SUBJECT DESCRIPTION FORM

Subject Title: Mathematics IA  
Subject Code: AMA203  
Number of Credits: 3  
Hours Assigned: Lecture 28 hours  
                  Tutorial and Student Presentation 14 hours

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

Aims:
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.

Learning Outcomes:
The subject aims to introduce students to some fundamental knowledge of engineering mathematics. The emphasis will be on the application of mathematical methods to solving practical engineering problems.

Upon satisfactory completion of the subject, students are expected to be able to:
1. apply mathematical reasoning to analyse essential features of different engineering problems such as ordinary differential equations;
2. extend their knowledge of mathematical techniques and adapt known solutions to different situations of engineering context;
3. develop and extrapolate mathematical concepts in synthesizing and solving engineering problems;
4. search for useful information in solving problems;
5. undertake the formulation of mathematical problems through continuous self-learning.

Syllabus:
1. Algebra of Complex Number
   Complex numbers; Geometric representation; n-th roots of complex numbers.
2. Linear Algebra
   Matrices and determinants; Vector spaces; Elementary algebra of matrices; Eigenvalues and eigenvectors; Normalization and orthogonality.
3. Ordinary Differential Equations
   First and second order linear ordinary differential equations; Laplace transforms; Convolution theorem; Fourier transforms.

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

To ensure that students learn and reflect continuously, Continuous Assessment is an important element and students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components. The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.
Textbooks and Reference Books:

# SUBJECT DESCRIPTION FORM

**Subject Title:** Mathematics IIA  
**Subject Code:** AMA204  
**Number of Credits:** 3  
**Hours Assigned:**  
- Lecturer: 28 hours  
- Tutorial and Student Presentation: 14 hours

**Pre-requisite:** Mathematics IA (AMA203)  
**Co-requisite:** nil  
**Exclusion:** nil

## Aims:
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.

## Learning Outcomes:
The subject aims to introduce students with some fundamental knowledge of engineering mathematics. The emphasis will be on application of mathematical methods to solving practical engineering problems.

Upon satisfactory completion of the subject, students are expected to be able to:

1. apply mathematical reasoning to analyse essential features of different engineering problems such as partial differential equations;
2. extend their knowledge of mathematical techniques and adapt known solutions to different situations of engineering context;
3. apply appropriate mathematical techniques to model and solve problems in engineering;
4. develop and extrapolate mathematical concepts in synthesizing and solving engineering problems;
5. undertake the formulation of mathematical problems through continuous self-learning.

## Syllabus:

1. **Calculus and Functions of Several Variables**  
   - Infinite series; Power series; Taylor series; Fourier series; Partial differentiation; Maxima and minima; Lagrange multiplier.

2. **Partial Differential Equations**  
   - Formulation of partial differential equations; Method of separation of variables; Initial and boundary value problems.

3. **Vector Calculus**  
   - Vectors; Scalar and vector products; Gradient, divergence and curl operators; Multiple integrals; Line, surface and volume integrals; Green’s theorem; divergence theorem and Stokes’ theorem.

## Method of Assessment:

- Continuous assessment: 40%  
- Examination: 60%

To ensure that students learn and reflect continuously, Continuous Assessment is an important element and students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components. The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.
Textbooks and Reference Books:
**SUBJECT DESCRIPTION FORM**

**Subject Title:** Electronic Circuits I  
**Subject Code:** EIE251  
**Number of Credits:** 3

**Hours Assigned:**  
- Lecture/Tutorial: 39 hours  
- Laboratory: 15 hours

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

### Objectives:
This is a foundation subject introducing circuit analysis methods, electronic components and simple analogue circuits.

### Student Learning Outcomes:
Upon satisfactory completion of the subject, students are expected to be able to:

**Category A: Professional/academic knowledge and skills**
1. Understand circuit operation.
2. Analyze circuit problems.
3. Understand the operations of semiconductor devices.
4. Understand the operation of amplifiers.
5. Understand the practical applications of operational amplifiers.

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

### Syllabus:

1. **Lumped Circuit Analysis**
   1.1 Voltage and current sources, resistor, parallel and series circuits, voltage and current divisions, use of Wheatstone Bridge, Kirchhoff's laws, mesh and nodal analyses.
   1.2 Dependent sources, Thevenin and Norton theorems, equivalent circuits, source transformations, superposition, maximum power transfer theorem.
   1.3 Capacitor and inductor, steady-state DC analysis and transient analysis in RL and RC circuits, time constant. Transformers and coupled inductors.
   1.4 AC circuits, symbol notation, steady-state analysis, reactance and susceptance, impedance and admittance, complex number analysis, phasor diagrams, complex power, power triangle and power factor.
   1.5 Dynamic circuit analysis, second-order circuits, linear differential equations, complex frequency, LaPlace equivalent circuits, solutions.
   1.6 Resonant circuits, High- and Low-pass filters, frequency response, transfer functions, Bode plots.

2. **Introduction to Semiconductor Devices**
   2.1 Diodes, load line analysis, ideal-diode model, diode applications, rectifier circuits, Zener diodes.
   2.2 Bipolar junction transistor (BJT), Filed-effect transistors: JFET, MOSFET, characteristics.
   2.3 Operation of BJT: cutoff, saturation, active operations, biasing amplification principle (load-line analysis) based on common-emitter amplifier, graphical interpretation of transconductance and gain.

3. **Amplifier Configurations**
   3.1 Common-emitter amplifier and emitter follower.
   3.2 Analysis of small-signal equivalent circuits, $h$-parameters, transconductance, voltage gains, input resistance and output resistance.
   3.3 Operational amplifiers, ideal characteristics, inverting and non-inverting amplifiers, summing and difference amplifiers, differentiator, integrator, voltage follower, comparator, etc.
   3.4 Operational Amplifier specifications: gain, bandwidth, slew rate, rating, electrical and operating characteristics.
3.5 Differential mode and common mode signals, differential mode and common mode gains, common-mode rejection.
3.6 Practical applications of Operational Amplifiers.

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

1. Title: Basic electronic measurement techniques
   Objective: To familiarize students with basic measurement techniques using CROs and digital meters.

   AND any 2 of the following:

2. Title: Kirchhoff's laws, equivalent and maximum power transfer theorem
   Objective: To verify Kirchhoff's laws applied to resistive networks, and to find equivalent resistance of a network.

3. Title: DC transients in RC circuits
   Objective: To study the characteristic of dc transients in RC circuits and the operation of an RC relaxation oscillator.

4. Title: DC biasing and thermal stability of transistor amplifier
   Objective: To design a common emitter amplifier and to investigate the thermal stability of the circuit.

5. Title: Use of 741 Amplifier
   Objective: To familiarize the students with Op Amp741 Amplifier and its common applications.

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

The continuous assessment consists of assignments, lab reports, and tests.

Textbooks:

Reference Books
SUBJECT DESCRIPTION FORM

Subject Title: Electronic Circuits II  
Subject Code: EIE252  
Number of Credits: 3  
Hours Assigned:  
Lecture/tutorial: 39 hours  
Laboratory: 3 hours  
(Equivalent to 9 laboratory hours)

Pre-requisite: Electronic Circuits I (EIE251)  
Co-requisite: nil  
Exclusion: nil

Objectives:
This subject introduces the fundamental principles and design of analogue electronic circuits/sub-systems including transistor amplifiers, power amplifiers, feedback circuits, oscillators and dc power supplies. The design will be illustrated with the application of practical ICs where appropriate.

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

Category A: Professional/academic knowledge and skills
1. Understand the operation of basic electronic circuits/sub-systems.  
2. Analyze basic circuit/sub-system problems.  
3. Design basic electronic circuits/sub-systems.

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.

Syllabus:

1. Frequency Response of Amplifiers
   1.1 Hybrid-pi equivalent circuit of transistors; analysis of voltage and current gain, input and output impedance of RC coupled amplifiers.  
   1.2 Analysis of low frequency and high frequency response of amplifiers; operation of tuned amplifier; effects of cascading amplifiers.

2. Feedback Circuits
   2.1 Types of negative feedback and their effects on gain, frequency and phase responses, distortion, noise, input and output impedance. Typical examples of discrete and IC circuits with feedback.  
   2.2 Design examples of small-signal audio and wideband amplifiers using ICs.

3. Oscillator Circuits
   Principle of operation of negative-resistance and feedback oscillators; Barkhausen criterion; analysis of typical R-C, L-C and crystal oscillator circuits. Operation of bistable, monostable and astable multivibrators and VCOs; design of pulse generators using monostable and timer ICs.

4. Power Amplifiers
   4.1 Classification of power amplifiers; analysis of efficiency, power dissipation and distortion of class A, B, AB and C amplifiers.  
   4.2 Design considerations of power amplifiers.

5. D.C. Power Supplies
   Half-wave and full-wave rectifying circuits, filtering of ripples. Series, shunt and switched regulators; the use of regulator ICs. Principles of voltage multipliers.

6. Power Control Devices and Applications
   Construction, operation and application of UJT, SCR, diac and triac. Analysis of typical single-phase phase-control circuits; protection of SCR and triac; suppression of interference.
Laboratory Experiments:
Each student is required to complete three of the following laboratory experiments:

1. Title: Power Amplifier  
   Objective: To study the waveform, efficiency and crossover distortion in a class AB amplifier.
2. Title: Negative Feedback Amplifier  
   Objective: To design the feedback network for a given amplifier in order to meet certain specifications.
3. Title: Oscillator  
   Objective: To design a Wien-bridge oscillator using an IC amplifier.
4. Title: Power Control Devices  
   Objective: To study the application of power control devices in a small system.

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

The continuous assessment consists of assignments, lab reports, and tests.

Textbook:

Reference Books:
SUBJECT DESCRIPTION FORM

Subject Title: Electronic Design Practice
Subject Code: EIE258
Number of Credits: 2
Hours Assigned: Lecture/tutorial 14 hours
Laboratory/project 14 hours
(Equivalent to 42 laboratory hours)

Pre-requisite: Electronic Circuits I (EIE251)
Co-requisite: nil
Exclusion: nil

Objectives:
This subject aims to introduce the basic knowledge and skills related to the use of equipment and electronic instruments, and to provide design and fault-finding experience through mini-projects.

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 basic electronic instruments.
2. Understand the practical aspects of electronic circuit applications.
3. Use equipment and basic electronic instruments.
4. Perform design and fault-finding of simple electronic circuits/sub-systems.

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

Syllabus:
1. Use of Equipment and Basic Instrumentation
   1.1 Demonstration and practice on power output meter, frequency counter, CRO, power supply, soldering tools.
   1.2 Oscilloscope: operating principles of CRT, time-base and trigger modules; basic concept of digital storage oscilloscope.
   1.3 Counter Timer: operating principles of universal counter timer.
   1.4 Digital Multimeter: operating principles of ohm converter, ac-dc converter, A/D converter.

2. Mini-Projects (Select three from the following)
   2.1 Title: Audio power amplifier
      Objective: To understand the design and the performance of a class AB power amplifier
   2.2 Title: Programmable power supply
      Objective: To understand the design problems and limitations of practical circuit design using operational amplifiers and analogue switches
   2.3 Title: Switching mode power converter
      Objective: To understand the design and performance of a dc-to-dc converter
   2.4 Title: Sound effect generator
      Objective: To apply the theoretical knowledge of multivibrator to the practical design of a sound effect generator to meet a given specification
   2.5 Title: Sine wave generator
      Objective: To understand the design problems and limitations of practical circuit design using multivibrators and operational amplifiers
Method of Assessment:

Course work: 100%

The course work consists of assignments, mini-project demonstrations and reports.

Textbooks/References:


SUBJECT DESCRIPTION FORM

Subject Title: Logic Design
Subject Code: EIE261
Number of Credits: 3
Hours Assigned: Lecture/tutorial 36 hours
Laboratory 6 hours
(Equivalent to 18 laboratory hours)

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

Objectives:
To provide students with a broad view in digital logic design and enable them to gain understanding and skills that will be used in later computer-related courses.

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

Category A: Professional/academic knowledge and skills
1. Analyze the function of combinational logic circuits
2. Apply the basic principle in designing sequential circuits
3. Match the interfaces among different logic family devices
4. Design logic systems using programmable logic devices
5. Analyze the organization of memory subsystems and to understand the read/write operation sequences

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

Syllabus:
1. Digital Systems and Logic Gates
   1.1 Digital representation of analogue signals. Methods of representing negative binary numbers, binary coded decimal numbers and floating-point numbers.
   1.2 Electrical representation of binary numbers and Boolean variables, positive logic and negative logic, TTL Vs MOS families, non-ideal digital waveforms, propagation delay.
   1.3 De Morgan's theorems, canonical forms of Boolean functions, NAND-only and NOR-only implementations.
   1.4 Boolean functions of logic circuits: code converter, comparator, full adder, etc.

2. Combinational Logic
   2.1 Boolean function simplification by K-map method.
   2.2 Synthesis of combinational circuits: decoder, encoder, multiplexer, de-multiplexer, arithmetic and logic unit (ALU), multiplier and divider circuits for integers, etc.

3. Sequential Logic
   3.1 Flip flop types, edge trigger and pulse trigger, asynchronous clear and preset.
   3.2 Construction of parallel and serial registers using D flip-flops, the role of registers and their addresses in memory systems.
   3.3 Construction of excitation tables for synchronous state machines using D flip-flops, construction of state diagrams for state machines, synthesis of counters and simple state machines using D flip-flops.

4. Electrical Characteristics of Digital Circuits
   4.1 Structure of typical input and output stages, open-collector Vs tri-state gates.
   4.2 Interpretation of typical electrical specifications in data sheets, fan-in and fan-out.

5. Programmable Logic Devices
   5.1 Use of PLD devices (PAL, GAL, CPLD, FPGA, etc.).
   5.2 PLD programming tools.
6. Memory
   6.1 Introduction to the internal organization of ROM, SRAM, DRAM, Flash memories, FIFO and LIFO memories.
   6.2 Organisation of multiple memory ICs, read and write operations, timing waveforms, access time of static RAM and dynamic RAM.

7. Computer arithmetic
   Fast addition; multiplication and division algorithm.

Laboratory Experiment and Mini-project:
1. Experiments using logic gates, decoders, multiplexers and ALU units.
2. Simulation of designing synchronous counters, shift registers using PLD devices.
3. Constructing a synchronous state machine using PLD devices and constructing a test-bed to test the product.

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

Reference Books:
## Subject Description Form

<table>
<thead>
<tr>
<th>Subject Title</th>
<th>Subject Code</th>
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<tr>
<td>Computer Programming</td>
<td>EIE264</td>
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<th>Number of Credits</th>
<th>Hours Assigned</th>
<th>Pre-requisite</th>
<th>Co-requisite</th>
<th>Exclusion</th>
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<td>Lecture/Laboratory/Tutorial 42 hours</td>
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### 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:

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

**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 with at least one C/C++ programming environment.
2. Be proficient in using the basic constructs of C/C++, such as variables and expressions, looping, arrays and pointers, to develop a computer program.
3. 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. 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.

### Syllabus:

1. **Introduction to Programming**

2. **Bolts and Nuts of C/C++**
   - Preprocessor, program codes, functions, comments. Variables and constants. Expressions and statements. Operators.

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. **Program Design and Debugging**

5. **Basic Object Oriented Programming**

6. **Pointer and Array**
7. **Stream I/O**

8. **Using C/C++ in Engineering Applications**
   Solving numerical problems using C/C++. Developing graphical user interfaces for Engineering applications.

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**Method of Assessment:**

Coursework: 100%

For this subject, students need to go through two 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 two tests are worth 50% 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.

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**Textbook:**


**Reference Books:**

### SUBJECT DESCRIPTION FORM

**Subject Title:** Information Technology  
**Subject Code:** EIE 282  
**Number of Credits:** 3  
**Hours Assigned:**  
- Lecture/Tutorial 36 hours  
- Laboratory 6 hours  
  (Equivalent to 18 laboratory hours)

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

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**Objectives:**

1. To provide the foundation knowledge in computer engineering, computer networking and data processing that is essential to modern information system construction.  
2. To appreciate how information technologies may be deployed in solving engineering problems.

**Student Learning Outcomes:**

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

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

1. Identify different components of a computer system and understand their features.  
2. Understand the basic functions of a computer operating system.  
3. Understand the basic principles underlining a database system and be able to set up a simple database.  
4. Develop simple Web-based database applications.  
5. Have the ability to develop simple Web document.  
6. Identify different components and technologies used in the Internet and understand their features.

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

7. Solve problems using systematic approaches.  
8. Learn independently and be able to search for the information required.

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**Syllabus:**

1. **Introduction to Computer Systems**  

2. **Introduction to Database Systems and Information Systems**  
   Data modeling, relational database concept, structured query language (SQL), database management, Web and database linking, database application development. Introduction to information systems. System development life cycle.

3. **Networking Essentials and The Internet**  
   Introduction to computer network: LAN and WAN, clients and servers, network topologies. Networking models. Network protocol case studies: Ethernet, TCP/IP. Internet services and Internet programming. IP addressing, sub-netting, routing and address resolution. Network devices – modem, hub, bridge, switch, and router.
Laboratory Experiments:
Possible Practical Works:
1. Using a debugger to explore the programming model of a microprocessor
2. Tracing the execution of a simple assembly language program
3. Installation and use of Linux
4. Database construction and query
5. Web-based database application development
6. Internet programming case studies
7. TCP/IP connectivity

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

Reference Books:
SUBJECT DESCRIPTION FORM

Subject Title: China Studies  
Subject Code: GEC2801

Number of Credits: 2  
Hours Assigned: Lecture 28 hours

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

Objective:
To help students acquire a broad-based knowledge about China.

Intended Learning Outcomes:
Upon completion of the subject, students shall be able to develop interest in:
1. the understanding of: Chinese culture, legal system, social and political institutions, economy and business, science and technology, etc.;
2. the relationship and linkage of the past and the present day China; and
3. the latest development and trends of the Mainland that shape the future of China.

Structure:
14 themes under the subject will be offered in Semester 1 of 2006/07, each theme lasts for 4 hours (2 hours for each week).

Students who participate in the Preferred Graduate Development Programme with their summer placement in Beijing can apply to take an alternate mode of China Studies during the summer term. This mode combines classroom lectures with associated guided study visits in Beijing. For details, please refer to the Student Affairs Office (www.polyu.edu.hk/sao/pgdp).

Medium of Instruction:
1. Cantonese will be the predominant medium of instruction. For some theme lectures, Putonghua and English will be used.
2. Non-Chinese speaking students can attend the English class (group 128).

Method of Assessment:
To complete the subject, students are required to:
1. Attend 7 different theme lectures out of the 14 themes offered.
2. Submit 7 reflective writings / quizzes and pass at least 5 themes; and
3. Pass an essay on a theme that has been attended.

Grading: Pass with Merit, Pass, or Fail

Learning Support:
1. WebCT  webct.polyu.edu.hk
2. General Education Centre’s Project Room (located at A529)
3. List of educational videos (China Studies) www.polyu.edu.hk/~gec/video
4. Online resources database accessible via PolyU campus network
   a. Infobank China 中國資訊行 www.chinainfobank.com
   b. Sinowisdom 中華智庫網 www.sinowisdom.com
5. Other electronic database accessible via the website of PolyU library
   a. China Studies www.lib.polyu.edu.hk/electdb/cdsbjhtm#CHINA
6. Books reserved for this subject at the Pao Yue-kong library
SUBJECT DESCRIPTION FORM

Subject Title: Computer Graphics  
Subject Code: COMP350  
Number of Credits: 3  
Hours Assigned: Lecture 28 hours, Tutorial/Laboratory 14 hours

Pre-requisite: Computer Programming (EIE264)  
Co-requisite: nil  
Exclusion: nil

Objectives:
This subject allows students to:
1. understand the concept and practice of computer graphics;
2. appreciate the role of graphics as foundations to user interfaces, visualization and digital design;
3. learn the fundamental techniques, data structures and algorithms used in standard graphics API’s;
4. learn about the common API’s, for example, Java 3D, OpenGL, DirectX.

Student Learning Outcomes:
After taking this subject, the students should be able to:

Category A: Professional/academic knowledge and skills
1. identify and integrate digital hardware components required for high-performance computer graphics;
2. develop programs using Java 3D, OpenGL and/or DirectX API’s;
3. understand and apply the problems and techniques in image synthesis;
4. effectively construct data structures and develop algorithms for handling 3D modeling and animation;
5. develop simple graphics software systems.

Category B: Attribute for all-roundedness
6. understand, appreciate and follow the development and advancement of computer graphics technologies, including advanced technologies for 3D modelling, high performance rendering.

Syllabus:
1. Hardware components (3 hours)
   Basic hardware modules necessary for a functional graphics workstation, such as display devices, color formation, frame buffers and image representation in hardware.

2. Rasterization and scan conversion (4 hours)
   Algorithms for digitizing basic 2D shapes, such as lines, curves, circles, polygons.

3. 2D transformations (3 hours)
   Transforming points, lines, and vectors in 2D; introduction to homogeneous transformations.

4. 3D modeling and projective spaces (4 hours)
   3D modeling: rotations, translations, scaling, shearing, and projective geometry.

5. Camera model (3 hours)
   Constructing the 3D viewing frustrum; modeling a pin-hole camera for digital image synthesis.

6. Basic 3D object modelling (4 hours)
   Object hierarchies; planes; polygon meshes; spline curves and surfaces.

7. 3D Visibility (4 hours)
   Visibility problems and solutions; the Z-Buffer algorithm.

8. Rendering (3 hours)
   Light, colour, illumination models; shading; ray-tracing; radiosity.
Laboratory Experiment:
Appropriate laboratory exercises will be conducted using the currently available computer graphics API such as OpenGL and DirectX.

Case Study:
If applicable, case studies may be conducted on modeling and design systems that are used in commercial applications.

Method of Assessment:
Assignments: 40%  Quizzes: 20%  Project: 40%

Textbook:

Reference Books:
Subject Title: Higher Diploma Project
Subject Code: EIE350
Number of Credits: 6
Hours Assigned: Structured Study 84 hours
Self-work/Guided Study 168 hours

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

Objectives:
The Higher-Diploma project is intended as a focal point, where students are expected to integrate knowledge from various subject areas to accomplish a task with a given specification. The task may be the design of a product, the characterization of a process, or the investigation of an engineering problem. Other factors encountered in real engineering, e.g., costing, scheduling should be taken into consideration when carrying out the project if appropriate. The student will work in group projects with two students in each group, but each student will be assigned different tasks to be accomplished. Group projects have the advantage of allowing a student to learn to interact with other people to simulate a real working environment.

Student Learning Outcomes:
On completion of the final year project, the 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. Integrate and apply knowledge learnt in present and previous stages (vertical integration) and across different subjects (horizontal integration).
3. Apply various professional skills in electronic and information engineering to achieve the objectives of the project.
4. Learn to use new tools and facilities, and to gather new information, for the conduction of the project.

Category B: Attributes for all-roundedness
5. Work under the guidance of a supervisor while exercising self-discipline to manage the project.
6. Communicate effectively with related parties (supervisor, peers, vendors).
7. Work with others (team partners, outsource company, technical support staff) collaboratively and develop leadership capability.
8. Realize different constraints, and to make appropriate compromise, when designing a solution to an engineering problem.
9. Disseminate effectively the results and knowledge learnt in the project.
10. Transfer the knowledge and skills learnt in the project.

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, each group of students 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 students 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

**Method of Assessment:**

Each student should be made responsible for a significantly non-overlapping subtask specified by the supervisor. However, each student is expected to understand their partner's work in sufficient depth to answer reasonable technical questions. Two hard copies and one soft copy of the final report, and the daily log-book are to be submitted at the end of the second semester. In both the report and in the presentation, students are required to state their individual contributions to the project work and the report. As far as practically possible, the supervisor will assess each student individually and award grades that commensurate with the student’s individual contributions.

The assessment of the project is according to the following guidelines:

**Nominal weighting**

1. The quality of work and the individual daily log-book; (60%)
2. The quality of the report (30%)
3. The quality of the presentation (10%)

A maximum of 10% of the total marks would be given to the English component.
SUBJECT DESCRIPTION FORM

Subject Title: Analogue and Digital Integrated Circuits
Subject Code: EIE351
Number of Credits: 3
Hours Assigned: Lecture/tutorial 39 hours Laboratory 3 hours (Equivalent to 9 laboratory hours)

Pre-requisite: Electronic Circuits I (EIE251)
Electronic Circuits II (EIE252)
Logic Design (EIE261)

Co-requisite: nil
Exclusion: nil

Objectives:
To introduce the fundamental principles, techniques, methods, and circuits for analogue and mixed-signal 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 fundamental design principles and applications of analogue and digital integrated circuits.
2. Understand the analysis and design techniques of circuits commonly used in operational amplifiers and digital integrated circuits.
3. Design simple electronic circuits by using commercially available integrated circuits.

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.

Syllabus:
1. Analogue Integrated Circuits
   1.1 Analogue basic building blocks: differential pairs, current mirrors, MOS switches, active load, and biasing networks.

2. Digital Integrated Circuits
   2.1 Structure, operation and design of TTL, MOS, BiCMOS, and ECL logic gates. Input and output characteristics. Practical issues: logic levels, fan-in, fan-out, noise margin, propagation delay and power dissipation. Design of interface circuitry between logic families.
   2.2 Typical structure, operation, design and applications of storage elements: flip-flops, registers, and counters. Performance estimation, sources of glitch, clock skew, ringing, causes of malfunctioning and hazards. Semiconductor memories: RAMs, ROMs.

Laboratory Experiment:
Design of electronic circuits using analogue and digital integrated circuits.
Method of Assessment:
Continuous assessment: 40%  Examination: 60%

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

Reference Books:
Subject Title: Computer System Fundamentals  
Number of Credits: 3  

Hours Assigned:  
Lecture/tutorial 36 hours  
Laboratory 6 hours  
(Equivalent to 18 laboratory hours)

Pre-requisite: Microcontroller Systems and Interface (EIE373)  
Co-requisite: nil  
Exclusion: nil

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

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 fundamentals of computer systems and associated technologies.
2. Solve hardware and software problems related to using small computer systems.
3. Apply interfacing techniques in using computer systems.

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.

Syllabus:
1. Microprocessors and Microcomputers
   The following topics will be discussed with references to one or two well-established (contemporary) microprocessors.
   1.1 CPU Architecture: control unit, hardwired control Vs micro-programmed control; instruction fetch and execution timing, pipelining; essential assembly language instruction types.
   1.2 I/O Interface: Memory-mapped I/O; I/O port address decoding; polling, handshaking I/O, interrupt I/O; priority interrupt controller; programmable peripheral interface.
   1.3 Memory Interface: Memory devices; address decoding; banking; bus buffering and driving; wait state; introduction to cache memory system.
   1.4 Direct Memory Access: Basic DMA operation, DMA controller, secondary memory systems, video displays.
   1.5 Interface bus: Introduction to ISA bus, PCI bus, USB and PCMCIA.

2. Operating System:
   2.1 Roles of basic input/output system (BIOS) and basic disk operating system(DOS); power-up sequence, bootstrap; command processor, file operating commands, system control, automatic program execution (e.g. batch file); operating system calls via software interrupts; system utilities; device driver.
   2.2 File system: space management e.g. file allocation table; file management, directory entry, file control blocks and file handles.
   2.3 Introduction to multitasking and time-sharing systems: time-slicing; process states and process control block; context-switching mechanism.
Laboratory Experiments:

Possible Laboratory Experiments

1. Exploring system data on a bootable floppy disk
2. File manipulation by assembly code
3. Interrupt I/O with priority controller
4. DMA I/O in DOS environment
5. Device driver
6. Exploring the process of software interrupt and BIOS calls
7. Accessing parallel port and serial communication port by OS calls

Method of Assessment:

Coursework: 40%   Examination: 60%

Reference Books:

3. W. Buchanan, PC Interfacing, Communications and Windows Programming, Addison-Wesley, 1999
**SUBJECT DESCRIPTION FORM**

**Subject Title:** Linear Systems  
**Subject Code:** EIE362  
**Number of Credits:** 3  
**Hours Assigned:**  
Lecture/tutorial 36 hours  
Laboratory 6 hours  
(Equivalent to 18 laboratory hours)

**Pre-requisite:** Mathematics I (AMA203)  
**Co-requisite:** nil  
**Exclusion:** nil

**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:**

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

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

1. Understand the representations and classifications of the signals and systems.  
2. Model linear systems using time and frequency domain approaches for both continuous-time and discrete-time models.  
3. Analyze signals and systems using both time domain and frequency domain techniques.  
4. Understand the generation of a discrete-time signal by sampling a continuous-time signal.  
5. Understand the design of analogue filters.  
6. Apply software tools, particularly MATLAB, to laboratory exercises for practicing the theories and to the analysis and design of signals and systems.  
7. Appreciate the advantages and disadvantages of using the different representations and modeling approaches.

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

8. Present ideas and findings effectively.  
9. Think critically.  
10. Learn independently.  
11. Work in a team and collaborate effectively with others.

**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
6. Laplace Transform

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

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

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**Reference Books:**
### SUBJECT DESCRIPTION FORM

<table>
<thead>
<tr>
<th>Subject Title:</th>
<th>Microcontroller Systems and Interface</th>
<th>Subject Code:</th>
<th>EIE373</th>
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<tbody>
<tr>
<td>Number of Credits:</td>
<td>3</td>
<td>Hours Assigned:</td>
<td>Lecture/tutorial 36 hours</td>
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<tr>
<td>Pre-requisite:</td>
<td>Logic Design (EIE261)</td>
<td>Co-requisite:</td>
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<td>Exclusion:</td>
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**Objectives:**
To provide students with the concepts and techniques required in designing computer hardware interfaces and embedded software for microcontrollers.

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

**Category A: Professional/academic knowledge and skills**
1. Use assembly languages in developing program for the use of microcontrollers.
2. Use the C programming language in developing more complicate program for the use of microcontrollers.
3. Apply the basic skills for interfacing common devices to microcontrollers.

**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.

**Syllabus:**
1. **Architecture of Typical Microcontrollers**
   Overview of programming model, instruction set, interface to external memory; use of stack in subroutine calls and interrupt services; access of built-in I/O ports, timers and counters.
2. **Software Development Environment**
   Features of a selected macro assembler, working principle of assembler; assembler directives, examples of assembly language programs; features of a selected C compiler, examples of C programs for controlling microcontrollers.
3. **I/O Interfacing**
   Output-pin driving limitations, current driving, inductive load driving; pulse generation and measurement; keyboard scanning, display multiplexing, LCD controllers, use of peripheral interface IC; analogue signal sensing, analogue and digital conversion; serial interface standards; examples of microcontroller-based industrial I/O standards.
4. **Embedded Software Development and Testing**
   Embedded software issues; tasks and events; interrupt system: nesting, priority and latencies; simulator, debugger and emulator.

**Laboratory Experiments:**
**Practical Works:**
1. Develop interrupt service routines serving timer interrupts and external interrupts.
2. Embedded software development using MCU development tools.
Mini-project:
Build a microcontroller system employing external peripheral interface IC, multiple 7-segment displays, LEDs and small keyboard, etc.

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

Reference Books:
Subject Title: Signal Processing Applications

Subject Code: EIE374

Number of Credits: 3

Hours Assigned: Lecture/tutorial 38 hours
Laboratory 4 hours
(Equivalent to 12 laboratory hours)

Pre-requisite: Linear Systems (EIE362)

Co-requisite: nil

Exclusion: nil

Objectives:

This subject provides students with the concepts and design techniques of basic signal processing systems, and familiarizes students with the techniques of using Matlab to understand different signal processing 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 and techniques for the realization of digital systems.
2. Design analogue filters and digital filters.
3. Apply DTF for signal and system analysis.
4. Understand the architectures of signal processors.
5. Apply signal processing theory on real applications.

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

Syllabus:

1. Discrete-time Systems and General Realization Techniques
   Basic definition of discrete-time signal. The z-transform and inverse z-transform, computation of frequency response, stability. Direct realization, canonic form realization, cascade and parallel realization of digital systems.

2. Design of Infinite Impulse-response (IIR) and Finite Impulse-response (FIR) Digital 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 step-invariant approaches. 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 (DFT)
   Fourier analysis using the DFT, convolution theorem, circular convolution, the fast Fourier transform (FFT) algorithm and implementation of the FFT.

4. Signal Processing Applications
   Architectures of digital signal processors and DSP chips. Application examples.

Laboratory Experiments:

1. Digital filter design
2. Encoding and decoding touch-tone signals for telephones
3. Frequency spectrum analyzer
4. Programming a signal processor
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:
Subject Title: Object-Oriented Design and Programming  
Subject Code: EIE375

Number of Credits: 3  
Hours Assigned: Lecture/tutorial 36 hours  
Laboratory 6 hours  
(Equivalent to 9 laboratory hours)

Pre-requisite: Computer Programming (EIE264)  
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. Understand and apply the programming language Java in object oriented software development.
3. Understand and apply the tool UML in object oriented software modeling.
4. Develop a simple software application using the object oriented approach.

Category B: Attributes for all-roundedness
5. Learn independently and be able to search for the information required in solving problems.

Syllabus:
1. Introduction to Software Engineering
   Software products; the software process; process models; process visibility.

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, HTML applet tag syntax, passing information from Web pages to applets. 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 Experiments:

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:
Coursework: 40%       Examination: 60%

Textbooks:

Reference Books:
SUBJECT DESCRIPTION FORM

Subject Title: Web-based Multimedia
Subject Code: EIE380
Number of Credits: 3
Hours Assigned: Lecture/Tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

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

Objectives:
This subject enables students to understand the production and use of multimedia for the World Wide Web (WWW).

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 fundamentals of web-based multimedia and associated technologies.
2. Apply theory to practice by doing laboratory experiments on how to use the tools to create digital audio, image and video, and how multimedia integrates with the WWW.
3. Solve problems and design applications related to web-based multimedia.
4. Appreciate the importance of creativity and critical thinking, and to find optimum solutions for designing web-based multimedia under any particular situation.

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

Syllabus:

1. System Requirements
   Internet access. Access information on the WWW. Software and hardware requirements for multimedia.

2. Tools for Multimedia Integration
   Audio/Video on the WWW. Synchronized Multimedia Integration Language (SMIL) and Virtual Reality Markup Language (VRML).

3. Basics of Multimedia Signals

4. Compression Standards

5. Media Production
   Production tools and concepts. Digital audio, image and video production.

6. Media File Formats

Laboratory Experiments:

1. Creating a simple multimedia presentation using SMIL.
2. Creating an interactive multimedia presentation using SMIL.
3. Building a simple 3-D scene using VRML.
4. Using Advanced Features of VRML.
5. Creating an Animated VRML World.
Method of Assessment:
Continuous assessment: 40% Examination: 60%

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

Reference Books:
SUBJECT DESCRIPTION FORM

Subject Title: Communication Fundamentals
Subject Code: EIE381
Number of Credits: 3

Hours Assigned:
- Lecture/Tutorial: 36 hours
- Laboratory: 6 hours
(Equivalent to 18 laboratory hours)

Pre-requisite: Mathematics I (AMA203)
Mathematics II (AMA204)
Co-requisite: nil
Exclusion: nil

Objectives:
To introduce
1. the fundamental techniques for the analysis of signals and systems,
2. the concept of information and channel capacity,
3. the theories and performance of analog communication systems, and
4. the pulse modulation techniques.

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 fundamentals of signal analysis and communication systems.
2. Apply the fundamentals to solve problems related to communications.

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

Syllabus:
1. Introduction
   Introduction to communication systems. Elements of a basic communication system. Examples of wired and wireless systems.

2. Fundamental Concepts of Signal and Systems
   Classification of signal and systems, Fourier series, Fourier transform, time-frequency relationships, Parseval’s theorem, power spectral density, autocorrelation correlation and cross-correlation function, convolution, sampling theorem, filters in communication systems, energy spectral density.

3. Information Theory
   3.1 Measure of information. Entropy.
   3.2 Channel capacity.

4. Analogue Communications
   4.1 Amplitude modulation: double sideband, single sideband and vestigial side band modulation, frequency spectrum and power relationship of the amplitude modulation signal, demodulation methods.
   4.2 Angular modulation: phase and frequency modulation, frequency spectrum of the angular modulation signals, demodulation methods.
   4.3 Output signal-to-noise ratio in various analogue modulations systems. S/N ratio improvement through pre-emphasis/de-emphasis.

5. Digital Communications
   5.1 Pulse amplitude modulation, quantizing and coding, quantization noise, uniform & non-uniform quantization, pulse code modulation, delta modulation. Comparison of pulse code modulation & delta modulation systems.
   5.2 Time division multiplexing: concept of framing and synchronizations, TDM-PCM telephone system, comparison of TDM & FDM.
Laboratory Experiments:

Experiments
1. Fourier Analysis of a Square Wave
2. Amplitude Modulation (Basic knowledge)
3. Amplitude Modulation (Circuit implementation)
4. Frequency Modulation (Basic knowledge)
5. Frequency Modulation (Circuit implementation)
6. Sampling and Time Division Multiplexing

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

Textbook:

Reference Books:
SUBJECT DESCRIPTION FORM

Subject Title: Data Communications
Subject Code: EIE399
Number of Credits: 3
Hours Assigned: Lecture/Tutorial 36 hours
Laboratory 6 hours
(Equivalent to 18 laboratory hours)

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

Objectives:
This subject aims at providing students with a firm foundation about data communications and TCP/IP-based computer networking. On completion of this subject, the students will be able to:

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

Category A: Professional/academic knowledge and skills
1. Identify various components in a data communication system, describe their properties, explain how they work and evaluate their performance.
2. Describe how the physical, data link, and network layers operate in a typical data communication.
3. Set up and configure an Intranet with LAN switches, routers and servers.
4. Design a 1200-baud modem with a given chip set, measure its performance and interface it to a computer via the EIE232 standard to implement a data communication solution.

Category B: Attributes for all-roundedness
5. Communicate ideas effectively.
6. Work collaboratively with others.
8. Think critically.

Syllabus:
1. Data Communication Systems and Components
   Distributed processing, protocols and services, interfacing standard, layering architecture.
2. Basic Concepts
   Line configuration, topology, transmission mode, networks categories.
3. Network Architecture Layering
   OSI 7-layer model, TCP/IP 4-layer model, typical components in layers.
4. Physical Layer Standards
   Transmission media, baseband data transmission and encoding methods, passband data transmission and modulation methods, modem design, interfacing standards, multiplexing.
5. Data Link Layer
   Error control – error detection code and line protocol, flow control, data link layer protocol examples – stop-and-wait protocol, sliding window protocol.
6. Local Area Network
   Ethernet and its variations, LAN internetworking – LAN switches and virtual LAN, wireless LAN, structured cabling system
7. Network Layer
   Internetworking and the Internet, TCP/IP protocol suite – protocol operations and performance
Laboratory Experiments:
1. Mini project: Design and construction of an ITU-T 1200-baud modem with EIA232 interface (12 hours).
2. Analysis of TCP/IP protocol with a packet capturing software (3 hours).
3. Setting up and configuring an Intranet with Cisco routers (3 hours).

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

The continuous assessment will consist of 5 assignments, 2 laboratory reports, a mini-project report, and two tests.

Reference Books:
4. M. Castelli, LAN Switching First-step, Cisco Press, 2005
Subject Title: English for Engineering Students  
Subject Code: ELC3503  
Number of Credits: 2  
Hours Assigned: Seminar 2 hours / for 14 sessions 28 hours  
Group Size: 20 (maximum)  
Pre-requisite: nil  
Co-requisite: nil  
Exclusion: nil  

Objectives:
To develop those English language skills required of engineering students to communicate effectively in their future professional careers. Attention will be given to helping students develop the core competences identified by the University as vital to the development of effective life-long learning strategies and skills.

Student Learning Outcomes:
By the end of the subject, students should be able to use appropriate language and text structure to:

Category A: Professional/academic knowledge and skills
1. Write reports related to technical studies.  
2. Write workplace correspondence related to engineering professions.  
3. Present information and ideas professionally.

Category B: Attributes for all-roundedness
4. Communicate effectively in speech and in writing.  
5. Work individually on their own initiative, and as team members.  

Syllabus:
1. Written Communication
   Identifying and writing functions common in technical subject discourse; understanding and applying principles of technical text structure; developing paraphrasing, summarising and referencing skills; improving editing and proofreading skills; achieving appropriate tone and style in technical and report writing; selecting and using relevant content, appropriate style, acceptable format, structure and layout in letters, memoranda and reports.

2. Spoken Communication
   Recognising the purposes of and differences between spoken and written communication in English in professional contexts; identifying and practising interactional and linguistic skills for oral presentations; preparing and delivering presentations.

3. Language Appropriacy
   Introducing notions of context-sensitive language use in both spoken and written English.

4. Language Development
   Improving and extending relevant features of students’ grammar, vocabulary and pronunciation.
Teaching and Learning Approach and Teaching Schedule:

The subject is designed to introduce students to the communication skills, both oral and written, that they may be expected to need to function effectively in their future professions. These skills will be necessary for successful employment in any organisation where internal and/or external communication is conducted in English.

The study method is primarily based on seminars which will include discussions, role-play, individual and group activities. In addition to learning materials specially prepared by English Language Centre staff, use will be made of information technology and the ELC’s Centre for Independent Language Learning. Teachers will also recommend additional reference materials as required. A considerable amount of individual self-access learning is expected of students.

Method of Assessment: Continuous Assessment: 100%

Reference Books:

Written Communication


Spoken Communication

SUBJECT DESCRIPTION FORM

Subject Title: Engineering Management A  
Subject Code: ENG305

Number of Credits: 3  
Hours Assigned: Lecture 28 hours  
Tutorial 14 hours

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

Objectives:
This subject will provide students with:
1. Skills for analysing and applying the basic principles and techniques involved in management of people and engineering activities in the production of goods and services. Techniques learned will enable students to carry out operations in an organization for the purposes of organizing, planning and control of project and process activities.
2. 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 ability to apply ethical and business behaviours in engineering organizations in the changing environment in which they operate.
4. The ability to apply the change management techniques and enable students to evaluate the changing factors that affect the change process before implementation of any changes.

Student Learning Outcomes:

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

1. To analyse the organisation structure, and identify the planning and strategic management factors affecting the success of organizations in both manufacturing, and service sectors. (Objective 1 and Syllabus Item 1). Category A
2. To apply appropriate management techniques to improve organization structure and procedures, and quality management. (Objective 2 and Syllabus Item 2). Category A
3. To describe and differentiate between the project management objectives and requirements, and select an appropriate project management technique and apply it to analyze project activities. (Objective 1 and Syllabus Item 3). Category A
4. To be able to analyse factors affecting the changes in the work environment, and be able to control and manage the change activities. (Objective 4 and Syllabus Item 4). Categories A & B
5. To discuss the environmental factors that affect on operations of engineering organizations in Hong Kong, and to recognise ethics and business behaviours in conducting business. (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. Industrial Engineering Planning
   Project management, project specifications, scope and objectives, work breakdown structure and organizational breakdown structure. Tools that support engineering operations; scheduling, business process re-engineering, etc.
4. The Management of Change
   Changes due to technical innovation, political-legal, economic and social issues. 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. legal aspects of employment; professional codes of conduct for engineers; contracting; product liability; sources, effect and control of environmental pollutants.

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: Industrial Centre Training
Subject Code: IC292
Number of Credits: 10 (training credits)
Hours Assigned: 10 weeks
Pre-requisite: nil
Co-requisite: nil
Exclusion: nil

Objectives:

Industrial Centre Training is provided by The Hong Kong Polytechnic University Industrial Centre. The objective of the subject is to equip students with practical skills, techniques and technologies which are general and essential in the practice of electronic and information engineering (EIE). The training is comprised of three parts; technology training, engineering graphic communication and industrial safety.

(i) Technology training comprised of engineering practice in EIE and computer training. In the engineering practice, student should acquire fundamental knowledge in electronic product design and prototype fabrication with an appreciation of electronic product manufacturing process and practise. On completion of the engineering practice, student should be able to handle projects and fabricate prototype for electronic design and development. Furthermore, students also receive training in fundamental practical skills in different types of computer software that is essential in engineering, which include computer operating systems, client-server operation, data networking, basic scientific computing, computer graphics and animations, Web authoring and Internet search, database and spreadsheets.

(ii) Engineering graphic communication provides an opportunity for student to learn and use technical graphics as a media to express ideas and describe objects. The emphasis is put on practicing the principle and interpretation of technical drawing and to communicate design idea using simple sketch and computer graphics. In addition to computer based technical graphics, students are expected to be familiar with using electronic design automation (EDA) software to capture and design electronic circuit boards and comprehend different types of electrical drawings that are frequently encountered in electronic and electrical engineering.

(iii) Industrial Safety provides students with an understanding of industrial hazards and their control in practicing engineering in industry.

Student Learning Outcomes:

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

Category A: Professional/academic knowledge and skills
1. Acquire practical professional skills and best practice in electronic and information engineering for application on the design, construction, operation and maintenance of electronic and information equipment.
2. Acquire fundamentals in using commercial available software to solve problems.
3. Demonstrate technical competence in handing electronic projects and produce prototypes for design and development.
4. Understand the importance of safety, responsibility and regulation in the practice of engineering.
5. Application of fundamental principles in electronic and information engineering and develop practical methods to solve circuit or product development problems.

Category B: Attributes for all-roundedness
6. Communicate effectively and work in harmony with other members in a team and develop leadership capability.
7. Communicate effectively with engineering graphics and computer graphics.
8. Demonstrate critical and creative thinking in electronic project development and handling.
9. Understand the importance of training and the needs for continue professional development in professional engineering career.
Syllabus:

I. Technology Training (8 weeks)

1. IC 1101 – Basic Electronic Practice for Electronics and Information Engineering (1 week)
   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 Introduction to embedded devices, hands on embedded device programming and testing practice.

2. IC 1102 – Advanced Electronic Practice for Electronics and Information Engineering (1 week)
   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 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.
   2.5 Introduction to Virtual Instrument, application and hands-on practice on Labview or equivalent software package.

3. IC1107 - Integrated Project (2 weeks)
   3.1 Integrated Project provides an opportunity for higher diploma students to develop skills in handling prototype electronic and information engineering projects.
   3.2 Students will participate in a team to realize and develop electronic product prototype under an EDA environment. Tasks included electronic circuit development, PCB design and assembly, prototype chassis fabrication, troubleshooting, testing, project web presentation and documentation.
   3.3 Besides polishing students’ personal quality in teamwork under simulated industrial environment, the projects are structured such that student can top up their training and coalesce their knowledge with experience.

4. IC1610 - Workshop practice for Electronic and Information Engineering (1 week)
   4.1 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.
   4.2 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 should include manual shear and press brake, drilling, stamping and application of sheet metal fastening solutions with necessary safety measures.
   4.3 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.
   4.4 Appreciation of mass production processes for sheet metal and plastic parts fabrication.

5. IC3003 - Basic Scientific Computing (30 hours)
   5.1 Approach and techniques in using the MATLAB Development Environment.
   5.2 Mathematical Operations, matrices, linear algebra, polynomials and interpolation, data analysis and statistics, function functions, differential equations.
   5.3 Programming, M-files programming and application examples, flow control statements, function files.
   5.4 Graphical user interface, data structures, input/output, and object-oriented capabilities.
   5.5 Graphics, data plotting, formatting, basic printing and exporting interfaces with examples in basic scientific applications, pie chart, bar chart, area chart, linear and log plots, 3D-View plot experiment with fitting curves to data.
6. **IC3004 - General Computer and Network Skills (30 hours)**
   6.1 General computer concepts: architecture, interface, peripherals and cabling. Good practice on Internet software application; basic PC troubleshooting; virus scan and cleaning; installation, patching, configuring, managing and troubleshooting Microsoft Windows.
   6.2 Introduction to the application and basic administration of Microsoft Windows Server; managing access to resources, system configuring with data, files and disks management, file transfer on Internet.
   6.3 Linux system administration, desktop environment, shells, text editing and printing.
   6.4 Network Configuration, TCP/IP addressing, name resolution and IP routing, remote access configuring and mobile computing.

7. **IC3009 - Database & Presentation for EIE (30 hours)**
   7.1 Design html based web page with Dreamweaver using graphics, fonts, layers and interactive features with multimedia, Java applet and Javascript.
   7.2 Application of Microsoft Access in simple database creation, indexing, input and output into Microsoft Excel, Microsoft Word and Microsoft Powerpoint. Make presentation with chart and graph using Microsoft Excel for basic business and scientific analysis.
   7.3 Application of Adobe Illustrator to create simple graphics in pixel-based and vector-based formats with simple graphic rendering techniques; colour, gradient, and pattern fill.
   7.4 Application of Adobe Photoshop with basic photo-editing techniques; selection, adjustment, transformation and masking.

II. **Engineering Drawing and Computer Graphics (46 hours)**

**IC8031 Drawing for Electronics & Information Engineering (46 hours)**

1. **Computer Based Technical Graphics (36 hours)**
   1.1 Overview and Technical Sketching
      - Engineering graphics as a communication medium, geometrical sketching, problems and visualization.
   1.2 Appreciation of Engineering Drawing
      - Orthographic Projection Systems, Sectioning, Auxiliary Projections.
   1.3 Technical Sketching
      - Axonometric projections and standard practices; dimension and tolerance.
   1.4 Application of CAD in Engineering Drawing
      - CAD command system and drawing aids, computer based documentation; export, import, attachment.
   1.5 Three-dimensional Modelling and Presentation
      - Three-dimensional visualization; wire frame, surface and solid models; constructive solid geometry; primitives, Boolean operations.
   1.6 Orthographic projection from solid models; viewpoints, model space.
      - Appreciation of parametric solid modelling, parametric constraints; NURBS surface modelling.

2. **Engineering Drawing in Electronic & Information Engineering (10 hours)**
   2.1 Introduction to electronic circuit schematics and logic diagrams; electronic design automation software, placement of components, capturing, annotation, labelling, net list generation.
   2.2 Electronic parts library, symbols, physical packages, discrete components, integrated circuits, logic and analogue circuits, gate and pin definition, swappability.
   2.3 Electrical & electronic device symbols and layout, system block diagrams and representation, architectural wiring diagram, wiring table and diagrams for electronic and electrical installations.

III. **Industrial Safety (15 hours)**

**IC2002 Industrial Safety I for Engineering Discipline (15 hours)**

1. Safety Management
   1.1 Overview in safety management.
   1.2 Development of safety in Hong Kong and Government’s current safety policy; safety training.
   1.3 Principles of safety management.
   1.4 Essential elements of safety management; causes of accidents and prevention methods; accident reporting procedures.
   1.5 Job safety analysis and fault tree analysis.

2. Safety Law
2.1 F&IU Ordinance and Principal Regulations.

2.2 Construction Sites (Safety) Regulations.

3. Occupational Hygiene
   3.1 Noise hazard and control.
   3.2 Dust hazard and control.
   3.3 Personal protective equipment.
   3.4 First aid and emergency procedures.

4. Safety Technology
   4.1 Manual and mechanical handling.
   4.2 Fire prevention.
   4.3 Dangerous substances and chemical safety.
   4.4 Machinery hazards and principles of guarding.
   4.5 Electrical safety.
   4.6 Construction safety - Potential hazards and risks associated with construction sites; safety codes of practice at work.

Training Pattern:
(I) Technology Training : IC3003 Year 1 term 1; IC1001 Year 1 term time; balance in Year 1 Summer.
(II) Engineering Graphic Communication : 46 hours in Year 1 term time.
(III) Industrial Safety : 15 hours in Year 1 term time.

Method of Assessment:
The assessment is comprised of 100% continuous assessment with the following weighting:
Assignment: 50% Report: 30% Test: 20%

Reference Books:
5. O'Hara, Martin, EMC at Component and PCB Level, Newnes, Oxford, 1998