3 c.h.)**

Fundamental concepts of project and operation management in the field of engineering. The challenge of estimating project times and costs, developing project plan and managing risks. Scheduling resources and reducing project duration. Being an effective project manager, managing project teams and managing inter-organizational relations. Approaches that primarily use mathematical models to formulate LP problems and make viable and optimum decisions. Qualitative and quantitative techniques used in forecasting, inventory and project management.

### **MANU 3318 ENGINEERING ECONOMICS AND MANAGEMENT (2 c.h.)**

Basic principles of engineering economics and management, organizational vision and mission, management functions, behaviour of people and corporate culture, motivation,

leadership, organisational structures and change, functions and activities of human resource management, break-even point, depreciation, investment analyses, cost and financial management, ethical and Islamic perspectives in engineering economics and management

**MANU 4211 ENTREPRENEUSHIP AND ENTREPRENEURIAL VENTURES ( 2 c.h.)**

Entrepreneurship as a process of transforming creative ideas into sustainable businesses. Entrepreneurial mind-set to address the characteristics to shape entrepreneurs and their thinking. Initiation of entrepreneurial ventures with the pursuit of ideas, opportunity recognition imbued with creativity, innovation and Islamic values. Method for assessing new ventures and business opportunities and pathways to ventures including issues related to legal, marketing, finance and a comprehensive business plan.

## COMMUNICATIONS ENGINEERING PROGRAMME

**Total credit hours required: 139**

### SEMESTER III (16.5 c.h.)

Course Codes	Course Title	Credit Hours	Pre-Requisites	Co-Requisites
EECE 2101	Electrical and Computer Eng. Lab-I	1	EECE 1101	EECE 2312 EECE 2313
EECE 2311	Digital Logic Design	3	EECE 1312	
EECE 2312	Circuit Analysis	3	EECE 1312, MATH 1320	EECE 2101
EECE 2313	Electronic Circuits	3	EECE 1312	EECE 2101
MATH 2310	Differential Equations	3	MATH 1320	
UNGS 2030	The Islamic Worldview	3		
CCXXXX	Co-curricular	0.5		

### SEMESTER IV (16.5 c.h.)

Course Codes	Course Title	Credit Hours	Pre-Requisites	Co-Requisites
EECE 2102	Electrical and Computer Eng. Lab-II	1	EECE 2311	EECE 2314
EECE 2314	Computer Organization and Microprocessors	3	EECE 2311	EECE 2102
EECE 2315	Engineering Electromagnetics	3	EECE 2312, MATH 1320	
EECE 2316	Signals and Systems	3	EECE 2312, MATH 1320	
MATH 2330	Computational Methods and Statistic	3	MATH 2310	
UNGS 2040	Islam, Knowledge and Civilization	3	UNGS 2030	
CCXXXX	Co-curricular	0.5		

### SEMESTER V (17.5 c.h.)

Course Codes	Course Title	Credit Hours	Pre-Requisites	Co-Requisites
EECE 3311	Introduction to Electrical Power System	3	EECE 2312	
ECOM 3101	Communication Engineering Lab I	1		ECOM 3312 ECOM 3313
ECOM 3312	Fundamentals of Communication Engineering	3	EECE 2316	ECOM 3101
ECOM 3313	Microwave Engineering	3	EECE 2315	ECOM 3101
ECOM 3100	Seminar	1		
MANU 3314	Project and operations management	3		
UNGS 2050	Ethics and Fiqh for Everyday Life	3	UNGS 2030 UNGS 2040	
CC XXXX	Co-curriculum	0.5		

### SEMESTER VI (16.5 c.h.)

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>	<b>Co-Requisites</b>
EECE 3102	Electrical and Computer Eng. Lab-III	1		EECE 3314 EECE 3315
EECE 3314	Digital Signal Processing	3	EECE 2316	EECE 3102
EECE 3215	Instrumentation and Control Systems	3	EECE 2313 EECE 2316	EECE 3102
ECOM 3316	Digital Communication System Design	3	ECOM 3312	EECE 3314
ECOM 3300	Integrated Design Project	3	ECOM 3312	MANU 3318
MANU 3318	Engineering Economics and Management	3		ECOM 3300
CCXXXX	Co-curriculum	0.5		

### SHORT SEMESTER (5 c.h.)

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>
EITR 3542	Engineering Industrial Training	5	

### SEMESTER VII (16 c.h.)

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>	<b>Co-Requisites</b>
ECOM 4101	Communications Engineering Lab II	1	ECOM 3316	ECOM 4311 ECOM 4313
ECOM 4311	Antennas and Wave Propagation	3	EECE 2315	ECOM 4101
ECOM 4312	Optical Communications	3	ECOM 3312	
ECOM 4313	Data Communications and Networking	3	ECOM 3316	ECOM 4101
ECOM 43xx	Elective I	3		
ECOM 4398	Project I	3		

### SEMESTER VIII (17 c.h.)

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>	<b>Co-Requisites</b>
ECOM 4314	Wireless Communications	3	ECOM 3316, ECOM 4311	
ECOM 43xx	Elective II	3		
ECOM 43xx	Elective III	3		
ECOM 4399	Final Year Project II	3	ECOM 4398	
MANU 4211	Technology Entrepreneurship	2	MANU 3318	
GENE 4300	Engineering Ethics from Islamic Perspective	3	UNGS 2050	

## LIST OF ELECTIVE COURSES FOR COMMUNICATIONS ENGINEERING

The elective courses are divided into three groups or streams. This is to promote focus towards a particular area.

**ELECTIVE COURSES (COMMUNICATION SIGNAL PROCESSING)**

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>	<b>Co-Requisites</b>
ECOM 4341	Information Theory and Coding	3	ECOM 3316	
ECOM 4342	Speech & Image Processing	3	EECE 3314	
ECOM 4343	Multimedia System	3	EECE 3314 ECOM 3316	

**ELECTIVE COURSES (WIRELESS COMMUNICATION SYSTEMS)**

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>	<b>Co-Requisites</b>
ECOM 4344	Satellite Communications Systems	3	ECOM 3316	
ECOM 4345	Radar System and Remote Sensing	3	ECOM 3313	
ECOM 4346	RF Device and Circuits	3	ECOM 3316 EECE 2313	

**ELECTIVE COURSES (COMMUNICATION NETWORKS)**

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>	<b>Co-Requisites</b>
ECOM 4347	Wireless Technology	3	ECOM 3312	
ECOM 4348	Communication Networks Security	3		
ECOM 4349	Teletraffic Engineering	3	MATH 2330	

**ELECTIVE COURSES (SELECTED TOPICS)**

<b>Course Codes</b>	<b>Course Title</b>	<b>Credit Hours</b>	<b>Pre-Requisites</b>	<b>Co-Requisites</b>
ECOM 4361	Advanced Instrumentation and Control	3	EECE 2315	
ECOM 4362	Computer Architecture and Design for Communication System	3	EECE 2314	
ECOM 4363	Selected Topics in Communication Engineering	3		



# COURSE DESCRIPTION FOR ELECTRICAL & COMPUTER ENGINEERING

## a) CORE COURSES

### **EECE 1101 Electrical Engineering Lab (1 c.h.)**

Experiments on electric/electronic circuits, circuit design techniques: computer assisted analysis, active and passive circuit elements characteristic and applications, basic circuit laws, Thevenin and Norton equivalents, maximum power transfer, AC networks.

*(Pre-requisites: EECE 1311, Co-requisites: EECE 1312 )*

### **EECE 1311 Electric Circuits (3 c.h.)**

Kirchhoff voltage and current laws; Resistors in series and parallel; Delta-wye and wye-delta conversions; Circuit theorems and analysis for resistive circuits; Maximum power transfer theorem; Inductance and capacitance; Sinusoidal excitation of RLC circuits, phasors and phasor diagrams, AC steady-state circuit analysis using phasors; Average and RMS values of AC signals; Power calculations and power factor.

### **EECE 1312 Electronics (3 c.h.)**

The design approach to electronic circuits and systems, basic amplifier concepts, introduction to operational amplifiers and their applications, P-N junction diodes characteristics and applications; bipolar junction transistors characteristics, DC biasing and AC analysis; operation of FET's, DC biasing and AC analysis.

*(Pre-requisites: EECE 1311, Co-requisites: EECE 1101 )*

### **ECIE 1313 Programming for Engineers (3 c.h.)**

This course is designed to expose the first year engineering students on the development of programming skills in solving engineering problems. It emphasizes on teaching the essential concepts of computer programming that includes steps of problem solving using computer, algorithm and program logic tools, control structures, modular programming using functions, arrays, pointers and files processing. By exposing the students to two programming paradigm: procedural programming and object oriented programming, at the end of the course, the student should be able to plan, analyze, and write computer programs to solve engineering problems.

### **MECH 1301 Statics (3 c.h.)**

General principles of statics, force vectors, equilibrium, analysis of trusses, frames and machines, forces and moments, centroids and moment of inertia.

### **MECH 1302 Dynamics (3 c.h.)**

Kinematics of particles and rigid bodies, kinetics of particles and rigid bodies, Newton's laws of motion, equations of motion, work and energy methods, impulse and momentum.

*(Pre-requisites: MECH 1301)*

### **MANU 1202 Workshop Technology (2 c.h.)**

Safety practices in engineering workshops, measurement and measuring tools, introduction to theory and practices of manual and NC machining processes: turning, milling, drilling,



grinding, introduction to theory and practices of fabrication processes: bench working, woodworking, molding and casting, welding, metal forming, heat-treatment.

*(Pre-requisites: MANU 1202)*

### **EECE 2101 Electrical and Computer Eng. Lab-I (1 c.h.)**

Application of equations and theory into practical examples of electric circuits and electronics. Transient response of RC and RL networks. Frequency response of an amplifier. Circuit analysis and design of two-port networks, differential and multistage amplifiers, passive and active filters, oscillators, voltage regulators.

*(Pre-requisites: EECE 1101, Co-requisites: EECE 2312, EECE 2313)*

### **EECE 2311 Digital Logic Design (3 c.h.)**

Topics in this course include; number systems and conversion. Boolean algebra. Logic gate networks. Multiplexers, decoders, read only memories, and programmable logic arrays. Combinational logic circuits. Sequential logic components. Flip-flop, registers and counters. Analysis and design of sequential synchronous and asynchronous networks. Programmable logic devices and field programmable gate array.

*(Pre-requisites: EECE 1312)*

### **EECE 2312 Circuit Analysis (3 c.h.)**

First order and second circuits; magnetically coupled circuits, self and mutual inductances, AC power analysis, single-phase and three-phase, power factor correction; maximum power transfer and matching theorems, series and parallel resonant circuits; Laplace transform and applications, transfer function; passive and active filters; two-port networks and parameters; using Matlab tools for frequency response plot of filters.

*(Pre-requisites: EECE 1320, EECE 1312, Co-requisites: 2101)*

### **EECE 2313 Electronic Circuits (3 c.h.)**

Frequency response of an amplifier, integrated circuit biasing, differential and multistage amplifiers, feedback and stability.

*(Pre-requisites: EECE 1312, Co-requisites: EECE 2101)*

### **EECE 2102 Electrical and Computer Eng. Lab-II (1 c.h.)**

Boolean functions and logic gates. Combinational and sequential logic. Microcomputer architectures and operations. Assembly language programming. Interrupt and interrupt applications. Bus signals and interfacing. Digital interfacing. Analog interfacing. Direct memory access. Synchronous and asynchronous serial data communications.

*(Pre-requisites: EECE 2311, Co-requisites EECE 2314)*

### **EECE 2314 Computer Organization and Microprocessors (3 c.h.)**

Computer Organizations: organization of computer system, data processing, computer arithmetic, interaction between processors in parallel processing systems, I/O organization, system buses and interconnections. Embedded system. Foundations of microprocessor: Introduction to the ATMEL AVR microprocessors, control unit, machine language, instruction sets, program design, hardware model, memory and peripherals interfacing.

*(Pre-requisites: EECE 2311, Co-requisites: 2102)*

### **EECE 2315 Engineering Electromagnetics (3 c.h.)**

Vector algebra, coordinates systems, locating fields on the coordinates. Electric fields, electric flux densities, field laws and theorems, coordinates, field configurations on coordinate systems. Magnetic fields, magnetic density, boundaries, and magnetic configurations along the coordinate systems. Time varying magnetic fields, loops, Maxwell equations with time varying magnetic and electric field.

*(Pre-requisites: MATH 1320, EECE 2312)*

### **EECE 2316 Signals And Systems (3 c.h.)**

Classification of signals and systems. Some useful signal operations and models. Internal and external description of a system. Time-domain analysis of continuous-time systems. Frequency-domain signals and systems analysis using the Laplace transform, Fourier series and Fourier transform. Introduction to discrete-time signal and systems analysis, and sampling theory. Computer exploration in Signals and System Analysis.

*(Pre-requisites: MATH 1320, EECE 2312)*

### **ECOM 3101 Communications Engineering Lab I (1 c.h.)**

Analogue communication techniques: amplitude modulation, angle modulation, frequency division multiplexing, pulse modulation. Pulse code modulation. Noise in analogue communication systems. Digital transmission and modulation. Microwave power measurement, Transmission line standing wave ratio (SWR), Smith chart, Load impedance matching.

*(Co-requisites: ECOM 3312, ECOM 3313)*

### **EECE 3314 Digital Signal Processing (3 c.h.)**

Frequency analysis of discrete time signals and systems. Sampling and reconstruction of signals. Z-transform: properties and applications to signal processing. Discrete Fourier transform: properties, applications and computations methods with emphasis on fast Fourier transform. Implementation of discrete time systems. Frequency analysis of discrete time signals and systems. Design of analog and Digital filters.

*(Pre-requisites: EECE 2316, Co-requisites: EECE 3102)*

### **ECOM 3312 Fundamentals Of Communication Engineering (3 c.h.)**

Introduction to communication systems: Review of signal analysis and system theory, Spectral density and correlation functions. Analogue communication systems: amplitude modulation/demodulation, angle modulation/demodulation, frequency division multiplexing. Noise in analogue communication systems. Pulse code modulation.

*(Pre-requisites: EECE 2316, Co-requisites: ECOM 3101)*

### **ECIE 3101 Computer and Information Engineering Lab I (1 c.h. )**

Using C++ to write basic concepts of data structures programs. Estimated of the running time and memory space of coded algorithms. Using C++ programming language to

implements low level programming (pointers) such as linked lists, queues stack ADT. Write C++ programs for Trees and their applications, graphs representation, traversal of graphs. Analysis of Sorting and searching algorithms. The second half of this course covers experiments related to data communications systems.

### **EECE 3102 Electrical and Computer Eng. Lab-III (1 c.h.)**

This course covers experiments to measure characteristics and accuracy of electronic measuring equipment, sensors, signal conditioning circuits, ADC and DAC, system simulation by MATLAB, Op-Amps in control system, velocity control loop, position control loop, design of position control system, compensating systems, and computer based instrumentation and control and electrical machines.

*(Co-requisites: EECE 3314, MANU 3318)*

### **ECIE 3100 Seminar (1 c.h.)**

Weekly presentation on current and relevant topics on engineering fields and profession by invited speakers from the industry and academia. Talks on basic research methodology, presentation and report writing, skills, followed by presentations given by the students on their findings from literature surveys of selected topics supervised by academic staff.

### **ECOM 3313 Microwave Engineering (3 c.h.)**

Reviewing Maxwell's equations, wave propagation, attenuation, polarization, reflection, transmission lines, classification, parameters, graphical solutions, transient on transmission lines, waveguides, rectangular, circular and other cross section, dielectric waveguides and optical fibers, rectangular and circular cavities, stripline and microstrip lines, computer-aided analysis in Engineering Electromagnetics.

*(Pre-requisites: EECE 2315, Co-requisites: ECOM 3101)*

### **EECE 3311 Introduction To Electrical Power Systems (3 c.h.)**

Principles of AC and DC motors, generators, and AC transformers and their operation. Basic concepts of electromagnetic circuits related to the machines. Application of concepts to practical problems of machine design and power system. Practical analytical models. Introduction to construction and synchronization methods. Introduction to power system components.

*(Pre-requisites: EECE 2312)*

### **ECIE 3312 Data Structure and Algorithms Design (3 c.h.)**

To provides comprehensive concepts of computer algorithms and its programming estimation of the running time and memory space. Including their design, analysis and implementation. Abstract Data Types (ADT) that includes a repertory of methods for performing operations on the data. Thus, introduce important design pattern as means to organize those implementations into classes, methods and objects. Stacks, Queues, Lists, Trees, Graphs representation, traversal of graphs, Analysis of Sorting and searching algorithms and its applications.

### **ECIE 3313 Data and Communications systems (3 c.h.)**

Data communications model, Nyquist and Shannon criteria, guided and unguided transmission media, analog and digital modulation schemes, data encoding, flow and error control, data link control, multiplexing, circuit and packet switching, LAN and WAN technologies, Ethernet, frame relay, Asynchronous Transfer Mode (ATM).

### **ECIE 3314 Electrical Machines and Power Systems (3 c.h.)**

Principles of AC and DC motors, generators, and AC transformers and their operation. Basic concepts of electromagnetic circuits related to the machines. Application of concepts to practical problems of machine design and power system. Practical analytical models. Introduction to construction and synchronization methods. Introduction to power system components.

### **EECE 3315 Instrumentation and Control Systems (3 c.h.)**

Fundamental aspects of measurement systems and instrumentation, configuration and description of measurement system, static and dynamic characteristics of measurement systems, signal conditioning circuits, sensors. Control system types and effects of feedback, mathematical modelling of dynamic systems, transient response and steady-state error analysis, stability analysis. Design and performance evaluation of PID controller, PLC programming.

*(Pre-requisites: EECE 2313, EECE 2316, Co-requisites: 3102)*

### **ECIE 3316 Computer Architecture and System Design (3 c.h.)**

This course provide student with solid understanding of fundamental architectural techniques and design of computer systems, Topics include components of a computer system, CPU and pipelining, superscalar, interaction between processors in parallel processing systems, system buses and interconnections, memory system and its implementations, alternate computer architectures including RISC computers, introduction to performance measurement and analysis of computer systems. The course includes a design project dealing with HDL and EDA tools that complement the theory covered in lectures.

### **ECIE 3300 Integrated Design Project (3 c.h.)**

Integrated design project provides students with in-depth knowledge and skills on project management and significant experience in developing, designing, prototyping, proving and verifying their design. Each design project is to be executed by a group of students. A group of advisors will be assigned to each design project to supervise and guide the project throughout its duration. The lecture component provides students with specific knowledge and skills on design and project management whereas the laboratory component allows students to design, prove and verify the prototypes of their design. In this course, students will carry out the detailed engineering design or/and implementation of the prototype.

### **ECIE 4101 Computer and Information Engineering Lab II(1 c.h.)**

This course covers the usage of multimedia software tools in developing multimedia applications. This course covers the usage of software modeling tools in developing software applications.

### **ECIE 4311 Software Engineering Design (3 c.h.)**

Introduction to characteristics and impacts of software engineering, ethics in software engineering, agile development, software life-cycle models; Requirements analysis and modeling: scenarios, information, classes, flow, behavior, patterns, and web-apps. Design models: architecture, component-based, user interface, and web application for software application. Software testing, software project management and quality assurance, software reengineering.

### **ECIE 4312 Multimedia Information Systems (3 c.h.)**

Introduction to multimedia, ethics in multimedia, multimedia resources, multimedia products, multimedia elements; text representation, image and graphics representation, animation, audio representation, video representation, broadcast video standard (PAL, SECAM, NTSC, DTV, HDTV), audio & video digitization, multimedia authoring tools, multimedia Environment (hardware, software, internet and web applications), data compression, lossless and lossy compression, design and develop Multimedia prototype.

### **ECIE 4313 Computer Networking (3 c.h.)**

Network protocols and architecture, concept of internetworking, Network layer addressing, Internet Protocol, IPv6, IGMP, ICMPv6, routing, transport protocols, TCP, UDP, congestion control, Domain Name System (DNS), network security.

### **ECIE 4314 Operating Systems (3 c.h.)**

Introduction to operating systems, operating systems structures, objectives and functions, characteristics of modern operating systems, Process management, storage management, paging and segmentation, virtual memory, hardware and control structures, Security and protection, Distributed systems.

### **ECIE 4398 Final Year Project I (3 c.h.)**

This course requires the implementation of the engineering knowledge learnt in the theoretical and practical classes. The final year projects involve planning, designing, experimental investigation, simulation, computer based study, literature review, and construction or fabrication where applicable in order to achieve the objectives. At the end of the semester, the student is to present his/her progress at a seminar.

### **ECIE 4399 Final Year Project II (3 c.h.)**

Engineering project implementation, literature review, design, fabrication, evaluation, simulation, data analysis, operation, project management.

### **ECOM 3316 Digital Communication Systems Design (3 c.h.)**

Communication system design considerations. Building blocks of digital communication systems. Characterization of digital signals and systems. Quick review of probability theory, random variables and random processes. Base-band digital transmission and inter-symbol interference (ISI). Basic digital modulation schemes - ASK; FSK; PSK and QAM. Effect of

noise and bandwidth limitation on the performance of base-band and pass-band modulation and demodulation schemes.

*(Pre-requisites: ECOM 3312)*

### **ECOM 3100 Seminar (1 c.h.)**

Weekly presentation on current and relevant topics on engineering fields and profession by invited speakers from the industry and academia. Talks on basic research methodology, presentation and report writing, skills, followed by presentations given by the students on their findings from literature surveys of selected topics supervised by academic staff.

### **ECOM 4311 Antennas And Wave Propagation (3 c.h.)**

Antennas: definition, types, radiation, and current distribution. Basic antenna parameters. Fields due to dipole and loop antennas. Array antennas: linear, planar, circular. Line sources. Slot, patch, microstrip, horn, aperture and reflector antennas. Radar equation. Radio wave propagation: Friis formula, mechanism of propagation, free space loss and fading. Terrestrial foundation and link budget.

*(Pre-requisites: EECE 2315, Co-requisites: ECOM 4101)*

### **ECOM 4312 Optical Communications (3 c.h.)**

Optical Communication systems. Principles of optics. Light propagation in dielectric waveguides. Dispersion, attenuation and scattering. Optical fibers. Fabrication of fibers, cables and passive components. Light sources and modulation. Light detectors, demodulation and noise considerations. Distributions networks and components. Optical rays and beams. Optical resonators. Laser amplification and oscillation. Classes of lasers components and applications. Optical system design consideration.

*(Pre-requisites: ECOM 3312)*

### **ECOM 4101 Communication Engineering Lab II (1 c.h.)**

This course covers experiments in the transmission and reception of digital data, conversion of analog signals to digital formats, digital modulation and demodulation techniques; experiments to measure the characteristics of commonly used antennas and design a simple patch antenna using simulator.

*(Pre-requisites: ECOM 3316, Co-requisites: ECOM 4311, ECOM 4313)*

### **ECOM 4313 Data Communications And Networking (3 c.h.)**

Data communications (OSI) model, TCP/IP, data link control and protocols, Transmission Media, circuit and packet switching, Digital Subscriber Line, error deduction and correction, error control protocols, ALOHA, CSMA/CD, CSMA/CA, CDMA, Reservation, Polling, Token passing protocols, Ethernet, Backbone Networks (Hub, Repeater, Switch, Router, Transparent Bridges, Gateway Virtual LANs, frame relay, Internetworking Devices, TCP/IP Protocol Suite. This course also includes experiments and simulations related to data communications and computer networks configurations and performance evaluation.

*(Pre-requisites: ECOM 3316, Co-requisites: ECOM 4101)*

### **ECOM 4314 Wireless Communications (3 c.h.)**

Large scale and small scale radio propagation, radio coverage and reliability Modulation techniques, error control, diversity and multiple access strategies. System capacity and spectral efficiency. Wireless network architectures and protocols.  
(Pre-requisites: ECOM 4311, ECOM 3316)

### **ECOM 4398 Final Year Project I (3 c.h.)**

This course requires the implementation of the engineering knowledge learnt in the theoretical and practical classes. The final year projects involve planning, designing, experimental works, simulation, computer based study, literature review, and construction or fabrication where applicable in order to achieve the objectives. At the end of the semester, the student is to present his or her progress at the Final Year Project I presentation session.

### **ECOM 4399 Final Year Project II (3 C.H.)**

Implementation of the engineering knowledge learnt in the theoretical and practical classes. Literature review, formulation, analysis, design and construction to develop products or system. Formulation of problem statement, objectives, scope of work and plan for engineering projects with consideration to society, social, cultural, global and environment.  
(Pre-requisites: ECOM 4398, EITR 3542)

## **B. ELECTIVE COURSES**

### **ECIE 4341 Semiconductors Devices(3 c.h.)**

Crystal properties, energy bands, semiconductor charge carriers, p-n junction: energy-band diagram, thermal equilibrium condition, depletion region, current voltage characteristics; bipolar junction transistors: basic concepts and structures of bipolar junction transistors, characteristics of bipolar junction transistors, frequency response and switching of bipolar transistor; MOSFET: the ideal metal oxide semiconductor capacitor and diode; capacitance-voltage characteristics of an MIS structure, fundamentals of metal oxide semiconductor, field effect transistors (MOSFETs), principle of operation, short-channel effects, inversion, enhancement and depletion modes of device, threshold voltage, complementary MOS.

### **ECIE 4342 Microelectronics (3 c.h.)**

Models of Integrated-Circuits (IC) Active devices. Basic processes in IC fabrications. Nonlinear op-amp circuits. Feedback and stability analysis. Oscillators and timing circuits. Integrated analogue circuits, timers, PLL, voltage and frequency converters. TTL, ECL, MOS, BICMOS, Power amplifiers, Instrument amplifiers.

### **ECIE 4343 VLSI Design (3 c.h.)**

Techniques for rapid implementation of very large scale integration (VLSI) circuits. Selection of technology and logic. Design process. Design rules and layout procedures. Static and Dynamic CMOS Circuits. Design aids for layout, rule checking, logic and circuit simulation. Timing and testability. Design and layout.

### **ECIE 4344 Embedded Systems (3 c.h.)**

Introduction to embedded system design using FPGA. Topics include: reconfigurable architecture, hard core and soft core design, scheduling, allocation, partitioning, mapping, communication architecture, interrupt synchronization, timing generation and measurement, serial and parallel I/O interfacing.

### **ECIE 4345 Microelectromechanical Sensors, Actuators and Systems(3 c.h.)**

Microelectromechanical (MEMS) devices require multidiscipline knowledge including microfabrication, mechanics and electromagnetism. This subject presents an introduction to this broad field where examples and design projects are derived from real-world MEMS applications. It covers fundamentals of micro-machined sensors and actuators. Standard IC fabrication technology. CMOS Technology. Bulk Micromachining Technology. Surface Micromachining Technology. Examples of Mechanical Microsystems. Thermal Microsystems. Capacitive Sensing, Thermal Microsystems, Smart Sensors, Bio-Sensors, Energy Harvesters, RF-MEMS.

### **ECIE 4346 Compiler Construction (3 c.h.)**

This course will discuss the major ideas used in the implementation of programming language compilers, including lexical analysis, parsing, syntax-directed translation, abstract syntax trees, types and type checking, intermediate languages, dataflow analysis, program optimization, code generation, and runtime systems. As a result, the students will learn how a program written in a high-level language designed for humans is systematically translated into a program written in low-level assembly more suited to machines.

### **ECIE 4348 Database Systems (3 c.h.)**

Introduction to data and database systems, file-based system, database approach, database components, database language: DDL and DML, data models, relational model, relational algebra and calculus, structured query language, database planning, analysis and design techniques, entity relationship modeling, types of relationships, attributes, normalization (1NF, 2NF, 3NF, BCNF and 4NF), design methodologies.

### **ECIE 4347 Computer Graphics (3 c.h.)**

Introduction to software and hardware for Computer Graphics. Objects and viewers, and the synthetic camera model. Graphics architectures, the graphics pipeline, clipping, rasterization, and programmable shaders. Input and interaction. Geometric objects, homogeneous coordinates, and transformations. Viewing, hidden surface removal, frame and depth buffers, compositing, and anti-aliasing. Shading, light and materials, texture mapping, ray tracing. Extensive programming with the OpenGL API and C++.

### **ECIE 4348 Database Systems (3 c.h.)**

Introduction to data and database systems, file-based system, database approach, database components, database language: DDL and DML, data models, relational model, relational algebra and calculus, structured query language, database planning, analysis and design techniques, entity relationship modeling, types of relationships, attributes, normalization (1NF, 2NF, 3NF, BCNF and 4NF), design methodologies.



### **ECIE 4349 Data mining and analysis (3 c.h.)**

Data mining and analysis, numeric and categorical attributes, item set mining, sequence mining, pattern and rule assessment, representative-based clustering, hierarchical clustering, density-based clustering, clustering validation, probabilistic classification, decision tree classifier, support vector machines, classification assessment.

### **ECIE 4351 Object Oriented Programming with JAVA (3 c.h.)**

History and evolution of JAVA, overview of JAVA, data types, variables, arrays, operators, control statements, classes, methods, inheritance, packages, interfaces, exception handling, multithreaded programming, enumerations, auto-boxing, annotations, I/O, applets, generics.

### **ECIE 4352 Mobile Application Development (3 c.h.)**

This course will cover the fundamental programming principles, software architecture and user experience considerations underlying handheld software applications and their development environments. At the end of the course, students will be able to build their own Android applications and master a powerful set of development skills.

### **ECIE 4354 Advanced Computer Networking (3 c.h.)**

Mobile IP, multicasting and multicast routing protocols, network architectures (Intserv, DiffServ, MPLS), Protocols for QoS support (TSVP, RTP, RTCP), Stream control transmission protocol (SCTP), network management framework, router design, mobile ad-hoc network, and sensor network.

### **ECIE 4355 Wireless Networking Technologies (3 c.h.)**

LOS transmission and impairments, Wireless Multiple Access Techniques: FDMA, TDMA, CDMA, Signal encoding: FSK, PSK. Spread spectrum communication: FHSS, DSSS, CDMA, Error control, Wireless networking: wireless LAN, IEEE 802.11x, Bluetooth, Broadband wireless access, Satellite Fundamental, Communications Satellites, Global Positioning Satellites, Cellular.

### **ECIE 4356 Network Performance Analysis (3 c.h.)**

Introduction to performance evaluation and analysis. Key steps for the systematic study of performance analysis. Techniques and metrics selection. Theory and application of analytic methods for evaluating computer system performance and reliability. Performance measures. Operational laws. Classification and representation of faults. Stochastic processes. Queuing models, Network of queues. Network reliability.

### **ECIE 4357 Fault Tolerant Computing (3 c.h.)**

Introduction to computing system reliability, models and methods used in designing faults tolerance hardware and software systems, fault detection and diagnosis, reconfiguration, design verification and testing, fault tolerance evaluation.

### **ECIE 4358 Information Security (3 c.h.)**

Introduction to concepts and techniques for security in access to computer system resources, information storage and communication, considerations in authentication of coded information against corruption, encryption keys, post-encryption verification, and erasure, cryptography, information theory foundations, encryption algorithms, computer software and hardware for encryption of data and data flows controls.

### **ECIE 4361 Advanced Instrumentation and Control (3 c.h.)**

Instrumentation measurement and control system, advanced thermal, mechanical and optical sensors, smart and wireless sensor network, advanced test instrumentation measurement parameter, filter and automation application, PID Controller design, discrete-state process control, ladder diagrams, programmable logic controller design and operation.

### **ECIE 4362 Selected Topics in Computer Technology (3 c.h.)**

This course will reflect current trends and emerging technologies in this field. It will give the department the opportunity to tailor and test a new course.

### **ECOM 4341 Information Theory And Coding (3 c.h.)**

Introduction to Information theory and Coding. Information measures. Discrete sources and entropy. Huffman code, Dictionary code and Arithmetic code. Shannon's theorems Channel Capacity. Channel coding for error detection; Linear block codes, Cyclic codes and Convolution Codes. Trellis representation. Viterbi Algorithm.  
(Pre-requisites: ECOM 3316)

### **ECOM4342 Speech And Image Processing (3 c.h.)**

Introduction to 2-D systems. Analysis/Synthesis based on speech production and perception. Speech sampling, quantization, filtering and transforms. Speech analysis techniques and modelling mechanism. Image representation and basic image processing techniques. Digitization, sampling, transformation, enhancement, filtering, restoration, compression and reconstruction. Machine learning for speech and image processing.  
(Pre-requisites: EECE 3314)

### **ECOM4343 Multimedia Systems (3 c.h.)**

Introduction to the technologies for multimedia communications, multimedia data, including video, image, and audio. Multimedia Compression, Encoding and Compression Techniques, Image Compression JPEG, JPEG2000, Video Compression MPEG/MPEG2/MPEG4, H264. Networking aspect, special considerations for sending multimedia over ATM, wireless, and IP networks, such as error resilience and quality of service. Streaming video standards, Video broadcasting, Video on Demand and, Videoconferencing.

(Pre-requisites: EECE 3314, ECOM 3316)

### **ECOM 4344 Satellite Communications Systems (3 c.h.)**

Introduction to satellite communications. Orbits and geostationary orbit. Space and earth segment. Radio link. Modulation, coding, and multiplexing. Multiple access systems. Transponders. Communication satellites. Earth stations. Interference. Special issues in satellite communications. Navigation, broadcasting and very small aperture terminal satellite applications.

*(Pre-requisites: ECOM 3316)*

### **ECOM 4345 Radar Systems And Remote Sensing (3 c.h.)**

The lectures initiate with an introductory description of advanced radar concepts and terms. The radar equation needed for the detailed understanding of radar is then developed, along with several examples of its use in radar system design. Radar propagation issues, such as attenuation, multipath effects and ducting, are described. The concept of radar cross-section, waveform design, antennas, transmitter and receiver characteristics and the detection of radar signals in the presence of noise are presented. The course continues with emphasizes in the understanding of the remote sensing foundation and the use of remote sensor data, image interpretation and processing techniques. The course will cover concepts of remote sensing, aerial photography and photogrammetry, visual image interpretation and characteristics of various sensing system, including as well the digital image processing techniques.

*(Pre-requisites: ECOM 3313)*

### **ECOM 4346 RF Devices And Circuits (3 c.h.)**

Review of transceiver architectures and introduction to RF circuit design. Circuit design of basic RF blocks: low noise amplifier (LNA), mixer, oscillator, frequency synthesizer, power amplifier, filter and resonator configuration. Introduction to AD converters used in transceiver. RF diodes and field effect transistors. Microwave linear beam tubes, Klystron, reflex Klystron, Magnetron, traveling wave tubes.

*(Pre-requisites: ECOM 3316, EECE 2313)*

### **ECOM 4347 Wireless Networking (3 c.h.)**

Elaboration of Line of Sight LOS transmission fundamentals, technology and impairments, Wireless Multiple Access Techniques: FDMA, TDMA, CDMA, Signal encoding: FSK, PSK. Spread spectrum communication: FHSS, DSSS, CDMA, Error control, Wireless networking: wireless LAN, IEEE 802.11x, Bluetooth, Broadband wireless access, Satellite Fundamental, Communications Satellites, Global Positioning Satellites, Cellular networks fundamentals, 1st, 2nd, and 3rd generation systems.

*(Pre-requisites: ECOM 3312)*

### **ECOM 4348 Communication Networks Security (3 c.h.)**

Introduction to communications network security, Crypto basics, Symmetric and asymmetric key cryptosystems, Cryptographic protocols, Access control, Malware, intrusion detection and firewalls, Cryptographic protocols and standards, Data link layer security, IP security, Transport layer security, Application layer security.

### **ECOM 4349 Teletraffic Engineering (3 c.h)**

Introduction - The objectives of Teletraffic Engineering -The Nature of Teletraffic. Features of Teletraffic Systems. Modeling of Teletraffic Systems. Markov Property. Little's Theorem. Traffic from Terminals and Aggregated Traffic. Markovian Loss Systems. Markovian Delay Systems. Birth-Death Process. Multi-Dimensional Traffic Models - Trunk Reservation System. Restricted availability. Overflow System -Equivalent Random Theory. Design of Alternative Routing. Traffic Simulation. Computer Implementation of Basic Teletraffic Formulas. Queueing Networks and Operational Laws. Mean Value Analysis in Queueing Networks.

*(Pre-requisites: MATH 2330)*

### **ECOM 4361 Advanced Instrumentation And Control (3 c.h.)**

Instrumentation measurement and control system, advance thermal, mechanical and optical sensors, smart and wireless sensor network, advanced test instrumentation measurement parameter, filter and automation application, PID Controller design, discrete-state process control, ladder diagrams, programmable logic controller design and operation.

*(Pre-requisites: EECE 3315)*

### **ECOM 4362 Computer architecture and Design for communication systems(3 c.h.)**

The course aims to provide a solid foundation for communication engineering students to understand modern computer system architecture and to apply these insights and principles to future computer designs in relation with communication systems. The first part of the course focuses on the fundamentals of each building block of a computer communication system. Topics include processor micro-coding and pipelining; cache microarchitecture and optimization; and network topology and flow control. The second part goes into more advanced techniques and will enable students to understand how these three building blocks can be integrated to build a modern computing system. System buses and interconnections, memory system and its implementations will be discussed. The third part addresses parallel computing, including multicore architectures, datacenters and cloud computing. The course includes a project dealing with HDL and EDA tools that complement the theory covered in lectures.

*(Pre-requisites: EECE 2314)*

### **ECOM 4363 Selected Topics In Communications Engineering (3 c.h.)**

This course will reflect current trends and emerging technologies in this field, will give the department the opportunity to tailor and test a new course.

## **A. Mathematics Courses**

### **MATH 1310 Engineering Mathematics I (3 c.h.)**

Complex numbers, vectors and geometry in space, matrix algebra, eigenvalues and eigenvectors, linear system of equations, differentiation and integration with applications.

### **MATH 1320 Engineering Mathematics II (3 c.h.)**

Parametric equations and polar coordinates, vectors and geometry in space, multivariable functions, partial derivatives and multiple integrals with applications, vector valued functions,

vector calculus, infinite and power series, ordinary differential equations, series solution, Bessel's and Legendre's equations, Laplace transformation.

*(Pre-requisites: MATH 1310)*

### **MATH 2310 Differential Equations (3 c.h.)**

Complex functions and derivatives, analyticity of function, complex integration, ordinary differential equations and modeling, partial differential equations and modeling, numerical methods to solve ordinary and partial differential equations.

*(Pre-requisites: EECE 1320)*

### **MATH 2330 Computational Methods and Statistics (3 c.h.)**

Numerical solution of linear systems, curve fitting and interpolation, numerical differentiation and integration, numerical solutions of ordinary differential equations. Probability, discrete and continuous random variables, estimation, testing hypothesis, simple and multiple linear regressions analysis, experimental design.

*(Pre-requisites: ECE 2310)*