SUBJECT DESCRIPTION FORM

Subject Title:  Foundation Biology
Subject Code:  ABCT102
Number of Credits:  3
Hours Assigned:  Lecture 32 hours
                  Tutorial 10 hours

Pre-requisite:  nil  Co-requisite:  nil  Exclusion:  nil

Objectives:
The lectures aim to explain and discuss the knowledge of biology at foundation level which is essential to proceed to higher level of study in biology-related disciplines.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:

1. understand the basic features and functions of cells;
2. describe the basic structures and functions of body systems;
3. understand the fundamental features of microorganisms; and
4. understand the basic features of ecosystems.

Keyword Syllabus (Indicative):

1. Cells
   • Structures and functions of the cell
   • Homeostasis and transport within the cell
   • Cellular respiration and photosynthesis
   • Cell reproduction - mitosis and meiosis

2. Genetics
   • Fundamentals of genetics
   • Nucleic acids and protein synthesis
   • Inheritance patterns
   • DNA technology

3. Body Functions
   • Organization of human tissues, organs and systems
   • Overview of physiological functions:
     Nervous system, cardiovascular system, respiratory system, digestive system, renal system, immune system, endocrine and reproductive systems

4. Microorganisms
   • Bacteria and viruses
   • Protozoa
   • Algae and fungi

5. Ecology
   • Introduction to ecology and populations

Teaching and Learning Approach:
The teaching and learning approach includes lectures which aim to enrich the knowledge and concepts of biology at foundation level. In addition, written assignments and tutorial sessions are also included for further consolidating the knowledge discussed in lectures. Students will be assessed by written assignments, quizzes and written examination.

Method of Assessment:
Continuous Assessment: 50%  Examination: 50%
Essential Reading:

Reference List:
# Subject Description Form

<table>
<thead>
<tr>
<th>Subject Title:</th>
<th>Fundamental Chemistry</th>
<th>Subject Code:</th>
<th>ABCT103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Credits:</td>
<td>3</td>
<td>Hours Assigned:</td>
<td>Lecture 36 hours, Tutorial 6 hours</td>
</tr>
</tbody>
</table>

(The students are also expected to spend about 80 hours for self-study.)

**Pre-requisite:** nil  
**Co-requisite:** nil  
**Exclusion:** nil

## Objectives:
This subject educates students with fundamental knowledge in chemistry. It is also a bridging course for students previously learned chemistry in a language other than English.

The subject aims to:

1. provide students with a broad fundamental knowledge in chemistry required for the study of science, technology, engineering or related programme; and
2. help students study chemistry effectively in an English-medium learning environment and to acquaint students with the necessary chemical vocabularies.

## Learning Outcomes:
On successful completion of this subject, students are expected to be able to:

1. understand the fundamental principles of chemistry;
2. have sufficient chemical knowledge for their chosen field of study; and
3. understand and appreciate the chemical terms and principles that they may encounter in written and oral communication.

## Keyword Syllabus:

1. **Atomic Structure**
   - Electromagnetic radiation, hydrogen spectrum, energy levels, electron spin, quantum numbers, dual properties of matter, wave function and probability, uncertainty principle, charge clouds of s, p, d and f orbitals, radial distribution curves, electronic configurations of many-electron atoms, Pauli exclusion principle, Aufbau principle, ionization energy, electron affinity, electronegativity, atomic and ionic radii and periodicity.

2. **Chemical Bonding**
   - Ionic bonds, covalent bonds, dative bonds, metallic bonds, van der Waals forces, hydrogen bonds, concepts of valence bond theory and hybridization, resonance, molecular shapes by VSEPR method, molecular orbital theory of homonuclear and heteronuclear diatomic molecules, multi-centre bonding in electron deficient molecules.

3. **Properties of Solid**
   - Solids: amorphous solids, types of crystals, unit cell, co-ordination number, closest packing, crystal structures.

4. **General Inorganic Chemistry**
   - Main group elements and their compounds.

5. **General Organic Chemistry**

## Teaching and Learning Approach:
Lectures will provide students with general outlines of key concepts and guidance on further reading. Lectures will be further consolidated through assignments and tutorials. Students will be assessed by assignments, quizzes as well as an end-of-term written examination.
Method of Assessment:
Continuous Assessment: 60%  Examination: 40%

Essential Reading:
SUBJECT DESCRIPTION FORM

Subject Title: Foundation Mathematics I for Science and Engineering
Subject Code: AMA103

Number of Credits: 3

Hours Assigned: Lecture 28 hours
Tutorial and Student Presentation 14 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
This is a subject to provide students with a solid foundation in Differential and Integral Calculus. It is essential for all undergraduate students of Engineering or Science. The emphasis will be on application of mathematical methods to solving basic engineering science problems.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:
1. understand the concept of functions and inverse functions;
2. use mathematical induction in various contexts;
3. understand the algebra and geometry of complex numbers and apply complex numbers to solve science and engineering problems;
4. apply mathematical reasoning to analyse essential features of different mathematical problems such as differentiation and integration;
5. apply appropriate mathematical techniques to model and solve problems in science and engineering;
6. extend their knowledge of mathematical techniques and adapt known solutions in different situations;
7. undertake continuous learning.

Keyword Syllabus:
1. Basic Concepts
   Mathematical induction; Functions and inverse functions; Elementary functions, trigonometric functions; Complex numbers; De Moivre’s Theorem; Roots of a complex number.
2. Differential Calculus
   Limits and continuity; Derivatives; Techniques of differentiation; Mean value Theorem; Higher derivatives; Maxima and minima; Curve sketching.
3. Integral Calculus
   Definite and indefinite integrals; Fundamental Theorem of Calculus; Techniques of integration; Taylor’s Theorem; Applications in geometry, physics and engineering.

Teaching and Learning Approach:
The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. To develop students’ ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

Method of Assessment:
Continuous Assessment: 40%  Examination: 60%
To pass this subject, students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components.
Reference List:

Subject Title: Foundation Mathematics II for Science and Engineering

Subject Code: AMA104

Number of Credits: 3

Hours Assigned: Lecture 28 hours
Tutorial and Student Presentation 14 hours

Pre-requisite: Foundation Mathematics I for Science and Engineering (AMA103)

Co-requisite: nil
Exclusion: nil

Objectives:
This is a subject to provide students with a solid foundation in Mathematics and Statistics. It aims to prepare the students for studying an undergraduate programme in Engineering or Science. The emphasis will be on application of mathematical methods to solving basic engineering science problems.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:
1. understand the concepts of convergence and divergence of series and to apply Taylor’s expansions in solving numerical problems;
2. use the methods in matrices and linear equations in problem solving; and
3. apply the techniques of statistics to model and solve problems in science and engineering;

Keyword Syllabus:
1. Infinite Series
   Convergence of series, including tests for convergence; power series; Taylor expansions of functions; applications.
2. Linear Algebra
   Matrices and determinants; Systems of linear equations.
3. Probability and Statistics:
   Descriptive statistics; Frequency distribution; Mean, median and mode; Variance and standard deviation; Probability; Discrete and continuous random variables; Normal distribution.

Teaching and Learning Approach:
The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. To develop students’ ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

Method of Assessment:
Continuous Assessment: 40%  Examination: 60%

To pass this subject, students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components.
Reference List:

Subject Title: Logic : Qualitative and Quantitative
Subject Code: AMA105
Number of Credits: 3

Hours Assigned:
- Lecture: 28 hours
- Tutorial: 14 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
This subject aims to develop students’ ability in logical and analytical thinking through the qualitative and quantitative aspects of logic. The first part will emphasize qualitative logic and will be taught by the General Education Centre. The second part will emphasize quantitative logic. Some topics from discrete mathematics will be presented as illustrations of the general theory. This part will be taught by the Department of Applied Mathematics.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to demonstrate some ability to:
1. demonstrate basic logical reasoning.
2. see the relationship between formal logic and natural language.
3. apply logical reasoning in both everyday and academic situations.
4. recognize and refute common logical fallacies.
5. appreciate the axiomatic approach in mathematics.
6. understand why proofs of mathematical statements work; and
7. apply logical reasoning in problem solving.

Keyword Syllabus:
1. Qualitative Logic:
2. Quantitative Logic:
   - Sets and propositions; Permutations and combinations; Relations and Functions; Graphs and Trees; Natural Numbers.

Teaching and Learning Approach:
Introduction to the key concepts and relationships of formal logic will be done primarily through lectures. Examples and case studies will be presented in small group tutorials. Finally, self-study will be encouraged through student accessible computer-based exercises. Assessment will be in the form of both in-class mid-term tests as well as group projects associated with tutorials.

Method of Assessment:
Continuous Assessment: 40%  Examination: 60%
To pass this subject, students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components.
Reference List:

SUBJECT DESCRIPTION FORM

Subject Title: Foundation Mathematics
Subject Code: AMA106
Number of Credits: 3

Hours Assigned:
Lecture 28 hours
Tutorial and Student Presentation 14 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
To provide students with a solid foundation in Differential and Integral Calculus, and in Matrix Algebra.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:

1. solve problems using the concept of functions and inverse functions;
2. apply the basic operations of matrices and calculate the determinant;
3. apply mathematical reasoning to analyse essential features of different mathematical problems such as differentiation and integration;
4. apply appropriate mathematical techniques to model and solve problems in science and engineering;
5. extend their knowledge of mathematical techniques and adapt known solutions in different situations.

Keyword Syllabus:
1. Basic concepts
   Functions and inverse functions; Elementary functions, Trigonometric functions.
2. Differential Calculus
   Limits and continuity (intuitive approach); Derivatives; Techniques of differentiation; Mean Value Theorem; Higher derivatives; Maxima and minima; Curve sketching.
3. Integral Calculus
   Indefinite integrals; Techniques of integration; Definite integrals. Fundamental Theorem of Calculus; Taylor’s Theorem; Applications in geometry, physics and engineering.
4. Matrix Algebra
   Introduction to matrices and determinants.

Teaching and Learning Approach:
The subject will be delivered mainly through lecturers, tutorials and presentation. The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. Tutorials and presentations will be held to develop students’ ability for logical thinking and effective communication.

Method of Assessment:
Problem-based questions in assignments: 10%
Mid-term test: 30%
Examination: 60%
Reference List:

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Assessment</td>
<td>1,2,3,4,5</td>
<td>Continuous Assessment comprises of assignments, in class quizzes, online quizzes and a mid-term test. A 3-hour examination is held at the end of the semester. Questions used in assignments, quizzes, tests and examinations are used to assess the student's level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.</td>
</tr>
</tbody>
</table>
### Subject Title: College Physics I  
### Subject Code: AP101  
### Number of Credits: 3  
### Hours Assigned:

- **Classroom teaching and laboratory experiments**
  - Lecture: 34 hours
  - Laboratory: 8 hours

- **Multimedia teaching/learning and other activities**
  - Virtual Laboratory: 12 hours
  - Self-study: 60 hours

### Objectives:
This is the first bridging course in physics of the Foundation Programme for students admitted from mainland. It provides a broad foundation in mechanics and thermal physics, preparing students to study science, engineering, or related programmes.

### Learning Outcomes:
On successful completion of this subject, students are expected to be able to:

1. solve simple problems in single-particle mechanics using calculus and vector;
2. solve problems on rotation of rigid body about fixed axis;
3. define simple harmonic motion and solve simple problems;
4. apply Archimedes’ principle to solve problems in hydrostatics;
5. apply Bernoulli’s equation to simple problems in fluid flow;
6. explain ideal gas laws in terms of kinetic theory;
7. apply the first law of thermodynamics to simple processes;
8. solve simple problems related to the Carnot cycle;
9. solve simple problems in travelling waves;
10. explain the formation of acoustical standing waves and beats; and
11. use Doppler’s effect to explain changes in frequency received.

### Keyword Syllabus:

1. **Preparation in Mathematics**
   - Review of algebra, geometry and trigonometry; Function and graph; Derivative; Integration; Vectors and coordinate system.

2. **Mechanics**
   - Calculus-based kinematics, dynamics and Newton’s laws; Calculus-based Newtonian mechanics, involving the application of impulse, momentum, work and energy, etc.; Conservation law; Gravitation field; Systems of particles; Collisions; Rigid body; Rotation; Angular momentum; Oscillations and simple harmonic motion; Pendulum; Statics and elasticity; Hydrostatics and Archimedes’ principle; Bernoulli’s equation.

3. **Thermal Physics**
   - Conduction, convection and radiation; Black body radiation and energy quantization; Ideal gas and kinetic theory; Work, heat and internal energy; First law of thermodynamics; Entropy and the second law of thermodynamics; Carnot cycle; Heat engine and refrigerators.

4. **Waves**
   - Longitudinal and transverse waves; Travelling wave; Doppler effect; Acoustics.
Teaching and Learning Approach:
1. Lectures are given to deliver the subject outline and key physics concepts to the students. The students will also get the guidance on further reading.
2. Assignments are used to help the students gain analytical abilities through problem-solving and also to help them strengthen the concepts taught.
3. Laboratories are designed to help the students gain hands-on experience in the operation of equipment and apply their knowledge in the experiments.

Method of Assessment:
Continuous Assessment: 40%  Examination: 60%

Essential Reading and CD-ROM:

Reference List:
SUBJECT DESCRIPTION FORM

**Subject Title:** College Physics II  
**Subject Code:** AP102  
**Number of Credits:** 3

**Hours Assigned:**
- Classroom teaching and laboratory experiments
  - Lecture: 34 hours
  - Laboratory: 8 hours
- Multimedia teaching/learning and other activities
  - Virtual Laboratory: 12 hours
  - Self-study: 60 hours

**Pre-requisite:** College Physics I (AP101)  
**Co-requisite:** nil  
**Exclusion:** nil

**Objectives:**
This is the second bridging course in physics of the Foundation Programme for students admitted from mainland. It is built on College Physics I and continues on topics in waves and optics, electromagnetism and modern physics, in preparing students to study science, engineering, or related programmes.

**Learning Outcomes:**
On successful completion of this subject, students are expected to be able to:

1. apply simple laws in optics to explain image formation;
2. explain phenomena related to the wave character of light;
3. define electrostatic field and potential;
4. use Gauss’ law in solving problems in electrostatics;
5. solve problems on interaction between current and magnetic field;
6. apply electromagnetic induction to various phenomena;
7. solve simple problems in AC circuits,
8. describe simple models of the atom and the nucleus, and

**Keyword Syllabus:**

1. **Waves and Optics**
   - Reflection and refraction; Image formation by mirrors and lenses; Compound lens; Microscope and telescope; Superposition of waves; Huygen’s principle; Interference and diffraction; Interferometers and diffraction grating; Polarization; Wave-particle duality.

2. **Electromagnetism**
   - Charge and field; Coulomb’s law and Gauss’ law; Electrostatic field and potential difference; Capacitors and dielectric; Current and resistance; Ohm’s law; Electromotive force, potential difference and RC circuits; Magnetic force on moving charges and current; Hall effect; Biot-Savart law and Ampere’s law; Faraday’s law and Lenz’s law; Self inductance and mutual inductance; Transformers; AC circuits and applications.

3. **Modern Physics**
   - Photons and photoelectric effects; Bohr model and hydrogen spectrum; Compton effect.

**Teaching and Learning Approach:**

1. Lectures are given to deliver the subject outline and key physics concepts to the students. The students will also get the guidance on further reading.
2. Assignments are used to help the students gain analytical abilities through problem-solving and also to help them strengthen the concepts taught.
3. Laboratories are designed to help the students gain hands-on experience in the operation of equipment and apply their knowledge in the experiments.
Method of Assessment:
Continuous Assessment: 40%  Examination: 60%

Essential Reading and CD-ROM:

Reference List:
SUBJECT DESCRIPTION FORM

Subject Title: Understanding the Hong Kong Community  
Subject Code: APSS184  
Number of Credits: 3  
Hours Assigned: Lecture 24 hours, Seminar 18 hours  
Pre-requisite: nil  
Co-requisite: nil  
Exclusion: nil

Objectives:
The subject aims to provide the students with an integrated knowledge required for the understanding and application of sociological concepts to understand the social and cultural development of Hong Kong.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:
1. understand and describe the historical development, social life, and cultural trajectory of colonial and post-colonial Hong Kong; and
2. analyze the social, cultural and political aspect of colonial and post-colonial Hong Kong.

Keyword Syllabus:
1. Pre-1841 Hong Kong: Wall Communities and the Form of Living.
2. Domestic Villages and the Survival Strategies.
3. 1841: The Coming of the Colonial Hong Kong.
4. The Chinese Communities.
5. Post-1950’s Hong Kong: the Minimally Integrated Social and Political System.
6. The Development and the Future of Social Service in Hong Kong.
7. Modern City Life of Hong Kong: Shopping Malls
8. Residence Patterns of Hong Kong People: Public Housing and Home Ownership.
9. Landscape of Hong Kong: Disney World, Tourism and Economic Development.
10. Hong Kong’s Tomorrow.

Students will also have to participate in field visits which introduce them to various aspects of the traditional and modern social lives in Hong Kong. They are encouraged to focus on the cultural and social aspects of Hong Kong society. Appropriate sites for visit may include: Market at Yuen Long, Fanling and Sheung Shui; Tai O- a fishing Village, Central and Sheung Wan: Wan Cha; Hong Kong Museum of History and etc.

Teaching and Learning Approach:
Apart from the lectures, students would participate in outings by which they are introduced to, on the one hand, the historic sites that could exhibit the traditional social lives of Hong Kong people, and on the other the modern landscapes of Hong Kong. In addition, students are required to attend seminars and present their views on various aspects of the traditional and modern social lives in Hong Kong. Students are encouraged to focus on the cultural and social aspects of Hong Kong society.

Method of Assessment:
Continuous Assessment: 100%
1. 30% - Individual term paper on social/cultural life of HK
2. 40% - Participation (lecture/seminar/fieldtrip)
3. 30% - Group presentation
Reference List:

4. S.K. Lau, et al., Indicators of Social Development: Hong Kong, Hong Kong: Hong Kong Chinese University Press, Various Years.
6. The Other Hong Kong Report, Hong Kong: Hong Kong Chinese University Press, Various Years.
Subject Title: Discovering Psychology

Subject Code: APSS185

Number of Credits: 3

Hours Assigned:
- Lecture: 28 hours
- Seminar: 14 hours

Pre-requisite: nil

Co-requisite: nil

Exclusion: nil

Objectives:
To enable students to:

1. acquire foundational understanding of major psychological theories and their relations to everyday life; and
2. clarify myths and facts about psychology through exploring different psychological specializations.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:

1. develop clear understanding of essentials of psychology; and
2. appreciate the diverse applications of psychological concepts and research findings to real-world problems and challenges.

Keyword Syllabus:
1. Discovering Major Psychological Perspectives and Their Contributions.
2. Exploring Diversity of Psychological Specializations.
   - Biological Psychology: brain’s building, nervous system and human behaviour
   - Cognitive Psychology: snapshots of memory, thinking and creativity
   - Developmental Psychology: life-span human development (from newborn to old age)
   - Psychology of Gender and Sexuality: psychology of men and women, theories of love and interpersonal attraction
   - Personality Psychology: major personality types and assessment
   - Health Psychology: stress and coping strategies
   - Abnormal Psychology: basic perspectives of abnormality and major therapies
   - Social Psychology: social perception, attitudes, social and group influence
   - Industrial and Organizational Psychology: work motivation and leadership
   - Consumer Psychology: advertising and conditioning, consumer behavioural patterns
   - Chinese Psychology: application of psychological theories in Chinese culture

Over the past decades, psychology as an integrated discipline of social sciences, arts and science, has become increasingly popular. This subject is designed to provide students with essential psychological concepts and their applications in everyday life. Students are encouraged to explore salient and interesting features of specializations of psychology in a student-friendly format, including: an overview of major theories of psychology and their contributions, brain and human behaviour (biological psychology), snapshots of memory, thinking and creativity (cognitive psychology), life-span approach to human development (developmental psychology), psychology of gender and sexuality, major personality theories and assessment (psychology of personality), concepts of abnormality and major therapies (abnormal psychology), stress and coping (health psychology), social cognition and influence (social psychology), work motivation and styles of leadership (industrial / organizational psychology), and application of psychological theories in Chinese culture (Chinese Psychology).

Teaching and Learning Approach:
The learning and teaching approach is characterized by active experiential learning, which encourages students to master psychological concepts through interactive lectures, small group discussions, and interaction with web-assisted learning and teaching materials. This learn-by-doing focus engages students through active class participation, seminar discussion, group project, and web-assisted practice exercises/quiz.
Method of Assessment:
Continuous Assessment: 100%
1. Class and Seminar Participation (10%)
2. Quiz (30%)
3. Individual Seminar Presentation or Reflection Paper (30%)
4. Group Project Presentation and Report (30%)

Essential Reading:

Reference List:
7. 丹尼斯·庫恩著、鄭鋼 等(譯), 《心理學導論 —— 思想與行為的認識之路》，北京：中國輕工業出版社, 2003.
Subject Title: Introduction to Information Technology
Subject Code: COMP100

Number of Credits: 3
Hours Assigned: Lecture 14 hours, Laboratory 42 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
This subject provides students with the basic concepts of information technology and computing, as well as knowledge and practice on deploying and controlling common information technology applications. This subject is suitable for all students as a first subject in information technology, whether they intend to continue to study information technology or not. Students who intend to study information technology-related programmes are strongly recommended to take both COMP100 and COMP111.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:

1. understand how a computer works;
2. understand the potentials of information technologies in business and industry;
3. use popular operating systems to carry out sequence of tasks;
4. appreciate the power of programmed computer operation;
5. understand the current trends in the development of popular information technologies such as the Internet and related tools; and
6. appreciate IT-related intellectual property issues and their protection.

Keyword Syllabus:

1. Introduction to Computer Systems
   Major components of computer systems: central processing units, storage devices and media, inputs / outputs; working principle of computers; contemporary types of CPU, memory, input / output devices currently in use.

2. System Software
   Functions and operations of system software; basic features and commands of MS Windows and Unix / Linux; script language and task control.

3. Communication, Multimedia and the Internet
   Communication and networking; Internet resources and tools; multimedia information creation and application.

4. IT Applications
   Introduce typical applications of information technologies such as office automation, knowledge management, education, entertainment, digital edutainment, manufacturing, geo- informatics, bio-informatics, etc.

5. Inside IT Applications
   Role of programming in IT applications, e.g. shell programs, macros in Excel, robotic control concept of algorithm and programming, debugging.

6. IT Intellectual Property
   Security, privacy and ethics with software; copyright and patent law; trade secrets and registered design.

Teaching and Learning Approach:
The course material will be delivered as a combination of mass lectures and small group supervised laboratory sessions. Students will get familiarized with common operating systems and environment, internet and multimedia tools. They will also attempt to use basic office automation tools such as word processing, spreadsheet, and simple database operations.
Method of Assessment:
Coursework: 100%

Reference List:
SUBJECT DESCRIPTION FORM

Subject Title: Enterprise Information Technology
Subject Code: COMP102
Number of Credits: 3
Hours Assigned: Lecture 28 hours
                 Tutorial/Laboratory 14 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
This subject provides students with the concept of information systems and their role in today’s enterprises. This subject can be taken with or without having taken COMP100 as a pre-requisite. It is suitable for all students.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to:

1. understand the use of information systems at various organizational levels;
2. understand the basic principles of the modelling, storage, retrieval and management of information in an enterprise;
3. appreciate the use of strategic information systems for competitive advantages; and
4. understand ethical and social implications of information systems.

Keyword Syllabus:
1. Basic Principles of Databases
   Data, information and knowledge; modelling and storage of information in databases; querying and retrieval of data; transaction processing.

2. More Advanced Manipulation and Management of Information
   The principles and applications of data warehousing, data mining, and knowledge management in an enterprise.

3. Decision Support for Business Intelligence
   Decision and executive support systems; business intelligence technologies such as expert systems, genetic algorithms for organizational modelling, neural networks and fuzzy logic for business applications; hands-on experience in using tools such as SPSS, data mining tool, neural network engine.

4. Electronic Commerce/Business
   Business use of the Internet, world wide web, intranets and extranets; electronic banking; cyber trading and investing; marketing on the internet; smart card trends, development methods and tools; security and cryptography.

5. Networked Enterprise
   Managing cooperative work environments; workflow and business process engineering; groupware and platforms for collaborative work, e.g. Novell.

6. Knowledge Management Concepts
   Corporate memory, intellectual capital, personal knowledge management, knowledge transfer, business intelligence.

Teaching and Learning Approach:
Lectures for delivery of conceptual knowledge and analytical techniques in case studies. Tutorials/Laboratories for discussion of real business cases and hands-on experience of tools and databases.

Method of Assessment:
Coursework: 60%    Examination: 40%
Reference List:

**SUBJECT DESCRIPTION FORM**

**Subject Title:** Information Technology Systems  
**Subject Code:** COMP111

**Number of Credits:** 3  
**Hours Assigned:**  
Lecture 28 hours  
Laboratory 28 hours

**Pre-requisite:** nil  
**Co-requisite:** nil  
**Exclusion:** nil

**Objectives:**
This subject provides the students with the foundations of information systems, and basic methods of problem-solving with computer-based tools. It can be taken with or without having taken COMP100. Students who intend to study information technology-related programmes are strongly recommended to take both COMP100 and COMP111.

**Learning Outcomes:**
On successful completion of this subject, students are expected to be able to:

1. understand underlying principles of computer organization;
2. solve simple problems with computer-based tools involving programming, algorithms and other technologies; and
3. be able to control and be aware of the opportunities and limitations provided by ready-made tools and software.

**Keyword Syllabus:**

1. **Fundamental Concepts**  
   Computer logic and organization, binary number representation and manipulation, modern computer architectures and trends, computer cluster, supercomputer, the computational grid.

2. **System Software**  
   Operating system concepts, basic software development methods and tools, programming language, compiler, project management (Unix make file), debugger.

3. **Basic Programming**  
   Basic C programming, simple data types, expression, control structure, structured data types, I/O, files.

4. **Basic Algorithm and Problem Solving**  
   Problem solving procedure and tool, flowchart, pseudo-code, simple algorithms like linear search and bubble sort, implication on program execution time.

5. **Data Communication, the Internet, and the World Wide Web**  
   Networking concepts; TCP/IP and Novell; features of Internet and Internet address, mobile computing.

6. **Problem Solving with Computer-based Tools**  
   Integration of different computer-based technologies such as system software, application software, databases, networking, and mobile technologies to solve real-world problems.

**Teaching and Learning Approach:**
Lectures for delivery of conceptual knowledge and problem solving techniques. Tutorials/Laboratory for discussions, hands-on programming and implementation of solutions.

**Method of Assessment:**
Coursework: 60%  
Examination: 40%
Reference List:

Subject Title: Extended Writing Skills
Subject Code: ELC1003
Number of Credits: 3
Hours Assigned: Seminars 42 hours

Pre-requisite: English for University Studies I (ELC1004)
Co-requisite: nil
Exclusion: nil

Objectives:
This subject aims to further develop students’ competence in written communication in academic contexts and to enhance their ability to communicate effectively in an English-medium learning environment. The main emphasis of the subject is on enhancing students’ confidence and their competence in the use of grammar, vocabulary and academic writing conventions.

Learning Outcomes:
On successful completion of this subject, students are expected to be able to use the language and study skills needed to:

1. organize, write and revise academic essays and project reports;
2. organize and write correspondence to request assistance for study-related work; and
3. participate effectively in discussions.

Keyword Syllabus:
The learning outcomes will focus on the use of grammar and vocabulary in the writing of a variety of text types. Activities to enhance speaking and listening skills will be integrated into the interactive and project-based work throughout the course.

1. Appropriateness and accuracy of vocabulary and grammar
   Collocation and connotation of words; verb forms, prepositions and complex sentences.

2. Coherence and cohesion in writing
   Paragraph development; topicalisation and thematisation; cohesive devices including articles, determiners, connectives, pronouns and anaphoric references.

3. Logical development in writing
   Organisation in a variety of text types; selection of information; logical development of themes and topics.

4. Language development and independent learning strategies
   Self-access study tools such as online dictionaries, thesauruses and web concordancers to enhance language proficiency and develop vocabulary; independent language learning strategies such as the use of learning portfolios.

Teaching and Learning Approach:
The study method is primarily seminar-based and interactive learning techniques will be employed in activities such as discussions, role-plays and individual and group activities. Information technology will be employed to facilitate the learning and application of writing skills and online writing tools.

Method of Assessment:
Continuous Assessment: 100%

Indicative references:
Subject Title: English for University Studies I  
Subject Code: ELC1004

Number of Credits: 3  
Hours Assigned: Seminars 42 hours

Pre-requisite: nil  
Co-requisite: nil  
Exclusion: nil

Objectives:
This subject aims to help students study effectively in an English-medium learning environment and to enhance their proficiency in English.

The course is designed to enable students to use English effectively in the contexts they will encounter in their university studies. The main emphasis is on improving students’ confidence and competence in grammar, vocabulary and pronunciation in these contexts.

Learning Outcomes:
At the end of the course, the students are expected to be able to use the language and study skills needed to:

1. deliver effective oral presentations;
2. summarise and paraphrase materials from written and spoken sources; and
3. plan, write and revise expository essays.

Keyword Syllabus:
This syllabus is indicative. The balance of the components, and the weighting accorded to each, will be based on the specific needs of the students.

1. Spoken communication
   Developing and practising specific oral skills required to prepare and deliver effective oral presentations; developing awareness of interpersonal communication strategies in different social and cultural contexts.

2. Written communication
   Analysing and practising common writing functions; improving abilities of writing topic sentences and strategies for paragraph development; understanding common patterns of organisation in writing; taking notes from written and spoken sources; introducing summarising skills; improving coherence and cohesion in writing; developing revision and proofreading skills.

3. Reading and listening
   Understanding the content and structure of information delivered orally and in print form; reading and listening for different purposes.

4. Language development
   Developing relevant grammar, vocabulary and pronunciation skills.

Teaching and Learning Approach:
The study method is primarily seminar-based. Seminar activities will include discussions, role-plays and individual and group activities. Use will be made of information technology where appropriate. Learning and teaching materials developed by the English Language Centre will be used throughout this course. Teachers will recommend additional reference materials as required.
Method of Assessment:
Continuous Assessment: 100%

Indicative references:
SUBJECT DESCRIPTION FORM

Subject Title: English for University Studies II
Subject Code: ELC1005
Number of Credits: 3
Hours Assigned: Seminar 42 hours

Pre-requisite: English for University Studies I (ELC1004)
Co-requisite: nil
Exclusion: nil

Objectives:
This course aims to further enhance the written and spoken English communication skills that students will need to function effectively in their university studies. The main emphasis is on improving students’ confidence and competence in writing essays and participating in discussions.

Learning Outcomes:
At the end of the course, students are expected to be able to use the language and study skills needed to

1. participate effectively in formal and informal discussions;
2. organise and compose descriptive writing; and
3. plan and write argumentative essays.

Keyword Syllabus:
This syllabus is indicative. The balance of the components, and the weighting accorded to each, will be based on the specific needs of the students.

1. Spoken communication
   Enhancing and practising specific oral and aural skills required to participate effectively in formal interactions involving such activities as discussions and debates, as well as in a variety of informal contexts.

2. Written communication
   Writing descriptive texts; understanding and using common organisational patterns of argumentative essays; improving coherence and cohesion in writing; reinforcing revision and proofreading skills; achieving appropriate tone and style in writing.

3. Reading and listening
   Understanding the content and structure of information delivered orally and in print; reading and listening for different purposes.

4. Language development
   Developing relevant grammar, vocabulary and pronunciation skills.

Teaching and Learning Approach:
The study method is primarily seminar-based. Seminar activities will include discussions, role-plays and individual and group activities. Use will be made of information technology where appropriate. Learning and teaching materials developed by the English Language Centre will be used throughout this course. Teachers will recommend additional reference materials as required.
Method of Assessment:
Continuous Assessment: 100%

Indicative references:
SUBJECT DESCRIPTION FORM

Subject Title: Foundation Year Seminar I  
Subject Code: ENG1001
Number of Credits: 1  
Hours Assigned: Seminars 8 hours  
Visits 6 hours

Pre-requisite: nil  
Co-requisite: nil  
Exclusion: nil

Objectives:
The subject is to enable students to have a foretaste of the discipline-specific or related study and to provide opportunities for more interaction with the Faculty members, through which students would also be helped to cultivate a sense of belonging to their parent faculty and departments and to build up a correct learning attitude in the University.

Learning Outcomes:
On completion of the subject, students will
1. have a better understanding of their discipline, parent Faculty and Departments;
2. develop a sense of belonging to their parent Faculty and Departments; and
3. familiarise with the issues in effective learning.

Seminar Topics:
Typical Topics of the Seminars
1. Enhancing study habits as independent learners
2. Introduction and development of computing science and its related disciplines
3. Introduction and development of electronic and information engineering and its related disciplines
4. Introduction and development of electrical engineering and its related disciplines
5. Introduction and development of industrial and systems engineering and its related disciplines
6. Introduction and development of mechanical engineering and its related disciplines

Three of the five topics (2) – (6) will be covered in this subject.

Teaching and Learning Approach:
This subject consists of four seminars and three laboratory visits delivered by three Engineering Departments of the Faculty and SAO. Each of the three Departments will offer one seminar and one laboratory visit, and SAO will be responsible for one seminar.

Method of Assessment:
Continuous Assessment: 100%

The subject is assessed on a pass/fail basis, and method of assessment involves a Personal Log Book and a Reflective Essay.
SUBJECT DESCRIPTION FORM

Subject Title: Foundation Year Seminar II
Subject Code: ENG1002
Number of Credits: 1
Hours Assigned:
- Seminars 6 hours
- Visits 6 hours
- Program Specific Activity 2 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
The subject is to enable students to have a foretaste of the discipline-specific or related study and to provide opportunities for more interaction with the Faculty members, through which students would also be helped to cultivate a sense of belonging to their parent faculty and departments and to build up a correct learning attitude in the University.

Learning Outcomes:
On completion of the subject, students will
1. have a better understanding of their discipline, parent Faculty and Departments;
2. develop a sense of belonging to their parent Faculty and Departments; and
3. familiarise with the issues in effective team work.

Seminar Topics:
Typical Topics of the Seminars
1. Building effective teams in learning
2. Introduction and development of computing science and its related disciplines
3. Introduction and development of electronic and information engineering and its related disciplines
4. Introduction and development of electrical engineering and its related disciplines
5. Introduction and development of industrial and systems engineering and its related disciplines
6. Introduction and development of mechanical engineering and its related disciplines

Two of the five topics (2) – (6) will be covered in this subject.

Teaching and Learning Approach:
This subject consists of three seminars, two laboratory visits, one visit to the Industrial Centre and one program specific activity. SAO will conduct one seminar, and two Engineering Departments of the Faculty will be responsible for two seminars and two laboratory visits. In addition to a visit to the Industrial Centre, a program specific activity will be arranged to let the students have further understanding of their own department. Typical activity includes a gathering to provide students opportunities to meet senior students of their own programmes.

Method of Assessment:
Continuous Assessment: 100%

The subject is assessed on a pass/fail basis, and method of assessment involves a Personal Log Book and a Reflective Essay.
Subject Title: Economics for Engineers
Subject Code: AF2617
Number of Credits: 3
Hours Assigned: Lectures 28 hours, Tutorials 14 hours

Pre-requisite: nil  Co-requisite: nil  Exclusion: Economics for Engineers (AF3901)

Role and Purpose:
This subject aims to provide students with fundamental concepts of economics/mathematics/engineering and to develop students’ ability to analyze the economic situations or solve problems by application of these concepts. It also aims to explain how these concepts can be applied to affect the functioning of an engineering company and contribute to decision making in engineering operations. It provides a foundation for related higher level subjects in economics/engineering. Assessment tools of the subject help students to enhance their oral and written skills and to communicate and work effectively with others.

Learning Outcomes:
Upon completion of the subject, students will be able to:

1. understand the fundamental concepts of economics/mathematics/engineering;
2. understand the concepts of costs and revenues in global business operation;
3. develop the ability to understand economic and engineering issues in reality;
4. identify, formulate and solve scientific and engineering problems in suitable mathematical or computable forms;
5. build up the skills to think innovatively, critically and creatively;
6. develop the problem-solving skills to deal with economic and engineering problems in reality;
7. understand the ethical dimension and responsibility of business and engineering decisions and the social consequences of any decisions made;
8. communicate effectively via graphic, numeric, verbal and written media.

Programme Outcomes

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: In this subject, the students will learn how to apply economics concepts and mathematics knowledge in analyzing the economics as well as engineering problems.
- Programme Outcome 7: The students will learn how to communicate effectively in writing by doing assignments and presentation reports. They will learn to communicate ideas effectively through presentation.
- Programme Outcomes 9 and 10: The students will learn the basic economics and mathematical concepts which would allow them to understand current and future economics and engineering issues and equip them with knowledge for life-long learning.

Category B Attributes for all-roundedness
- Programme Outcome 14: In this subject, the students will have chances to exercise leadership when working in a presentation team to present various tutorial topics and preparing for presentation reports.

Syllabus:
1. Introduction to Microeconomics
   - Scarcity, Choice and Opportunity Cost; Demand, Supply and Price; Profit-maximizing Objective of a Firm; Cost and Output of a Firm; Depreciation and Cost.

2. Engineering Economic Decisions
3. Time Value of Money and Project Evaluation
   Economic Equivalence and Interest Formulas; Evaluation of Engineering Projects using Methods of Present Value, Annual Worth, and Internal Rate of Return.

4. Capital Budgeting Decision
   Methods of Financing Cost of Capital, and Evaluation of Investment Alternatives.

Teaching/Learning Approach:
There will be a lecture of two hours per week that will be structured to help students to understand engineering economics concepts. Besides, there will be an one-hour tutorial per week, for which students are required to present answers from tutorial questions and discuss relevant cases and examples relating to the subject.

Method of Assessment:
Coursework: 50%  Final Examination: 50%

To pass this subject, students are required to obtain Grade D or above in both the Continuous Assessment and Examination components.

Textbooks:

Reference Books:

Other Readings:
1. The Economist.
2. Far Eastern Economic Review.
3. Hong Kong Economic Journal.
4. Various newspaper articles.

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td>1,2,3,4,5,6,8</td>
<td>-</td>
</tr>
<tr>
<td>Presentation report</td>
<td>1,2,3,4,5,6,8</td>
<td>-</td>
</tr>
<tr>
<td>Test</td>
<td>1,2,3,4,5,6</td>
<td>-</td>
</tr>
<tr>
<td>Attendance and discussion</td>
<td>1,2,3,4,5,6,7,8</td>
<td>-</td>
</tr>
<tr>
<td>Final Examination</td>
<td>1,2,3,4,5,6</td>
<td>-</td>
</tr>
</tbody>
</table>
**SUBJECT DESCRIPTION FORM**

<table>
<thead>
<tr>
<th>Subject Title: Mathematics I</th>
<th>Subject Code: AMA201</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Credits: 3</td>
<td>Hours Assigned:</td>
</tr>
<tr>
<td></td>
<td>Lecture 28 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorial 14 hours</td>
</tr>
<tr>
<td></td>
<td>Mid-term Test and Examination 5 hours</td>
</tr>
<tr>
<td>Pre-requisite: nil</td>
<td>Co-requisite: nil</td>
</tr>
<tr>
<td>Exclusion: nil</td>
<td></td>
</tr>
</tbody>
</table>

**Objectives:**
To introduce students to the fundamentals of basic engineering mathematics. Emphasis will be on the basic theory as well as application of mathematical methods to solving engineering problems.

**Learning Outcomes:**
Upon completion of the subject, students will be able to:

1. apply mathematical reasoning to analyse essential features of different engineering problems;
2. extend their knowledge of mathematical and numerical techniques and adapt known solutions to different situations;
3. apply appropriate mathematical concepts and techniques and adapt known solutions to different situations;
4. develop and extrapolate the mathematical concepts in synthesizing and solving new problems;
5. search for useful information in the process of problem solving.

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**
- Programme Outcomes 1, 5 and 7.

**Category B Attributes for all-roundedness**
- Programme Outcome 13.

**Syllabus:**
1. **Algebra of Complex Number**
   - Complex numbers, geometric representation, complex exponential functions, \( n \)-th roots of a complex number.

2. **Linear Algebra**
   - Matrices and determinants, systems of linear equations, vector spaces, inner product and orthogonality, eigenvalues and eigenvectors, applications.

3. **Ordinary Differential Equations**
   - ODE of first and second order, Laplace transforms, Convolution theorem, applications to mechanical vibrations and simple circuits.

4. **Series expansion**
   - Infinite series, Taylor’s expansion, Fourier series expansion of a periodic function, Parseval’s Identity.

**Teaching and Learning Approach:**
The subject will be delivered mainly through lecturers and tutorials. The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. Tutorials will mainly be used to develop students’ problem solving ability.
Method of Assessment:
Continuous Assessment: 40%  Examination: 60%

To pass this subject, students are required to obtain grade D or above in both the continuous assessment and the examination components.

Textbooks and Reference Books:

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Assessment</td>
<td>1,2,3,4,5</td>
<td>Continuous Assessment comprises of assignments, in class quizzes, online quizzes and a mid-term test. A 3-hour examination is held at the end of the semester. Questions used in assignments, quizzes, tests and examinations are used to assess the student's level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.</td>
</tr>
<tr>
<td>Examination</td>
<td>1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>
Subject Title: Mathematics II
Subject Code: AMA202
Number of Credits: 3
Hours Assigned:
- Lecture: 28 hours
- Tutorial: 14 hours
- Mid-term Test and Examination: 5 hours

Pre-requisite: Mathematics I (AMA201)
Co-requisite: nil
Exclusion: nil

Objectives:
To introduce students to the differential and integral calculus of functions of several variables, vector field theory and partial differential equations of mathematical physics. Emphasis will be on the basic theory as well as application of mathematical methods to solving engineering problems.

Learning Outcomes:
Upon completion of the subject, students will be able to:

1. apply mathematical reasoning to analyse essential features of different engineering problems;
2. extend their knowledge of mathematical and numerical techniques and adapt known solutions to different situations;
3. apply appropriate mathematical concepts and techniques and adapt known solutions to different situations;
4. develop and extrapolate the mathematical concepts in synthesizing and solving new problems;
5. search for useful information in the process of problem solving.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcomes 1, 5 and 7.

Category B Attributes for all-roundedness
- Programme Outcome 13.

Syllabus:
1. Differential calculus of functions of several variables
   Partial derivatives, total differential, chain rule, Taylor’s expansion, maxima and minima, directional derivatives, Lagrange multipliers, implicit differentiation, applications.
2. Multiple integrals
   Double and triple integrals, change of variables, applications to problems in geometry and mechanics
3. Vector calculus
   Vector and scalar fields, the del operator, line and surface integrals, the theorems of Green, Gauss and Stokes, applications to electromagnetic theory and fluid mechanics.
4. Partial differential equations
   Formulation of PDE of mathematical physics, separation of variables, initial-boundary value problems, introduction to Fourier transforms.

Teaching and Learning Approach:
The subject will be delivered mainly through lecturers and tutorials. The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. Tutorials will mainly be used to develop students’ problem solving ability.
Method of Assessment:
Continuous Assessment: 40%  Examination: 60%

To pass this subject, students are required to obtain grade D or above in both the continuous assessment and the examination components.

Textbooks and Reference Books:

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</tr>
<tr>
<td>Examination</td>
<td>1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>
Subject Title: Elementary Cantonese 基礎粵語
Subject Code: CBS2050
Number of Credits: 3
Hours Assigned: 每週 4 小時（共 10.5 週）
Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
本課程旨在幫助國內學生在短期內學會日常生活所需使用的香港廣州話，並且通過粵語的學習，幫助他們了解香港文化，認識香港社會。

Learning Outcomes:
1. 幫助學員掌握香港粵語的語音、詞匯和語法的基本特點；
2. 幫助學員以粵語進行日常交際；
3. 通過學習粵語使學員了解香港社會文化並認識香港方言字。

Keyword Syllabus:
第一單元 簡介香港粵語的特點 粵語的拼音方案、粵語的語音
第二單元 介紹 重點學習：常見姓氏 “先”字的句式
第三單元 問候 重點學習：香港人常用的問候方式 比較格式
第四單元 打電話 重點學習：香港人電話交談的方式雙賓語句式
第五單元 約會 重點學習：簡單式語氣助詞
第六單元 問路 重點學習：方位表達法
第七單元 購物 重點學習：算錢的方式
第八單元 交通 重點學習：粵語“定”的動補結構式
第九單元 天氣 重點學習：天氣的表達
第十單元 飲食 重點學習：“之嘛”等複合式語氣助詞
第十一單元 香港 重點學習：將字句
第十二單元 買餸 重點學習：單音節形容詞的重疊式
第十三單元 看醫生 重點學習：意願的表達方式
第十四單元 工作——搵工跳槽 重點學習：表達同意的方式
第十五單元 報紙 重點學習：表達可能的方式
第十六單元 旅遊——海洋公園 重點學習：囑咐的表達方式
第十七單元 電視文化 重點學習：責備的表達方式
第十八單元 香港廟宇——黃大仙

重點學習：安慰的表達方式

Teaching and Learning Approach:
本課程採取情境教學法，共有十八個單元，讓學生在模擬的情境中對話，自然地學習語言。本課程也著重講解在每個情境中所使用的粵語各個成分，包括語音、詞匯和語法，讓學生全面地和更有效地掌握香港粵語，以進行基本的語言交際，包括課堂上的一般討論。

Method of Assessment:

<table>
<thead>
<tr>
<th>評估方式</th>
<th>當期分值</th>
</tr>
</thead>
<tbody>
<tr>
<td>課堂表現</td>
<td>10%</td>
</tr>
<tr>
<td>測試</td>
<td></td>
</tr>
<tr>
<td>一. 課堂練習測驗</td>
<td>20%</td>
</tr>
<tr>
<td>二. 個人短講</td>
<td>30%</td>
</tr>
<tr>
<td>三. 期末小組口頭報告</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Essential Reading:
1. 鄭定歐等編,《粵語香港話教程》, 三聯書店出版, 2003 年 10 月.

Reference List:
1. 高華年,《廣州方言研究》, 商務印書館, 1984 年 1 月.
2. 李新魁等,《廣州方言研究》, 廣東人民出版社, 1995 年 6 月.
3. 歐陽覺亞,《普通話廣州話的比較與學習》, 中國社會科學出版社, 1996 年 9 月.
4. 饒秉才等,《廣州話方言詞典》, 商務印書館, 1996 年 11 月.
5. 《廣州音字典》, (普通話對照), 三聯書店（香港）有限公司, 1996 年 4 月.
6. 曾子凡,《廣州話、普通話口語詞對譯手冊》, 三聯書局, 1994 年 5 月.
7. 張洪年,《香港粵語語法的研究》, 香港中文大學, 1972 年 10 月.
SUBJECT DESCRIPTION FORM

Subject Title: Chinese for Electronic and Information Engineering  
Subject Code: CBS2065

Number of Credits: 2  
Hours Assigned: 28 hours

Pre-requisite: nil  
Co-requisite: nil  
Exclusion: nil

Role and Purpose:
This subject aims to equip the students of EIE with competence in written Chinese and Putonghua to cope with the increasing professional interactions between Chinese mainland and Hong Kong. The training will enhance the students’ abilities in (1) writing Chinese official letters, notice, email for communication / negotiation, (2) reading document such as report, articles and to familiarize with Chinese terminology of the profession; and (3) writing professional report, proposal.

Learning Outcomes:
On successfully completing the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. master the functions, formats and styles of various Chinese practical writing for formal communication and other purposes in professional settings,
2. be familiarized with the style and the terminology of the profession in reading professional articles, reports and other documents,
3. produce professional documents such as report, proposal, guidelines/manuals.

Category B: Attributes for all-roundedness
4. develop the confidence in writing Chinese genres / documents for official communication and professional interaction;
5. develop the competence of choosing suitable styles and strategies of expression for the intended functions through Chinese writing.

Indicative Content:
1. Practical Chinese writing for effective communication (12 hrs)  
   - official letters  
   - internal memos  
   - press releases  
   - web writing  
   - direct-mail packages
2. Reading of professional documents and terminology (4 hrs)  
   - glossary of terminology (English vs Chinese)  
   - articles  
   - reports
3. Writing of professional documents ( 12 hrs)  
   - report  
   - proposal  
   - manual / guideline

Forms of learning and teaching:
This subject will mainly be in the form of lectures interspersed with small group discussions. By using working examples, a tight link between theoretical input and practical applications will be made. Students are required to work individually and in small groups to develop their language and analytical skills.
Method of Assessment:
100% of the assessment for this subject is based on coursework in terms of both subject knowledge and writing skills in professional contexts, among which 60% will be based on 3 written assignments which evaluate students' written expression and 40% will be based on a group project on project activity. The group project will also include an end-of-semester oral presentation.

Reading List:
1. 司有和，《科技写作简明教程》，安徽教育出版社，1984。
2. 香港贸易发展局中文事务组编，《中国贸易应用文》，香港三联书店，1994。
3. 于成鲲，《现代应用文》，复旦大学出版社，1996。
4. 陈瑞端著，《生活错别字》，中华书局，2000。
5. 邢福义 汪国胜 主编，《现代汉语》，华中师范大学出版社，2003。
SUBJECT DESCRIPTION FORM

Subject Title: Logic Design
Subject Code: EIE211
Number of Credits: 3
Hours Assigned: Lecture/tutorial 36 hours
Laboratory 6 hours
(Equivalent to 16 hours spent by student in laboratory)

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
To provide students with a broad view in both hardware and software aspects of digital systems in general and microprocessor systems in particular, and enable them to gain understanding and skills that will be used in later computer related courses. Emphasis will be placed on topics including
1. Common binary logic components found in a microcomputer system
2. Use and applications of programmable logic devices
3. Structure and organization of microprocessors
4. Basic assembly language programming techniques.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamentals of digital systems and associated technologies.
2. Analyse and design simple systems related to digital logic.
3. Apply logic design techniques to construct digital systems with programmable logic devices and microprocessors, and appreciate the use of them.
4. Appreciate the importance of creativity and critical thinking on finding “good” solutions or making “good” designs.

Category B: Attributes for all-roundedness
5. Present ideas and findings effectively.
6. Think critically.
7. Learn independently.
8. Learn team working skills.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the foundation concepts of logic design.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with a number of experiments and exercises to analyze and interpret data.
- Programme Outcomes 3 and 5: This subject contributes to these two programme outcomes through requiring students to conduct experiments.
- Programme Outcomes 11 and 12: This subject contributes to these programme outcomes through the teaching of the concepts and skills for designing digital systems, and by providing students with the opportunity to apply the techniques and tools to solve practical engineering problems.

Category B: Attributes for all-roundedness
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team for the experiment.
Syllabus:

1. **Logic Circuit and ICs**
   1.1 Decoders and encoders
   1.2 Multiplexers and demultiplexers
   1.3 Binary adders, binary adder-subtractors
   1.4 Binary multipliers
   1.5 Sequential circuit analysis and design
   1.6 Registers and counters
   1.7 HDL representation - Verilog HDL.

2. **Memory and Programmable Logic Devices**
   2.1 RAM: Write and read operations, timing waveforms, RAM integrated circuits, three-state buffers, DRAM ICs
   2.2 Programmable logic technologies
   2.3 ROM, PLA and PAL
   2.4 VLSI programmable logic devices: Xilinx FPGA.

3. **Microprocessor**
   3.1 Register transfer operations
   3.2 Microoperations
   3.3 Bus-based transfer
   3.4 ALU
   3.5 Shifter
   3.6 Datapath representation
   3.7 Control word
   3.8 Control unit
   3.9 Hardwired control.

4. **Basic Assembly Language Programming**
   4.1 Concepts of assembly/machine languages
   4.2 Operand addressing
   4.3 Addressing modes
   4.4 Instruction set: Data transfer, data manipulation, program control

Laboratory Experiment:

1. Basic logic gates and their applications
2. Hardware description language
3. Programmable logic devices, Assembly language programming

Method of Assessment:

Continuous Assessment: 50%   Examination: 50%

The continuous assessment will consist of a number of assignment, short quizzes, and two tests.

Textbook:


Reference Books:

### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3, 4</td>
<td>fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1, 2, 3, 4, 5, 6, 7</td>
<td>supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture materials; problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>3, 4, 5, 6, 7, 8</td>
<td>students will make use of the software and hardware tools to develop simple digital systems, perform simulations, and do programming on microprocessor systems.</td>
</tr>
</tbody>
</table>

### Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 2</td>
<td>mainly objective tests (in short questions) conducted to measure the students' ability to remember facts and figures as well as their comprehension of subject materials</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>1, 2, 3, 4, 6, 7</td>
<td>end-of chapter type problems used to evaluate students’ ability in applying concepts and skills learned in the lessons; students need to think critically and creatively in order to come up with solutions for an existing problems.</td>
</tr>
<tr>
<td>Laboratory sessions, mini-project</td>
<td>3, 4, 5, 8</td>
<td>each student is required to produce a logbook; each group of students are required to finish a short quiz after the laboratory; accuracy and the presentation of the logbook will be assessed.</td>
</tr>
</tbody>
</table>
Objectives:
This subject aims to help students to study effectively in the University’s English medium learning environment and, more specifically, to improve and develop their English language proficiency within a framework of academic contexts.

In striving to achieve the two interrelated objectives, attention will be given to developing the core competencies the University has identified as vital to the development of effective life-long learning strategies and skills.

Learning Outcomes:
By the end of the subject, students should be able to communicate effectively in an academic context through

1. writing well-organised academic texts, such as expository essays;
2. delivering effective oral presentations; and
3. using appropriate referencing skills in academic writing and speaking.

To achieve the above outcomes, students are expected to use language and text structure appropriate to the context and to critically select relevant information to develop a theme in a text.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 7: Communicate effectively.

Category B: Attributes for all-roundedness
- Programme Outcome 14: Exercise leadership when working in a team.

Content:
This syllabus is indicative. The balance of the components, and the corresponding weighting accorded to each, will be based on the specific needs of the students.

1. Written academic communication
   Identifying and employing functions common in written academic discourse; note-taking from reading and listening inputs; understanding and applying principles of academic text structure; developing paraphrasing, summarising and referencing skills; improving editing and proofreading skills; achieving appropriate tone and style in academic writing.

2. Spoken academic communication
   Recognising the purposes of, and differences between, spoken and written communication in English in academic contexts; identifying and practising the verbal and non-verbal interaction strategies in oral presentations; explaining and presenting ideas that require the development and application of logical thinking.

3. Reading and listening in academic contexts
   Understanding the content and structure of information delivered orally and in print; reading and listening for different purposes e.g. as input to tasks, and for developing specific reading or listening skills; using a dictionary to obtain lexical, phonological and orthographical information.

4. Language development
   Improving and extending relevant features of students’ grammar, vocabulary and pronunciation.
Teaching and Learning Approach:
The subject is designed to introduce students to the communication skills, both oral and written, that they may need to function effectively in academic contexts.

The study method is primarily seminar-based. Activities include teacher input as well as individual and group work involving drafting and evaluating texts, mini-presentations and discussions. Students will be referred to information on the internet and the ELC’s Centre for Independent Language Learning.

Learning materials developed by the English Language Centre are used throughout this course. Additional reference materials will be recommended as required.

Method of Assessment:
Continuous Assessment: 100%

Students’ oral and writing skills are evaluated through assessment tasks related to the learning outcomes. Students are assessed on the accuracy and the appropriacy of the language used in fulfilling the assessment tasks, as well as the selection and organisation of ideas.

Indicative references:

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorials</td>
<td>1,2,3</td>
<td>Independent learning is also encouraged</td>
</tr>
</tbody>
</table>

Alignment of Assessment with Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written test</td>
<td>1,3</td>
<td>A short academic text</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>2</td>
<td>Based on a group research project</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: University English II  
Subject Code: ELC2502
Number of Credits: 2  
Hours Assigned: 28 hours

Pre-requisite: University English I (ELC2501)  
Co-requisite: nil  
Exclusion: nil

Objectives:
This subject aims to further develop those English language skills required by students to study effectively in the University’s English medium learning environment.

Learning Outcomes:
By the end of the subject, students should be able to communicate effectively in academic contexts through
1. writing academic argumentative essays, and
2. participating actively in academic discussions.

To achieve the above outcomes, students are expected to use language and text structure appropriate to the academic context and to critically select relevant information to develop a thesis and arguments in a text.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 7: Communicate effectively.

Category B: Attributes for all-roundedness
- Programme Outcome 14: Exercise leadership when working in a team.

Content:
This syllabus is indicative. The balance of the components, and the corresponding weighting, will be based on the specific needs of the students.

1. Written academic communication
   Understanding and applying principles of the text structure of persuasive and argumentative academic texts; further developing paraphrasing, summarising and referencing skills; improving editing and proofreading skills; achieving appropriate tone and style in academic writing.

2. Spoken academic communication
   Identifying and practising the verbal and non-verbal interaction strategies in academic discussions; explaining and presenting ideas that require the development and application of creative and critical thinking.

3. Reading and listening in academic contexts
   Understanding the content and structure of ideas delivered orally and in print; distinguishing between ‘fact’ and ‘opinion’.

4. Language development
   Further improving and extending relevant features of grammar, vocabulary and pronunciation.

Teaching and Learning Approach:
The subject is designed to introduce students to the communication skills, both oral and written, that they may need to function effectively in academic contexts.

The study method is primarily seminar-based. Activities include teacher input as well as individual and group work involving drafting and evaluating texts, mini-presentations and discussions. Students will be referred to information on the internet and the ELC’s Centre for Independent Language Learning.
Learning materials developed by the English Language Centre are used throughout this course. Additional reference materials will be recommended as required.

**Method of Assessment:**

Continuous Assessment: 100%

Students’ oral and writing skills are evaluated through assessment tasks related to the learning outcomes. Students are assessed on the accuracy and the appropriacy of the language used in fulfilling the assessment tasks, as well as the selection and organisation of ideas.

**Indicative references:**


**Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:**

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<tbody>
<tr>
<td>Tutorials</td>
<td>1,2</td>
<td>Independent learning is also encouraged</td>
</tr>
</tbody>
</table>

**Alignment of Assessment with Learning Outcomes:**

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar discussion</td>
<td>2</td>
<td>Based on a research project</td>
</tr>
<tr>
<td>Discursive essay</td>
<td>1</td>
<td>2 versions: draft and final</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Information Technology
Subject Code: ENG224

Number of Credits: 3
Hours Assigned: Lecture/Tutorial 42 hours, Laboratory 9 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
To provide the foundation knowledge in computers, computer networks and data processing that is essential to modern information system design.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the functions and features of computer hardware and software components.
2. Understand the architecture and functions of a computer operating system and be able to use the services it provided for managing computer resources.
3. Understand the basic structure of a database system and be able to set up and configure a simple database system.
4. Understand the principles of computer networks and be able to set up and configure a simple computer network.

Category B: Attributes for all-roundedness
5. Solving problems using systematic approaches.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme outcome 1: Apply knowledge of mathematics, science, and engineering appropriate to electronic and information engineering.
- Programme outcome 9: Stay abreast of contemporary issues.
- Programme outcome 12: Use the computer/IT tools relevant to electronic and information engineering along with an understanding of their processes and limitations.

Syllabus:

1. Introduction to computers
   Introduction to applications of information technology in different engineering disciplines. Introduction to computer hardware components: CPU, RAM, ROM, I/O devices and internal buses. Software components: applications, utilities and operating systems.
   Case study: Linux – user Interfaces, file management and process management.
   (10 hours)

2. Computer networks
   Case studies: Ethernet – cabling, topology and access methods.
   (18 hours)

3. Introduction to data processing and information systems
   Database systems – architecture, relational database concept, structural query language (SQL), database management systems, Web and database linking, database application development. Introduction to Information systems. Workflow management.
   Case study: Database management using Microsoft Access/MySQL.
   (14 hours)
Laboratory Experiments and other Practical Work (18 hours):
1. File management and process management in Linux
2. Setting up a Web server
3. Network Address Translation and IP Routing

Method of Assessment:
Continuous Assessment: 40%  Examination: 60%

The continuous assessment consists of assignments and test.

Reference Books:

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>1, 3, 4</td>
<td>Part of Learning outcome 4: Understand the principles of computer networks</td>
</tr>
<tr>
<td>Tutorial</td>
<td>1, 3, 4</td>
<td>-</td>
</tr>
<tr>
<td>Lab</td>
<td>2,3</td>
<td>Part of Learning outcome 2: Understand the architecture and functions of a computer operating system</td>
</tr>
</tbody>
</table>

Alignment of Assessment with Learning Outcomes:

<table>
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<tr>
<th>Assessment Methods</th>
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<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment/Tests</td>
<td>1, 2, 3, 4, 5</td>
<td>-</td>
</tr>
<tr>
<td>Exam</td>
<td>1, 2, 3, 4, 5</td>
<td>-</td>
</tr>
</tbody>
</table>
Subject Title: Engineering Science
Subject Code: ENG232
Number of Credits: 3
Hours Assigned: 42 hours

Pre-requisite: nil  Co-requisite: nil  Exclusion: nil

Objectives:
This subject aims:
1. to enable students to establish a broad knowledge base on the atomic structure and properties of materials with an emphasis on using this knowledge to solve engineering problems.
2. to provide a basic understanding on relationship between material properties and manufacturing processes so that they (students) are able to select those that are appropriate taking into consideration green design and environmental issues.
3. to enable students to understand the forms of energy and their conversion.

Student Learning Outcomes:
Upon satisfactory completion of the subject, students are expected to achieve the following learning outcomes:
1. To be able to apply the knowledge of materials science to analyse and solve basic engineering problems related to stress, strain and fracture of materials.
2. To be able to select appropriate materials and manufacturing processes for different products taking into consideration of issues in cost, quality and environmental concerns.
3. To be able to familiarize and apply thermodynamic properties of common substances, such as air and water, for the reversibility and efficiency considerations of energy balance, usage, and waste disposal in common energy transformation devices and systems.

Syllabus:
Materials Science and Engineering (27 hours)
Atomic Structure and Structure of Crystalline Solids: Atomic structure; Bonding forces and energies; Primary interatomic bonds and secondary bonding; Crystal structures and energy levels; Introduction to phase diagram.

Electrical and Optical Properties of Materials: Conductors and insulators; Semi-conductor materials; N-type and P-type semiconductors; P/N junction; Light interactions with materials; Light emitting diode (LED) and optical detectors; Laser; Light propagation in optical fibres.

Mechanical Properties of Materials: Concept of stress and strain; Stress-strain behaviour; Elastic properties of materials; Tensile properties; Elastic recovery after plastic deformation; Hardness; Stress concentration; Design and safety factors; Fracture and fatigue.

Dislocations and Strengthening Mechanism: Characteristics of dislocations; Mechanism of strengthening in metals; Grain size reduction; Solid solution strengthening; Strain hardening; Precipitation hardening.

Manufacturing Technology of Materials: Role of materials in manufacturing; Relationship between manufacturing processes and material properties; Process capability.

Applications and Selection of Engineering Materials: Metallic materials; Ferrous and non-ferrous alloys; Ceramics; Polymers; Thermoplastics and thermosets; Composite materials.

Process Selection and Ecological Design: Cost consideration in materials selection; Selection of materials and manufacturing processes; Green manufacturing and environmentally conscious design.
Energy Utilization (15 hours)

Energy Trends, Conversion and Engineering: World consumption of primary energy sources; Technologies and issues in the conversion of different sources of energy.

Basic Concepts and Laws of Energy Conversion: Thermodynamic states, variables and systems; Thermodynamic properties of H2O; Work, heat, and internal energy; Conservation of mass and energy; Reversibility of energy exchange; Energy balance for a flow.

Basic Cycles and Common Thermal Systems: Rankine cycle and the steam engine; Refrigeration and heat pump; Ideal gas basics; Otto cycle and the internal combustion engine; Brayton cycle and the gas turbine.

Laboratory Experiment (4 hours)

1. Tensile strength of metallic and plastic materials.
2. Conversion of fuel energy into engine power.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

Continuous Assessment may include assignments and short tests

Textbooks and references:

SUBJECT DESCRIPTION FORM

Subject Title: Computer Programming
Subject Code: ENG236
Number of Credits: 3
Hours Assigned: Lecture/Tutorial/Laboratory 42 hours

Pre-requisite: nil  Co-requisite: nil  Exclusion: nil

Objectives:
1. To introduce the fundamental concepts of computer programming.
2. To equip students with sound skills in C/C++ programming language.
3. To equip students with techniques for developing structured computer programs.
4. To demonstrate the techniques for implementing engineering applications using computer programs.

Student Learning Outcomes:
Category A: Professional/academic knowledge and skills
After taking this subject, the students should be able to develop a good computer program using C/C++ programming language. To be specific, the students should be able to achieve the following:
1. Familiarize themselves with at least one C/C++ programming environment.
2. Be proficient in using the basic constructs of C/C++ to develop a computer program.
3. Be able to develop a structured and documented computer program.
4. Understand the fundamentals of object-oriented programming and be able to apply it in computer program development.
5. Be able to apply the computer programming techniques to solve practical engineering problems.

Category B: Attributes for all-roundedness
6. Solve problems by using systematic approaches.
7. Write technical reports and present the findings.
8. Learn team working skills.

Programme Outcomes:
Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the foundation concepts of computer programming.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with a number of programming exercises to analyze and interpret data.
- Programme Outcomes 3 and 5: This subject contributes to these two programme outcomes through the teaching computer programming and requiring students to finish a mini-project.
- Programme Outcomes 11 and 12: This subject contributes to these programme outcomes through the teaching of the concepts and skills for using C/C++ programming language, and by providing students with the opportunity to apply the programming techniques to solve practical engineering problems.

Category B: Attributes for all-roundedness
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team for the mini-project.

Syllabus:
1. Introduction to programming
   Software components of a computer – Operating system, directories, files. Evolution of programming languages. Programming environment – Compiler, linker and loader. Building the first program – Hello World. (3 hours)
2. Bolts and Nuts of C/C++
   Preprocessor, program codes, functions, comments. Variables and constants. Expressions and statements. Operators. (3 hours)
3. Program Flow Control
If, else, switch, case. Looping – for, while, do. Functions, parameters passing, return values. Local and global variables. Scope of variables. (4.5 hours)

4. Program Design and Debugging

5. Basic Object Oriented Programming
Objects and classes. Encapsulation. Private versus public. Implementing class methods. Constructors and destructors. (4.5 hours)

6. Pointer and Array

7. Stream I/O
Input and Output. Input using cin. Output using cout. File I/O using streams. (6 hours)

8. Using C/C++ in Engineering Applications
Solving numerical problems using C/C++. Developing graphical user interfaces for Engineering applications. Control I/O devices using C/C++. (7.5 hours)

Method of Assessment:
Continuous Assessment: 100%
For this subject, students need to go through three 2-hours programming tests in which students will be asked, within the allowed time period, to develop a set of computer programs using the C/C++ programming language to solve a problem. These three tests are worth 30% of the total marks.

Students also need to go through three 1-hour written tests to demonstrate their understanding to C/C++ programs. These three tests are worth 20% of the total marks.

Besides, students need to finish a mini-project in this subject. Students are expected to spend not less than 35 hours of self-studying in order to finish the mini-project. The mini-project is worth 30% of the total marks.

The remaining 20% of marks are allotted to assignments that will be given during and after the classes.

Textbook:

Reference Book:

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<th>T&amp;L Method</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>1 – 6</td>
<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Programming exercises</td>
<td>1 – 6</td>
<td>As a supplementary to lectures, the exercises help students to clarify concepts and to have a deeper understanding of the lecture materials. Problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>exercises during and after class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini-project</td>
<td>1 – 8</td>
<td>Students in groups of 2 are required to build a medium-scale software system.</td>
</tr>
</tbody>
</table>
Alignment of Assessment and Learning Outcomes:

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<tr>
<th>Assessment Methods</th>
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</thead>
<tbody>
<tr>
<td>Programming tests</td>
<td>1 – 6</td>
<td>For this subject, students need to go through three 2-hours programming tests in which students will be asked, within the allowed time period, to develop a set of computer programs using C/C++ programming language to solve a problem. These three tests are worth 30% of the total marks.</td>
</tr>
<tr>
<td>Written tests</td>
<td>1 – 6</td>
<td>Students also need to go through three 1-hour written tests to demonstrate their understanding to C/C++ programs. These three tests are worth 20% of the total marks.</td>
</tr>
<tr>
<td>Mini-project</td>
<td>1 – 8</td>
<td>Besides, students need to finish a mini-project in this subject. Students are expected to spend not less than 35 hours of self-studying in order to finish the mini-project. For this mini-project, students need to make a presentation and submit a project report. The mini-project is worth 30% of the total marks.</td>
</tr>
<tr>
<td>Assignments and class exercises</td>
<td>1 – 6</td>
<td>The remaining 20% of marks are allotted to exercises and assignments that will be given during and after the classes, respectively.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Basic Electricity and Electronics I  
Subject Code: ENG237  
Number of Credits: 3  
Hours Assigned: Lecture/Tutorial 42 hours, Laboratory 12 hours

Pre-requisite: nil  
Co-requisite: nil  
Exclusion: nil

Objectives:
1. Introduce the fundamental concepts of operation of electric circuits applicable to all engineering students.
2. Develop an ability for solving problems involving electric circuits.
3. Develop skills for experimentation on electric circuits.
4. Impart relevant skills and knowledge in basic electricity and electronics for independent learning of other subjects that require such skills and knowledge.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:
1. have acquired a good understanding of the electric circuit operating principles;
2. be able to solve simple problems in electric circuits;
3. be able to use suitable instrumentation to carry out experimental investigations to validate the theoretical investigations;
4. be able to search for useful information in solving problems in electric circuits.

Programme Outcomes:

Category A Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through teaching the fundamentals of electric circuit operating principles and providing the students with an opportunity to practise the application of knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing the students with an opportunity to conduct experiments.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the students with an opportunity to solve problems involving electric circuits.

Category B Attributes for all-roundedness
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to practise working in a team.

Syllabus:

1. DC Circuits

2. Capacitance, Inductance and First Order Transients

3. Mutual Inductance and Transformer
   Basic coupled inductance equation. Concept of ideal transformer (assuming sinusoidal voltages and currents). Dot convention. Physical transformer as ideal transformer with leakage and magnetizing inductances. Applications in galvanic isolation and voltage/current level conversion. (3 hours)
4. **Steady-state Analysis of AC Circuits**
   Average and rms values. Phasors (rotating vectors). Steady-state analysis of circuits driven by single fixed frequency sinusoidal sources. Impedance and admittance. Analysis approach 1: phasor diagrams for simple circuits. Analysis approach 2: systematic complex number analysis, i.e., same treatment as DC circuits but with complex numbers representing phase and magnitude of AC voltages and currents. Real and reactive powers. Power factor. Three-phase circuits. Measuring three-phase power by two-wattmeter method. (9 hours)

5. **Load Line Analysis and Diode Circuits**
   I-V characteristics of general nonlinear components. Diode as specific case. Low voltage case: DC solution based on load line construction. High voltage case: rectifier circuits, clipping and clamping circuits. (4 hours)

6. **Digital Logic Circuits**

7. **Instrumentation and Measurement**
   Choice of measurement method; Analogue and digital instruments; Bridges; Measurement uncertainties. (4 hours)

**Laboratory Experiments:** (12 hours, 3 hours each)
1. Instrumentation and circuit theorems
2. First order transient
3. Single-phase and three-phase AC circuits
4. Simple digital circuits

**Method of Assessment:**
Continuous Assessment: 40%   Examination: 60%

**Textbook:**

**References:**
## Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture, supplemented with interactive questions and answers (Q&amp;A), and short quizzes</td>
<td>1,2,4</td>
<td>In lectures, students are introduced to the knowledge of the subject, and comprehension is strengthened with interactive Q&amp;A and short quizzes.</td>
</tr>
<tr>
<td>Tutorials where problems are discussed, and are given to students for them to solve</td>
<td>1,2,4</td>
<td>In tutorials, students apply what they have learnt in lectures and solve problems that are given by the tutor.</td>
</tr>
<tr>
<td>Laboratory sessions, where students conduct experimental investigations</td>
<td>2,3,4</td>
<td>Students acquire hands-on experience in using electronic instruments. They will carry out experimental investigations to validate the theoretical investigations.</td>
</tr>
<tr>
<td>Assignment and homework</td>
<td>1,2,3,4</td>
<td>Through working assignment and homework, students will develop a firm understanding and comprehension of the knowledge taught.</td>
</tr>
</tbody>
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## Alignment of Assessment with Learning Outcomes:

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<tr>
<th>Assessment Methods</th>
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<tbody>
<tr>
<td>Assignment, homework, and quizzes</td>
<td>1,2,4</td>
<td>Assignment, homework, and quizzes are given to students to assess their competence level of knowledge and comprehension, and ability to apply knowledge and skills in new situations. Feedback about their performance will be given promptly to students for helping them to improve their learning.</td>
</tr>
<tr>
<td>Laboratory works and reports</td>
<td>1,2,3,4</td>
<td>Students are required to keep a log on all experiments and submit a report on one experiment assigned by the tutor.</td>
</tr>
<tr>
<td>Mid-semester test</td>
<td>1,2,4</td>
<td>There will be a mid-semester test to evaluate students' achievement of the learning outcomes and students will be given timely feedback for prompt improvement.</td>
</tr>
<tr>
<td>End-of-semester test and examination</td>
<td>1,2,3,4</td>
<td>There will be an end-of-semester test and examination to assess students' achievement of all the learning outcomes of the entire subject.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Basic Electricity and Electronics II
Subject Code: ENG238
Number of Credits: 3
Hours Assigned: Lecture/tutorial 42 hours, Laboratory 12 hours

Pre-requisite: Basic Electricity and Electronics I (ENG237) Co-requisite: nil Exclusion: nil

Objectives:
To introduce students to the operating principles of electrical and electronic circuits. Several classes of electronic circuits will be covered in this subject – diode circuits, BJT transistor circuits, FET transistor circuits, and operational amplifier circuits. An introduction to electrical machines will be given.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

1. should have acquired some understanding in the fundamental aspects of electric and electronics principles with specific focus in the following topics:
   a) PN junction characteristics, load line concept, and the design of basic diode circuits;
   b) DC biasing of BJT and FET circuits
   c) basic operating principles of BJT and FET transistor circuits and design;
   d) basic operating principles of ideal operational amplifiers;
   e) basic frequency response of amplifiers.
   f) electrical machines basics
2. should have the ability to solve basic circuit problems in electric and electronic circuits;
3. should have acquired better skills in performing the laboratory experiments;
4. should be able to perform independent learning in basic electric and electronic principles.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: Students will be required to apply their knowledge of mathematics, science, and engineering in learning, analyzing, and solving the course materials which cover circuits and electronics.
- Programme Outcome 5: Students will encounter laboratory and tutorial assignments that require them to identify, formulate and solve basic engineering problems related to the coursework.

Syllabus:

1. Diode Fundamentals
   P-N junction basics. Input, output and transfer characteristics of practical diodes. Biasing through load line concept. (3 hours)
2. Transistors and Biasing Circuits
   The bipolar junction transistors (BJT). DC biasing and analysis of BJT circuits. MOS field-effect transistors (MOSFET). Junction field effect transistors (JFET). Simple biasing arrangements. Load line and graphical large-signal analysis. Transistor amplification concept. (6 hours)
3. Transistor Amplifiers and Small-signal Concepts
   Basic BJT and MOSFET amplifier configurations: common emitter and common source configurations. Small-signal models and parameters. Concept of transconductance. Voltage gain. Input and output impedances. Introduction to loading effect (arrived naturally from consideration of loading a common emitter amplifier). Need for emitter follower as buffer. (9 hours)
4. Frequency Domain Analysis
   Transfer functions from ac circuits in terms of $j\omega$. Introduction to frequency domain, from $j\omega$ to $s$. General s-domain transfer functions. Simple first-order filter circuits. Introducing concepts of pole, corner frequency, bandwidth. For sinusoidal driving sources, use of $j\omega$ axis for magnitude and phase plots. Extension to asymptotic plots and hence Bode plots. (10 hours)
5. Operational Amplifiers
Ideal operational amplifier. Defining characteristics (i.e., infinite gain and infinite input resistance). Op-amp circuits: inverting amplifier, non-inverting amplifier, summer, difference amplifier, integrator and differentiator. Applications: analog-digital converter, instrumentation amplifier; current-to-voltage and voltage-to-current converters. (6 hours)

6. Fundamentals of Electrical Machines
Basic operating principles of transformers, d.c. machines, induction motors and synchronous machines. (8 hours)

**Laboratory Experiments:**
1. Op-amps as analog computers and as current-to-voltage converters.
2. DC transistor biasing/load line and diode clamping circuits.
3. Transistor amplifier circuits.
4. Transformer tests and characteristics.

**Method of Assessment:**
Continuous Assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignments and tests.

**Textbook:**

**References:**

**Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:**

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1</td>
<td>Basic skills and understanding in mathematics, science, and engineering are required for the learning of the subject material which covers basic knowledge in electrical and electronic engineering at a fundamental level.</td>
</tr>
<tr>
<td>Laboratory and tutorial classes</td>
<td>1, 5</td>
<td>The solving of the tutorial problems and the attendance of the laboratory classes will require students to apply their knowledge in mathematics, science, and engineering in arriving at an appropriate solution. The lessons embed in itself the process of identifying, analyzing, and solving basic engineering problems.</td>
</tr>
</tbody>
</table>

**Alignment of Assessment and Learning Outcomes:**

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test and examination</td>
<td>1, 5</td>
<td>The students’ ability in achieving outcomes 1 and 5 can be revealed from their tests and examination performances. In the tests and examination, a few tricky questions that the students have never been taught to answer will be embedded to test their ability as to whether they can apply their knowledge of mathematics, science, and engineering in identifying, formulating and solving these problems.</td>
</tr>
</tbody>
</table>
**SUBJECT DESCRIPTION FORM**

**Subject Title:** Introduction to Engineering Communication and Fundamentals  
**Subject Code:** IC2105

**Number of Credits:** 4 training credits  
**Hours Assigned:**  
Class Contact 120 hours  
Other Student Study Effort 8 Hours

**Pre-requisite:** nil  
**Co-requisite:** nil  
**Exclusion:** nil

**Objectives:**

This subject offers a wide spectrum of coverage on various engineering fundamental matters, including Engineering Communication and CAD, Basic Scientific Computing, Basic Mechatronic Practice, and Industrial Safety, that aims at providing the necessary fundamental knowledge and computing skills to all year 1 students interested in engineering.

**Student Learning Outcomes:**

Upon completion of the subject, students will be able to:

1. explain the principles and conventional representation of engineering drawings according to engineering standards and be able to use it as a medium in technical communication and documentation with CAD application, modelling and practice with application in mechanical, industrial systems, electrical, electronic and information engineering;
2. apply scientific computing software for computing in science and engineering including visualization and programming;
3. design and analyze practical controller hardware, software, actuation devices and human-machine interface for simple mechatronic systems including basic practice in hydraulic, pneumatic and electric systems with common engineering components such as motor drives, mechanical drives, gears, cams, belts, pulleys, couplings, bearings, seals and fasteners;
4. explain basic occupational health and industrial safety requirements for engineering practice.

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**

- Programme Outcomes 1, 7, 11 and 12: This subject contributes to the programme outcome through teaching and training in engineering communication, graphics with CAD and EDA tools and scientific computing software.
- Programme Outcomes 2, 5: This subject contributes to the programme outcome through practical training in mechatronics and scientific computing software. Students are introduced to the design and the test with industrial grade mechatronic components and the use of scientific computing software.
- Programme Outcome 3: This subject contributes to the programme outcome through teaching and training in industrial safety and engineering graphics so as to enable the practice of engineering design in reality.
- Programme Outcomes 3, 6, 8, 9, 10: This subject contributes to the programme outcome through induction, practical training and industrial safety teaching with practical training in an international recognized professional engineer training centre. Through this subject and subsequent training, student will aware and recognize the importance of training, life-long learning, responsibility and ethics as demanded for a professional engineer.

**Category B: Attributes for all-roundedness**

- Programme Outcome 13: This subject contributes to the programme outcome through the teaching of engineering graphics; an essential tool in a creative process to communicate ideas and its realisation.
- Programme Outcome 13, 14: This subject contributes to the programme outcome through practical training in mechatronics practice. Students are organized in groups for practical work. Students should be able to practise and demonstrate their team work skills, leadership potential, critical thinking ability and creativity through working with each other in projects that are
Syllabus:

1 Engineering Drawing & CAD (TM0805 - 48 hours)
   1.1 Mechanical & Electrical Drawing, 2D & 3D CAD (39 hours)
   Principles of orthographic projection; sectioning; dimensioning; sketching; general tolerances and surface finishes; conventional representation of screw threads and fasteners; types of drawings including part drawing and assembly drawing.

   Introduction to CAD; 2D drawings and general concepts on 3D computer modelling including extruding, revolving, sweeping, and lofting; parametric feature based solid modelling; construction and detailing of solid features; solid model modification and its limitations; concepts of assembly modelling including bottom up and top down approaches for the generation of parts, subassemblies, and final assembly; generation of 2D drawings from 3D parts and assemblies; drawing annotation including dimensioning, tolerancing, surface finishing, and part list.

   1.2 Electrical Drawing (3 hours)
   Wiring diagram and wiring table for electronic and electrical installation, functional representation of circuit, system block diagram, electrical & electronic device symbols and layout, architectural wiring diagram with reference to the architectural symbols for electrical drawings in Hong Kong and international standards.

   1.3 Electronic Design Automation (6 hours)
   Introduction to electronic design automation software; circuit schematics capture and representation; placement of components, capturing, annotation, labelling, net list. Electronic parts library, symbols, decals, physical packages, discrete components, integrated circuits, logic and analogue circuits, electronic parts creation and application.

2 Basic Scientific Computing (TM3012 - 27 hours)
   2.1 Introduction to MATLAB; interactive calculations, random number generators, variables, vectors, matrices and string; mathematical operations, polynomial operation, data analysis and curve fitting, file I/O functions.

   2.2 Basic plotting, formatting graph, 2D and 3D plots, annotations, contour, mesh and surface plots, colormap.

   2.3 M-file programming & debugging; scripts, functions, logic operations, flow control and graphic user interfaces.

3 Basic Mechatronic Practice (TM0510 - 30 hours)
   3.1 Definitions of mechatronics; design and operation of typical mechatronic systems (such as: car park system); appreciation of measurement system, actuator system, motor drives, mechanical drives, pneumatic and hydraulic systems, signal conditioning, and human-machine interfaces.

   3.2 Integration of system components using appropriate controller hardware and software such as PLC, PAC, and Microcontroller system; use of simulation software packages for pneumatic and hydraulic circuit design

4 Industrial Safety (TM2009 - 15 hours)
   4.1 Safety Management: Overview, essential elements of safety management, safety training, accident management, and emergency procedures.

   4.2 Safety Law: F&IU Ordinance and principal regulations, OSH Ordinance and principal regulations.

   4.3 Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling.

   4.4 Safety Technology: Mechanical lifting, fire prevention, dangerous substances and chemical safety, machinery hazards and guarding, electrical safety, first aid, job safety analysis, fault tree analysis, personal protective equipment.

Teaching and Learning Approach:

The teaching and learning methods include lectures, workshop tutorials, and practical works. The lectures are aimed at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, use of standard engineering components and systems, and importance of industrial safety. The workshop tutorials are aimed at enhancing students’ in-depth knowledge and ability in applying the knowledge and skills to complete specific tasks. The practical
works aim at facilitating students to review the diverse topics covered in this course and perform active learning with research, practice, questioning, and problem solving in a unified activity.

**Method of Assessment:**

**Continuous Assessment: 100%**

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment / Project</td>
<td>30%</td>
</tr>
<tr>
<td>Tests</td>
<td>30%</td>
</tr>
<tr>
<td>Others (Reports &amp; Logbook)</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Reference Software List:**
1. AutoCAD from Autodesk Inc.
2. SolidWorks from Dassault Systèmes Solidworks Corp.
3. MATLAB from The Mathworks Inc.
4. PADS from Mentor Graphics Inc.

**Reference Standards:**
1. BS8888 Technical Product Specification (TPS) Specification
2. IEEE Std 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols for Electrical and Electronics Diagrams
3. IEC 61082 Preparation of Documents used in Electrotechnology

**Reference Books:**
Training material, manual and articles published by Industrial Centre.

**Alignment of Assessment and Learning Outcomes:**

<table>
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<th>Assessment Methods</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
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<td>Assignment / Project</td>
<td>1,2,3,4</td>
<td>The projects are designed to facilitate students to reflect and apply the knowledge periodically throughout the training.</td>
</tr>
<tr>
<td>Tests</td>
<td>1,2,3,4</td>
<td>Tests are designed to facilitate students to review the breadth and depth of their understanding on specific topics.</td>
</tr>
<tr>
<td>Others (Reports &amp; Logbook)</td>
<td>1,2,3,4</td>
<td>Report writing is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.</td>
</tr>
</tbody>
</table>
**SUBJECT DESCRIPTION FORM**

<table>
<thead>
<tr>
<th>Subject Title</th>
<th>Industrial Centre Training I for EIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Code</td>
<td>IC2111</td>
</tr>
<tr>
<td>Number of Credits</td>
<td>5 training credits</td>
</tr>
<tr>
<td>Hours Assigned</td>
<td>Class Contact 150 hours</td>
</tr>
<tr>
<td></td>
<td>Other Student Study Effort 12 Hours</td>
</tr>
</tbody>
</table>

| Pre-requisite                 | nil                                          |
| Co-requisite                  | nil                                          |
| Exclusion                     | nil                                          |

**Objectives:**
The objective of this subject is to equip students with the best practical training that are fundamental and essential in their study and professional practice of electronic and information engineering (EIE).

**Student Learning Outcomes:**
Upon completion of the subject, students will be able to:

1. design and fabricate simple electronic equipment prototype for demonstration, development and experimentation purposes;
2. specify and explain contemporary pragmatic manufacturing processes, interconnects and assembly methods for electronic equipment fabrication;
3. prescribe and perform parametric test and analysis and the troubleshooting of simple electronic circuits with the application of basic and virtual electronic instruments;
4. design and verify simple electronic equipment with embedded system;
5. design and create commercial grade, Web based information system for information sharing, business control and logistics;
6. recognize training forms an important part for a professional engineer career and the needs for multi-disciplinary training and continue professional development in professional engineering practice.

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**
- Programme Outcomes 1, 2, 3, 5, 8, 9, 11: This subject contributes to the programme outcome through practical training on the professional practice in the design, development, fabrication, test and troubleshooting of electronic or information equipment and products under an international recognized professional engineer training centre.
- Programme Outcomes 3, 8, 9, 11: This subject contributes to the programme outcome through induction and training in workshop environments with contemporary production grade machinery. Practical training will focus on best practice of electronic and information work and the application of tools in an industrial or engineering setting. Students will aware industrial safety, environmental and sustainability issues in electronic and information product design and manufacturing during practical training.
- Programme Outcome 4: This subject contributes to the programme outcome through practical training in multidisciplinary workshops.
- Programme Outcome 5: This subject contributes to the programme outcome through training tasks organised with context to provide training in the identification and problem solving while focusing on the objective of the training contents.
- Programme Outcome 6: This subject contributes to the programme outcome through induction on the importance of training, responsibility and ethics for a professional engineer.
- Programme Outcome 7: This subject contributes to the programme outcome through training in groups, discussions, report and logbook writing.
- Programme Outcome 10: This subject contributes to the programme outcome through induction and practical training that could bring up the awareness and cognition in self-learning and life-long learning as demanded for a professional career.
- Programme Outcomes 12: This subject contributes to the programme outcome through practical training in the software in electronic and information engineering which include electronic design automation software, microcontroller development system, virtual instrumentation and business applications from off-the-shelf commercial software.
Category B: Attributes for all-roundedness

- Programme Outcome 13: This subject contributes to the programme through practical training. In training tasks, student will perform practical tasks to create practical design on realistic constraint and work through its implementation.

- Programme Outcome 14: This subject contributes to the programme outcome through practical training in student groups. Student can seize the opportunities to practise and demonstrate their team work skills, leadership potential, critical thinking ability and creativity through working with each other in projects that are encountered in practical training.

Syllabus:

1. **TM1101 – Basic Electronic Practice for Electronics and Information Engineering**
   - 1.1 Introduction to common electronics parts, use of basic test instruments, best practices and basic troubleshooting techniques, electronics workshop safety.
   - 1.2 Soldering and de-soldering techniques, mounting and installation of electronic circuits, wiring of subassemblies.
   - 1.3 PCB design, hands on practice on PCB circuit design in EDA.
   - 1.4 Circuit artwork, etching process, PCB prototype fabrication.
   - 1.5 Application and use of electronic test instruments: current and voltage measurements, two wire and four wire techniques, power and signal sources, oscilloscope probes, analogue and digital oscilloscopes.
   - 1.6 Introduction to Virtual Instrument, application and hands-on practice on Labview or an equivalent software package.

2. **TM1102 – Advanced Electronic Practice for Electronics and Information Engineering**
   - 2.1 Introduction to electronic circuit interconnect technologies: SMT, COB and wave-soldering.
   - 2.2 Introduction to electronic assembly design and manufacturing process, components, tools and machines.
   - 2.3 Hands-on practice on wave-soldering, SMT process, chip level wire bonding, chip-on-board encapsulation, LCD display attachment with heat seal connector.
   - 2.4 Introduction to advanced electronic packaging and assembly process: fine-pitch SMT, BGA, Flip-chip and CSP.
   - 2.5 Soldering quality of BGA assembly and X-ray inspection machine.

3. **TM1610 - Workshop practice for Electronic and Information Engineering**
   - 3.1 Introduction to materials and design of mechanical small parts, chassis and support for electronic products. Hands-on training will focus on the design and fabrication of parts for electronic prototype assembly using available stock material and fastening solution.
   - 3.2 Design and application of sheet metal on electronic chassis and small parts. Make use of basic sheet metal processing tools in machine shop to fabricate prototype parts such as heat sink, chassis or mechanical structure for electronic products. Typical tools include manual shear and press brake, drilling, stamping and application of sheet metal fastening solutions with necessary safety measures.
   - 3.3 Application of engineering plastic stock in the design and fabrication of parts, linkages and structures for electronic product prototype. Hands-on training will focus on the application of tools and processes including laser processing, heat forming and vacuum forming with appropriate joining techniques, fastening and assembly solution.
   - 3.4 Appreciation of mass production processes for metal and plastic parts fabrication.

4. **TM1110 – Microcomputer Application and Practice**
   - 4.1 Introduction to Microchip Microcomputer families and development tools.
   - 4.2 Hands-on practice on memory, I/O, data communications, ADC operations.
   - 4.3 Hands-on practice on LED and LCD displays.
   - 4.4 Hands-on practice on motor control and sensors.
   - 4.5 Application of Microcomputer on consumer electronic products, mechatronics, home automation products, wired and wireless connectivity.

5. **TM1111 – Business Software Applications for EIE**
   - 5.1 Application and practice of Microsoft relational database on Web. Data binding and database creation, indexing, input and output operations.
   - 5.2 Introduction to business computing and logistics; workflow, electronic forms, information acquisition and dissemination on Web.
   - 5.3 XML-based webform development forms and form server using InfoPath & SharePoint.
   - 5.4 Hands-on introduction to Microsoft Office Server for business operation, Sharepoint Designer and applications.
Teaching and Learning Approach:

The teaching and learning methodology included instructor guided practice, demonstration and projects. Students will be exposed to industrial grade training facilities and workshop environment for pragmatic work in different engineering disciplines. Different training activities are arranged for individual module. Training activities are designed with a project centred learning or problem based learning approach so as to motivate learning and enable critical thinking.

Method of Assessment:

Continuous Assessment: 100%

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects</td>
<td>30%</td>
</tr>
<tr>
<td>Tests</td>
<td>30%</td>
</tr>
<tr>
<td>Others (Reports &amp; Logbook)</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Reference Software List:
1. PADS from Mentor Graphics Inc.
2. LabVIEW from National Instrument
3. MPLAB from Microchip Corp.

Reference Books:
Training material, manual and articles published by Industrial Centre.

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects</td>
<td>1,2,3,4,5</td>
<td>The projects are designed to facilitate students to reflect and apply the knowledge periodically throughout the training.</td>
</tr>
<tr>
<td>Tests</td>
<td>1,2,3,4,5</td>
<td>Tests are designed to facilitate students to review the breadth and depth of their understanding on specific topics.</td>
</tr>
<tr>
<td>Others (Reports &amp; Logbook)</td>
<td>1,2,3,4,5,6</td>
<td>Report writing is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Management and Organisation
Subject Code: MM2021
Number of Credits: 3
Hours Assigned: Lectures 28 hours, Tutorials 14 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: Engineering Management (ENG306) or People and Management (MM2191)

Role and Purpose:
This subject contributes to the achievement of the programme outcomes by enabling students with an understanding of management functions, group and individual dynamics within organisations and to apply such concepts to analyse and solve problems in business situations. The subject also provides students with knowledge and skills in leadership, teamwork, and decision making. In addition, it prepares students on how to analyse and resolve ethical issues in various business settings.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

1. explain the nature of managerial work in a variety of forms of organisations, and analyse the impact of the external environments, both domestic and global, on managers’ jobs;
2. explain and analyze the functions of management in organisations, i.e. planning, organising, leading, and controlling;
3. apply the essence of human behaviour in teamwork, leadership, and decision making and evaluate the implications for the management of organisations;
4. analyse and compare the arguments surrounding social responsibility and ethical behaviour in organisations and businesses.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcomes 1, 2 & 12: apply, identify and analyse the functions of management in organisations, i.e. planning, organising, leading, and controlling.
- Programme Outcomes 3 & 8: examine the impact of the external environments, such as economic, environmental, social, political, ethical, health and safety in management field.
- Programme Outcomes 5 & 9: solve and evaluate the practical management problems pertaining to the business environment.
- Programme Outcomes 4, 10 & 11: apply the essence of human behaviour in teamwork and demonstrate self-learning and life-long learning capability with the foundations for life-long learning and continual professional development in management field.
- Programme Outcome 6: understand social responsibility and ethics in business organisations.

Category B: Attributes for all-roundedness
- Programme Outcomes 13 & 14: understand the creative process and exercise leadership in teams.

Indicative Contents:
1. Management Functions
   The major elements of the management functions: planning, organising, leading, and controlling, and their importance for the effective management of business organisations.
2. Planning
3. Organising an Enterprise
Review of a variety of organisational structures and the identification of the conditions under which they are appropriate. Managerial communication and information technology. Staffing and human resource management.

4. Leading
The manager’s role as a leader. Foundations of human behaviour. Leading and motivating employees – individuals and groups.

5. Controlling

6. Social Responsibility and Managerial Ethics
Arguments for and against social responsibility as a business objective. Factors affecting managerial ethics. Approaches to improving ethical behaviour.

Teaching / Learning Approach:
The two-hour weekly lecture will be structured to guide and promote students’ understanding of relevant management and organisation concepts. In addition, there will be one tutorial of one hour per week. The tutorials will adopt a student-centred approach, including case study, in-class exercises, newspaper and professional articles for discussion and team-presentation.

Method of Assessment:
Coursework: 50% Final Examination: 50%

To pass this subject, students are required to obtain Grade D or above in both the Continuous Assessment and Examination components.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
The various methods are designed to ensure that all students taking this subject –

- Read the key chapters of the recommended textbooks and indicative journals in subject outline;
- Demonstrate the basic understanding of management functions which are presented in the lectures;
- Analyse business situations and problems in contemporary business settings;
- Identity teamwork, leadership and decision making process in the business environment;
- Discuss the ethical issues arising from the cases and other questions;
- Participate in in-class exercises, case study, professional articles or discussion question to be presented in the lectures.

Feedback is given to students immediately following the presentations and all students are invited to join this discussion.

Recommended Textbooks:

References:
Indicative Periodicals & Newspapers Readings:
1. Company Annual Reports
2. The Asian Wall Street Journal
3. The Economist
4. South China Morning Post
5. Business Week

Indicative Journal Readings:
1. Academy of Management Journal
2. Academy of Management Review
3. Asia Pacific Journal of Management
4. Journal of Management
5. Journal of Organizational Behaviour
6. Human Relations

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Programme Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3, 8</td>
<td>Fundamental management principles and key concepts of the subject</td>
</tr>
<tr>
<td>Tutorials</td>
<td>4, 7, 11, 14</td>
<td>Adopt a student of centred approach, including case study, in-class exercises, newspaper and professional articles for discussion and team-presentation. Students will involve in discussion and gain a deeper understanding of the lecture material.</td>
</tr>
</tbody>
</table>

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Programme Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Work</td>
<td>1, 2, 3, 8</td>
<td>These can measure the students' understanding of the management theories and concepts</td>
</tr>
<tr>
<td>Group Project</td>
<td>5, 11, 12</td>
<td>Each group of students are required to have an oral presentation, and produce a written report to evaluate their management knowledge and communication skills</td>
</tr>
<tr>
<td>Participation</td>
<td>7, 10, 13, 14</td>
<td>Students need to participate in class activities, and think critically and learn independently</td>
</tr>
</tbody>
</table>
### Subject Description Form

**Subject Title:** Probability and Engineering Statistics  
**Subject Code:** AMA305  
**Number of Credits:** 3  
**Hours Assigned:**  
- Lecture: 28 hours  
- Tutorial: 14 hours  
- Mid-term Test and Examination: 5 hours

**Pre-requisite:** nil  
**Co-requisite:** nil  
**Exclusion:** nil

### Objectives:
The lectures aim to provide the students with an integrated knowledge required for the understanding and application of statistical techniques. To develop students’ ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

### Learning Outcomes:
Upon completion of the subject, students will be able to:

1. apply mathematical reasoning to analyse essential features of different statistical problems in engineering;
2. apply appropriate probabilistic techniques to model and solve problems in engineering;
3. make use of stochastic and Markov processes to solve typical engineering problems;
4. search for useful information and use statistical software in solving statistical problems in the context of engineering.

### Programme Outcomes:

**Category A: Professional/academic knowledge and skills**
- Programme Outcomes 1, 2, 5, 7 and 10.

**Category B Attributes for all-roundedness**
- Programme Outcome 13.

### Syllabus:
1. **Probability Theory**
   Probability and random variables; Probability distributions; Sampling distributions; Sampling means; The Central Limit Theorem; Significance and test of hypothesis.

2. **Stochastic Process**
   Bernoulli process; time averaging and ergodicity; Spectral analysis; Correlation and spectra; Wiener-Khintchine theorem; White noise; Narrow-band noise; thermal noise; Signal-to-noise ratio and probability of error; Effective noise temperature and noise figure.

3. **Markov Process**
   Recursions and Markov chains; Applications to queuing theory; Birth-death process.

### Teaching and Learning Approach:
A two hour mass lecture will be conducted each week to initiate students into the ideas, concepts and techniques of the topics in the syllabus, which is then reinforced by a one hour tutorial designed to consolidate and develop students’ knowledge through discussion and practical problem solving.

### Method of Assessment:
Continuous assessment: 40%  
Examination: 60%

To pass this subject, students are required to obtain grade D or above in both the continuous assessment and the examination components.
Textbooks and Reference Books:

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Assessment</td>
<td>1,2,3,4</td>
<td>Continuous Assessment comprises of assignments, in class quizzes, online quizzes and a mid-term test. A 3-hour examination is held at the end of the semester. Questions used in assignments, quizzes, tests and examinations are used to assess the student's level of understanding of the basic concepts and their ability to use mathematical and statistical techniques in solving problems in science and engineering.</td>
</tr>
<tr>
<td>Examination</td>
<td>1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>
Subject Title: Electronic Circuits

Subject Code: EIE304

Number of Credits: 3

Hours Assigned:
- Lecture/tutorial: 39 hours
- Laboratory: 3 hours
  (Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: Basic Electricity and Electronics I (ENG237)

Co-requisite: nil

Exclusion: nil

Basic Electricity and Electronics II (ENG238)

Objectives:
This is the main foundation subject introducing the working principles and constructions of analog electronic circuits. The specific aim is to familiarize students with the design and operation of analog building blocks (e.g., mirrors, differential stages, output stages), practical operational amplifiers, frequency response of transistor amplifiers, feedback amplifiers and oscillators.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the operations of transistor devices, e.g., BJT and MOSFET
2. Analyze the small-signal characteristics of transistor amplifiers
3. Design basic analog building blocks
4. Understand the operations and limitations of operational amplifiers
5. Analyze frequency responses and design feedback circuits and oscillators

Category B: Attributes for all-roundedness
6. Communicate effectively
7. Think critically and creatively
8. Assimilate new technological development in related field

Programme Outcomes

Category A Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of some of the fundamentals of electronic circuits and the associated technologies and providing opportunities for students to practice the application of the knowledge.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunities for students to solve practical engineering problems pertaining to the field of electronic circuits.

Category B Attributes for all-roundedness
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team, e.g., conducting experiments and report writings.

Syllabus:
1. Analog Building Blocks
   1.1 Simple current mirrors; problem due to Early effect and non-ideality; Wilson and Widlar mirrors; use of mirrors as active loads.
   1.2 Differential amplifier (DA) stage; analysis using half-circuit models, common-mode and differential-mode gains; common-mode rejection ratio (CMRR).
   1.3 Output stages; class A, class B and class AB output stages; efficiency; harmonic distortions.
2. Operation Amplifier Design
   2.1 Typical operational amplifier circuit: input differential stage, CE gain stage, and output stage; details of internal circuit design: active loading, level shift, current sourcing.
   2.2 Non-idealities: dc offset, input bias current (causing offset); finite input impedance, etc.
   2.3 Slew-rate limitation; gain-bandwidth product; stability design; concept of unity-gain feedback; phase margin; design of low-frequency pole and use of Miller effect for internal compensation.

3. Frequency Responses of Transistor Amplifiers
   3.1 Parasitic junction capacitances and their effects on the current gain of transistors.
   3.2 Complete high-frequency model of single-stage common-emitter amplifiers.
   3.3 Derivation of first roll-off frequency (dominant pole) due to Miller effect.

4. Feedback Circuits and Oscillators
   4.1 General feedback configuration; basic amplifier gain, loop gain and closed-loop (overall) gain.
   4.2 Effects of feedback on gain, frequency response, distortion, input and output impedances.
   4.3 Feedback circuit configurations: shunt-series, shunt-shunt, series-shunt and series-series feedback; stability analysis; phase margins and compensation methods; analysis of feedback circuits via two-port models.
   4.4 Oscillation criteria; amplitude limiting and sustained oscillation; Colpitts, Hartley, Wien bridge, phase-shift and crystal oscillators.

Laboratory Experiments:
Each student is required to complete the following three laboratory experiments:

1. Title: Negative Feedback Amplifier
   Objective: To design the feedback network for a given amplifier in order to meet certain specifications.

2. Title: Oscillator
   Objective: To design a Wien-bridge oscillator using an IC amplifier.

3. Title: Characteristics of Operational Amplifier
   Objective: To study the internal operation of an operation amplifier and measure the characteristics of the responses.

Method of Assessment:
Continuous assessment: 40% Examination: 60%

The continuous assessment consists of assignments, lab reports, and a test.

Textbooks:

Reference Books:
### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3, 4, 5</td>
<td>Fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
<tr>
<td>Tutorials</td>
<td>2, 3, 4, 5, 7, 8</td>
<td>Students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>3, 4, 5, 6, 7</td>
<td>Students in groups of 2-3 will conduct practical measurement and evaluate the performance of electronic circuits</td>
</tr>
</tbody>
</table>

### Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>1, 2, 3, 4, 5</td>
<td>Analytical and design problems are used to evaluate students’ ability in applying concepts and skills learnt in the classroom.</td>
</tr>
<tr>
<td>Test and examination</td>
<td>1, 2, 3, 4, 5, 7</td>
<td>Mid-semester test is used to measure the students’ ability to remember facts and figures as well as their comprehension of subject materials; Final exam is used to evaluate students’ ability to think critically and creatively in order to come up with an effective solution for an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 5, 6, 7, 8</td>
<td>Each group of students is required to produce a written report; accuracy and the presentation of the report will be assessed; Assessment of the reports will focus on both technical knowledge and ability to communicate effectively.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Integrated Analogue and Digital Circuits
Subject Code: EIE305
Number of Credits: 3
Hours Assigned: Lecture/tutorial 39 hours Laboratory 3 hours (Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: Basic Electricity and Electronics I (ENG237) Basic Electricity and Electronics II (ENG238) Electronic Circuits (EIE304)
Co-requisite: nil
Exclusion: nil

Objectives:
To develop an in-depth understanding of the design principles and applications of integrated analogue and digital circuits.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. An understanding of the fundamental principles and applications of digital logic circuits.
2. An ability to design periodic signal generators from digital logic circuits.
3. An understanding of filter design principles and circuit technologies.
4. An ability to apply theory and realize analog filter circuits.
5. An understanding of designing digital system with HDL language.
6. An ability to perform logic synthesis using FPGA tools.

Category B: Attributes for all-roundedness
7. An ability to communicate effectively
8. An ability to think critically and creatively
9. An ability to assimilate new technological development in related field

Programme Outcomes:

Category A Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of some of the elements of integrated analogue and digital circuits and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to solve practical engineering problems pertaining to the field of integrated analogue and digital circuits.
- Programme Outcome 7: Communicate effectively to meet the standard required for the electronic and information engineering profession. This subject contributes to the programme outcome through teaching of some of the elements and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 12: This subject contributes to the programme outcome through providing the students with an opportunity to practice computer/IT tools, e.g., Xilinx FPGA, SPICE.

Category B Attributes for all-roundedness
- Programme Outcome 13: Think critically and understand the creative process. This subject contributes to the programme outcome through teaching of some of the elements and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 14: Work in a team collaboratively. This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team.
Syllabus:

1. Digital Circuits
   1.1 Digital logic circuit families: Transistor-transistor logic (TTL), emitter-coupled logic (ECL), and CMOS logic. Input and output characteristics. Fan-in (in CMOS) and fan-out (in TTL). Noise margin. Time delay. Power loss. Switching speed.
   1.3 Memory circuits: RAMs, ROMs and EPROMs.

2. Analog Filter Design
   2.1 Basic filter principles. Filter approximations (e.g., Butterworth, Chebychev, elliptic, Cauer, etc.). Transfer functions for low-pass, band-pass, high-pass, and band-stop filters. Frequency responses (magnitude and phase).
   2.2 Analogue filters: lossless passive realization and active RC realization. Standard first-order filters and biquads.
   2.3 Discrete-time realizations. z-domain functions. Active switched-capacitor realization. Standard first-order filters and biquads.

3. Introduction to HDL Styles Digital Design and Synthesis
   3.1 Basic language structures: data types and modules. Structural and behavioural specifications: basic gates, user-defined primitives, modelling levels, synthesizable operations, continuous assignments. Procedural specifications: blocks, functions and tasks, blocking and non-blocking assignments, control and conditional constructs.
   3.2 Basic design methodology: small module design, module validation, finite state machines. Managing large complexity leading to large designs.
   3.3 Synthesis to FPGA: timing, area and power considerations.

Laboratory Experiments:

1. Design of electronic circuits using Xilinx FPGA tools.
2. Simulation of filter design using SPICE.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

The continuous assessment consists of assignments, quizzes, and two tests.

Textbooks:


Reference Books:

### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<tr>
<th>T&amp;L Method</th>
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<tr>
<td>Lectures</td>
<td>1, 2, 3, 4, 5</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
<tr>
<td>Tutorials</td>
<td>2, 4</td>
<td>students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 6, 7, 8, 9</td>
<td>students in groups of 2-3 will conduct practical measurement and evaluate the performance of electronic circuits</td>
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### Alignment of Assessment and Learning Outcomes:

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<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 3, 5</td>
<td>mainly objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students’ ability to remember facts and figures as well as their comprehension of subject materials</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>2, 4</td>
<td>end-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem</td>
</tr>
<tr>
<td>Laboratory sessions, mini-project</td>
<td>4, 6, 7</td>
<td>each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: IC Technology and Processes  
Subject Code: EIE306  
Number of Credits: 3  
Hours Assigned: Lecture/Tutorial 39 hours, Laboratory 3 hours  
(Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: nil  
Co-requisite: nil  
Exclusion: nil

Objectives:
To enable students to gain basic knowledge and understanding in the following aspects:
1. Fundamentals of semiconductors
2. The operating principles of pn junctions and MOSFETs
3. CMOS processes and basic CMOS logic gates
4. Fabrication processes of semiconductor devices

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamental aspects of the science of semiconductor.
2. Understand the basic physical mechanisms of modern semiconductor devices.
3. Hands-on experience in the fabrication of basic semiconductor devices.

Category B: Attributes for all-roundedness
4. Present ideas and findings effectively.
5. Think critically.
7. Work in a team and collaborate effectively with others.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
• Programme Outcomes 1, 5, and 11: In this subject, students will learn to apply mathematics, science, and engineering knowledge in analyzing the features of, and solving problems in basic semiconductor devices.
• Programmes Outcome 2: Students will conduct experiments for the fabrication of semiconductor devices. They will learn the physical principles behind the fabrication processes and most importantly they will learn the safety pre-caution that must be taken during the fabrication process.
• Programme Outcome 7: Students will learn to communicate effectively in writing by doing homework assignments and writing laboratory reports and log books.

Category B: Attributes for all-roundedness
• Programme Outcome 14: Students are required to work together in a team for the fabrication of the devices. They need to learn to collaborate effectively with their team members.

Syllabus:
1. Semiconductor Fundamentals
   Energy band, extrinsic semiconductor, carrier concentration, mobility, drift and diffusion currents, Einstein Relationship.

2. P-N Junctions
   Energy band diagram, electrostatics of p-n junctions, capacitance, forward and reverse current characteristics, applications in optoelectronics.

3. Bipolar Junction Transistors
Energy band diagram at equilibrium and under bias, current components, dependence of current gain on transistor parameters, Ebers-Moll model, Charge control model.

4. MOS Field-Effect Transistors
   MOS structure, capacitance of MOS system, operation of MOSFETs, oxide and interface charge, derivation of the threshold voltage, I-V characteristics, short channel effects.

Laboratory Experiments:
Fabrication of Semiconductor Device
Session 1: Cleaning of wafers and oxidation and windows opening and doping;
Session 2: Thin film deposition, photolithography, mask alignment, pattern definition and etching; and
Session 3: Device characterization

Method of Assessment:
Continuous assessment: 40% Examination: 60%
The continuous assessment consists of assignments, quizzes, and two tests.

Textbook:

Reference Book:

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, supplemented with interactive questions and answers, and short quizzes</td>
<td>A(1,2) B(7)</td>
<td>In lectures, students are introduced to the knowledge of the subject. Comprehension is strengthened with interactive Q&amp;A and short quizzes. State-of-the-art development of the technology will be discussed whenever possible. Students will be capable of appreciating underlying physical mechanisms of the electronic devices.</td>
</tr>
<tr>
<td>Tutorials where case studies are conducted, and problems are given to students for them to solve</td>
<td>A(1,2) B(4,5)</td>
<td>In tutorials, students apply what they have learnt in analyzing the cases and solving the problems given by the tutor. They will analyze the properties of the devices and their dependencies on the structure of the devices.</td>
</tr>
<tr>
<td>4-5 laboratory exercises, where students will fabricate a electronic/ optoelectronic devices in the micro-fabrication laboratory.</td>
<td>A(3) B(4-7)</td>
<td>1 special lecture on safety issues and fabrication procedures will be given. After that will fabricate a device in the micro-fabrication laboratory. They will learn the practices of a class 1000 clean room. They will be able to operate equipments in a typical fabrication facility such as evaporator, mask aligner ... etc. They will analyze and interpret the data they obtain from the devices fabricated in the laboratory. Each laboratory session will be conducted in small groups to ensure that each student will have hands-on experience on the operation of the equipment.</td>
</tr>
<tr>
<td>Assignment and Homework, solving end-of-chapter problems</td>
<td>A(1,2) B(4,5)</td>
<td>Through working assignment and homework, and end-of-chapter problems in text books, students will develop a firm understanding and comprehension of the knowledge taught. They will analyze given information and apply knowledge in solving problem. For some design type of questions (e.g. designing a simple protocol to guarantee error-free data exchange), they will have to synthesize solutions by evaluating different alternatives.</td>
</tr>
</tbody>
</table>
### Alignment of Assessment and Learning Outcomes:

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<th>Assessment Methods</th>
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<tbody>
<tr>
<td>Assignment/Homework</td>
<td>A(1,2) B(4,5)</td>
<td>Assignment/Homework are given to students to assess their competence level of knowledge and comprehension, ability to analyze given information, ability to apply knowledge and skills in new situation, ability to synthesize structure, and ability to evaluate given data to make judgment. The criteria and level of achievement will be graded and marks will be given accordingly. These will be made known to the students before an assignment/homework is given. Feedback about their performance will be given promptly to students to help them improvement their learning.</td>
</tr>
<tr>
<td>Laboratory works and reports</td>
<td>A(3) B(4)</td>
<td>Students will be required to perform 4-5 laboratory sessions and write an individual laboratory report. The emphasis is on assessing their performance in the laboratory, and their ability to apply, synthesize and evaluate. Expectation and grading criteria will be given.</td>
</tr>
<tr>
<td>Mid-semester test</td>
<td>A(1,2) B(5)</td>
<td>There will be a mid-semester test to evaluate students’ achievement of all the learning outcomes and give feedback to them for prompt improvement. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
<tr>
<td>End-of-semester test and Examination</td>
<td>A(1-3) B(5)</td>
<td>There will be an end-of-semester test and examination to assess students’ achievement of all the learning outcomes. These are mainly summative in nature. Expectation and grading criteria will be given.</td>
</tr>
</tbody>
</table>
**SUBJECT DESCRIPTION FORM**

<table>
<thead>
<tr>
<th>Subject Title:</th>
<th>Computer System Fundamentals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Code:</td>
<td>EIE311</td>
</tr>
<tr>
<td>Number of Credits:</td>
<td>3</td>
</tr>
<tr>
<td>Hours Assigned:</td>
<td>Lecture/Tutorial 39 hours</td>
</tr>
<tr>
<td></td>
<td>Laboratory 3 hours</td>
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<tr>
<td></td>
<td>(Equivalent to 9 hours spent</td>
</tr>
<tr>
<td></td>
<td>by student in laboratory)</td>
</tr>
</tbody>
</table>

Pre-requisite: Logic Design (EIE211)  
Co-requisite: nil  
Exclusion: nil

Objectives:
To provide a broad treatment of the fundamentals of computer systems.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

**Category A: Professional/academic knowledge and skills**
1. Apply knowledge of mathematics, science, and engineering appropriate to a basic computer system.
2. Use computer tools with an understanding of the processes and limitations.
3. Understand the fundamentals of computer systems and associated technologies.

**Category B: Attributes for all-roundedness**
4. Communicate effectively.
5. Work in a team and collaborate effectively with others.

Programme Outcomes:

**Category A Professional/academic knowledge and skills**
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of the fundamentals of a computer system and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome through providing the students with an opportunity to conduct experiments, analyze, and interpret data.
- Programme Outcome 3: This subject contributes to the programme outcome by teaching students function of various components commonly found in a computer system and how they cooperate with each other to make the system function properly.
- Programme Outcome 7: This subject contributes to the programme outcome through presentations and exchange of ideas.

Syllabus:
1. **Microprocessors and Microcomputers**
   The following topics will be discussed in detail with references to one or two well-established (contemporary) microprocessor systems.
   1.1 CPU architecture; memory space and I/O space; instruction fetch and execution; pipelining; essential assembly language instruction types; working principle of assembler; assembler directives/pseudocodes; examples of assembly language programs.
   1.2 Memory interface: Memory devices; address decoding; memory interface; banking; bus buffering and driving; wait state, bus cycle, instruction cycle.
   1.3 Basic I/O Interface: Memory-mapped I/O; I/O port address decoding; programmable peripheral interface; handshaking.
   1.4 Interrupts: polling, programmed I/O, interrupt I/O; Basic interrupt processing, software interrupt, expanding the interrupt structure, interrupt controller.
   1.5 Serial interface: Asynchronous/synchronous interface, RS232C serial interface and handshaking.
   1.6 Direct memory Access and DMA-controlled I/O: Basic DMA operation, DMA controller, shared-bus operation, disk memory systems, video displays.
   1.7 Cache memory: mapping, associativity; replacement policies; write policies; performance.
2. Disk Operating System
   2.1 Roles of basic input/output system (BIOS) and basic disk operating system (DOS); power-up sequence; bootstrap; command processor; system control, automatic program execution (e.g. batch file); operating system calls via software interrupts; system utilities; file operating commands; device driver.
   2.2 File system: space management e.g. file allocation table; File management; directory entry and file control block.
   2.3 Multitasking and time-sharing: time-slicing; process states and process control block; context-switching mechanism; scheduling schemes and process priorities.

3. Computer Arithmetic
   3.1 Data formats: signed/unsigned numbers, binary/decimal/BCD numbers, ASCII, fixed/floating point numbers, IEEE standard; Arithmetic algorithms: Fast addition, multiplication and division algorithms.

Laboratory Experiment:
Five of the following topics or others.
1. Memory manipulation & Data representation
2. Serial communication
3. Parallel communication
4. Interrupt I/O
5. DMA I/O
6. BIOS
7. Device driver
8. Power-up procedures
9. User interface

Method of Assessment:
Continuous Assessment: 40% Examination: 60%
The continuous assessment consists of short quizzes, assignments, laboratory reports and tests.

Textbook:

Reference Books:
Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
<tr>
<td>Tutorials</td>
<td>2, 3, 4, 5</td>
<td>supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>2, 3, 4, 5</td>
<td>students will make use of a x86 assembler and debugger to develop an assembly program; software MATLAB to simulate various OS management techniques and evaluate their performance; and circuit board to study various interfacing techniques and evaluate their efficiency and performance</td>
</tr>
</tbody>
</table>

Alignment of Assessment and Learning Outcomes:

<table>
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<tr>
<th>Assessment Method</th>
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<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 3, 4</td>
<td>objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students’ ability to remember facts and figures as well as their comprehension of subject materials</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>2, 3, 4, 5</td>
<td>end-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>2, 3, 4, 5</td>
<td>each student is required to produce a written report; accuracy and the presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills</td>
</tr>
</tbody>
</table>
**SUBJECT DESCRIPTION FORM**

**Subject Title:** Linear Systems  
**Subject Code:** EIE312  
**Number of Credits:** 3  
**Hours Assigned:** Lecture/Tutorial 36 hours, Laboratory 5 hours (Equivalent to 15 hours spent by student in laboratory)

**Pre-requisite:** For 42070 and 05004 Mathematics I (AMA201)  
**Co-requisite:** nil  
**Exclusion:** nil  
For 11039 Mathematics for Scientists and Engineers (AMA288)

**Objectives:**
1. To provide students with basic concepts and techniques for the modelling and analysis of linear continuous-time and discrete-time signals and systems.
2. To provide students with an analytical foundation for further studies in Communication Engineering and Digital Signal Processing.

**Student Learning Outcomes:**
Upon completion of the subject, students will be able to:

**Category A: Professional/academic knowledge and skills**
1. Understand the representations and classifications of the signals and systems.
2. Understand the modelling of linear systems.
3. Use different techniques to analyze and design systems.
4. Apply software tools to laboratory exercises for experimenting with theories, and to the analysis and design of signals and systems.
5. Appreciate the advantages and disadvantages of using the different representations and modeling approaches.

**Category B: Attributes for all-roundedness**
6. Present ideas and findings effectively.
7. Think critically and learn independently.
8. Work in a team and collaborate effectively with others.

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of linear systems and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to analyze signals and system responses.
- Programme Outcome 3: This subject contributes to the programme outcome through teaching the different ways of analyzing and modelling linear systems.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the fields of signal processing and linear systems.
- Programme Outcome 10: This subject contributes to the programme outcome by providing students with the foundations for life-long learning and continual professional development in the areas of signal processing and linear systems.
- Programme Outcome 11: This subject contributes to the programme outcome through the teaching of software tools for analyzing signals and systems.

**Category B: Attributes for all-roundedness**
- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about the most suitable signal processing techniques for analyzing linear systems.
Syllabus:

1. **Signal Representation**
   - Signal Classification, Continuous and Discrete-Time Signals, Random Signals. Time-Domain and Frequency-Domain Representations.

2. **Continuous-Time and Discrete-Time Systems**

3. **Fourier Representations for Signals**

4. **Laplace Transform**

5. **z-Transform**

6. **Analogue Filters**
   - Ideal Filters, Bode Plots. Filter Design: Butterworth Filters, Chebyshev Filters, Frequency Transformations.

Laboratory Experiments:

1. Fundamentals of Signals
2. Linear Time-Invariant Systems
3. Fourier Analysis of Continuous-time Signals
4. Sampling
5. Fourier Analysis of Discrete-time Signals

Method of Assessment:

Continuous Assessment: 40%  
Examination: 60%

Reference Books:

### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3, 5, 7</td>
<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1, 2, 3, 5, 7</td>
<td>These are supplementary to lectures and are conducted with smaller class sizes; students will be able to clarify concepts and to gain a deeper understanding of the lecture material; problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 6, 7, 8</td>
<td>Students will make use of the software MATLAB and/or LabView to simulate the various theories and visualize the results.</td>
</tr>
</tbody>
</table>

### Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 2, 3, 5</td>
<td>These can measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials.</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>6, 7</td>
<td>End-of-chapter-type problems are used to evaluate the students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 6, 8</td>
<td>Each group of students are required to produce a written report; the accuracy and presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate their technical knowledge and communication skills.</td>
</tr>
</tbody>
</table>
Subject Title: Object-Oriented Design and Programming
Subject Code: EIE320
Number of Credits: 3
Hours Assigned: Lecture/Tutorial 36 hours, Laboratory 6 hours (Equivalent to 18 hours spent by student in laboratory)

Pre-requisite: Computer Programming (ENG236)  
Co-requisite: nil  
Exclusion: nil

Objectives:
This subject will provide students with the principles of object orientation from the perspective of Java implementation and UML. Students are expected to learn the concepts of and practical approaches to object-oriented analysis, design and programming using UML and Java.

Student Learning Outcomes:
On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the principles of object oriented design.
2. Apply Java in object oriented software development.
3. Apply UML in object oriented software modeling.
4. Apply object oriented approach to developing computer software.

Category B: Attributes for all-roundedness
5. Learn independently and be able to search for the information required in solving problems.
6. Present ideas and findings effectively.
7. Think critically.
8. Work in a team and collaborate effectively with others.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of the principles of object oriented design and providing the students with an opportunity to apply knowledge of engineering appropriate to electronic and information engineering.
- Programme Outcome 2: This subject contributes to the programme outcome through designing of object oriented programming applications and providing the students with an opportunity to design and conduct experiments, as well as to analyse and interpret data.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to identify, formulate and solve practical Java programming problems pertaining to the field of object oriented programming.
- Programme Outcome 7: This subject contributes to the programme outcome through presentations and exchange of design ideas to communicate effectively.

Category B: Attributes for all-roundedness
- Programme Outcome 13: This subject contributes to the programme outcome through teaching of the principles of object oriented design and providing the students with an opportunity to understand the creative process.
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to exercise leadership when working in a team.

Syllabus:
1. Introduction to Software Engineering
   Software products; software processes; software process models.
2. **Java Programming Basic**
   Java technologies; Java platform; Java language basic: variables, operators, expressions, statements, blocks, control flow, methods, arrays.

3. **Object-Oriented Programming with Java**
   Objects and classes; class definition; fields, constructors and methods; object interaction; grouping objects; array and collections; designing classes; inheritance and polymorphism; managing inheritance: creating subclasses and super-classes, hiding member variables, overriding methods. Interfaces and packages.

4. **Web Programming with Java**
   Java applets: creating custom applet subclasses, create interactive applets using Java Swing. Java Servlets: architecture of servlets, client interaction, life cycle of servlets, saving client states; servlet communications, session tracking, and using server resources.

5. **Unified Modelling Language (UML)**

**Laboratory Experiment:**

1. **Laboratory Work**
   Students will implement an on-line shopping system using Java Servlets and Tomcat Web server. Students will use a UML software tool to write requirement specifications and design documents for the on-line shopping system.

2. **Practical Work**
   Students will be requested to write and debug Java programs during tutorial and lab sessions.

**Method of Assessment:**

<table>
<thead>
<tr>
<th>Coursework</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>60%</td>
</tr>
</tbody>
</table>

The continuous assessment consists of a number of short quizzes, programming assignments, a mini-project, laboratory reports and a mid-term test.

**Textbooks:**


**Reference Books:**

### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
<tr>
<td>MC Quizzes</td>
<td>1, 2, 3</td>
<td>students’ knowledge on/understanding of certain topics can be easily estimated, and the corresponding teaching time will be adjusted accordingly</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1,2,4,5,6</td>
<td>supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts through developing simple Java programs.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4,5,7</td>
<td>Students will need to design, develop, test, and document Java programs.</td>
</tr>
<tr>
<td>Mini-project</td>
<td>3,4,5,7,8</td>
<td>Students in groups of 2-3 are required to build a 3-tier online shopping software. They will also need to use UML to document their software.</td>
</tr>
</tbody>
</table>

### Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short quizzes</td>
<td>1</td>
<td>Multiple choices and true/false questions will be used to test and enhance students’ understanding about the topics covered in lectures.</td>
</tr>
<tr>
<td>Assignments</td>
<td>2, 3, 4, 5, 7</td>
<td>Students will be asked to write Java programs and test the programs. They will also need to use UML diagram to illustrate the structure of their programs. Students will need to think critically and creatively in order to come up with a good solution for an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions and mini-project</td>
<td>2, 4, 6-8</td>
<td>Each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed; In the mini-project, students will need to work as a team to solve a complex problem. Each of them will be responsible for part of the software.</td>
</tr>
<tr>
<td>Test and Exam</td>
<td>1</td>
<td>End-of-chapter problems will be used to evaluate students’ ability in applying concepts and skills learnt in the classroom.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Interface and Embedded Systems  
Subject Code: EIE322

Number of Credits: 3  
Hours Assigned: Lecture/Tutorial 37 hours  
Laboratory 5 hours  
(Equivalent to 15 hours spent by student in laboratory)

Pre-requisite: Computer System Fundamentals (EIE311)  
Co-requisite: nil  
Exclusion: nil

Objectives:
To provide students with the concepts and techniques in designing embedded software and hardware interfaces.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamental knowledge of embedded systems
2. Apply programming techniques to satisfy functional and response-time requirements of embedded systems
3. Apply circuit and computer knowledge onto product design
4. Develop life-long learning practice through exploring information about embedded systems from WWW.
5. Demonstrate practical skills in the construction of prototypes

Category B: Attributes for all-roundedness
6. Think critically and creatively

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of the fundamentals of embedded systems and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome providing the students with an opportunity to conduct experiments such as applying programming techniques to satisfy functional and response-time requirements of embedded systems
- Programme Outcome 3: This subject contributes to the programme outcome by providing opportunity for students to design a simple embedded system to meet realistic specification.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to formulate and evaluate the performance of different embedded systems.
- Programme Outcome 11: This subject contributes to the programme outcome providing opportunity for students to applying modern development tools for virtual prototyping.

Category B Attributes for all-roundedness
- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically and creatively in conducting experiments.

Syllabus:
1. Embedded System Hardware
   Microcontroller-based, microprocessor-based and PC-based approaches
   The details of a typical microcontroller architecture, e.g. the 8051 or AVR family

2. Programming with Embedded System
   Timers/counters, serial port communications and interrupt handling
3. **I/O Interfacing**  
Introduction to different I/O interfacing techniques such as output-pin driving limitations, current driving, inductive load driving; pulse generation and measurement; keyboard multiplexing, display multiplexing, driving LCD controllers, analog signals sensing, motor control and measurements

4. **System Bus and Memory Interfacing**  
Concepts of system bus  
Interfacing to memory devices

5. **Embedded Software Development and Real-time Operating System (RTOS)**  
Discussion on the embedded software issues including tasks and events, interrupt, inter-task communication and shared-variables problems  
Introduction to RTOS: Kernel services, semaphores, priority inversion, task priority and scheduling

6. **Industrial I/O Standards**  
Timing specifications and arbitration of different industrial I/O standards, e.g. RS485, SPI, i2C, CAN and USB

**Laboratory Experiments:**  
1. Serial I/O and timer-based baud rate generation  
2. Timer-based pulse width measurement  
3. Interrupt handling  
4. Pulse-Width-Modulated pulse generation.

**Method of Assessment:**  
Continuous Assessment: 45%  
Examination: 55%  
The continuous assessment will consist of assignments, tests and laboratory work.

**Reference Books:**  

**Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:**

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3</td>
<td>Fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
</tbody>
</table>
| Tutorials & laboratory sessions | 1, 2, 3, 4, 5, 6 | Some exercises and application examples are given for discussion  
The students will be able to clarify concepts and to have a better understanding of the lecture material  
Students will make use of the software and hardware tools to develop simple prototype of embedded systems |
### Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>1, 2, 3</td>
<td>Enhance the understanding of the materials taught in lectures</td>
</tr>
<tr>
<td>Tests and examination</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>End-of-chapter type problems are used frequently to evaluate students’ ability in applying concepts and skills learned in classes. Students are required to think critically and creatively in order to come with alternate solutions for existing problems.</td>
</tr>
<tr>
<td>Laboratory sessions, mini-project</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>Each student is required to give demonstrations and submit logbook and/or reports. Questions in tests will be closely related to laboratory exercises.</td>
</tr>
</tbody>
</table>
**Subject Description Form**

**Subject Title:** Integrated Project  
**Subject Code:** EIE329  
**Number of Credits:** 3  
**Hours Assigned:**  
- Lecture: 24 hours  
- Laboratory: 36 hours  
- Mini-project Work: 60 hours  
- Total: 120 hours

**Pre-requisite:** Computer Systems Fundamentals (EIE311)  
**Co-requisite:** nil  
**Exclusion:** nil  
Basic Electricity and Electronics II (ENG238)

**Objectives:**

At a mid-stage of the programme, this subject plays the role of applying knowledge acquired in other subjects in an integrated manner. While the emphasis will mainly be placed on the technical challenges that may encompass component evaluation, circuit design, software development and troubleshooting, students will also be given opportunities to face various non-technical difficulties behind the implementation/fabrication of electronic/information products.

**Student Learning Outcomes:**

Upon completion of the subject, students will be able to:

**Category A: Professional/academic knowledge and skills**
1. Integrate and apply knowledge acquired in previous subjects.  
2. Design under cost constraints and with component limitations/tolerances in mind.  
3. Locate and resolve practical problems, in both circuits and software.

**Category B: Attributes for all-rounderdness**
4. Search, self-learn and try untaught solutions.  
5. Exercise discipline and time-planning to meet deadlines.  
6. Present ideas and findings effectively.  
7. Think critically.  
8. Learn independently.  
9. Work in a team, collaborate effectively with others, and exercise leadership.

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**
- Programme Outcome 1: This subject contributes to the programme outcome through requiring students to demonstrate their abilities in applying knowledge in science and engineering.
- Programme Outcome 2: This subject contributes to the programme outcome by requiring students to analyze and measure the performance of a robot system.
- Programme Outcome 3: This subject contributes to the programme outcome through teaching the design and requirements of a robotic system.
- Programme Outcome 5: This subject contributes to the programme outcome by requiring students to solve practical engineering problems.
- Programme Outcome 7: This subject contributes to the programme outcome by providing the opportunity for students to communicate effectively, both verbal and written, to meet the standard required for the electronic and information engineering profession.
- Programme Outcome 10: This subject contributes to the programme outcome by requiring students to self-study technical reference material and to develop a foundation for life-long learning and continual professional development.
- Programme Outcome 11: This subject contributes to the programme outcome through the use of hardware troubleshooting equipment and software development tools for building real systems.
Category B: Attributes for all-roundedness

- Programme Outcome 13: This subject contributes to the programme outcome by providing students with the opportunity to think critically and understand the creative process.
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to exercise leadership in teamwork.

Syllabus / Operation:

The project(s) shall be of engineering development in nature with objectively defined milestones (or Subtasks). The scope to be covered shall include embedded software development and circuit design, but does not exclude the possibilities of extending into areas such as DSP or RF. The project(s) shall not be close-ended in nature and shall provide ample headroom for the more enthusiastic students to excel. Students shall work in groups of two or three. Each Subtask will be given a certain period of time to complete. Each student will take turn in serving as the Team Leader to lead the group in accomplishing a subtask assigned. Progress will be measured by functional Demonstrations, and one or two written Progress Reports. Upon the completion of the project, each group should give a demonstration/presentation of the completed product and submit a Final Report. Students are required to individually keep a Logbook on the work performed during the entire period. The logbooks are to be evaluated and signed by the supervisor/assessor on a monthly basis.

Lectures:

Lectures are to be conducted during the first half of the semester. During these lectures, the instructor shall give clear explanation on the functional and technical requirements, with a schedule for submitting deliverables. Concepts specific to the project(s), which are not yet learnt by the students, are to be covered in these lectures. Concepts behind critical use of tools and equipment shall also be strengthened. Copies of supplementary/reference material shall be distributed, or, links to on-line material shall be provided for self-paced learning.

Guided Laboratory Experiments:

The project will normally require the students to learn to use specific tools and/or equipment. Laboratory demonstrations and exercises will be arranged in the early weeks. Below are some examples:
1. Troubleshooting and measurement techniques using typical equipment.
2. Use of project-specific development tools, software and hardware.
3. Use of specialized equipment for project-specific measurements.

Self-Paced Work:

The class could well be composed of a good mix of students with different timetables. Multiple sessions of laboratory, inevitably some evening slots, will be scheduled to cater for self-paced work in the laboratory, particularly during the second half of the semester.

Method of Assessment:

Continuous assessment: 100%

Throughout the project, the subject lecturer will conduct periodic interview discussions with the student groups. On these occasions, assessment on individual student’s ability and contribution will be conducted, according to the attributes detailed below.

- INSIGHT as evidenced by how well issues are understood and resolved
- DRIVE as evidenced by initiative, diligence and tenacity
- CREATIVITY as evidenced by ingenuity and imagination
- COMMUNICATION as evidenced by an ability to express ideas clearly and succinctly

At the completion of each subtask, one member of a team will be asked to give a demonstration to the assessor. Based on the presentation and response to questions addressed to the members, the assessor shall rate the contribution, achievement, and performance of each member.
Below is a recommended assessment scheme:

<table>
<thead>
<tr>
<th>Assessment type</th>
<th>Weighting</th>
<th>Number of times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>5 %</td>
<td></td>
</tr>
<tr>
<td>Quiz/Test</td>
<td>20 %</td>
<td>≥ 2</td>
</tr>
<tr>
<td>Logbook</td>
<td>10 %</td>
<td>≥ 2</td>
</tr>
<tr>
<td>Report</td>
<td>10 %</td>
<td>1</td>
</tr>
<tr>
<td>Progress Demonstrations</td>
<td>25 %</td>
<td>≥ 2</td>
</tr>
<tr>
<td>Final Demonstration</td>
<td>30 %</td>
<td>1</td>
</tr>
</tbody>
</table>

Reference Books:
To be specified by the subject lecturer for each project.

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 7.</td>
<td>Principles and key concepts of the experimental skeletal robot platform are explained to students. The performance goals are specified. The various problems to be encountered are explained. Usage of tools are demonstrated.</td>
</tr>
<tr>
<td>Supervised Laboratory sessions</td>
<td>1, 2, 3, 5, 7, 9.</td>
<td>Students will work in teams of two to construct a robot from mechanical and electronic components. They will need to modify the mechanical design and expand the circuitry to accommodate extra sensing/actuation functionalities. Students will also need to learn the use of cross compilers and firmware-programming devices to construct or improve the embedded program in the robot.</td>
</tr>
<tr>
<td>Extended self-paced laboratory work</td>
<td>1, 2, 3, 5, 7, 8, 9.</td>
<td>Same as above.</td>
</tr>
</tbody>
</table>

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes/tests</td>
<td>1, 2, 4, 6, 7, 8.</td>
<td>Written tests/quizzes are conducted to measure the students’ understanding of the theories and concepts as well as self-studies of specified reference materials.</td>
</tr>
<tr>
<td>Progress and Final Demonstrations</td>
<td>2, 3, 5, 6, 7, 9.</td>
<td>Delivered functionalities/performance are assessed to measure how well students can think critically and creatively in coming up with specific solution(s). Oral examination on the approach taken will be conducted for each group member to evaluate his/her individual contribution, technical knowledge, creativity, communication skills and leadership.</td>
</tr>
<tr>
<td>Logbook &amp; Report</td>
<td>2, 3, 4, 5, 6, 7, 9.</td>
<td>Each group of students is required to produce a written report in which the clarity of communication, technical competence and presentation of ideas will be assessed. Individual logbooks are assessed to differentiate individual’s contributions and the quality of records on the conducted experimental work.</td>
</tr>
</tbody>
</table>
Objectives:

Telecommunication plays an important role in modern societies that rely heavily on a knowledge economy. Telecommunication systems enable the transfer and exchange of information over communication channels that are corrupted by disturbances and noises in a cost-effective manner. The major objectives of this subject are for the students to establish a firm foundation for the understanding of telecommunication systems, and the relationship among various technical and socio-economic factors when such systems are designed and operated.

Student Learning Outcomes:

Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Identify various elements, processes, and parameters in telecommunication systems, and describe their functions, effects, and interrelationship.
2. Analyze, measure, and evaluate the performance of a telecommunication system against given criteria.
3. Design typical telecommunication systems that consist of basic and essential building blocks.

Category B: Attributes for all-rounderedness
4. Communicate effectively.
5. Think critically and creatively.
6. Work in a team collaboratively.
7. Assimilate new technological development in related field.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcomes 1, 5, and 11: In this subject, the students will learn how to apply mathematics, science and engineering knowledge in analyzing the features of, and solving problems for communication systems. They will also learn how the relationship between various conflicting factors (power, bandwidth, signal-to-noise ratio, costs) that when solving problems for communication systems.
- Programme Outcomes 2 and 3: In this subject, the students will learn how to setup and conduct experiments for the study of communication systems. They will design simple communication systems with basic building blocks (filter, limiter, mixer, local oscillator, and pre-emphasis circuit ...etc.). In laboratory sessions, they will implement their design, take measurement data, relate the performance to theory, and draw conclusion. They will be aware of the need of creativity in the process of design and solving problems.
- Programme Outcome 7: The students will learn how to communicate effectively in writing by doing homework and assignments, writing laboratory reports, and writing laboratory log books.
- Programme Outcome 12: In this subject, the students will learn how to make use of appropriate IT tools to analyze, visualize, and present features about communication systems.
Category B: Attributes for all-roundedness
- Programme Outcome 13: In this subject, the students will be aware of the need of creativity in the process of design basic telecommunication systems.

Syllabus:

1. Introduction
   1.1 Introduction to telecommunication systems, their past and present development; elements of a basic communication system; examples of practical telecommunication systems.

2. Analog Communications
   2.1 Amplitude Modulation (AM): double sideband, double sideband with suppressed carrier, single sideband, vestigial sideband modulation; frequency spectrum and power of the AM signal
   2.2 Demodulation of AM signals: envelope detector, coherent detector
   2.3 Radio receiver design: Tuned Radio Frequency (TRF) receiver and superheterodyne receiver.
   2.4 Angle modulation: phase modulation (PM) and frequency modulation (PM), frequency spectrum of the PM and FM signals, Stereo FM.
   2.5 Demodulation of angle modulation signals: discriminator, Phase-Locked Loop (PLL) detector.

3. Noise in Analog Modulation
   3.1 Random variables, white noise, bandpass noise
   3.2 Effect of noise on AM and FM systems, figure of merit
   3.3 Signal-to-noise ratio (S/N) and its improvement through pre-emphasis/de-emphasis in FM systems

4. Analog pulse Modulation
   4.1 Sampling of analog signals and the sampling theorem; pulse amplitude modulation
   4.2 Quantizing and coding, quantization noise, uniform and non-uniform quantization
   4.3 Pulse code modulation (PCM), differential PCM, delta modulation
   4.4 Time division multiplexing: concept of framing and synchronization, TDM-PCM telephone system, comparison of TDM and FDM.

5. Information Theory
   5.1 Measure of information and entropy.
   5.2 Conditional, joint and mutual information. Channel capacity.

Laboratory Experiment:

Mini Projects
1. Design and implementation of an Amplitude Modulator with a linear multiplier IC; AM generation and coherent demodulation (two 3-hour sessions).
2. Design and implementation of Stereo FM signal generator; generation of standard stereo FM signals, and reception of FM signals with a commercial FM radio receiver (four 3-hour sessions).

Method of Assessment:
Continuous assessment: 40% Examination: 60%

Recommended Textbook:

Reference Books:
### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, supplemented with interactive questions and short quizzes</td>
<td>1,2,3,5,7</td>
<td>In lectures, students are introduced to the <em>knowledge</em> of the telecommunication field; <em>comprehension</em> of the knowledge is strengthened with interactive Q&amp;A and short quizzes. The students will be able to <em>define</em> and <em>describe</em> key terms and concepts about telecommunication. They will also be able to <em>explain</em> and <em>generalize</em> knowledge about telecommunication (e.g. different modulation techniques and their performance, difference between analog and digital modulation techniques)</td>
</tr>
<tr>
<td>Tutorials where case studies are conducted, and problems are given to students for them to solve</td>
<td>1,2,3,4,5,7</td>
<td>In tutorials, students <em>apply</em> what they have learnt in analyzing cases (e.g. superheterodyne receiver structure) and solving problems (e.g. calculating the channel capacity of a given channel). They will <em>analyze</em> the given information, <em>compare</em> and <em>contrast</em> different scenarios and propose solutions or alternatives.</td>
</tr>
<tr>
<td>Laboratories, where students will design and implement an AM modulator and a stereo FM signal generator</td>
<td>2,3,4,5,6</td>
<td>By performing hands-on authentic tasks, the students will be able to <em>synthesize</em> a structure of knowledge by <em>designing</em> a solution to a communication problem (in this case, an AM modulator). They will <em>relate</em> the observation to theories and principles. They will also <em>evaluate</em> outcomes of the tasks they perform and <em>interpret</em> the data they gather (e.g. the interleaved waveform of stereo FM signal).</td>
</tr>
<tr>
<td>Assignment/homework, online quizzes, tests, end-of-chapter problems</td>
<td>1,2,3,4,5,7</td>
<td>Through working assignment and homework, online quizzes, and end-of-chapter problems in text books, students will develop a firm understanding and <em>comprehension</em> of the <em>knowledge</em> taught. They will <em>analyze</em> given information and <em>apply</em> knowledge in solving problems. For some design type of questions (e.g. design a communication link with a given S/N ratio), they will have to <em>synthesize</em> solutions by <em>evaluating</em> different alternatives.</td>
</tr>
</tbody>
</table>
Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Learning Outcome</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment/Homework, tests, examinations</td>
<td>1-5, 7</td>
<td>Assignment/Homework, tests, and examinations are given to students to assess their competence level of <em>knowledge</em> and <em>comprehension</em>, ability to <em>analyze</em> given information, ability to <em>apply</em> knowledge and skills in new situation, ability to <em>synthesize</em> structure, and ability to evaluate given data to make judgment. The criteria (i.e. <em>what</em>) to be demonstrated) and level (i.e. the <em>extent</em>) of achievement will be graded according to six levels: Excellent (A+ and A), Good (B+ and B), Satisfactory (C+ and C), Marginal (D) and Failure (F). These will be made known to the students before an assignment/homework is given. Feedback about their performance will be given promptly to students to help them improvement their learning.</td>
</tr>
<tr>
<td>Laboratory works and reports</td>
<td>2,3,4,5,6</td>
<td>Students are required to perform some laboratory works (e.g. design an AM modulator and a stereo FM signal generator) in six laboratory sessions. The emphasis is on assessing their ability to <em>apply</em> knowledge and skills learned in <em>designing</em>, <em>synthesizing</em> and <em>evaluating</em>, ability in working with other people, and ability to take data and relate the measurement results to theory. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

**Subject Title:** Data and Computer Communications  
**Subject Code:** EIE333

**Number of Credits:** 3  
**Hours Assigned:** Lecture/Tutorial 36 hours, Laboratory 6 hours  
(Equivalent to 18 hours spent by student in laboratory)

**Pre-requisite:** Communication Fundamentals (EIE331)  
**Co-requisite:** nil

**Exclusion:** Data and Computer Communications (EIE442)

**Objectives:**
1. To provide a solid foundation to the students about architectural concepts of data communications and computer networking
2. To enable the students to master the knowledge about data communications and computer networking in the context of real-life applications
3. To prepare the students for understanding, evaluating critically, and assimilating new knowledge and emerging technology about computer networks
4. To enable the students to understand the impact of new computer and communication technology on human society

**Student Learning Outcomes:**
Upon completion of the subject, students will be able to:

**Category A: Professional/academic knowledge and skills**
1. Describe the services, functions, and inter-relation ship of different components with an architectural model such as Open System Interconnection (OSI) seven layer model and TCP/IP model.
2. Describe how components and subsystems in the physical layer, data link layer, and network layer inter-operate and analyze their performance.
3. Evaluate critically the performance of some common computer communication.
4. Design solutions to solve engineering problems that require the applications of computer communication technology.
5. Appreciate the principles and operations of various digital transmission systems and Local Area Networks.
6. Take up new knowledge by reading related magazines, journal papers, and trade brochures, and by analyzing new situations while taking into account various constraints.
7. Describe how rapid progress of computer and communication technology can impact on the society in various aspects, such as culture and economics.

**Category B: Attributes for all-roundedness**
8. Present ideas and findings effectively.
9. Think critically.
10. Learn independently.

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of data and computer communications and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to understanding of networking and internetworking concepts.
- Programme Outcome 3: This subject contributes to the programme outcome through teaching the different ways of analyzing in data and computer communications.
- Programme Outcome 5, 9: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the fields of data and computer communications and to stay abreast of contemporary issues.
Category B: Attributes for all-roundedness
• Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about the most suitable analysis techniques for analyzing digital transmission systems.

Syllabus:
1. Computer Networks, Services, and Layered Architectures

2. Digital Transmission
   Baseband data transmission and line coding. Digital modulation and its applications in modems. Transmission impairments, data rate limit, error detection and correction.

3. Protocols in Data Link Layer
   Automatic Repeat Request (ARQ) protocol and reliable data transfer service. Sliding-window flow control. Framing and point-to-point protocol, flow control and error controls.

4. Local Area Networks
   Media Access Control (MAC) protocols: the IEEE802.3 and IEEE802.11 standards. Interconnection of LANs: bridge, switch, and virtual LAN

5. Packet Switching Technology

6. TCP/IP Protocols
   IP packet format, addressing, subnetting, and IP routing. TCP protocol: connection management and congestion control. Dynamic Host Configuration, Network Address Translation.

7. Case Studies (conducted in tutorial sessions)
   Recent development in data communications and computer networking
   Selected topics: Voice over IP, Virtual Private Network, Internet 2, high speed router design, etc.

Laboratory Experiments:
1. Digital transmission
2. Error detection/correction
3. Protocol analysis
4. Routing simulation study

Method of Assessment:
Continuous Assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignments, laboratory reports, case study reports (administered in tutorial sessions), and two tests.

Textbook:
Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3, 4, 5, 9</td>
<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1, 2, 3, 4, 5, 6, 7, 9, 10</td>
<td>Supplementary to lectures and are conducted with smaller class size; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>8, 9, 10</td>
<td>Students will conduct practical exercises to reinforce concepts and techniques learned.</td>
</tr>
</tbody>
</table>

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
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</thead>
<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 2, 3, 5</td>
<td>Mainly objective tests conducted to measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials.</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>4, 6, 7, 8, 9, 10</td>
<td>End-of-chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom; Students need to think critically and creatively in order to come with an alternate solution for an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>8, 10</td>
<td>Each group of students are required to produce a written report; Accuracy and the presentation of the report will be assessed; Oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Applied Electromagnetics
Subject Code: EIE338
Number of Credits: 3
Hours Assigned: Lecture/tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
1. To introduce to students the physical laws that govern the electromagnetic phenomena commonly encountered in electrical engineering systems.
2. To familiarise students with the techniques for solving problems in Electromagnetics.
3. To introduce to students the applications of electromagnetics

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional / academic knowledge and skills
1. Apply mathematical techniques to formulate the fundamental field equations and to analyse electromagnetic phenomena related to electronic engineering.
2. Select the most appropriate laws/theorems/solution techniques for electromagnetic field analysis.
3. Apply electromagnetic theory to the design of practical electromagnetic devices and components.

Category B: Attributes for all-roundedness
4. Solve problems by using systematic approaches.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of electromagnetics and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 3: This subject contributes to the programme outcome through participating in the mini-project.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical problems pertaining to the fields of electromangetics.

Category B: Attributes for all-roundedness
- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about the most suitable way to solve electromagnetic problems.

Syllabus:
1. Mathematical Preliminaries
   Vectors, vector and scalar product. The operators, grad, div and curl. Concept of line, surface and volume integrals. Stokes's and divergence theorems.

2. Static fields
   Electrostatics: electric fields, Coulomb's law, Gauss's law, potential, capacitance and energy storage. Magnetostatics: Biot-Savart law, magnetic fields, Ampere's circuitual law, force on a current-carrying conductor, Lorentz force and energy storage.

3. Time-varying Fields
   Faraday's Law and Lenz's Law; self-inductance, mutual inductance and stored energy.
4. **Maxwell's Equations and electromagnetic waves**
   Fraraday’s Law, the displacement current, Maxwell’s equations. The wave equation, plane polarized wave, velocity of propagation and energy flows.

5. **Applications of electromagnetics**
   Antennas: antenna radiation characteristics, effective area of a receiving antenna, Friis transmission formula; Transmission lines: transmission-line equations, wave propagation on a terminated transmission line, the Smith chart.

**Laboratory / Mini-project:**
A number of hardware, software (use Matlab) or research mini-projects will be offered to the students. The students are ideally worked in pairs and have to select one of them. The total time allocated for the project is 18 hours.

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**Method of Assessment:**

Continuous Assessment: 40%  Examination: 60%

The continuous assessment will consist of assignments, tests and mini-project.

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**Textbook:**

**References:**

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**Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:**

<table>
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<tr>
<th>T&amp;L Method</th>
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<tbody>
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<td>Lectures</td>
<td>1, 2, 4</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
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<tr>
<td>Tutorials</td>
<td>1, 2, 4</td>
<td>supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>3</td>
<td>students in groups of 3-4 are required to build a high frequency component.</td>
</tr>
<tr>
<td>Mini-project</td>
<td>3</td>
<td>students will form groups of 3-4. Each group is required to perform a detailed study on one of the current applications of electromagnetics.</td>
</tr>
</tbody>
</table>
**Alignment of Assessment and Learning Outcomes:**

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<tr>
<td>Short quizzes</td>
<td>1, 2, 3, 5</td>
<td>These can measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials.</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>4, 5, 6</td>
<td>End-of-chapter-type problems are used to evaluate the students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 5, 6</td>
<td>Each group of students are required to produce a written report; the accuracy and presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate their technical knowledge and communication skills.</td>
</tr>
</tbody>
</table>
Subject Title: English for Effective Workplace Communication

Subject Code: ELC3508

Number of Credits: 2

Hours Assigned: 28 hours

Pre-requisite: University English I (ELC2501)

University English II (ELC2502)

Co-requisite: nil

Exclusion: nil

Objectives:

This subject aims to develop the English language skills required by students to communicate effectively in their future professional careers.

Learning Outcomes:

By the end of the subject, students should be able to communicate effectively in workplace contexts through

1. interacting professionally in a job interview;
2. writing appropriate correspondence related to engineering professions; and
3. writing logical and coherent reports.

To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, present ideas systematically and logically, and provide support for stance and opinion.

Content:

This content is indicative. The balance of the components, and the corresponding weighting, will be based on the specific needs of the students.

1. Job interviews and work-related discussions
   Practising the specific verbal and non-verbal skills required when communicating with potential employers in job-seeking interviews.

2. Workplace correspondence
   Selecting and using relevant content; organising ideas and information; maintaining appropriate tone, distance and level of formality; achieving coherence and cohesion; adopting an appropriate style, format, structure and layout.

3. Workplace reports
   Selecting and using relevant content; organising ideas and information; describing tables and graphs; discussing and analysing data; adopting an appropriate style, format, structure and layout.

4. Language appropriacy
   Using context-sensitive language in spoken and written English.

5. Language development
   Improving and extending relevant features of grammar, vocabulary and pronunciation.

Teaching and Learning Approach:

The subject is designed to introduce students to the communication skills, both oral and written, that they may need to function effectively in their future professions.

The study method is primarily seminar-based. Activities include teacher input as well as individual and group work involving drafting and evaluating texts, mini-presentations, discussions and simulations. Students will be referred to information on the Internet and the ELC’s Centre for Independent Language Learning.
Learning materials developed by the English Language Centre are used throughout this course. Additional reference materials will be recommended as required.

**Method of Assessment:**

Continuous Assessment: 100%

Students' oral and writing skills are evaluated through assessment tasks related to the learning outcomes. Students are assessed on the accuracy and the appropriacy of the language used in fulfilling the assessment tasks, as well as the selection and organisation of ideas.

**Indicative references:**

SUBJECT DESCRIPTION FORM

Subject Title: Engineering Management
Subject Code: ENG306
Number of Credits: 3
Hours Assigned: Lecture/Tutorial 42 hours

Pre-requisite: nil
Co-requisite: nil
Exclusion: Management and Organisation (MM2021)

Objectives:
This subject will provide students with:
1. The skills and techniques involved in management of people and engineering activities in the production of goods and services.
2. The skills in the use and understanding of different quality management tools and techniques in an organisation, hence enable students to interpret the quality work content of typical jobs.
3. The background to understand ethical and business behaviours in engineering organizations, and the change management techniques.

Student Learning Outcomes:

Category A: Professional/academic knowledge and skills
Category B: Attributes for all-roundedness

1. The ability to analyse the organisation structure, and identify the importance of planning and strategic management on the success of organizations in both manufacturing, and service sectors. (Objective 1 and Syllabus Item 1). Category A
2. The ability to apply appropriate management techniques to improve organization structure and procedures, and quality management. (Objective 2 and Syllabus Item 2). Category A
3. The ability to apply appropriate project management techniques to analyze project activities. (Objective 1 and Syllabus Item 3). Category A
4. The ability to analyse factors affecting the changes in the work environment; and to control and manage the change activities. (Objective 3 and Syllabus Item 4). Categories A & B
5. The ability to recognise the environmental factors that affect on operations of engineering organizations in Hong Kong, and the ethical issues in business environment. (Objective 3 and Syllabus Item 5). Categories A & B

Syllabus:

1. Introduction.
   General management concepts in organizations; functions & types of industrial organizations, structure, corporate objectives, strategy and policy
2. Industrial Management
   Roles of managers. Process of management, planning, organising, motivating, leading and controlling of social and engineering activities. Quality management and tools
3. Project Management
   Project scope and objectives, network analysis. Tools that support engineering operations and scheduling.
4. Management of Change
   Strategic leadership and innovation, organizational change, leading planned change, organisation development, stress and stress management. Factors that affect the execution of changes.
5. Effects of Environmental Factors
   The effects of environmental factors on the operations of engineering organizations in Hong Kong, e.g. corporate social responsibilities.

Teaching and Learning Approach:
A mixture of lectures, tutorial exercises, and case studies will be used to deliver the various topics in this subject. Some of which will be covered in a problem-based format where this enhances the learning
objectives. Others will be covered through directed study in order to enhance the students’ ability of “learning to learn”. Some case studies, largely based on real experience will be used to integrate these topics and thus demonstrate to students how the various techniques are inter-related and how they apply in real life situations.

**Method of Assessment:**

| Coursework: 40% | Examination: 60% |

Coursework comprises assignments with individual and group components; and team work is an essential element in the coursework assessment. All assessment components will require students to apply what they have learnt to realistic work applications.

**Reference Books:**

SUBJECT DESCRIPTION FORM

Subject Title: Society and the Engineer
Subject Code: ENG307
Number of Credits: 3
Hours Assigned: Lecture/Case Study/Seminar 42 hours

Pre-requisite: nil  Co-requisite: nil  Exclusion: nil

Objectives:
This subject is designed for engineering students as a complementary subject about the role of the professional engineer in practice and their responsibilities towards the profession, colleagues, employers, clients and the public. The objectives of the subject are to enable students to:

1. appreciate the historical context of modern technology and the nature of the process whereby technology develops;
2. understand the social, political, economic responsibility and accountability of a profession in engineering and the organizational activities of professional engineering institutions;
3. appreciate the relationship between technology and environment and the implied social costs and benefits;
4. be aware of the short-term and long-term effects on the use of technology relating to safety, health and welfare aspects;
5. observe the professional conduct, the legal and more constraints relating to various engineering aspects.

In class, there will be short lectures to provide essential knowledge and information on the relationship between society and the engineer under a range of dimensions. There will be discussions, case studies, seminars to engage student’s in-depth analysis of the relationship.

Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Describe different types of intellectual protection and evaluate impacts of modern technology on education, business and societal development [1,5].
2. Explain the importance of professional conduct and responsibilities in various engineering activities [2,5].
3. Identify the effects on the use of technology relating to health and safety, environment and welfare of the public in real life cases [3,4].
4. Interpret the academic, training and professional experience requirement of local and overseas of professional engineering institutions. [2]

Category B: Attributes for all-roundedness
5. Discuss, in a team setting, the social problems related to engineers and present the findings. [2, 3, 4,5].

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme outcome 3: Design a system, component or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
- Programme outcome 5: Identify, formulate and solve engineering problems.
- Programme outcome 6: Understand professional and ethical responsibility.
- Programme outcome 7: Communicate effectively.
- Programme outcome 8: Understand the impact of engineering solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public.

Category B: Attributes for all-roundedness
- Programme outcome 14: Exercise leadership when working in a team.
Syllabus:
2. Environmental protection and related issues. Role of the engineer in energy conservation, ecological balance and sustainable development.
3. The outlook of Hong Kong’s industry, its supporting organizations and impact on development from the China Markets.
5. The Professional Institutions: both local and overseas. Training of engineers.
6. Professional ethics, bribery and corruption including the work of the ICAC. Social responsibilities of engineers.
7. Intellectual property right such as patents and copyright protection. Contract law for engineers.

Method of Assessment:
Continuous Assessment: 60% Examination: 40%

Students will form into groups and throughout the course, students will work on engineering cases by completing the following learning activities:
1. Case analysis;
2. Presentation;
3. Case portfolio; and
4. Final presentation.

Reference books:

Reading material:
Engineering journals:
- Engineers by The Hong Kong Institution of Engineers
- Engineering and Technology by The Institution of Engineers and Technology
Magazines:
- Times
- Far East Economics
Current newspaper:
- South China Morning Post
- China Daily
- Ming Pao Daily

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<tr>
<th>T&amp;L Method</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>1,2,3,4</td>
<td>Lectures are to intended to illustrate how, in considering large engineering projects, many different aspects have to be weighted. These include professional, social, historical, political, economic, legal, environmental, and health.</td>
</tr>
</tbody>
</table>
### Alignment of Assessment with Learning Outcomes:

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<tr>
<td>Presentation</td>
<td>2,3,4,5</td>
<td>Each student, in a team of 4 or 5, has to present their chosen topic based on one of the ‘Aspects’. Towards the end of the semester, he has to present it by considering many more aspects of the project.</td>
</tr>
<tr>
<td>Feedback on Presentation</td>
<td>2,3,4,5</td>
<td>Students have to write down critical comments on the other teams’ presentation and give their own view or counter-proposals on the solutions. The short reports on the other teams’ understanding of their chosen topic is very useful in achieving the learning outcomes.</td>
</tr>
<tr>
<td>Exam</td>
<td>1,2,3,4</td>
<td>This open-book exam is meant to test the students overall ability to tackle engineering problems.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Introduction Centre Training II for EIE  
Subject Code: IC367

Number of Credits: 4 training credits  
Hours Assigned:  
Class Contact 120 hours  
Other Student Study Effort 60 Hours

Pre-requisite: Student who have completed more than two level-2 subjects in EIE areas including electronics, data communications, computing, logic design, electronic instrumentation or equivalent.

Co-requisite: nil  
Exclusion: nil

Objectives:
The objective of this course is to nurture and develop practical skills and technical competence for students to practice in electronic & information engineering.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

1. start and manage EIE projects includes; planning, specification, market study, costing and working prototype fabrication from raw material or basic components;
2. attain technical competence in the design, construction, testing and commissioning of projects in EIE;
3. design presentations in EIE projects in varies stages for communication, control and commissioning;
4. apply teamwork skills in a product development team proactively and professionally.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcomes 1, 2, 3, 4, 5, 8, 9, 11,12: This subject contributes to the programme outcome through practical training on the professional practice in the design, development, fabrication, test and troubleshooting of electronic or information equipment or products under an international recognized professional engineer training centre.
- Programme Outcomes 1, 3, 5, 8: This subject contributes to the programme outcome through practical project training. Students will learn to apply knowledge in engineering studies and that from previous training to execute a design project from scratch. Consultation and supervision will be kept at a minimum level so as to enable the development of students’ ability to identify, formulate and solve engineering problems. Students will aware industrial safety, environmental and sustainability issues in the design project through reflections and report.
- Programme Outcome 4: This subject contributes to the programme outcome through design realization in multidisciplinary workshops.
- Programme Outcome 6: This subject contributes to the programme outcome through induction and practice in Industrial Centre. Student will practice the protocol and experience discipline as demanded in a workshop context with the importance of training, responsibility and ethics for a professional engineer.
- Programme Outcome 7: This subject contributes to the programme outcome through training in groups, discussions, report and logbook writing. Students will be required to present ideas and project for an audience and on Web.
- Programme Outcome 10: This subject contributes to the programme outcome through induction and practical training. Minimal supervision environment on design project should bring up the awareness and cognition in self-learning and life-long learning as demanded for a professional career.
- Programme Outcomes 11,12: This subject contributes to the programme outcome through practical design project. Students must use the techniques, skills and tools in electronic and information engineering to achieve the objectives and solve design problem for the delivery.

Category B: Attributes for all-roundedness
- Programme Outcome 13: This subject contributes to the programme through practical training. In
training tasks, student will perform practical tasks on creative design and process with realistic constraint and work through its implementation.

- Programme Outcome 14: This subject contributes to the programme outcome through practical project in student groups. Students must exercise team work skills to demonstrate leadership ability, critical thinking ability and creativity through working with each other to complete the project.

Syllabus:

1. **TM1103 – Integrated Training in Electronic & Information Engineering (4 weeks)**
   1.1 The technical complexity of projects typically involves commercially available parts in the area of consumer electronics, communication electronics, power electronics and mechatronics. Student will begin their design from industrial application notes for devices or reference circuits where applicable.
   1.2 The project approach of Integrated Training II provides an arena for students to develop their personal ability and attitude in teamwork and leadership in real world industrial environment. Projects are structured so that student can bring their training, knowledge, creativity and experience together and consolidate them into one coherent activity.
   1.3 The scope of the projects may include software and hardware design, planning, costing, parts manufacture, printed circuit board (PCB) and chassis assembly, testing, documentation, evaluation and presentation. Components such as embedded system, sensors, drivers, actuators, ADC/DAC, filters, signal processors and transceivers may be deployed in the area of consumer electronics, communication electronics, mechatronics, power & control electronics and information technology.
   1.4 The project simulates a project team or a young company being assigned the task to design and manufacture electronic or IT product for a client. The team has to conduct a market research to come up with an appropriate design and marketing strategy. At the end of the training period, the team has to create a Web site and present their achievement, manufacturing plan and business plan of this product. In the course of the project, the group has to complete necessary project documentation including test data sheet, operation & maintenance manual and submit technical report.

Teaching and Learning Approach:

The teaching and learning methodology takes the form of technical projects with typically 3 to 6 students in a team working in the Industrial Centre for a minimum of 4 weeks.

Method of Assessment:

Continuous Assessment: 100%

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prototype Construction</td>
<td>40%</td>
</tr>
<tr>
<td>Project Demonstration</td>
<td>20%</td>
</tr>
<tr>
<td>Report &amp; Presentation</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

Reference Books:

1. Training material, manual and articles published by Industrial Centre.
2. Relevant application notes and data sheets from manufacturers.

Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prototype Construction</td>
<td>1,2,3,4</td>
<td>-</td>
</tr>
<tr>
<td>Project Demonstration</td>
<td>1,2,3,4</td>
<td>-</td>
</tr>
<tr>
<td>Report &amp; Presentation</td>
<td>1,2,3,4</td>
<td>-</td>
</tr>
</tbody>
</table>
OBJECTIVE:

To enable students to gain knowledge and understanding in the following aspects:

1. Fundamentals of VLSI circuits and systems based on silicon.
2. Awareness of the different facets of VLSI design using CAD tools.
3. Hands-on experience on VLSI design.

STUDENT LEARNING OUTCOMES:

Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the fundamentals of CMOS VLSI and associated technologies.
2. Solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.
3. Acquire hands-on skills of using CAD tools in VLSI design.
4. Appreciate the design process in VLSI through a mini-project on the design of a CMOS sub-system.

Category B: Attributes for all-roundedness

5. Communicate effectively.
6. Think critically and creatively.
7. Assimilate new technological and development in related field.

PROGRAMME OUTCOMES:

Category A: Professional/academic knowledge and skills

- Programme Outcome 1: This subject contributes to the programme outcome through teaching of the fundamentals of VLSI technologies and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome through designing of a CMOS sub-system and providing the students with an opportunity to conduct experiments, analyze, and interpret data.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to solve practical engineering problems pertaining to the field of VLSI designs.
- Programme Outcome 7: This subject contributes to the programme outcome through presentations and exchange of design ideas.

Category B: Attributes for all-roundedness

- Programme Outcome 13: This subject contributes to the programme outcome through teaching of key elements in VLSI design processes and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team.
Syllabus:

1. Overview of VLSI Design
   VLSI design methodology; functional, logic and physical design; gate arrays and standard cells, programmable logic devices; system-on-chip.

2. CMOS Fabrication and Layout
   Fabrication processes in CMOS VLSI; latch-up; characteristics of devices in VLSI; mask layout techniques and design rules.

3. CMOS Logic Circuits
   Transmission gates; static and dynamic gates and flip flops; domino logic; low power design; design for testability.

4. High Speed CMOS Logic Design
   Delay estimation and transistor sizing; device and interconnect capacitance; optimal delay design of buffers; power supply grid; clock distribution.

5. CAD Techniques in VLSI Design
   Circuit and logic simulation, mask layout, layout extraction and verification; standard cell placement and routing.

6. Sub-system Design
   Examples to illustrate sub-system design in VLSI: data path in a microprocessor, random-access-memory.

Laboratory Experiment:

1. Practice of CAD tools for VLSI design: circuit simulation, mask layout, layout extraction and verification, placement and routing.

2. Mini-project: design of a sub-system for computer or communication applications.

Method of Assessment:

Continuous assessment: 50%        Examination: 50%

The continuous assessment will consist of a mini-project, a number of assignments, and two tests.

Reference Books:

## Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, supplemented with interactive questions and short quizzes</td>
<td>1, 2, 6, 7</td>
<td>In lectures, students are introduced to the <strong>knowledge</strong> of the subject, and <strong>comprehension</strong> is strengthened with interactive Q&amp;A and short quizzes. They will be able to <strong>explain</strong> and <strong>generalize</strong> knowledge in VLSI.</td>
</tr>
<tr>
<td>Tutorials where design problems are discussed, and are given to students for them to solve</td>
<td>1, 2, 5, 6</td>
<td>In tutorials, students <strong>apply</strong> what they have learnt in analyzing the cases and solving the problems given by the tutor. They will <strong>analyze</strong> the given information, <strong>compare</strong> and <strong>contrast</strong> different scenarios and propose solutions or alternatives.</td>
</tr>
<tr>
<td>Laboratory sessions, where students will perform a mini-project on a subsystem design using CAD tools. They will have to write a report on their mini-projects.</td>
<td>2, 3, 4, 5, 6, 6</td>
<td>Students <strong>acquire</strong> hands-on experience in using CAD tools in VLSI design, and <strong>apply</strong> what they have learnt in lectures/tutorials to do a mini-project on the design of a sub-system.</td>
</tr>
<tr>
<td>Assignment and Homework</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>Through working assignment and homework, students will develop a firm understanding and <strong>comprehension</strong> of the <strong>knowledge</strong> taught. They will <strong>analyze</strong> given information and <strong>apply</strong> knowledge in solving problem. For some design type of questions, they will have to <strong>synthesize</strong> solutions by <strong>evaluating</strong> different alternatives.</td>
</tr>
</tbody>
</table>

## Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Learning Outcome</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment/Homework/Case study reports</td>
<td>1, 2, 5, 6</td>
<td>Assignment/Homework and case study reports are given to students to assess their competence level of <strong>knowledge</strong> and <strong>comprehension</strong>, ability to <strong>analyze</strong> given information, ability to <strong>apply</strong> knowledge and skills in new situation, ability to <strong>synthesize</strong> structure, and ability to evaluate given data to make judgment. The criteria (i.e. <strong>what</strong> to be demonstrated) and level (i.e. the <strong>extent</strong>) of achievement will be graded according to six levels: (A+ and A), Good (B+ and B), Satisfactory (C+ and C), Marginal (D) and Failure (F). These will be made known to the students before an assignment/homework is given. Feedback about their performance will be given promptly to students to help them improvement their learning.</td>
</tr>
<tr>
<td>Laboratory works and reports</td>
<td>2, 3, 4, 5</td>
<td>Students will be required to perform a mini-project and submit a report. The emphasis is on assessing their ability to <strong>use</strong> VLSI CAD tools effectively to perform VLSI <strong>design</strong>. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
<tr>
<td>Mid-semester test</td>
<td>1, 2, 3, 4, 6</td>
<td>There will be a mid-semester test to evaluate students’ achievement of all the learning outcomes and give feedback to them for prompt improvement. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
<tr>
<td>End-of-semester test and Examination</td>
<td>1, 2, 3, 4, 6</td>
<td>There will be an end-of-semester test and examination to assess students’ achievement of all the learning outcomes. These are mainly summative in nature. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
</tbody>
</table>
**Subject Description Form**

**Subject Title:** Power Electronics  
**Subject Code:** EIE402  
**Number of Credits:** 3  
**Hours Assigned:** Lecture/Tutorial 39 hours  
Laboratory 3 hours  
(Equivalent to 9 hours spent by student in laboratory)

**Pre-requisite:** Basic Electricity and Electronics I (ENG237)  
Basic Electricity and Electronics II (ENG238)  
Electronic Circuits (EIE304)  
**Co-requisite:** nil  
**Exclusion:** nil  

**Objectives:**
To enable students to gain knowledge and understanding in the following aspects:
1. Fundamentals of power electronics.
2. The concepts and operating principles of power electronics circuits.
3. Design procedures and techniques of power electronics systems.

**Student Learning Outcomes:**
Upon completion of the subject, students will be able to:

**Category A: Professional/academic knowledge and skills**
1. Understand the fundamental principles and applications of power electronics circuits.
2. Solve problems and design switching regulators according to specifications.
3. Use Computer-aided techniques for the design of power converter circuits.
4. Appreciate the latest developments in power electronics.

**Category B: Attributes for all-roundedness**
5. Communicate effectively.
6. Think critically and creatively.
7. Assimilate new technological and development in related field.

**Programme Outcomes**

**Category A: Professional/academic knowledge and skills**
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of the fundamental principles and applications of power electronics circuits and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome through designing of switching regulators and providing the students with an opportunity to conduct experiments, analyze, and interpret data.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to solve practical engineering problems pertaining to the field of power electronics.
- Programme Outcome 7: This subject contributes to the programme outcome through presentations and exchange of design ideas.

**Category B: Attributes for all-roundedness**
- Programme Outcome 13: This subject contributes to the programme outcome through teaching of key elements in the design of switching regulators and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team.

**Syllabus:**
1. **Introduction to Power Electronics**  
   Overview of power electronics systems: applications and areas of future development.
2. Basic Switching Regulator Topologies
   Practical considerations. Merits and drawbacks.

3. State-Space Averaging and Linearization

4. Switching Regulators with Transformer Isolation

5. Feedback Control Design

6. Magnetic Components
   Inductor. Transformer. Saturation, hysteresis, and residual flux.

7. Latest Development in Power Electronics

Laboratory Experiments:
2. Design of a closed-loop controlled power converter circuit.

Method of Assessment:
Continuous assessment: 40%  Examination: 60%

The continuous assessment consists of assignments, quizzes, and two tests.

Reference Books:
<table>
<thead>
<tr>
<th>T&amp;L Method</th>
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<tr>
<td>Lectures, supplemented with interactive questions and short quizzes</td>
<td>1, 2, 6, 7</td>
<td>In lectures, students are introduced to the <em>knowledge</em> of the subject, and <em>comprehension</em> is strengthened with interactive Q&amp;A and short quizzes. They will be able to <em>explain</em> and <em>generalize</em> knowledge in the design of power converter circuits.</td>
</tr>
<tr>
<td>Tutorials where design problems are discussed, and are given to students for them to solve</td>
<td>1, 2, 5, 6</td>
<td>In tutorials, students <em>apply</em> what they have learnt in analyzing the cases and solving the problems given by the tutor. They will <em>analyze</em> the given information, <em>compare</em> and <em>contrast</em> different scenarios and propose solutions or alternatives.</td>
</tr>
<tr>
<td>Laboratory sessions, where students will perform a mini-project by computer simulations and experimental verifications. They will have to write a report on their mini-projects.</td>
<td>2, 3, 4, 5, 6, 6</td>
<td>Students <em>acquire</em> hands-on experience in using CAD tools in power converter design, and <em>apply</em> what they have learnt in lectures/tutorials to do a mini-project on the design of a power converter circuit.</td>
</tr>
<tr>
<td>Assignment and Homework</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>Through working assignment and homework, students will develop a firm understanding and <em>comprehension</em> of the <em>knowledge</em> taught. They will <em>analyze</em> given information and <em>apply</em> knowledge in solving problem. For some design type of questions, they will have to <em>synthesize</em> solutions by <em>evaluating</em> different alternatives.</td>
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</tr>
<tr>
<td>Case study reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory works and reports</td>
<td>2, 3, 4, 5</td>
<td>Students will be required to perform a mini-project and submit a report. The emphasis is on assessing their ability to <em>use</em> VLSI CAD tools effectively to perform VLSI <em>design</em>. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
<tr>
<td>Mid-semester test</td>
<td>1, 2, 3, 4, 6</td>
<td>There will be a mid-semester test to evaluate students’ achievement of all the learning outcomes and give feedback to them for prompt improvement. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
<tr>
<td>End-of-semester test and Examination</td>
<td>1, 2, 3, 4, 6</td>
<td>There will be an end-of-semester test and examination to assess students’ achievement of all the learning outcomes. These are mainly summative in nature. Expectation and grading criteria will be given as in the case of assignment/homework.</td>
</tr>
</tbody>
</table>
Subject Title: High Frequency Circuit Design
Subject Code: EIE403
Number of Credits: 3
Hours Assigned: Lecture/Tutorial 39 hours, Laboratory 3 hours (Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: Basic Electricity and Electronics I (ENG237), Basic Electricity and Electronics II (ENG238), Electronic Circuits (EIE304)
Co-requisite: nil
Exclusion: nil

Objectives:
Designing electronic circuits in the tens and hundreds of MHz range can be a challenge because the presence of parasitics poses a lot of problems in the physical circuits. This makes designing high-frequency circuits a rather specialized subject, although much can still be resolved under the lumped circuit assumption. But as the frequency moves up to the GHz range, the use of lumped circuit models can be seriously handicapped because voltage and current change within the physical boundary of the circuit as a result of the wavelength being comparable to the dimension of the physical circuits. A different approach must be used to look at the problem. This course will look mainly at circuit design in the tens to hundreds MHz range and will touch upon some basics for the GHz range design.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the characteristics of transistor devices at high frequencies
2. Analyze high-frequency roll-off problems in transistor amplifiers
3. Design amplifier circuits for high-frequency applications
4. Design matching filters
5. Solve design problems using Smith charts, e.g., transmission line and antenna matching
6. Understand the stability problems in power amplifiers

Category B: Attributes for all-roundedness
7. Communicate effectively
8. Think critically and creatively

Category A Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of some of the elements of design high frequency electronic circuits and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 3: This subject contributes to the programme outcome by providing opportunity for students to design a system, component, or process to meet desired needs pertaining to the field of high frequency electronic circuits.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to solve practical engineering problems pertaining to the field of high frequency electronic circuits.
- Programme Outcome 7: Communicate effectively to meet the standard required for the electronic and information engineering profession. This subject contributes to the programme outcome through teaching of some of the elements and providing the students with an opportunity to practice the application of knowledge.

Category B Attributes for all-roundedness
- Programme Outcome 13: Think critically and understand the creative process. This subject contributes to the programme outcome through teaching of some of the elements and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 14: Work in a team collaboratively. This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team.
1. **Analogue Circuit Fundamentals**

2. **Radio Frequency Circuit Design**

3. **High-frequency Filter Design**
   Operational Transconductance Amplifier (OTA or gm). OTA design principles. BJT and MOS OTAs. Gm-C filter design principles. Method of signal flow graphs.

4. **Distortion Analysis**

5. **Impedance Matching**

6. **Transmission Line Matching**

7. **Power Amplifier Design**

**Mini-project:**
Each student is required to complete a mini-project on either one of the following topics:
- **Topic 1:** High frequency roll-off of transistor amplifiers
- **Topic 2:** Design of matching circuits
- **Topic 3:** Transmission line matching

**Method of Assessment:**
Continuous assessment: 40% Examination: 60%

The continuous assessment consists of assignments, mini-projects, and a test.

**Textbooks:**

**Reference Books:**
### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3, 6</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
<tr>
<td>Tutorials</td>
<td>4, 5</td>
<td>students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>3, 4, 6, 7, 8</td>
<td>students in groups of 2-3 will conduct practical measurement and evaluate the performance of high frequency circuits</td>
</tr>
</tbody>
</table>

### Alignment of Assessment and Learning Outcomes:

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<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 6</td>
<td>mainly objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students’ ability to remember facts and figures as well as their comprehension of subject materials</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>2, 3, 4, 5</td>
<td>end-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem</td>
</tr>
<tr>
<td>Laboratory sessions, mini-project</td>
<td>3, 4, 5, 7</td>
<td>each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills</td>
</tr>
</tbody>
</table>
**SUBJECT DESCRIPTION FORM**

**Subject Title:** Principles of Virtual Reality  
**Subject Code:** EIE408  
**Number of Credits:** 3  
**Hours Assigned:** Lecture/Tutorial 33 hours  
Laboratory 9 hours  
(Equivalent to 27 hours spent by student in laboratory)

<table>
<thead>
<tr>
<th>Pre-requisite:</th>
<th>nil</th>
<th>Co-requisite:</th>
<th>nil</th>
<th>Exclusion:</th>
<th>nil</th>
</tr>
</thead>
</table>

**Objectives:**
To provide the theoretical and practical knowledge about virtual reality technologies and the fundamental concepts involved in building and displaying virtual worlds.

**Student Learning Outcomes:**
Upon completion of this course, students are expected to be able to:

**Category A: Professional/academic knowledge and skills**
1. Understand the underlying enabling technologies of VR systems,
2. Design and create a basic virtual environment, and
3. Design an appropriate virtual reality solution for an application.

**Category B: Attributes for all-roundedness**
4. Learn independently.
5. Acquire teamwork and presentation skills.
6. Appreciate the importance of creativity and critical thinking, and to realize that there is no perfect virtual reality system for any particular situation and that engineers have to find "optimal" solutions, or make practical designs.
7. Develop a fuller understanding of social and community issues related to the application of virtual reality systems form case studies.

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**
- Program Outcome 1: This subject contributes to the programme outcome through teaching of the fundamentals of VR technology and providing the students with an opportunity to practice the application of knowledge.
- Program Outcome 2: This subject contributes to the programme outcome through providing the students with an opportunity to conduct experiments in VR.
- Program Outcome 3: This subject contributes to the programme outcome through designing of simple VR systems.
- Program Outcome 7: This subject contributes to the programme outcome through mini-project presentation and discussion.
- Program Outcome 8: This subject contribute to the programme outcome through the study of human factor in conduction VR experiments and designing of VR systems.
- Program Outcome 11: This subject contributes to the programme outcome by providing students with the techniques, skills, and modern engineering tools necessary for engineering practice appropriate to VR Technology and tools.
- Program Outcome 12: This subject contributes to the programme outcome by introducing students with the techniques, skills, and modern software tools necessary for developing of VR Technology and tools.

**Category B: Attributes for all-roundedness**
- Program Outcome 13: This subject contributes to the programme outcome through student mini-projects and site visits.
- Program Outcome 14: This subject contributes to the programme outcome through student mini-projects.
Syllabus:

1. Introduction to Virtual Reality
   1.1 Historical development of Virtual Reality
   1.2 The benefits of Virtual Reality
   1.3 Generic Virtual Reality Systems
   1.4 Real-time computer graphics, virtual environments: visual feedback, tactile feedback, acoustic feedback

2. 3D Computer Graphics
   2.1 Transformations and the 3D world; Modelling objects, dynamics objects
   2.2 Physical modelling: Constraints; Collision Detection, Surface Deformation
   2.3 Perspective Views; Stereoscopic Vision

3. Human Factors
   3.1 Vision and Display
   3.2 Hearing, Tactile and Equilibrium
   3.3 Health and Safety Issues

4. VR Hardware
   4.1 Computers: Graphics and workstation architectures
   4.2 Input Devices: Sensors and transducers, Gloves, 3D mice, 3D trackers, Navigation and Gesture Interfaces
   4.3 Output Devices: 3D Sound, Graphics; Haptic Displays, Force feedback Transducers, HMD

5. VR Software
   5.1 VR Software features and web-based VR
   5.2 Animation and Virtual Environment: linear and non-linear translations, angular rotation; shape and object inbetweening; free-form deformation
   5.3 Modelling virtual worlds; physical simulation; VR toolkits
   5.4 Programming of Virtual Environment: Mechanics of VRML; VRML browser; creating VRML environment; 3D modellers; worldbuilding toolkits; VRML utilities

6. VR Applications
   6.1 Engineering and Industrial: CAD and CAM techniques
   6.2 Training, education and simulations: Flight Simulator, Cab Simulator
   6.3 Games and entertainment: PC based games, XBOX and Wii

Laboratory Experiment:
1. VR related Hardware
2. VR related Programming Tools
3. Practical VR Systems

Case Study:
1. Applications of VR/VE in Training
2. Applications of VR/VE in Entertainment
3. Applications of VR/VE in Manufacturing and Product Design
4. Applications of VR/VE in Therapy

Method of Assessment:
Continuous Assessment: 50%  Examination: 50%

The continuous assessment consists of a mini-project, a number of site visit and logbooks, case study reports, a number of short quizzes/assignments and a mid-term test.

Textbook:
Reference Books:
7. Electronic Visualization Laboratory at the University of Illinois in Chicago, [http://www.evl.uic.edu/EVL/index.html](http://www.evl.uic.edu/EVL/index.html).

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<tbody>
<tr>
<td>Lectures</td>
<td>1</td>
<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials,</td>
<td>5,6,7</td>
<td>These are supplementary to lectures and are conducted with smaller class sizes; students will be able to clarify concepts and to gain a deeper understanding of the lecture material; problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>Site visits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>1,2,3,4,5</td>
<td>Students will conduct mini-project to better understand in the various practical aspect of VR Systems.</td>
</tr>
<tr>
<td>Mini-project</td>
<td></td>
<td></td>
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<tbody>
<tr>
<td>Site visit reports</td>
<td>1,5,6,7</td>
<td>These can measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials.</td>
</tr>
<tr>
<td>Assignments, tests</td>
<td>1,2,3,6</td>
<td>End-of-chapter-type problems are used to evaluate the students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem.</td>
</tr>
<tr>
<td>and examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini-project reports</td>
<td>2,3,4,5,6</td>
<td>Each group of students are required to produce a written report; the accuracy and presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate their technical knowledge and communication skills.</td>
</tr>
<tr>
<td>and presentation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Subject Title: Digital Signal Processing

Subject Code: EIE413

Number of Credits: 3

Hours Assigned: Lecture/Tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: For 42070 and 05004
Mathematics I (AMA201/AMA227)
Mathematics II (AMA202/AMA228)
Linear Systems (EIE312)

Co-requisite: nil
Exclusion: nil

For 11039
Mathematics for Scientists and Engineers (AMA288)
Methods of Theoretical Physics (AMA289)
Linear Systems (EIE312)

Objectives:
This is an essential subject to provide fundamental signal processing techniques important to many communications and multimedia subjects. Both theory and practical realisation are stressed. After completion of the subject, the student should be able to understand the design principles and the implementation of digital filters and DFT/FFT, and be able to make use of random signal processing concepts and wavelets to perform some simple applications.

Student Learning Outcomes:
On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the basic theories behind and to be able to realize filter equations and DFT/FFT for practical applications.
2. Design digital filters on paper by using MATLAB, and implement the design using some simulation techniques.
3. Understand the basic theory of wavelet transform and the concepts of using simple wavelets for simple applications.
4. Understand the importance of random signal processing in DSP, and its application on statistical measures, prediction and data modelling.
5. Possess basic background in the DSP area sufficiently for supporting subjects such as: communication principles, computer networks, speech processing, image processing, multimedia, and video technology.
6. Possess necessary background for advance studies in DSP, especially for taking the subject Advanced Digital Signal Processing, or other multimedia signal processing subjects.

Category B: Attributes for all-roundedness
7. Present ideas and findings effectively.
8. Think critically.
9. Learn independently.
10. Work in a team and collaborate effectively with others.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of digital signal processing and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to analyze digital signals and systems.
- Programme Outcome 3: This subject contributes to the programme outcome through teaching the design and requirements of digital systems.
Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the field of digital signal processing.

Programme Outcome 10: This subject contributes to the programme outcome by providing students with the foundations for life-long learning and continual professional development in the areas of signal processing.

Programme Outcome 11: This subject contributes to the programme outcome through the use of software tools for analyzing digital signals and systems.

Category B: Attributes for all-roundedness

Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about the design and analysis of digital signals and systems.

Programme Outcome 14: This subject contributes to the programme outcome by providing students with an opportunity to practice working in a team.

Syllabus:

1. Revision on the Discrete-time Systems and General Realization Techniques
   1.1 Basic definition of discrete-time signal. Sampling of continuous-time signal. Time invariance, causality, linearity, convolution. The z-transform and its inverse, delay property and its meaning in the time domain, frequency response and stability.
   1.2 Realization of digital filter structures, direct realization, canonic form, cascade and parallel realization of digital systems.

2. Design of Infinite Impulse-response (IIR) and Finite Impulse-response (FIR) Digital Filters
   2.1 Revision of analog systems, Butterworth filters and Chebyshev filters. Types of digital filters: IIR and FIR. IIR filter design, bilinear transformation, frequency scaling, transformation from prototype low-pass filter to high-pass filter and band-pass filter. Impulse-invariant and/or step-invariant approaches.
   2.2 FIR filter analysis, Fourier series approach, windowing, Gibbs phenomenon, commonly used windows, concept of linear phase, frequency transformation, low-pass, band-pass, high-pass filters and filter band design.

3. Discrete Fourier Transform and Convolution
   3.1 Convolutions and its applications, circular convolution, convolution by section, overlap-add method and overlap-save method.
   3.2 Fourier series and continuous-time Fourier transform. Discrete Fourier series and discrete Fourier transform (DFT), properties of the DFT, Fourier analysis using the DFT, convolution theorem, the fast Fourier transform (FFT) algorithm and implementation of the FFT.

4. Wavelets
   4.1 Short-time Fourier transform, continuous wavelet theory, dyadic structure, discrete wavelet transform, wavelet and scaling functions, multi-resolution analysis, sample applications of wavelet transform.

5. Random Signal Processing

6. Advanced DSP and Applications: To discuss not less than one of the following topics,
   6.1 Architectures of digital signal processors and DSP chips.

Laboratory Experiments:

The student will carry out at least three laboratory exercises on the topics below:

1. Laboratory 1: MATLAB for DSP laboratory exercises.
2. Laboratory 2: FIR filter analysis and design.
3. Laboratory 3: IIR filter analysis and design.
4. Laboratory 4: Properties of DFT and the fast Fourier transform.
5. Laboratory 5: Wavelet properties and its applications.

**Method of Assessment:**
Continuous Assessment: 40%  
Examination: 60%

The continuous assessment will consist of a number of assignments, laboratory reports, short quizzes, and two tests.

**Textbooks:**

**Reference Books:**

**Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:**

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3, 4, 5, 6, 8</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1, 2, 3, 4, 5, 6, 8</td>
<td>supplementary to lectures/tutorials and are conducted with smaller class size, or large class with sufficient no. of tutors. students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>7, 8, 9, 10</td>
<td>students will make use of the software MATLAB to simulate the various theories and visualize the results</td>
</tr>
</tbody>
</table>

**Alignment of Assessment and Learning Outcomes:**

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<tr>
<th>Assessment Method</th>
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<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>mainly objective tests conducted to measure the students’ basic understanding of the theories, concepts and physical meanings of subject materials</td>
</tr>
<tr>
<td>Tests and examination</td>
<td>7, 8, 9</td>
<td>End-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom, and their comprehension of subject materials students need to think critically and creatively in order to come with an alternate solution for an existing problem</td>
</tr>
<tr>
<td>HW Assignment and Oral Presentations</td>
<td>7,8,9,10</td>
<td>Students have to learn independently, to search, digest and analyze data, and to make oral defence of their findings.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>7, 8, 9, 10</td>
<td>each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills</td>
</tr>
</tbody>
</table>
Subject Title: Computer Architecture and Systems
Subject Code: EIE414
Number of Credits: 3
Hours Assigned: Lecture/Tutorial 39 hours, Laboratory 3 hours (Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: Computer System Fundamentals (EIE311) or Computer System Principles (EIE343)
Co-requisite: nil
Exclusion: nil

Objectives:
To provide students with
1. Concepts and design techniques of high performance computer architectures
2. Techniques to analyze performance in time domain

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamental knowledge of microprocessor
2. Design and conduct experiments, as well as to analyze different microprocessors
3. Identify the issues of designing a microprocessor.
4. Write efficient programs along with understanding the limitations and mechanisms of different microprocessors

Category B: Attributes for all-roundedness
5. Present their ideas and observation effectively
6. Think critically and creatively

Programme Outcomes:

Category A: Professional/academic knowledge and skills
• Programme Outcome 1: This subject contributes to the programme outcome through teaching of the fundamentals of different microprocessors and providing the students with an opportunity to practice the application of knowledge.
• Programme Outcome 2: This subject contributes to the programme outcome through providing the students with an opportunity to conduct experiments and analyze the characteristics of different types of microprocessors.
• Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to identify the issues of designing a microprocessor.
• Programme Outcome 7: This subject contributes to the programme outcome through report writings.
• Programme Outcome 12: This subject contributes to the programme outcome through using simulation tools to evaluate the performance and limitation of different microprocessors.

Category B Attributes for all-roundedness
• Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically and creatively in conducting experiments.

Syllabus:
1. Introduction to Computer Architectures
   1.1 Revision on different computer architectures: ISA and HAS, Von Neumann, RISC and CISC
   1.2 Performance issues
2. Basic Processor Designs
   2.1 Data path: Data movement
   2.2 Control path: Instruction decode and branching
   2.3 Multi-cycle Implementation
2.4 Microprogramming
2.5 Exception

3. Pipelined Processors
3.1 Pipelined data-paths
3.2 Pipelined control
3.3 Data hazards
3.4 Branch hazards

4. Superscalar Processing
4.1 Parallel decoding
4.2 Superscalar instruction issue: shelving and register renaming
4.3 Speculative execution: preserving processor consistency

5. Branching Processing
5.1 Branch checking
5.2 Branch processing: delayed branching and multi-way branching
5.3 Speculative execution: early detection and prediction

6. Cache Organization
6.1 Cache mapping: direct mapping and associative mapping
6.2 Replacement algorithm
6.3 Cache miss and performance
6.4 Cache coherence

7. Memory System
7.1 Memory system hierarchy
7.2 Paging
7.3 Segmentation
7.4 Virtual memory

Laboratory Experiments:
1. Superscalar simulation tool.
2. Tracing the operation of superscalar CPU by simulation.

Method of Assessment:
Continuous Assessment: 50% Examination: 50%

The continuous assessment will consist of assignments, tests and a mini-project.

Reference Books:
## Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<tr>
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<tbody>
<tr>
<td>Lectures</td>
<td>1, 3, 4, 6</td>
<td>Fundamental principles and key concepts of the subject are delivered to students</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1, 3, 4, 5, 6</td>
<td>Conducted with smaller class size Students will be able to clarify concepts and to have a deeper understanding of the lecture material Problems and exercises are given and discussed</td>
</tr>
<tr>
<td>Mini-project</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>Students will make use of the software VSIM to simulate various types of Superscalar processors and critically compare their features and performance</td>
</tr>
</tbody>
</table>

## Alignment of Assessment and Learning Outcomes:

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<tr>
<th>Method</th>
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<tbody>
<tr>
<td>Assignments, tests and examination</td>
<td>1, 3, 4, 5, 6</td>
<td>Analytical problems are used to evaluate students’ ability in analyze performance issues Students need to think critically and creatively in order to come with an alternate solution for an existing problem</td>
</tr>
<tr>
<td>Mini-project</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>Each student is required to give demonstrations and produce a written report Accuracy and the presentation of the report will be assessed Oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills</td>
</tr>
</tbody>
</table>
Subject Title: Multimedia Technology

Subject Code: EIE415

Number of Credits: 3

Hours Assigned:
- Lecture/Tutorial 37 hours
- Laboratory 5 hours

(Equivalent to 15 hours spent by student in laboratory)

Pre-requisite: nil

Co-requisite: nil

Exclusion: nil

Objectives:

1. To provide students with foundation knowledge in multimedia technologies.
2. To provide students with thorough understanding of techniques and standards adopted in the multimedia industry.

Student Learning Outcomes:

On successful completion of this subject, students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the requirements of a multimedia system and the formats of different multimedia signals.
2. Understand the different multimedia standards and the technologies.
3. Understand simple systems for multimedia retrieval and management.
4. Perform multimedia authoring, and to process and integrate different types of signals to form multimedia presentations.
5. Understand, describe, the technologies for streaming multimedia content over the Internet.
6. Understand the architectures and technologies of various multimedia systems, such as HDTV, Video-on-Demand (VoD), etc.

Category B: Attributes for all-roundedness

7. Think creatively.

Programme Outcomes:

Category A: Professional/academic knowledge and skills

- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of multimedia technologies and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to work with different multimedia production and integration.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the fields of multimedia technologies.

Category B: Attributes for all-roundedness

- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think creatively about the development of various multimedia systems.

Syllabus:

1. Introduction to Multimedia Systems
   Perspective of multimedia computing and communications, review of the key enabling technologies, overview of multimedia system requirements and multimedia software tools.

2. Multimedia Signal Representations
   Basics of audio/image/video file formats, introduction to MIDI (Musical Instrument Digital Interface), basics of digital video and colour processing.
3. **Multimedia Standards**

4. **Multimedia Information Indexing and Retrieval**
   MPEG-7, Content-based retrieval (CBR) in image database, some existing CBR systems/applications. Digital libraries.

5. **Multimedia Authoring and Integration**
   Multimedia authoring: authoring metaphors, multimedia production and presentation, SMIL: concept, structure, timelines, synchronization, implementation.

6. **Multimedia Communications**
   Quality of Service (QoS) requirements for multimedia communications, traffic modelling of multimedia sources, multiplexing, loss concealment, transport protocol support for multimedia communications. Multimedia on Internet: resource reservation protocol (RSVP), MBone.

7. **Case Studies**
   Digital Video Disc (DVD), Multimedia conferencing, video-on-demand (VOD), set-top box and interactive TV, digital TV and high definition TV (HDTV).

**Laboratory Experiments:**
1. Analysis of MPEG video coding
2. Audio signal processing
3. Developing simple multimedia applications using SMIL
4. Multimedia production
5. Multimedia integration

**Method of Assessment:**
Continuous assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignments, laboratory reports, and two tests.

**Reference Books:**
### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<td>Lectures</td>
<td>1, 2, 3, 5, 6, 7</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
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<td>Tutorials</td>
<td>1, 2, 3, 5, 6, 7</td>
<td>supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 7</td>
<td>students will make use of the software to develop multimedia applications.</td>
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### Alignment of Assessment and Learning Outcomes:

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<td>1, 2, 3, 5, 6</td>
<td>mainly objective tests conducted to measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>1, 2, 3, 5, 6, 7</td>
<td>end-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 7</td>
<td>each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills</td>
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SUBJECT DESCRIPTION FORM

Subject Title: Distributed Systems and Network Programming
Subject Code: EIE424

Number of Credits: 3
Hours Assigned: Lecture/Tutorial 36 hours
Laboratory 6 hours
(Equivalent to 18 hours spent by student in laboratory)

Pre-requisite: For 42070 and 05005
Object Oriented Design and Programming (EIE320)

For 42077
Principles of Programming (COMP201) or
Object Oriented Design and Programming (EIE320)

For 61024 and 61031
Principles of Programming (COMP201)

Co-requisite: nil
Exclusion: nil

Objectives:
This subject will provide students with the principles of distributed systems. It enables students to master the development skills for providing and constructing distributed services on the Web. Through a series of lab exercises, students will be able to develop interoperable and distributed Web applications.

Student Learning Outcomes:
On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the concepts of distributed computing and distributed systems.
2. Be able to identify the key components in distributed systems.
3. Be able to apply Java to build distributed systems.
4. Understand the advantages and limitations of different distributed system architectures.
5. Understand the enabling technologies for building distributed systems.
6. Understand the different components of Web Services.
7. Be able to set up and configure a standard Web Service system and develop simple Web Service applications.

Category B: Attributes for all-roundedness
8. Think critically.
9. Learn independently.
10. Work in a team and collaborate effectively with others.
11. Present ideas and findings effectively.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the foundation knowledge in distributed computing and distributed systems and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 3: This subject contributes to the programme outcome through the teaching of the knowledge in distributed systems, distributed computing and web services.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the fields of distributed systems and distributed computing.
- Programme Outcome 10 This subject contributes to the programme outcome by providing students with the foundations for life-long learning and continual professional development in the areas of distributed software and systems.
- Programme Outcome 12 This subject contributes to the programme outcome by providing students with the software development tools for building web applications and distributed systems.
Category B: Attributes for all-roundedness
- Programme Outcome 14: This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team.

Syllabus:

1. Introduction to Distributed Systems and Distributed Computing
   1.1 Operating systems. Multithreading.
   1.2 Computer networking. Internet protocol.
   1.3 Examples of distributed systems and distributed computing

2. Distributed Computing Paradigms

3. Enabling Tools and Techniques for Building Distributed Systems
   3.1 Socket API and socket programming. Datagram sockets. Stream-mode sockets.

4. Distributed Services on the Web: Web Services
   4.2 XML-RPC.
   4.4 Web Services Description Language (WSDL). Role of WSDL in Web services, WSDL documents, remote web-services invocation using WSDL.
   4.5 Universal Description, Discovery and Integration (UDDI). Role of UDDI in Web services. UDDI registries. Discovery technologies.

Laboratory Experiment:

Practical Works
1. Socket API
2. Remote Method Invocation (RMI)
3. Extensible Markup Language (XML)
4. XML-RPC
5. SOAP
6. WSDL

Method of Assessment:

Coursework: 40%   Examination: 60%

The continuous assessment consists of assignments, laboratory reports and tests.

Textbooks:


Reference Books:

3. IEEE Internet Computing.
4. IEEE Distributed Systems Online.
### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<td>Lectures</td>
<td>1,2,4,5,6</td>
<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1,3,4,5,6,8,9</td>
<td>Supplementary to lectures and are conducted with smaller class size; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Programming exercises will be provided to strengthen students' hands-on experiences.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>3,6,7,8,10,11</td>
<td>Students will go through the development process of various distributed systems and evaluate their performance.</td>
</tr>
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### Alignment of Assessment and Learning Outcomes:

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<tbody>
<tr>
<td>Short quizzes</td>
<td>1,2,4,5,6</td>
<td>Mainly objective tests conducted to measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>1,2,4,5,6,8,9</td>
<td>End-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom. Students need to think critically and creatively in order to come with an alternate solution for an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions, mini-project</td>
<td>3,6,7,8,10,11</td>
<td>Each group of students is required to produce written reports. For some of the practical works, students are required to make demonstration to illustrate their understanding of the related technical knowledge and skills.</td>
</tr>
</tbody>
</table>
Objectives:
Engineering is the science of the applying scientific principles and technology to improve human life. This may take the form of invention, design, implementation, so on and so forth. The objective is to come up with solutions to existing problems while considering various constraints. Hence the students studying in a curriculum will be most benefited from doing a project in order to have the chance to practise hands-on application of the knowledge the student has learned throughout the curriculum, while producing something useful or valuable. Against this background, there is a final year project (FYP) component in the curriculum with the objectives:

1. To provide the opportunity to the student so that he/she can apply what he/she has learnt in previous stages in a real-life engineering context.
2. To enable the student to acquire and practise project management skills and discipline while pursuing the FYP.
3. To enable the student to apply engineering knowledge in analysis of problems and synthesis of solution while considering various constraints.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand, take up, and master the basic knowledge and skills related to the specific project.
2. Understand the background, the requirements, objectives, and deliverables to be produced.
3. Integrate and apply knowledge learnt in present and previous stages (vertical integration) and across different subjects (horizontal integration).
4. Apply various professional skills in electronic and information engineering to achieve the objectives of the project.
5. Learn to use new tools and facilities, and to gather new information, for the conduction of the project.

Category B: Attributes for all-roundedness
6. Work under the guidance of a supervisor while exercising self-discipline to manage the project.
7. Review critically the student’s own achievement and other related works.
8. Communicate effectively with related parties (supervisor, peers, vendors).
9. Work with others (team partners, outsource company, technical support staff) collaboratively.
10. Realize different constraints, and to make appropriate compromise, when designing a solution to an engineering problem.
11. Disseminate effectively the results and knowledge learnt in the project.
12. Transfer the knowledge and skills learnt in the project.

Programme Outcomes
Category A: Professional/academic knowledge and skills
- Programme Outcomes 1, 2, 3, 5, 6, 8, 11, and 12: In working through the final-year project, the students will learn how to apply knowledge of mathematics, science, and engineering in designing engineering solutions to a problems with consideration of professionalism and realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability factors. They also will learn how to make use of appropriate computer/IT tools with an understanding of their processes and limitations in the course of the conducting the project.

- Programme Outcome 4: In the final-year project, the student will learn how to work with others (supervisor, other students, other teaching staff, technicians, vendors, industrialists…etc.) to accomplish the project tasks and to produce the deliverables. S/he will need to
communicate/consult people in other disciplines, cooperate with others in the use or acquiring of resources. S/he needs to exercise leadership and taking initiative when working with others.

- Programme Outcome 7: In this subject, the students will learn how to conduct effective written or verbal communication with various parties. They will use different media such as texts, mathematics, graphics, images, video, animation…etc. They will learn how to use different communication tools such as log book, project proposal, final-year project report, presentation, and demonstration to communicate their ideas, the project design, the underlying theory, and the project results to various audiences in the suitable context.

- Programme Outcome 9 and 10: In this subject, the students will learn how to gather information about the background or frontier of their projects and related subject matters. They will learn how to stay abreast of contemporary issues by reading and information gathering. They will recognize the need for life-long learning.

Category B: Attributes for all-roundedness
- Programme Outcome 13: The students will be given the chance to exercise creativity and innovation by designing something new (a new software, a new hardware, a new process, a new method) to solve a given problem as required by the project.

- Programme Outcome 14: The students will be given the chance to learn how to exercise leadership when working in a team project or group project that requires collaboration among different students.

Syllabus:
The progression of the project will be guided by a framework, which consists of the following indicative stages. The specific details will vary from project to project.

Project Specification
In this stage, the student will work in conjunction with the project supervisor to draw up a concrete project plan specifying at least the following:

1. Background of the project
2. Aims and objectives
3. Deliverables
4. Methodology to be adopted
5. Schedule

Project Execution
This is the major part of the project. After the specification is done, the project will be pursued so that the objectives are to be met; the deliverables are to be produced in accordance with the schedule. The student and the project supervisor will meet constantly to discuss the progress. In particular the following should be demonstrated:

1. Adherence to the schedule
2. Achievement of objectives by the student’s work
3. Initiatives of the students to work, design, and to solve problems
4. Inquisitiveness of the student (e.g. to probe into different phenomena or to try different approaches)
5. Diligence of the students to spend sufficient effort on the project
6. Systematic documentation of data, design, results, …etc. during the process of working out the project

Project Report
After the project is finished, it is important that the student can be able to disseminate the results so that the results can be reviewed by others. Through this dissemination process, project achievements can be communicated, experience can be shared, knowledge and skills learnt can be retained and transferred. The following elements will be important:

1. Project log book
2. Project report (hardcopy and softcopy)
3. Presentation
4. Performance in a Question-and-Answer session

Method of Assessment:
Continuous Assessment: 100%
Reference Books:
To be prescribed by the project supervisor for each project.
Subject Title: Image and Audio Processing
Subject Code: EIE435
Number of Credits: 3
Hours Assigned: Lecture/tutorial 42 hours
Laboratory 3 hours
(Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: For 42070, 05004 and 05005
Linear Systems (EIE312)
For 42077
Linear Systems (EIE312) or
Signal Processing Fundamentals (EIE327) or
Signals and Systems (EIE341)

Co-requisite: nil
Exclusion: nil

Objectives:
To provide a broad treatment of the fundamentals in image and audio processing.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamentals of image and audio signal processing and associated techniques.
2. Understand how to solve practical problems with some basic image and audio signal processing techniques.
3. Have the ability to design simple systems for realizing some multimedia applications with some basic image and audio signal processing techniques.

Category B: Attributes for all-roundedness
4. Present ideas and findings effectively.
5. Think critically and creatively.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the knowledge of image and audio processing and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to process and analyze images and audios.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the field of image and audio processing.

Category B: Attributes for all-roundedness
- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about and practice the different image/audio processing techniques for different applications.
- Programme Outcome 14: This subject contributes to the programme outcome by providing students with an opportunity to practice working in a team.

Syllabus:
1. Image processing
   1.1 Fundamentals of digital image: Digital image representation and visual perception, image sampling and quantization.
   1.2 Image enhancement: Histogram processing; Median filtering; Low-pass filtering; High-pass filtering; Spatial filtering; Linear interpolation, Zooming.
1.3 Image coding and compression techniques: Scalar and vector quantizations; Codeword assignment; Entropy coding; Transform image coding; Wavelet coding; Codec examples.
1.4 Image analysis and segmentation: Feature extraction; Histogram; Edge detection; Thresholding.
1.5 Image representation and description: Boundary descriptor; Chaincode; Fourier descriptor; Skeletonizing; Texture descriptor; Moments.

2. Audio processing
2.1 Fundamentals of digital audio: Sampling; Dithering; Quantization; psychoacoustic model.
2.2 Basic digital audio processing techniques: Anti-aliasing filtering; Oversampling; Analog-to-digital conversion; Dithering; Noise shaping; Digital-to-analog Conversion; Equalisation.
2.3 Digital Audio compression: Critical bands; threshold of hearing; Amplitude masking; Temporal masking; Waveform coding; Perceptual coding; Coding techniques: Subband coding and Transform coding.
2.4 Case Study of Audio System/Codecs: MP3; MP3-Pro; CD; MD; DVD-Audio; AC-3; Dolby digital; Surround; SRS Surround system; Digital Audio Broadcasting, etc.

Laboratory Experiments:
1. Image processing techniques
2. Image compression
3. Audio compression
4. Psychoacoustic behaviour

Method of Assessment:
Continuous Assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignments, laboratory reports, and two tests.

Textbooks:

Reference Books:

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
<th>Learning Outcome</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>Lectures</td>
<td>1, 2, 3</td>
<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials</td>
<td>2, 3, 5</td>
<td>These are supplementary to lectures and are conducted with smaller class sizes; students will be able to clarify concepts and to gain a deeper understanding of the lecture material; problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 5</td>
<td>Students will make use of software to simulate the various theories and visualize the results.</td>
</tr>
</tbody>
</table>
## Alignment of Assessment and Learning Outcomes:

<table>
<thead>
<tr>
<th>Assessment Method</th>
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<th>Remarks</th>
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<tbody>
<tr>
<td>Short quizzes</td>
<td>1, 2, 3, 5</td>
<td>These can measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials.</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>4, 5, 6</td>
<td>End-of chapter type problems are used to evaluate the students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 5, 6</td>
<td>Students are required to conduct some laboratory works, and produce the written reports; the accuracy and presentation of the report will be assessed; the emphasis is on assessing the students’ ability to apply knowledge and skills learned in lectures, and their ability to relate the taken data and results to the most relevant theory.</td>
</tr>
</tbody>
</table>
**SUBJECT DESCRIPTION FORM**

<table>
<thead>
<tr>
<th>Subject Title:</th>
<th>Telecommunication Networks</th>
<th>Subject Code:</th>
<th>EIE443</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Credits:</td>
<td>3</td>
<td>Hours Assigned:</td>
<td>Lecture/tutorial 39 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Laboratory 3 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Equivalent to 9 hours spent by student in laboratory)</td>
</tr>
<tr>
<td>Pre-requisite:</td>
<td>nil</td>
<td>Co-requisite:</td>
<td>nil</td>
</tr>
<tr>
<td>Exclusion:</td>
<td>nil</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Objectives:**
This subject aims at introducing to the students the knowledge about the telecommunication industry: its services and market, the theoretical basis about performance (queueing theory) and operation (multiplexing, switching, routing, and signalling).

**Student Learning Outcomes:**
Upon completion of the subject, students will be able to:

**Category A: Professional/academic knowledge and skills**
1. Describe and relate fundamentals of telecommunication networks and associated technologies.
2. Apply the principles of queueing theory in evaluating the performance of telecommunication networks.
3. Solve problems and design simple systems related to telecommunications networks.
4. Appreciate the reasons for switching, and the relative merits of the possible switching modes, e.g. packet and circuit switching.
5. Understand the principles of the internal design and operation of communication switches, and the essence of the key protocols that are used with switched networks.

**Category B: Attributes for all-roundedness**
6. Present ideas and findings effectively
7. Think critically and learn independently
8. Assimilate new technological development in related field

**Programme Outcomes:**

**Category A: Professional/academic knowledge and skills**
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of various telecommunication networks and its applications.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to analyze the queueing theory and its applications to telecommunication networks.
- Programme Outcome 3: This subject contributes to the programme outcome through teaching the different ways of analyzing the telecommunication networks.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the fields of telecommunication networks design and evaluations.
- Programme Outcome 9: This subject contributes to the programme outcome through the assimilate new technological development in telecommunication networks.
- Programme Outcome 10: This subject contributes to the programme outcome by providing students with the foundations for life-long learning and continual professional development in the areas of telecommunication networks design.
- Programme Outcome 11: This subject contributes to the programme outcome through the teaching of software tools for analyzing the telecommunication networks.

**Category B: Attributes for all-roundedness**
- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about the most suitable design techniques of the telecommunication networks for different applications.
- Programme Outcome 14: This subject contributes to the programme outcome by providing students with market trend and product development requirements in telecommunication networks design.
Syllabus:

1. Overview of Telecommunication Networks and Industry
   1.1 Trends, technologies and network elements in telecommunication networks.
   1.2 Telecommunication industry in Hong Kong: Regulatory bodies, major telecommunication operators, major telecommunication services and activities.

2. Queuing Theory and Traffic Engineering
   2.1 Poisson source characteristics.
   2.2 Analysis of different queuing systems: M/M/1, M/M/2, M/M/N/N queues.
   2.3 Traffic engineering: Erlang’s formula, blocking probability.

3. PCM and Digital Multiplexing Hierarchy
   3.1 Telecommunication network hierarchy.
   3.2 Digital multiplexing hierarchies: T1, E1, T2, and T3 carrier systems.
   3.3 Plesiochronous and synchronous multiplexing, SONET and SDH transmission systems.

4. Switching Systems Design
   4.1 Switching fabrics: Switch architecture, performance evaluation; Time division switches: shared memory switch, time-slot-interchange switch; Space division switches: Crossbar, Clos and Banyan.
   4.2 Traffic management and scheduling in a switch.
   4.3 Optical switching: wavelength division multiplexing (WDM)
   4.3 Signalling principles: SS7 signalling and public telephone networks.

Laboratory Experiments:

1. Poisson source properties and their characterization.
2. Simulation study on queuing properties.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignments, quizzes and two tests.

Reference Books:

### Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<td>Lectures</td>
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<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
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<td>Tutorials</td>
<td>1, 2, 3, 5, 7</td>
<td>These are supplementary to lectures and are conducted with smaller class sizes; students will be able to clarify concepts and to gain a deeper understanding of the lecture material; problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>2, 3, 6, 7</td>
<td>Students will make use of the software to simulate the various theories and visualize the results.</td>
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### Alignment of Assessment and Learning Outcomes:

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<td>These can measure the students’ understanding of the theories and concepts as well as their comprehension of subject materials.</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>6, 7</td>
<td>End-of-chapter-type problems are used to evaluate the students’ ability in applying concepts and skills learnt in the classroom. Students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>4, 6</td>
<td>Each student is required to produce a written report; The accuracy and presentation of the report will be assessed. The emphasis is on assessing the students’ ability to apply knowledge and skills learned in lectures, and their ability to relate the taken data and results to the most relevant theory.</td>
</tr>
</tbody>
</table>
Subject Title: Mobile Communications

Subject Code: EIE447 (for 42070, 05004 and 05005)

Number of Credits: 3

Hours Assigned: Lecture/tutorial 36 hours
Project/presentation 6 hours (Equivalent to 18 hours spent by student in laboratory)

Pre-requisite: Communication Fundamentals (EIE331)
Co-requisite: nil
Exclusion: nil

Objectives:
1. To introduce the fundamental design principles & issues in cellular & mobile communications.
2. To enable the student to understand the basic features of cellular-mobile communication systems and digital radio: FDMA, TDMA, and DS-CDMA.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. To understand the basic physical-layer architecture of a mobile-communication system.
2. To understand the frequency-reuse concept in mobile communications, and to analyze its effects on interference, system capacity, and the grade of service.
3. To understand large-scale and small-scale fading-channel models, and to analyze their influences on a mobile-communication system’s performance.
4. To understand various multiple-access techniques for mobile communications, and their advantages and disadvantages.
5. To recognize the relative pros/cons of various digital-modulation schemes and to select the modulation-scheme for a given channel environment.
6. To understand the basic features of mobile communication systems and digital radio: FDMA, TDMA and CDMA.

Category B: Attributes for all-roundedness
7. Ability to think critically and to learn independently.
8. Ability to coordinate work among group members and to work as a team.
9. Ability to present ideas and results in front of an audience.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts underlying mobile communications and through providing the students with opportunities to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with computer exercises to simulate, to process, and to analyze mobile-communication data.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the field of mobile communications.
- Programme Outcome 7: This subject contributes to the programme outcome by providing the opportunity for students to make oral presentations before a live audience in only English.

Category B: Attributes for all-roundedness
- Programme Outcome 14: This subject contributes to the programme outcome by providing students with an opportunity to practice working in a team.

Syllabus:
1. Introduction to Cellular-Mobile Radiowave Wireless-Communication Systems
Cellular structure, frequency reuse & cells splitting. Channel assignment. Co-channel interference, adjacent-channel interference, system capacity, and power control.

2. Radiowave Propagation’s Macroscopic-Fading Models

3. Radiowave Propagation’s Microscopic-Fading Models
   Lognormal, Rician and Rayleigh fading models. Doppler frequency, delay spread, coherence bandwidth, level crossing rate. Characterisation of multipath phenomena. Fading effects due to multi-path time delay spread. Fading effects due to Doppler spread. Simulation of Rayleigh fading channel.

4. Modulations for Mobile Radiowave Communications

5. Current Cellular-Mobile Communication Multiple-Access Schemes & Standards
   Multiple-access schemes: frequency-division multiple-access (FDMA), time-Division multiple-access (TDMA), code-division multiple-access (CDMA), hybrid schemes, space-division multiple-access (SDMA).

**Project:** Either one of the followings:
1. To orally present an advanced topic in mobile communications in a team, or
2. To test well-known formulas of outdoor radio-wave propagation path-loss using empirically measured data, or some other project(s), in a team.

**Method of Assessment:**

| Continuous Assessment: 35% | Examination: 65% |

The continuous assessment will consist of a test and a project.

**Reference Book:**

**Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:**

<table>
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<tr>
<th>T&amp;L Method</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>1,5</td>
<td>Fundamental principles and key concepts of the subject are delivered to the students.</td>
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**Alignment of Assessment and Learning Outcomes:**

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<th>Assessment Method</th>
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</thead>
<tbody>
<tr>
<td>Test &amp; examination</td>
<td>1,5</td>
<td>These can measure the students’ understanding of the theories and the concepts of the subject materials.</td>
</tr>
<tr>
<td>Projects</td>
<td>2,5</td>
<td>Each group of students is required to solve a problem on a topic directly related to at one of learning outcomes 1-6.</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>2,5,7</td>
<td>Each group of students is required to orally summarize a research paper from the open literature on a topic directly related to at one of learning outcomes 1-6; the accuracy and the delivery of the oral presentation will be assessed.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Bioengineering Signals and Systems  
Subject Code: EIE448

Number of Credits: 3

Hours Assigned:
- Lecture/tutorial: 36 hours
- Laboratory: 3 hours
(Equivalent to 18 hours spent by student in laboratory)

Pre-requisite: Mathematics II (AMA202)
Co-requisite: nil
Exclusion: nil

Objectives:
To introduce
1. a broad range of bioengineering systems
2. the engineering foundation of bio-signal data collection,
3. a sample of data analysis techniques for biomedical engineering.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Briefly describe the basics of human physiology and biology with an emphasis on particular systems.
2. Perform quantitative measurement and analysis of typical bio-signals
3. Describe the operational details of various medical monitoring and data collection devices
4. Demonstrate an understanding of mathematical foundations of bioengineering systems
5. Describe and synthesize the computational process of various contemporary medical devices.

Category B: Attributes for all-roundedness
6. Communicate effectively.
7. Think critically and creatively.
8. Work in a team collaboratively.
9. Demonstrate an ability to think logical as well as laterally.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: Apply knowledge of mathematics, science, and engineering appropriate to electronic and information engineering
- Programme Outcome 2: Design and conduct experiments, as well as analyse and interpret data
- Programme Outcome 11: Use techniques, skills, and modern engineering tools necessary for engineering practice appropriate to electronic and information engineering
- Programme Outcome 12: Use computer/IT tools that relevant to EIE along with an understanding of their processes and limitations

Syllabus:
1. Introduction
   1.1 Introduction to bioengineering. A historical perspective.
2. Bioelectric phenomena
   2.1 Cardiovascular system: the human heart, the cardiac cycle, cardiac mechanics, biological oscillators and reaction-diffusion
   2.2 Neurophysiology: The neuron, action potential, ionic concentrations and channels, Hodgkin-Huxley and FitzHugh-Nagumo equations.
3. Biomedical instrumentation and measurement
3.1 Electroencephalography: EEG signal and its characteristics, EEG rhythms (δ, θ, α and β) EEG analysis (linear methods).
3.2 Electrocardiography: 12-lead and 3-lead ECG, ECG morphologies, QRS detection, Estimation of RR interval, ECG data compression.

4. Epidemiology
4.2 Epidemic models: SIR, SEIR, SIS. Geographical spread of disease.
4.3 Examples/Case studies selected from: Black death, Venereal diseases, Gonorrhoea, HIV, Influenza, SARS, Avian Influenza and emergent diseases.

Laboratory Experiment:

Experiment/Mini Project:
A selection from the following topics (total of 9 hours work) to be completed in small groups:
1. Instrumentation development for measurement of Galvanic Skin Response (GSR).
2. EEG measurement and rhythm detection.
3. Automated sleep staging from pre-recorded data library.
4. Analysis of transmission parameters for SARS epidemic in Hong Kong.
5. GSR, Pulse and Respiration for detection of psychological stress.

Method of Assessment:
Continuous assessment: 40% Examination: 60%

Text/Reference Books:

Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<th>T&amp;L Method</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>1, 3, 4, 5, 7, 9</td>
<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1, 2, 4, 5, 6-9.</td>
<td>These are supplementary to lectures and are conducted with smaller class sizes; students will be able to clarify concepts and to gain a deeper understanding of the lecture material; problems and application examples are given and discussed.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>2, 3, 5, 6-9.</td>
<td>Students will make use of the software MATLAB and BIOPROBE software and BIOPROBE data acquisition unit to record a variety of biophysical signals and analyse the resultant data.</td>
</tr>
</tbody>
</table>
### Alignment of Assessment and Learning Outcomes:

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<td>Short quizzes</td>
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<td>These can measure the students' understanding of the theories and concepts as well as their comprehension of subject materials.</td>
</tr>
<tr>
<td>Assignments, tests and examination</td>
<td>1, 3, 4, 5, 6, 7, 9</td>
<td>End-of-chapter-type problems are used to evaluate the students' ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>2, 3, 6, 7, 8, 9</td>
<td>Each group of students are required to produce a written report; the accuracy and presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate their technical knowledge and communication skills.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Optical Communication Systems and Networks
Subject Code: EIE449

Number of Credits: 3
Hours Assigned: Lecture/Tutorial 36 hours
Laboratory 2 hours (Equivalent to 6 hours spent by student in laboratory)

Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:
To provide students with the design and operating principles of modern optical communication systems and networks. Upon completion of the subject, students should be familiar with commonly used components and subsystems in optical communication and network systems and be able to design a simple optical communication link.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the basic operating principles of single mode and multimode fibres.
2. Understand the basic operating principles of light sources, detectors and amplifiers.
3. Understand the basic operating principles of passive optical devices.
4. Have the ability to design a simple optical communication link.
5. Appreciate the principles of optical communication networks.

Category B: Attributes for all-roundedness
6. Present ideas and findings effectively.
7. Think critically.
8. Learn independently.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of optical communication systems and through providing the students with an opportunity to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to conduct experiments and to analyze and interpret data obtained.
- Programme Outcome 3: This subject contributes to the programme outcome through teaching the design of an optical fibre based transmission link.
- Programme Outcome 5: This subject contributes to the programme outcome by providing the opportunity for students to use the knowledge learnt to design an optical communication subsystem.
- Programme Outcome 7: This subject contributes to the programme outcome through providing the opportunity for students to learn independently and present the information obtained effectively.

Category B: Attributes for all-roundedness
- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about the way to design an optical communication system.
- Programme Outcome 14: This subject contributes to the programme outcome by providing students with the opportunity to work in a team collaboratively in the laboratory experiments.
Syllabus:

1. **Optical Fibre**
   - 1.1 Principles of optical waveguiding, single mode and multimode fibres and their transmission characteristics.

2. **Active and passive components**
   - 2.1 Light emitting diodes(LEDs) and semiconductor lasers: operating principles and characteristics.
   - Semiconductor optical detectors: PINs and APDs. Optical amplifiers: Erbium doped fibre amplifiers(EDFAs).
   - 2.2 Coupler, isolator, circulator, wavelength division multiplexer and demultiplexer.

3. **Optical communication systems**
   - 3.1 Transmission impairments: noise, dispersion, nonlinearity and crosstalk. Bit error rate(BER) and receiver sensitivity.
   - 3.2 Point to point link design: power budget and dispersion budget.
   - 3.3 Wavelength division multiplexing(WDM). Design of multi-span WDM links.

4. **Optical communication networks**
   - 4.1 WDM add/drop multiplexer, WDM optical crossconnect, Basic architecture of a WDM optical network. Passive optical networks(PONs).

Laboratory Experiments:

Practical Works:

1. Optical fibre passive component measurement
2. Common fibre optic test and measurement techniques

Method of Assessment:

Coursework: 40%   Examination: 60%

The continuous assessment consists of a number of assignments, laboratory reports and tests.

Text Books:


Reference Books:


Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:

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<td>Fundamental principles and key concepts of the subject are delivered to students.</td>
</tr>
<tr>
<td>Tutorials</td>
<td>1,2,3,4,5,7,8</td>
<td>Supplementary to lectures and are conducted with smaller class size; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Assignments and application examples are given and discussed.</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>1,2,3,6,7</td>
<td>Students will enhance their understanding of the concepts learnt through measuring the characteristics of various fibre components. Students are given the opportunity to analyze results obtained and to solve practical problem encountered.</td>
</tr>
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### Alignment of Assessment and Learning Outcomes:

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<td>Tests</td>
<td>1,2,3,4,5</td>
<td>Objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students' ability to remember facts and figures as well as their comprehension of subject materials and end-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom</td>
</tr>
<tr>
<td>Assignments and examination</td>
<td>1,2,3,4,5,7,8</td>
<td>End-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom; Students need to think critically and creatively in order to come with an alternate solution for an existing problem. They need to find additional information independently in order to solve a given problem</td>
</tr>
<tr>
<td>Laboratory sessions</td>
<td>1,2,3,6,7</td>
<td>Each group of students are required to produce a written report; Accuracy and the presentation of the report will be assessed.</td>
</tr>
</tbody>
</table>
SUBJECT DESCRIPTION FORM

Subject Title: Nanoscience and Technology for Electronic Engineering
Subject Code: EIE450
Number of Credits: 3

Hours Assigned: Lecture/tutorial 36 hours
Laboratory 3 hours
(Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: Mathematics II (AMA202)
Probability and Engineering Statistics (AMA305)
Engineering Science (ENG232)
Applied Electromagnetics (EIE338)

Co-requisite: nil
Exclusion: nil

Objectives:
To provide electronic engineering students with the basic concept and scientific foundation to enter the world of nanomaterials and nanotechnology.

Student Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. Be able to describe the basic structure of materials down to the nanometer (atomic) level, with particular emphasis on crystal structure, nano-defects and their kinetics.
2. Achieve a conceptual understanding of the laws of nature in the nanoscale governing electronic, magnetic, photonic, mechanical and thermodynamic properties of materials.
3. Possess the basic knowledge of quantum technology based on magnetism, electron and nuclear spin and superconductivity in the nanoworld.
4. Understand the functional properties of various nanostructures, such as quantum dots, nanowires, ultrathin films and various nanocomposite structures.

Category B: Attributes for all-roundedness
5. Communicate effectively.
6. Think critically and creatively.
7. Work in a team collaboratively.
8. Demonstrate an ability to think logical as well as laterally.

Programme Outcomes:

Category A: Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the theories and concepts of nanoscience and providing the students with an opportunity to apply their knowledge.
- Programme Outcome 2: This subject contributes to the programme outcome by providing students with laboratory exercises to design and conduct experiments related nanomaterials and nanotechnology.
- Programme Outcome 9: This subject contributes to the programme outcome by providing the opportunity for students to stay abreast of one of contemporary issues in engineering – nanomaterials and nanotechnology.

Category B: Attributes for all-roundedness
- Programme Outcome 13: This subject contributes to the programme outcome by providing students with an opportunity to think critically about modern concepts in material science.

Brief Syllabus:
1. Introduction.
3. Interatomic forces, electronic structure of atoms and physical properties of materials.
5. Nanoelectronics.

**Laboratory Experiment:**

**Experiment/Mini Project:**

A selection from 3 topics (minimum 9 hours work) to be completed in small groups.

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**Method of Assessment:**

Continuous assessment: 50% Examination: 50%

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**Text/Reference Book:**


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**Alignment of Teaching and Learning (T&L) Methods with Learning Outcomes:**

<table>
<thead>
<tr>
<th>T&amp;L Method</th>
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<tr>
<td>Lectures</td>
<td>1, 2, 3, 4</td>
<td>fundamental principles and key concepts of the subject are delivered to students</td>
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<td>Tutorials</td>
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<td>students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed</td>
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<tr>
<td>Laboratory sessions</td>
<td>4, 5, 6, 7</td>
<td>students in groups of 2-3 will conduct experiments in the area of nanotechnology</td>
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**Alignment of Assessment and Learning Outcomes:**

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<td>Assignments, tests and examination</td>
<td>2, 4, 8</td>
<td>end-of chapter type problems used to evaluate students’ ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem</td>
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<td>Laboratory sessions, mini-project</td>
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<td>each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each group member to evaluate his technical knowledge and communication skills</td>
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SUBJECT DESCRIPTION FORM

Subject Title: Circuits for Telecommunications
Subject Code: EIE451
Number of Credits: 3

Hours Assigned:
- Lecture/tutorial: 36 hours
- Mini-projects: 3 hours
  (Equivalent to 9 hours spent by student in laboratory)

Pre-requisite: Basic Electricity and Electronics I (ENG237)
- Basic Electricity and Electronics II (ENG238)
- Electronic Circuits (EIE304)

Co-requisite: nil
Exclusion: nil

Objectives:
To study the operating principles and design of telecommunication circuits.

Student Subject Learning Outcomes:
Upon completion of the subject, students will be able to:

Category A: Professional/academic knowledge and skills
1. An ability to design analog electronic circuits for telecommunications applications;
2. An ability to design the basic building blocks of telecommunication systems;
3. An ability to analyze the performance of telecommunication circuits under real-world environments, i.e., in the presence of noise and nonlinear device characteristics;
4. An ability to appreciate the problems associated with the design of telecommunication circuits;

Category B: Attributes for all-roundedness
5. An ability to communicate effectively.
6. An ability to think critically and creatively.
7. An ability to think logically as well as laterally.

Programme Outcomes:

Category A Professional/academic knowledge and skills
- Programme Outcome 1: This subject contributes to the programme outcome through teaching of some of the elements of design analog electronic circuits for telecommunications applications and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 3: This subject contributes to the programme outcome by providing opportunity for students to design a system, component, or process to meet desired needs pertaining to the field of analog electronic circuits for telecommunications applications.
- Programme Outcome 5: This subject contributes to the programme outcome by providing opportunity for students to solve practical engineering problems pertaining to the field of analog electronic circuits for telecommunications applications.
- Programme Outcome 7: Communicate effectively to meet the standard required for the electronic and information engineering profession. This subject contributes to the programme outcome through teaching of some of the elements and providing the students with an opportunity to practice the application of knowledge.

Category B Attributes for all-roundedness
- Programme Outcome 13: Think critically and understand the creative process. This subject contributes to the programme outcome through teaching of some of the elements and providing the students with an opportunity to practice the application of knowledge.
- Programme Outcome 14: Work in a team collaboratively. This subject contributes to the programme outcome by providing the students with an opportunity to practice working in a team.
Syllabus:

1. **Review of Analog Circuits and Overview of Communication Systems**
   - Bipolar junction transistor, MOS field effect transistor, device models, major device parameters, review of building blocks, amplifier configurations, small-signal models, frequency responses, high-frequency limitations, overview of radio communication systems, architecture of communication receivers and transmitters.

2. **Noise and Distortion**
   - Thermal noise, shot noise, flicker noise, avalanche noise, noise figure, noise analysis of analog circuits, intermodulation distortion, harmonic distortion, distortion in amplifiers, dynamic range.

3. **Filters and Transformers**
   - Series resonant circuits, parallel resonant circuits with transformers, frequency selection principles, impedance matching overview.

4. **Phase-locked Loops and Frequency Synthesizers**
   - Basic model of phase-locked loop (PLL), VCO, loop filter, phase detection, operating and design principles, transient performance, applications, PLL frequency synthesizer, fractional-N loop frequency synthesizer, direct digital synthesis (DDS).

5. **Mixers and Oscillators for Communications**
   - Single-ended mixers, balanced mixers, design principles of oscillators, quartz oscillators, dielectric resonant oscillators, tuned oscillators, applications in modulation and demodulation.

6. **Power amplifiers**
   - Class A, B, C, D, S, E, F power amplifiers, operating principles and applications, performance overview.

**Laboratory Experiment:**

**Experiment/Mini Project:**

Possible mini-projects include
- Construction and design of mixer circuits, oscillators, or phase-locked loops.
- In-depth simulation study of the behavior of phase-locked loops.
- Detailed analysis of noise in feedback amplifiers.

**Method of Assessment:**

Continuous assessment: 40%  
Examination: 60%

**Text/Reference Books:**

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