

The School of Electrical and Electronic Engineering of the Singapore Polytechnic is one of the largest schools in Singapore, offering courses at the diploma, specialist, and advanced diploma levels. Close to 5000 students are enrolled in its courses. The academic staff, numbering more than 200, comprise both local and expatriate staff with good credentials. Many are professional engineers who have years of industrial and teaching experience.

## The School offers the following:

### Diploma Courses

- **Diploma in Aerospace Electronics (DASE)**
- **Diploma in Computer & Network Technology (DCNT)**
- **Diploma in Electrical & Computer Control Engineering (DECE)**, concentrating in one of the following:
  - Biomedical Engineering
  - Computer Control Engineering
  - Electrical Power & Services
  - Electrical Transportation Engineering
- **Diploma in Electronics, Computer & Communication Engineering (DECC)**, with final-year options in
  - Biomedical Engineering
  - Computer Systems Technology
  - Microelectronics
  - Telecommunications
- **Diploma in Information Communication Technology (DICT)** (jointly offered with the School of Info-Communications Technology)



Many challenging projects in the School to hone the skills of students.

### Advanced Diploma Courses

- **Advanced Diploma in Building Automation & Services**
- **Advanced Diploma in Electronics & Telecommunication Engineering**
- **Advanced Diploma in Power Electronics & Industrial Applications**
- **Advanced Diploma in Power Systems Engineering (with Computer Applications)**
- **Advanced Diploma in Process Control & Instrumentation**

### Specialist Diploma Courses

- **Specialist Diploma in Biomedical Engineering**
- **Specialist Diploma in Broadband Communications**
- **Specialist Diploma in Computer Networking**
- **Specialist Diploma in Energy Efficiency and Management**
- **Specialist Diploma in Hard Disk Media Technology**
- **Specialist Diploma in Mobile Communications**

Over the years, the School has gained a reputation for providing high quality and relevant courses for the industrial community in Singapore. The courses offered are well recognised, and many of our graduates have furthered their education at both local and overseas universities.

Comprising some of the newest buildings on campus located conveniently next to the Dover MRT station, the School is easily accessible from virtually any location in Singapore.



Students have the privilege to train on many state-of-the-art training facilities.

### Practical Training

Students and staff at the School of EEE have access to some of the best and most up-to-date facilities for training and development, with numerous general-purpose and specialised laboratories.

The School is also active in R&D activities in technological areas such as Broadband Communications and ATM (Asynchronous Transfer Mode), DSP (Digital Signal Processing), Robotics and Intelligent Control, Renewable Energy, Fieldbus Technology and IC Design, to name a few. Various R&D centres have been set up including

- **Advanced Robotics & Intelligent Control Centre**
- **Broadband Communication Technology Centre**
- **Centre for Fieldbus Technology**
- **Centre for IC Design**
- **Digital Signal Processing Centre**
- **Energy Conservation Technology Centre**
- **SP Technology Centre for Nanofabrication and Materials**
- **Singapore Robotic Games Centre**
- **Wireless Communication Technology Centre**

Students of the School have consistently performed well at both national and international competitions such as the Singapore Robotics Games, National Skills Competition (now known as World Skills Singapore), and Robot World Cup Soccer, attesting to the high quality of training that the School of EEE provides.

### Diploma in Aerospace Electronics (DASE)

The aerospace industry has an annual output in excess of S\$4.1 billion and is a key component of the engineering industry's contribution to Singapore's GDP. Today, there are over 80 aerospace companies in Singapore engaged in various activities in the MRO (maintenance, repair and overhaul), manufacturing and aerospace services. The growth potential of the transport engineering industry is largely in the aerospace industry.

As there are over 60 international airlines serving Singapore, the aerospace industry here, especially in the areas of aircraft maintenance, repair and overhaul, is well poised to reap the benefits arising from the high rates of growth.

The Diploma in Aerospace Electronics course aims to provide students with a broad-based engineering foundation to support a wide spectrum of activities of the aerospace industry in Singapore. These are in the areas of maintenance, repair and overhaul of aircraft electrical, instrument, radio systems. Specifically, students will be able to:

- understand the working principles of Electrical, Instrument and Radio systems in the aircraft,
- perform tasks, such as installation, maintenance, trouble shooting, repair, and overhaul of aircraft systems,
- demonstrate professional responsibility and good work attitude such as teamwork,
- demonstrate supervisory and leadership skills,
- demonstrate analytical and problem-solving skills,
- communicate effectively on technical and management matters,
- initiate and implement safe operating procedures.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Industrial Training Programme (ITP)

In the second year of the full-time course, during the vacation, students will have the opportunities to be attached to airlines and aerospace companies involved in manufacturing, servicing, repair and overhaul activities. This gives students a taste of the working world, and also the opportunity to pick up technical knowledge and skills not taught in classrooms. This programme also enables students to put into practice what they have learnt and hence contribute to the company. Students will also learn how to relate to working adults, and acquire communication skills essential in a working environment.

### Assessment

Assessment during each year of the diploma course will be by means of in-course assessments, practical tests and semestral examinations.

### Career Prospects

As the aerospace industry is expanding at a rapid rate, graduates of this course will be well-positioned to be employed by airlines to acquire license as aircraft maintenance engineers to work on commercial aircrafts from Boeing and Airbus.

There will also be many and highly challenging job opportunities to work on, and receive further training on advanced fighter jet, helicopter and transport aircraft in military related aerospace companies, and the Republic of Singapore Air Force.



The military-related aerospace industry is but one of many career possibilities open to graduates of the Aerospace Electronics course.

ET0402	Project 1	45
ET0403	Structured Programming	60
MS5167	Engineering Maths 1	60
SP0301	Character Development	30
	General Elective Module 1 (Semester 2)	30

### Stage 1B

ET0400	Principles of Electrical & Electronic Engg	97.5
ET0401	Digital Electronics	60
ET0402	Project 1	45
ET0404	CADD	30
LC0318	Critical Reasoning Skills	30
MS5167	Engineering Maths 1	60
SP0302	Innovation, Design & Enterprise in Action	30
	General Elective Module 1 (Semester 2)	30

### Full-Time Second Year

#### Stage 2A

ET0405	Analog Communication System	75
ET0406	Circuit Analysis	75
ET0407	Applications Programming	60
MM0251	Aeronautical Engineering Science	45
MM0307	Principles of Mechanical Engineering	45
MS5265	Maths 2A	60
	General Elective Module 2	30

#### Stage 2B

ET0408	Aircraft Servomechanisms & Electronics	90
ET0409	Microcontroller Technology	75
ET0410	Aircraft Systems Maintenance Practices	45
LC0303	Report Writing & Presentation	30
MM3840	Human Factors & Error Management	60
MS5266	Maths 2B	60
	General Elective Module 3	30

## Course Modules

### Full-Time First Year

#### Hours

#### Stage 1A

ET0400	Principles of Electrical & Electronic Engg	97.5
ET0401	Digital Electronics	60

## Full-Time Third Year

### Stage 3A

ET0411	Aircraft Radio Fundamentals 1	82.5
ET0412	Aircraft Instrument Systems 1	82.5
ET0413	Aircraft Electrical Systems 1	82.5
ET0417	Project 3	60
ET0419	EMI/EMC	45
	General Elective Module 4 (Semester 1)	30

### Stage 3B

ET0414	Aircraft Radio Fundamentals 2	82.5
ET0415	Aircraft Instrument Systems 2	82.5
ET0417	Project 3	60
ET0418	Aircraft Electrical Systems 1	82.5
LC0304	Communication Skills for Work	30
	General Elective Module 4 (Semester 1)	30

## Diploma in Computer & Network Technology (DCNT)

Singapore is fast becoming a global hub in communications and Information Technology. In order to maintain this position, Singapore has to develop a world-class infrastructure to transfer, store and process the information arriving from all parts of the world. Hence, there is a huge demand for trained personnel skilled in the use of computers and knowledgeable in networks.

The Diploma in Computer & Network Technology aims to train technologists who can recommend, install, manage and maintain computers and computer networks tempered with a background in Electronics and Computer Software.

The course has two major areas of study:

- **Computer Technology** - students will focus on the use and impact of Personal Computers, their hardware make-up and the necessary software and operating systems required to run them.
- **Computer Network Technology** - students are taught how LANs, WANs and Enterprise computer networks are installed, managed and maintained. In order to support these areas, they will also complete modules in Electronics, Computer Programming, Software Application and Development, Mathematics and practical troubleshooting skills.

In the first year, students are provided with the necessary foundation in electronics and computer programming. They will be introduced to the basic concepts of networking and network technology centred on the use of computer networks. They

will learn about the internal components of the personal computer and how the PC interacts with other peripherals. They will also learn how to use basic operating system tools to troubleshoot and manage personal computers. The first year rounds up with a common project that imparts to the students the necessary practical skills required to design, manufacture and build an electronic project.

In the second year, students are exposed to the control and management of networks using LANs, WANs and enterprise systems. They will learn how to configure and use switches and routers, and plan networks that talk to other networks. They will also learn how to install operating systems for network servers, managing them across computer networks and creating an environment for collaborative computing. To support these areas, they will also learn about digital systems, programming for Internet applications and how to plan the network layout of a facility. The second year rounds up with a group project that involves the setting up of their own small LAN and interacting with the other groups in the year to form a small Internet of computers and networks.

The third year is divided into two semesters, one of which is reserved for Internship. Students will be further tutored in the areas of Internet Technologies and Computer Systems in the large and enterprise solutions. In addition, they will choose two technical electives from the areas of Software Development, Operating Systems, Embedded Systems and Further Mathematics. These electives are designed to provide students with a broader outlook towards the field of Computers and Network Technology, which may apply in future developments. A final-year project in this area is to be carried out and completed on an individual basis.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.



Combination of expertise in computers and networks ensure graduates of the Computer & Network Technology course are in demand by industry.

## Internship

In one semester of the final year, students will complete 18 weeks of Internship with an external establishment. The Internship will be in a related field of computers and networking. This internship will allow students to apply the knowledge they have learnt during the course and to have a feel for the areas in which they would like to work upon graduation.

## General Elective Modules

In addition to the mainstream technical modules, students will do several General Elective Modules throughout the course. These modules prepare them to take on challenges in their career by equipping them with the necessary skills in problem-solving and life-long learning. These are modules offered outside School of EEE's curriculum so that students can benefit from a cross-disciplinary curriculum.

## Assessments

Assessment during each year of the diploma will be by means of in-course assessments, practical tests and semestral examinations. Students will also be expected to write and submit reports and papers to be filed electronically, and to participate in e-learning.

## Career Prospects

There is a demand for trained computer and network personnel both in the Information Technology sectors as well as in all industries, businesses and establishments. There will be ample opportunities for our graduates as they will be able to recommend, install, manage and maintain such computer systems and networks in addition to providing the necessary support to bring Singapore forward as a global hub for Info Communication Services.

In addition, our graduates will be able to meet industry standard certifications and programmes, and be able to contribute towards the necessary technical support as computer and computer network personnel.

## Further Studies

In addition to attaining the Diploma, students will be able to sit for Industry Certification, which will further enhance their value as Computer and Network professionals.

The prospects for further studies are also very good. Graduates can choose to pursue a degree in Computer Engineering, Computer Systems Technology, Computer Networking or Electronic/Electrical Engineering.

## Course Modules

### Full-Time First Year

		Hours
<b>Stage 1A</b>		
ET0001	Networking Essentials	75
ET0002	Computer Hardware	60
ET0004	Digital Circuits	75
ET0029	Computer Programming	45
LC0307	Written Technical Communication	30
MS5145	Engineering Mathematics I (A)	60
SP0301	Character Development	30
SP0302	Innovation, Design & Enterprise in Action	30

### Stage 1B

ET0005	Computer Communications	75
ET0006	Workstation Operations	60
ET0008	Electronic Circuits	75
ET0009	Technology Project	90
ET0029	Computer Programming	45
LC0303	Report Writing & Presentation	30
MS5146	Engineering Mathematics I (B)	60
	General Elective Module 1	30

### Full-Time Second Year

#### Stage 2A

ET0010	Computer Networking	75
ET0011	Computer Interfacing	60
ET0012	Network Infrastructure	60
ET0013	Ethics & IT Law	30
MS5245	Engineering Mathematics IIA	45
	General Elective Module 2	30

#### Stage 2B

ET0014	Internetworking	75
ET0015	Server Management	60
ET0016	Digital Systems	75
ET0017	Internet Programming	60
ET0018	Computer Networking Project	90
LC0318	Critical Reasoning Skills	30
MS5246	Engineering Mathematics IIB	60
	General Elective Module 3	30

### Full-Time Third Year

#### Stage 3A

ET0019	Wireless Networking	70
ET0021	Computer & Network Security	60
ET0022	Final-Year Project	90
ET0026	Network Management	75
	Technical Elective 1	75
	Technical Elective 2	75
	General Elective Module 4	30

## Technical Electives

Choose two of the following:

ET0023	Operating Systems
ET0024	Software Engineering

ET0025 Embedded Systems  
MS5380 Higher Mathematics

### Stage 3B

ET0028 Internship 18 Weeks

## Diploma in Electrical & Computer Control Engineering (DECE)

This diploma course is broad-based, covering the areas of electrical and control engineering. It has incorporated many new emerging technologies, particularly in computer engineering and applications involving the use of computers and software.

The course will train you to be a competent, innovative and versatile technologist, knowledgeable in the modern practices of the electrical engineering profession. The curriculum covers the fields of electrical engineering, electronics, microprocessors, computers, measurement and control engineering, power electronics, building services, intelligent energy management and product and system design.

Students will be exposed to a wide variety of software and computer applications such as MATLAB, LabView, AutoCAD, CircuitMaker and C++ Programming. The course offers the latest in power, control, biomedical and electrical transportation technologies, as well as technology in setting up computer networks in a local area control application.

Students will be able to select from a wide range of electives, both technical as well as general education modules, offered in the second and third year of studies. In the final year, full-time students can choose to concentrate on one of the following specialisations:

- **Biomedical Engineering**

This will equip students with the knowledge and understanding of the latest application of engineering concepts, techniques and



Qualified and experienced teaching staff to guide students to bring out the best in them.

technology to all aspects of life sciences, particularly to the clinical sciences. They will also learn about the techniques used in the installation, maintenance and calibration of sophisticated medical instruments and devices widely used in healthcare industries.

- **Computer Control Engineering**

This will equip students with further knowledge and understanding of the latest tools and techniques of instrumentation, control and computer systems as applied to modern industries. They will also learn about the techniques used in computer networking, Internet control, embedded systems and digital signal processing.

- **Electrical Power & Services**

This will equip students with the understanding of the electrical power system and electrical services in the power and M&E industries. They will get an in-depth knowledge of how electrical power is transmitted, distributed and protected. Students will also learn the latest techniques used in the design, supervision and control of electrical power system and services using computers.

- **Electrical Transportation Engineering**

This will prepare students for a possible career in the electrical transportation industries, namely the MRT or LRT systems. They will get further training in the concepts and applications of electromagnetic devices, power electronics and electrical drives in the electrical transportation industries. Their understanding of how electrical power is being distributed and protected will also be enhanced.

Throughout the course, lectures are supported by practical and tutorial sessions. The latter give students the opportunity to discuss topics in more detail in groups or to work individually. Active participation is encouraged to enable students to develop their communication skills and self-confidence.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Special Industry Field Orientation and Training Programme

In the second year of the full-time course, during the vacation, students will be attached to electrical, electronic and computer firms, including manufacturing plants, power and building industries, product maintenance and customer

services industries during the vacation. In addition, special industry field visits will be arranged to orientate them to the major industries that they are likely to work in. This gives students a taste of the working world, and also the opportunity to pick up technical knowledge and skills not taught in classrooms. This programme also enables students to put into practice what they have learnt and hence contribute to the company. Students will also learn how to relate to working adults, and acquire communication skills essential in a working environment.

## Ability Driven Education and Project-Based Learning Programme

A special programme for selected second-year full-time students will enable them to embark on project-based learning. Through this programme, they will learn to be adaptable and versatile, and to exercise logical and independent thinking and reasoning to solve real-life problems. Students will be able to apply and integrate content across different modules, in a fun and enjoyable setting. This will nurture students to be innovative and adept at working in an R&D environment.

General elective modules are also available to help them to broaden their knowledge. They will also be able to attend a range of cross-disciplinary modules to prepare them for further studies and work.

## Assessment

Assessment during each year of the diploma course will be by means of in-course assessments, practical tests and semestral examinations.

## Career Prospects

Graduates from this course can develop careers as electrical engineering technical officers, technologists, design specialists and assistant engineers in both private and public sector organisations. Some have ventured on to become successful technopreneurs or set up their own proprietary companies.

The industries most likely to employ our graduates are:

- Automation and Control
- Building Services
- Computer and Information Technology-related
- Defense and Military Organisations
- Electrical Contracting Firms
- Electrical Design and Consultancy Firms
- Electrical Power
- Electrical Transport Corporations

- Instrument Servicing and Marketing
- Manufacturing
- Process Instrumentation and Control
- Pharmaceutical and Petrochemical
- Other Electrical, Electronic and Computer Industries

## Further Studies

Graduates with this Diploma will be well prepared to pursue degree qualifications in local and overseas universities in Electrical/Electronic Engineering. Many of our past graduates (from the previous Diploma in Electrical Engineering Course and Diploma in Instrumentation & Control Engineering Course) have successfully done so, with some even attaining PhD level.

## Course Modules

### Full-Time First Year (1FT) Hours

#### Stage 1A

ET0040	Principles of Electrical & Electronic Engg	97.5
ET0041	Digital Electronics	60
ET0042	Project 1	45
ET0043	Structured Programming	60
MS4107	Engineering Mathematics 1	60
SP0301	Character Development	30
	General Elective Module 1 (Semester 2)	30

#### Stage 1B

ET0040	Principles of Electrical & Electronic Engg	97.5
ET0041	Digital Electronics	60
ET0042	Project 1	45
ET0045	CADD	30
LC0318	Critical Reasoning Skills	30
MS4107	Engineering Mathematics 1	60
SP0302	Innovation, Design & Enterprise in Action	30
	General Elective Module 1 (Semester 2)	30

### Full-Time Second Year (2FT)

#### Stage 2A

ET0047	Microcontroller & PC Technology	75
ET0048	Systems & Control	75
ET0049	Sensors & Instrumentation	75
ET0051	Project 2	45
LC0303	Report Writing & Presentation	30
MS4205	Engineering Mathematics II (A)	60
	General Elective Module 2	30

#### Stage 2B

ET0050	Electrical Installation Design	75
ET0052	Electromagnetic Devices	75

ET0053	Circuit Theory & Analysis	75
ET0054	Object-Oriented Programming	45
MS4206	Engineering Mathematics II (B)	60
	General Elective Module 3	30

### Full-Time Third Year (3FT)

#### Stage 3A

BA9017	Technopreneurship	30
LC0304	Communication Skills for Work	30
ET0057	Project 3	60
	General Elective Module 4 (Semester 1)	30
	Technical Elective 1 (Group 3A)	75
	Technical Elective 2 (Group 3A)	75
	Technical Elective 4 (Group 3A)	75

#### Technical Electives (Group 3A)

To choose three of the following:

ET0059	Computer Control Systems
ET0063	Electrical Power
ET0064	Power Electronics & Drives
ET0066	Digital Signal Processing
ET0072	Telecommunication Principles
ET0073	Biomedical Signal & Image Processing
ET0074	Biomedical Equipment & Practices
ET0104	Embedded Computer Systems

#### Stage 3B

MM0306	Principles of Mechanical Engineering	45
ET0057	Project 3	60
	General Elective Module 4 (Sem 1 only)	30
	Technical Elective 1 (Group 3B)	75
	Technical Elective 2 (Group 3B)	75
	Technical Elective 3 (Group 3B)	75

#### Technical Electives (Group 3B)

To choose three of the following:

ET0055	Power Distribution & Electrical Services
ET0056	Power System Analysis
ET0058	Computer Networks
ET0061	Intelligent Systems
ET0062	Electrical Transportation Systems
ET0070	Internet Control Technology
ET0075	Biomedical Instrumentation
ET0076	Physiology for Engineers

### Evenings-Only First Year (1EO)

#### Stage 1A

ET0040	Principles of Electrical & Electronic Engg	90
ET0041	Digital Electronics	60

MM0306	Principles of Mechanical Engineering	30
MS4607	Engineering Mathematics 1(A)	30

#### Stage 1B

ET0040	Principles of Electrical & Electronic Engg	90
ET0041	Digital Electronics	60
ET0071	Project 1 (EO)	30
MS4607	Engineering Mathematics 1(A)	30

### Evenings-Only Second Year (2EO)

#### Stage 2A

ET0043	Structured Programming	60
ET0045	CADD	30
ET0046	Electronic Design Automation (EDA)	30
LC0318	Critical Reasoning Skills	30

#### Stage 2B

ET0053	Circuit Theory & Analysis	75
LC0303	Report Writing & Presentation	30
MM3825	Organisational Management	45
MS4707	Engineering Mathematics 1(B)	60

### Evenings-Only Second Year (2EO Direct Entry)

#### Stage 2A

ET0043	Structured Programming	60
ET0045	CADD	30
ET0046	Electronic Design Automation (EDA)	30
LC0318	Critical Reasoning Skills	30
MS4107	Engineering Mathematics I	60

#### Stage 2B

ET0053	Circuit Theory & Analysis	75
LC0303	Report Writing & Presentation	30
MM3825	Organisational Management	45
MS4107	Engineering Mathematics I	60

### Evenings-Only Third Year (3EO)

#### Stage 3A

ET0047	Microcontroller & PC Technology	75
ET0049	Sensors & Instrumentation	75
MS4205	Engineering Mathematics II (A)	60

#### Stage 3B

ET0050	Electrical Installation Design	75
MS4206	Engineering Mathematics II (B)	60

### Evenings-Only Third Year (3EO Direct Entry)

#### Stage 3A (same as 3EO)

#### Stage 3B

ET0050	Electrical Installation Design	75
ET0053	Circuit Theory & Analysis	75
MS4206	Engineering Mathematics II (B)	60

## Evenings-Only Fourth Year (4EO)

### Stage 4A

ET0048	Systems & Control	75
ET0063	Electrical Power	75
ET0067	Project 2 (EO)	45

### Stage 4B

ET0052	Electromagnetic Devices	75
ET0054	Object Oriented Programming	45
ET0058	Computer Networks	75

## Evenings-Only Fifth Year (5EO)

### Stage 5A

BA9017	Technopreneurship	30
ET0055	Power Distribution & Electrical Services	75
ETxxxx	Technical Elective	75
LC0304	Communication Skills for Work	30

### Technical Elective (EO/5A)

Choose one of the following:

ET0056	Power System Analysis	75
ET0061	Intelligent Systems	75
ET0062	Electrical Transportation System	75
ET0072	Telecommunication Principles	75

### Stage 5B

ET0059	Computer Control Systems	75
ET0068	Project 3 (EO)	45
	Technical Elective	75

### Technical Elective (EO/5B)

Choose one of the following:

ET0064	Power Electronics & Drives
ET0066	Digital Signal Processing
ET0070	Internet Control Technology
ET0104	Embedded Computer Systems

## Diploma in Electronics, Computer and Communication Engineering (DECC)

This diploma course prepares students for careers in the electronics industry. The electronics industry remains an important pillar in Singapore's economy, contributing about 12% to Singapore's Gross Domestic Product. The first two years of the course is broad-based, covering the fundamentals of electronics, telecommunications and computer technology. This provides a firm foundation for subsequent specialisation in the final year.

In the final year, full-time students can opt for one of the following options:

- **Biomedical Engineering**

This option covers the design, development and application of biomedical instruments for clinical measurements and biomedical research. Subjects taught include physiology for engineers, biomedical instrumentation, biomedical signal & image processing and biomedical equipment & practices.

- **Computer Systems Technology**

This option gives a more detailed study on computer software and hardware. It keeps pace with the rapid advances in computer technology by teaching topics on client-server systems, computer networks, PC technology and embedded computer systems.

- **Microelectronics**

This option deals with the design, fabrication, testing and application of integrated circuits (ICs) which are the basic components used in making various electronic products such as computers, cellular phones, etc. Topics taught include IC design and testing, wafer fabrication technology, quality and reliability.

- **Telecommunications**

This option covers the processing, and transmission of information from one point to another. Topics taught include digital signal processing, digital communications, computer networks, satellite communication and cable television (CATV).

Besides options, full-time students can also choose from a wide range of technical and general electives.

Throughout the course, lectures are supported by practical and tutorial sessions. The latter give students the opportunity to discuss topics in more detail in groups or to work individually. Active participation is encouraged to enable students to develop their communication skills and self-confidence.

Exemptions from some modules may be given to 'A' level holders who wish to enrol on either full-time or part-time basis. Higher NITEC (formerly known as ITC) holders, who gain direct entry into second year of the full-time course or third year of the part-time course, are expected to have a good grasp of calculus. Those lacking this prerequisite may take a longer time to complete the course.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Industrial Training Programme (ITP)

In the second year of the full-time course, students will be attached to a company during the vacation. This gives students a taste of the working world, and also the opportunity to pick up skills not taught in classrooms. Students will also learn how to relate to working adults, and acquire communication skills essential in a working environment.

### Product and Process Research & Development (PPR&D) Programme

In line with the government's emphasis on R&D, academically outstanding second-year full-time students are encouraged to participate in this programme to nurture technologists adept at working in an R&D environment.

### Preparation for Further Studies

Selected students will be able to attend Higher Engineering Maths and other enrichment modules to prepare them for further studies.

### Assessment

Assessment during each year of the diploma course will be by means of in-course assessments, practical tests and semestral examinations.

### Career Prospects

The electronics industry currently provides about 100,000 jobs. The Singapore Economic Development Board (EDB) aims to develop Singapore into a world-class electronics hub for manufacturing solutions and high value-added components for the global market. Prospects are therefore excellent for graduates from this course. Besides electronic companies, graduates can also work in organisations whose main business is not electronics, but which rely on electronic systems for their operation. Examples of such organisations are banks, government and statutory boards, airports and seaports.

### Further Studies

Graduates of the course have also furthered their education at different levels locally and in US, UK, Canada and Australia, with some even up to the PhD level.

## Course Modules

### Full-Time First Year (1FT) Hours

#### Stage 1A

ET0080	Principles of Electrical & Electronic Engineering	97.5
ET0081	Digital Electronics	60



Lots of opportunities for students to engage in interesting research and development work.

ET0082	Project 1	45
ET0083	Structured Programming	60
MS5107	Engineering Mathematics 1	60
SP0301	Character Development	30
	General Elective Module 1 (Semester 2)	30

#### Stage 1B

ET0080	Principles of Electrical & Electronic Engineering	97.5
ET0081	Digital Electronics	60
ET0082	Project 1	45
ET0085	CADD	30
LC0318	Critical Reasoning Skills	30
MS5107	Engineering Mathematics 1	60
SP0302	Innovation, Design & Enterprise in Action	30
	General Elective Module 1 (Semester 2)	30

### Full-Time Second Year (2FT)

#### Stage 2A

ET0087	Analog Communication Systems	75
ET0088	Circuit Analysis	75
ET0089	Data Communications	75
ET0090	Applications Programming	60
MS5205	Mathematics 2A	60
	General Elective Module 2	30

#### Stage 2B

ET0091	Analog Systems	75
ET0092	Logic Design	75
ET0093	Microcontroller Technology	75
ET0094	Project 2	45
LC0303	Report Writing & Presentation	30
MS5206	Mathematics 2B	60
	General Elective Module 3	30

## Full-Time Second Year (2FT Direct Entry) Higher NITEC Direct Entry Intake\*

### Stage 2A (Semester 1)

ET0083	Structured Programming	60
ET0087	Analog Communication Systems	75
ET0088	Circuit Analysis	75
ET0089	Data Communications	75
MS5205	Mathematics 2A	60

### Stage 2B (Semester 2)

ET0090	Applications Programming	60
ET0092	Logic Design	75
LC0303	Report Writing & Presentation	30
LC0318	Critical Reasoning Skills	30
MS5206	Mathematics 2B	60
SP0302	Innovation, Design & Enterprise in Action	30
	General Elective Module 1	30
	General Elective Module 2	30

\* When promoted to the final-year (3FT), direct entry students will follow the same course as other final-year students, except that they will have to take one General Elective Module in semester 1 and one in semester 2.

## Full-Time Third Year (3FT)

### BIOMEDICAL ENGINEERING OPTION

#### Stage 3A

BA9017	Technopreneurship	30
ET0073	Biomedical Signal & Image Processing	75
ET0074	Biomedical Equipment & Practices	75
ET0119	Project 3	60
ET0416	EMI/EMC	75
	General Elective Module 4 (Semester 1)	30

#### Stage 3B

ET0075	Biomedical Instrumentation	75
ET0076	Physiology for Engineers	75
ET0112	Biomedical Microdevices	75
ET0119	Project 3	60
LC0304	Communication Skills for Work	30
	General Elective Module 4 (Semester 1)	30

### COMPUTER SYSTEMS TECHNOLOGY OPTION

#### Stage 3A

BA9017	Technopreneurship	30
ET0095	Computer Networks	75
ET0103	Client-Server Systems	75

ET0119	Project 3	60
	General Elective Module 4 (Semester 1)	30
	Technical Elective 3A	75

#### Technical Elective 3A

Choose one of the following:

ET0096	Digital Signal Processing	
ET0098	Satellite Communications & Cable TV Technology	
ET0101	IC Design	
ET0102	Wafer Fabrication	

#### Stage 3B

ET0104	Embedded Computer Systems	75
ET0105	PC Technology	75
ET0119	Project 3	60
LC0304	Communication Skills for Work	30
	General Elective Module 4 (Semester 1)	30
	Technical Elective 3B	75

#### Technical Elective 3B

Choose one of the following:

ET0097	Digital Communications	
ET0099	IC Testing	
ET0100	Quality & Reliability	
ET0110	Software Engineering	

### MICROELECTRONICS OPTION

#### Stage 3A

BA9017	Technopreneurship	30
ET0099	IC Testing	75
ET0100	Quality & Reliability	75
ET0119	Project 3	60
	General Elective Module 4 (Semester 1)	30
	Technical Elective 3A	75

#### Technical Elective 3A

Choose one of the following:

ET0096	Digital Signal Processing	
ET0098	Satellite Communications & Cable TV Technology	
ET0104	Embedded Computer Systems	
ET0416	EMI/EMC	

#### Stage 3B

ET0101	IC Design	75
ET0102	Wafer Fabrication	75
ET0119	Project 3	60
LC0304	Communication Skills for Work	30
	General Elective Module 4 (Semester 1)	30
	Technical Elective 3B	75

**Technical Elective 3B**

Choose one of the following:

ET0095	Computer Networks
ET0097	Digital Communications
ET0103	Client-Server Systems
ET0112	Biomedical Microdevices

**TELECOMMUNICATIONS OPTION****Stage 3A**

BA9017	Technopreneurship	30
ET0095	Computer Networks	75
ET0097	Digital Communications	75
ET0119	Project 3	60
	General Elective Module 4 (Semester 1)	30
	Technical Elective 3A	75

**Technical Elective 3A**

Choose one of the following:

ET0101	IC Design
ET0102	Wafer Fabrication
ET0104	Embedded Computer Systems
ET0117	Microwave Technology

**Stage 3B**

ET0096	Digital Signal Processing	75
ET0098	Satellite Communication & CATV	75
ET0119	Project 3	60
LC0304	Communication Skills for Work	30
	General Elective Module 4 (Semester 1)	30
	Technical Elective 3B	75

**Technical Elective 3B**

Choose one of the following:

ET0099	IC Testing
ET0100	Quality & Reliability
ET0103	Client-Server Systems
ET0152	RF Fundamentals & Measurements

**Enrichment Modules** (for selected students only)

All modules are of 30-hour duration, unless otherwise indicated.

LC1510	Business Chinese
LC1511	Verbal Reasoning
MS5080	Reasoning Skills in Maths
MS5301	Higher Engineering Mathematics (2 x 30 hours, sequential) Product, Process, Research & Development (PPRD)

**Evenings-Only First Year (1EO)****Stage 1A**

ET0080	Principles of Electrical & Electronics Engineering	90
ET0081	Digital Electronics	60
MS5607	Engineering Mathematics 1A	30

**Stage 1B**

ET0080	Principles of Electrical & Electronics Engineering	90
ET0081	Digital Electronics	60
ET0111	Project 1 (EO)	30
MS5607	Engineering Mathematics 1A	30

**Evenings-Only Second Year (2EO)****Stage 2A**

ET0085	CADD	30
ET0113	Circuit Simulation	30
LC0318	Critical Reasoning Skills	30
MS5707	Engineering Mathematics 1B	60
SP0302	Innovation, Design & Enterprise in Action	30

**Stage 2B**

ET0091	Analog Systems	75
ET0094	Project 2	45
LC0303	Report Writing & Presentation	30

**Evenings-Only Second Year (2EO Direct Entry)  
Higher NITEC Holders Direct Entry Only****Stage 2A**

EET0085	CADD	30
ET0113	Circuit Simulation	30
LC0318	Critical Reasoning Skills	30
MS5107	Engineering Mathematics 1	60
SP0302	Innovation, Design & Enterprise in Action	30

**Stage 2B**

ET0091	Analog Systems	75
ET0094	Project 2	45
LC0303	Report Writing & Presentation	30
MS5107	Engineering Mathematics 1	60

**Evenings-Only Third Year (3EO)****Stage 3A**

ET0083	Structured Programming	60
ET0087	Analog Communication Systems	75
ET0089	Data Communications	75

**Stage 3B**

ET0092	Logic Design	75
ET0093	Microcontroller Technology	75
MS5206	Mathematics 2B	60

## Evenings-Only Third Year (3EO Direct Entry) Higher NITEC Holders Direct Entry Only

### Stage 3A

ET0083	Structured Programming	60
ET0087	Analog Communication Systems	75
ET0089	Data Communications	75

### Stage 3B

LC0318	Critical Reasoning Skills	30
ET0092	Logic Design	75
LC0303	Report Writing & Presentation	30
MS5806	Mathematics 2B	60
SP0302	Innovation, Design & Enterprise in Action	30

## Evenings-Only Fourth Year (4EO)

### Stage 4A

ET0088	Circuit Analysis	75
ET0090	Applications Programming	60
MS5205	Mathematics 2A	60

### Stage 4B

BA9017	Technopreneurship	30
ET0101	IC Design	75
ET0104	Embedded Computer Systems	75

## Evenings-Only Fifth Year (5EO)

### Stage 5A

ET0095	Computer Networks	75
ET0097	Digital Communications	75
ET0118	Project 3(EO)	45

### Stage 5B

ET0096	Digital Signal Processing	75
ET0098	Satellite Communication & CATV	75
LC0304	Communication Skills for Work	30

## Diploma in Information Communication Technology (DICT) Jointly offered by the School of Electrical & Electronic Engineering and the School of Info-Communications Technology

The convergence of Information Technology and Telecommunications Technology has led to a strong demand for new skills to support organisations in a wide range of info-communication technologies. Info-comm professionals are creative people working at the cutting edge of innovation. The spirit of questioning why things are the way they are, and how they can be improved lies at the heart of innovation.

The Diploma in Information Communication Technology aims to produce innovative technologists well versed in the areas of broad-band communication, wireless communication and



Broad-based education covering Information Technology and Telecommunications Technology for students of the Information Communication Technology course.

Internet appliances. The emphasis of the course is on the use of communication technology for the

- transmission of information,
- development of communication devices and
- providing access to new media and rich content any place, any time with in-built interactivity.

The course focuses on a broad-based education, by requiring students to take core technical modules across a wide spectrum to build up a technical foundation. In addition, a range of elective modules is offered to cater to the diverse interest of the students. This will provide students with the opportunities to acquire knowledge in other fields beyond their immediate areas of specialisation. Where possible, students from different courses within the school will be grouped to work on projects. This will create a cross-disciplinary environment for students to apply problem-solving skills, to develop their talents, and to learn to work in teams.

Students will have lectures, tutorials, practical computer sessions, laboratory sessions and projects during the three years of study. All students will participate in an Industrial Training Programme for 10 weeks where they will be attached to info-communication related companies. Final-year students will have to complete a project where they will learn to apply knowledge in design and implementation.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

## Career Prospects

Graduates can find employment in the industrial sectors covering Internet Application Development, Multimedia & On-Line Services, Mobile/Wireless Communications, and Broadband Communications. They can work as System / Network Engineer, Broadcast Engineer, Technical Support Executive, Internet Engineer, Network / Wireless / Internet / Security Consultant, IT Infrastructure / Support Engineer or Software Development Engineer / Web Developer.

## Further Studies

Graduates with good results will be able to obtain admission to degree courses at local universities to further their education. A number of universities in Australia, New Zealand, UK and US also offer degree courses in the areas of Information Technology and Telecommunication Engineering. Some of these universities have recognised this diploma as an entry requirement to their degree courses.

## Course Modules

### Full-Time First Year

### Hours

#### Stage 1A

ET0120	Digital Circuits	75
ET0121	Data Communication Systems	75
ET0122	Computer Hardware	60
LC0318	Critical Reasoning Skills	30
MS5125	Mathematics I(A)	60
SP0302	Innovation, Design & Enterprise in Action (Semester 1 only)	30
ST3101	Visual Programming	60

#### Stage 1B

ET0124	Electronic Circuits	75
ET0126	Workstation Operations	60
MS5126	Mathematics I(B)	60
SP0301	Character Development	30
ST3103	Multimedia Development	60
ST3104	Internet Programming	75
	General Elective 1 (Semester 2 only)	30

### Full-Time Second Year

#### Stage 2A

ET0130	Networks & Protocols	75
ET0132	Communication Electronics	75
ET0134	Digital Systems	75
LC0306	Oral Communication	30
MS5225	Mathematics II(A)	45
ST3203	Computer Programming	60
	General Elective II	30



Students get to train on equipment similar to those used in industry.

#### Stage 2B

ET0131	DSP Fundamentals	90
ET0135	Digital Comm. Fundamentals	90
LC0303	Report Writing & Presentation	30
MS5226	Mathematics II(B)	60
ST3201	Network Server Management	60
	General Elective III	30
	General Elective IV	30

### Full-Time Third Year

#### Stage 3A

ET0140	Info-communication System Implementation	225
	Technical Elective I	75
	Technical Elective II	75

#### Technical Electives I & II

Choose two of the following:

ET0142	Multimedia Signal Processing	
ET0148	Broadband Network Technology	
ET0154	Bluetooth Technology	
ET0155	Wireless Applications Development	
ET0156	IP Telephony	
ST3301	Database Management Systems	

#### Stage 3B

ET0141	Broadband Communications	60
ET0143	Mobile Communication Systems	75
ET0150	Embedded Systems	75
LC0304	Communication Skills for Work	30
ST3304	Internet Applications Development	75
	Technical Elective III	75

#### Technical Elective III

Choose one of the following:

ET0012	Network Infrastructure	
ET0153	Satellite & Optical Communication	
MS5380	Higher Mathematics	
ST3303	Computer & Network Security	

## Advanced Diploma in Building Automation & Services (ABAS)

The increasing use of intelligence in new commercial and residential buildings has created an increasing demand for technologists capable of utilising the latest knowledge in building automation and services.

This course is designed to provide a path for diploma graduates to update and upgrade themselves in the fields of building automation and building services, and to alleviate the need of the building industry for better-trained technologists to cater for the ever-increasing sophistication in buildings demanded by the market.

### Special Features

- This course is restructured to use Information Technology and Internet for learning and course delivery.
- Students will be able to interact with lecturers through Internet from office, home, or even from abroad. (Applicants are expected to have access to Internet)
- Students need only attend classes for tutorials, some lectures and laboratories.
- The course curriculum has been revamped so that it can be completed over a period of one-and-a-half-year.
- Advanced Diploma Graduates receive advanced standing for admission to degree courses at several universities on a case-by-case basis.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

Graduates of this Advanced Diploma can find employment in building industries, and research and development, maintenance, marketing and servicing organisations relating to the building industries. The qualification equips them for positions such as engineering assistants, supervisors, senior technical officers and management executives.

### Course Assessment

Assessment in most of the modules will take the form of in-course assessments (70%) and a semestral examination (30%). Assessment in the remaining modules is 100 percent in-course assessment without any semestral examination.

### Course Duration

This is a one-and-a-half-year long, evenings-only course which requires attendance three times per week (up to nine hours per week). The course must be completed in not more than four years.

### Course Structure

There are 12 modules representing 540 hours of course work spread over one-and-a-half-years. An additional 60 hours will also be allocated to project work in the final semester.

## Course Modules

### Year One

#### Semester 1

EE9116	Computer Programming
EE9118	Dynamics & Control
EE9119	Engineering Management
MS4940	Engineering Mathematics

#### Semester 2

EE9219	Project or Dissertation
EE9234	Power Distribution System in Buildings
ET0300	Advanced Programming & Networking
EExxxx	One Elective Module from Group Y1S2
MM0600	Air-Conditioning Systems Design & Operation*

### Year Two

#### Semester 1

EE9219	Project or Dissertation
EE9235	Building Automation Systems
EE9242	Electrical Services Design
EExxxx	One Elective Module from Group Y2S1

Any one elective module from the following:

EE9117	Circuits & Field*
EE9120	Artificial Intelligence & Applications*
MM0411	Mechanical Systems Design & Operation*

### Group Y1S2 modules

Core modules of Advanced Diplomas, APCI, APSE and APEIA, which are offered in Year 1 Semester 2 and the following:-

EE9228	Computer Control Theory*
EE9231	Robotics & Vision Systems*

### Group Y2S1 modules

Core modules of Advanced Diplomas, APCI, APSE and APEIA, which are offered in Year 2 Semester 1 and the following:-

EE9229	Computer-Aided Analysis of Power Electronics Systems*
EE9230	Digital Signal Processing & Computer Relaying*
EE9241	Real-Time Computer Control Systems*

Elective Modules will be offered, subject to minimum number of students

## Advanced Diploma in Electronics & Telecommunication Engineering (AETE)

This two-year long course provides practising technologists from preferably the electronics, computer and communication engineering disciplines with up-to-date training in the fast-changing electronics field. All students will go through common modules in their first year course of study. In their second year, students are allowed to pursue their respective areas of interest from the six elective groupings offered, with three groupings offered per semester.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

For practising technologists involved in the areas of manufacturing, servicing, maintenance, marketing, R&D in industrial electronics, automation, tele-communications, and microelectronics, this course provides them with a solid foundation for further enhancement in their careers. For those who are academically inclined, certain overseas universities will admit graduates with good grades into their relevant graduate courses.

### Course Assessment

Assessment will include a written examination for most modules, and in-course assessments which include practical work, assignments and class tests.

## Course Modules

Year One		Hours
<b>Stage 1A</b>		
EC1250	Engineering Management	45
EC1379	Computer Programming	45
MS5901	Engineering Mathematics	45
<b>Stage 1B</b>		
EC1254	Integrated Electronics	45
EC1259	Control Engineering	45
EC1380	Communications & Signals	45

## Year Two

### Stage 2A

Select one group from the following groups of electives

#### IE1

EC1274	Power Electronics & Motion Control	45
EC1275	Programmable Controllers & Industrial Applications	45
EC1381	Fuzzy Logic & Control	45

#### ME1

EC1395	IC Wafer Fabrication Process	45
EC1396	Full Custom IC Design	45
EC1397	Electronics Component Testing	45

#### TE1

EC1282	Digital Signal Processing	45
EC1283	Digital Communications	45
EC1286	Microwave & Satellite Communications	45

### Stage 2B

Select one group from the following groups of electives

#### IE2

EC1278	Industrial Power Supplies	45
EC1385	Machine Vision & Image Processing	45
EC1386	Sensor Technology	45

#### ME2

EC1392	Disk Media Technology	45
EC1393	IC Failure Analysis & Reliability	45
EC1394	HDL Chip Design	45

#### TE2

EC1284	Optical Communications	45
EC1285	Integrated Services & Digital Network	45
EC1390	Wireless Communications	45

### Stages 2A - 2B

EC1297	Project	60
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## Advanced Diploma in Power Electronics & Industrial Applications (APEIA)

The control and conversion of electric power using power semiconductors is now very common. The sophistication of automation in industry demands the knowledge of power electronics and its applications. It requires a good understanding of the performance, maintenance and state-of-the-art designs to select such equipment or system for industrial applications.

This course has therefore been designed to offer training to practicing technologists in manufacturing, servicing, maintenance, and research and development organisations dealing with various industrial applications of power electronics such as switching and resonant dc power supplies, uninterruptible power supplies, motor drive applications, motion control systems and electric utility applications.

## Special Features

- This course is restructured to use Information Technology and Internet for learning and course delivery.
- Students will be able to interact with lecturers through Internet from office, home or even from abroad. (Applicants are expected to have access to Internet)
- Students need only attend classes for tutorials, some lectures and laboratories.
- The course curriculum has been revamped so that it can be completed over a period of one-and-a-half-year.
- Advanced Diploma Graduates receive advanced standing for admission to degree courses at several universities on a case-by-case basis.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

## Career Prospects

Graduates of the Advanced Diploma can find employment in manufacturing, servicing, maintenance, and research and development organisations, in positions such as engineering assistants, plant maintenance engineers, supervisors and design engineers.

## Course Assessment

Assessment in most of the modules will take the form of in-course assessments (70%) and a semestral examination (30%). Assessment in the remaining modules is 100 percent in-course assessment without any semestral examination.

## Course Duration

This is a one-and-a-half-year long, evenings-only course which requires attendance three times per week (up to nine hours per week). The course must be completed in not more than four years.

## Course Structure

There are 12 modules representing 540 hours of course work spread over one-and-a-half-year. An additional 60 hours will also be allocated to project work in the final semester.

## Course Modules

### Year One

#### Semester 1

EE9116	Computer Programming
EE9118	Dynamics & Control
EE9119	Engineering Management
MS4940	Engineering Mathematics

#### Semester 2

EE9219	Project or Dissertation
EE9224	Power Semiconductor Devices & Converter Technology
EE9226	Power Supply Applications of Converters
EExxxx	One Elective Module from Group Y1S2
ET0300	Advanced Programming & Networking

### Year Two

#### Semester 1

EE9219	Project or Dissertation
EE9237	Industrial Drives & Motion Control
EE9238	Digital Control of Drives
EExxxx	One Elective Module from Group Y2S1

Any one elective module from the following:

EE9117	Circuits & Field
EE9120	Artificial Intelligence & Applications
MM0411	Mechanical Systems Design & Operation

#### Group Y1S2 modules:

Core modules of Advanced Diplomas, ABAS, APCI and APSE, which are offered in Year 1 Semester 2 and the following:

EE9228	Computer Control Theory*
EE9231	Robotics & Vision Systems*

#### Group Y2S1 modules:

Core modules of Advanced Diplomas, ABAS, APCI and APSE, which are offered in Year 2 Semester 1 and the following:

EE9229	Computer-Aided Analysis of Power Electronics Systems*
EE9230	Digital Signal Processing & Computer Relaying*
EE9241	Real-time Computer Control Systems*

\* Elective Modules will be offered, subject to minimum number of students

## Advanced Diploma in Power Systems Engineering (with Computer Applications) (APSE)

Electrical power plays an essential role in the development of a nation. A reliable and economic supply of electrical power is essential for the effective and productive operation of Singapore's industries. This can only be achieved by having an efficient and well-planned power system operated by skilful operators.

With the advancement of technology in areas such as computerised supervisory control and data acquisition, computer-aided analysis and planning and control, there is a need for practising technologists to update and upgrade the knowledge and skills.

This course aims to upgrade the knowledge and skills of practising engineers and technologists involved in the operation, planning, design, maintenance, protection, control and management of power systems. Students will also learn about computer applications and the use of microprocessor systems for the analysis, protection, control, planning and utilisation of electrical power.

### Special Features

- This course is restructured to use Information Technology and Internet for learning and course delivery.
- Students will be able to interact with lecturers through Internet from office, home or even from abroad. (Applicants are expected to have access to Internet)
- Students need only attend classes for tutorials, some lectures and laboratories.
- The course curriculum has been revamped so that it can be completed over a period of one-and-a-half-year.
- Advanced Diploma Graduates receive advanced standing for admission to degree courses at several universities on a case-by-case basis.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

Graduates of this Advanced Diploma can find employment in planning, operation and control of electrical power systems for electricity supply authorities, engineering consultants, large industrial users, and in various application sectors of the industry.

### Course Assessment

Assessment in most of the modules will take the form of in-course assessments (70%) and a semestral examination (30%). Assessment in the remaining modules is 100 percent in-course assessment without any semestral examination.

### Course Duration

This is a one-and-a-half-year long, evenings-only course which requires attendance three times per week (up to nine hours per week). The course must be completed in not more than four years.

### Course Structure

There are 12 modules representing 540 hours of course work spread over one-and-a-half-year. An additional 60 hours will also be allocated to project work in the final semester.

## Course Modules

### Year One

#### Semester 1

EE9116	Computer Programming
EE9118	Dynamics & Control
EE9119	Engineering Management
MS4940	Engineering Mathematics

#### Semester 2

EE9215	Power Transmission & Distribution
EE9216	Computer Methods for Power System Analysis
EE9219	Project or Dissertation
ET0300	Advanced Programming & Networking
EExxxx	One Elective Module from Group Y1S2

### Year Two

#### Semester 1

EE9217	Power System Protection
EE9218	Power System Planning & Control
EE9219	Project or Dissertation
EExxxx	One Elective Module from Group Y2S1

Any one elective module from the following:

EE9117	Circuits & Field*
EE9120	Artificial Intelligence & Applications*
MM0411	Mechanical Systems Design & Operation*

### Group Y1S2 modules:

Core modules of Advanced Diplomas, ABAS, APCI and APEIA, which are offered in Year 1 Semester 2 and the following:

EE9228	Computer Control Theory*
EE9231	Robotics & Vision Systems*

## Group Y2S1 modules

Core modules of Advanced Diplomas, ABAS, APCI and APEIA, which are offered in Year 2 Semester 1 and the following:

EE9229	Computer-Aided Analysis of Power Electronics Systems*
EE9230	Digital Signal Processing & Computer Relaying*
EE9241	Real-Time Computer Control Systems*

\* Elective Modules will be offered, subject to minimum number of students

## Advanced Diploma in Process Control & Instrumentation (APCI)

In recent years, the advancements in the field of electronics and microprocessors have been tremendous and digital computers and microprocessors are becoming important components in industrial and process/plant control systems.

This advanced diploma course will provide and update practising technologists with knowledge and understanding of the latest tools and techniques of instrumentation and control as applied to modern industries.

### Special Features

- This course is restructured to use Information Technology and Internet for learning and course delivery.
- Students will be able to interact with lecturers through Internet from office, home or even from abroad. (Applicants are expected to have access to Internet)
- Students need only attend classes for tutorials, some lectures and laboratories.
- The course curriculum has been revamped so that it can be completed over a period of one-and-a-half-year.
- Advanced Diploma Graduates receive advanced standing for admission to degree courses at several universities on a case-by-case basis.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

Graduates of this Advanced Diploma can find employment in manufacturing, petroleum, chemical, aeronautical, power plant, research and development, maintenance and servicing organisations.

The qualification equips them for positions such as engineering assistants, plant maintenance and service personnel, instrumentation and process technologists, supervisors and management executives.

### Course Assessment

Assessment in most of the modules will take the form of in-course assessments (70%) and a semester end examination (30%). Assessment in other modules is 100% in-course assessment with no end of the semester examination.

### Course Duration

This is a one-and-a-half-year long, evenings-only course which requires attendance three times per week (up to nine hours per week). The course must be completed in not more than four years.

### Course Structure

There are 12 modules representing 540 hours of course work spread over one-and-a-half-year. An additional 60 hours will also be allocated to project work in the final semester.

## Course Modules

### Year One

#### Semester 1

EE9116	Computer Programming
EE9118	Dynamics & Control
EE9119	Engineering Management
MS4940	Engineering Mathematics

#### Semester 2

EE9219	Project or Dissertation
EE9223	Process Control Engineering
EE9240	Intelligent Instrumentation & Measurement Systems
ET0300	Advanced Programming & Networking
EExxxx	One elective module to be selected from Group Y1S2

### Year Two

#### Semester 1

EE9219	Project or Dissertation
EE9220	Digital & Advanced Control
EE9222	Automation & Programmable Controller Application
EExxxx	One elective module to be selected from Group Y2S1

Any one elective module from the following:

EE9117	Circuits & Field*
EE9120	Artificial Intelligence & Applications*
MM0411	Mechanical Systems Design & Operation*

### Group Y1S2 modules

Core modules of Advanced Diplomas, ABAS, APSE and APEIA, which are offered in Year 1 Semester 2 and the following:

- EE9228 Computer Control Theory\*
- EE9231 Robotics & Vision Systems\*

### Group Y2S1 modules

Core modules of Advanced Diplomas, ABAS, APSE and APEIA, which are offered in Year 2 Semester 1 and the following:

- EE9229 Computer-Aided Analysis of Power Electronics Systems\*
- EE9230 Digital Signal Processing & Computer Relaying\*
- EE9241 Real-Time Computer Control Systems\*

\* Elective Modules will be offered, subject to minimum number of students

## Specialist Diploma in Biomedical Engineering (SBE)

In the Economic Development Board's Industry 21 Plan, Biomedical Sciences is to become the fourth pillar of the manufacturing sector in Singapore. By 2010, EDB's aim is for Singapore to become home to 15 world-class companies, and the region's centre for clinical trials and drug development. Right next to Singapore Polytechnic, situated at the One North in Buona Vista, Biopolis is a dedicated science park providing space for lab-based R&D activities tailored to biomedical sciences companies. These will generate more and better opportunities for our workforce.

To support these Government initiatives, the School of Electrical & Electronic Engineering offers a Specialist Diploma in Biomedical Engineering as a part-time course. This course is designed for technologist and engineers who would like to train or retrain in biomedical engineering.

This course aims to provide the participants with practical knowledge and understanding of biomedical engineering as applied to the healthcare industries such as hospitals, medical equipment manufacturing, servicing and sales companies, and medical research centres.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

Graduates are expected to carry out work related

to installation and commissioning of biomedical equipment, maintenance, repair and calibration of equipment, do acceptance tests, routine performance tests and application of electrical safety standards and practices on equipment. Graduates will also be able to assist in the research and development work in the biomedical engineering area, provide technical support for marketing and sales of biomedical equipment and provide technical support to medical and clinical staff.

Besides being able to work in manufacturing companies, government ministries and statutory bodies, graduates can also choose a career in R&D centres, universities, hospitals, clinical laboratories, rehabilitation centres, community care centres and healthcare and biotechnology companies.

### Course Assessment

Assessment in all of the modules will take the form of in-course assessments (70%) and a semestral examination (30%). The project/dissertation module is an in-course assessment (100%) module.

### Course Duration

This is a one-year long, evenings-only course which requires attendance two times per week (up to eight hours per week). Students may have to spend a few Saturday mornings on hospital visits or seminars. The course must be completed in not more than two years.

### Course Structure

There are five modules representing 300 hours of course work, spread over one year with two semesters of 15 weeks each. Students will take two modules per semester and a year-long project.

## Course Modules

Stage A		Hours
ET0207	Biomedical Signals & Systems	60
ET0209	Physiology	60
Stage B		
ET0206	Medical Imaging & Image Processing	60
ET0208	Biomedical Instrumentation	60
Stages A - B		
ET0210	Project / Dissertation (year-long)	60

## Specialist Diploma in Broadband Communications (SBC)

This year-long course provides practising technologists from preferably the electronics, computer and communication engineering disciplines with up-to-date training in the area of broadband communications. The course aims to provide training in areas such as broadband networking, LANs, WANs, protocols and enterprise networks.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

This course provides practising technologists involved in the areas of servicing, maintenance, marketing and R&D in broadband communications with a solid foundation for further enhancement in their careers.

### Course Assessment

Assessment in all of the modules will take the form of in-course assessments, which include practical work, assignments and class tests, and a semestral examination.

### Course Duration

The course consists of six modules of 45 hours each, and one e-learning module of 30 hours.

## Course Modules

Stage A		Hours
ET0211	Broadband Communication Networks	45
ET0212	Fibre Optic Communications	45
ET0213	Communication Architecture & Protocols	45
Stage B		Hours
ET0214	Optical Networks	45
ET0215	Enterprise Networks	45
ET0216	Multimedia Communications	45
ET0217	Voice Over IP	30

## Specialist Diploma in Computer Networking (SCN)

Computer and computer networks play an important role in helping organisations gain a strategic advantage by allowing information to be moved across the world quickly, easily and reliably. As more organisations move into the Information

Technology areas, there is a need for support personnel who can plan, implement, troubleshoot and manage computers and computer networks.

Over the past few years, the Information Development Authority (Singapore) had conducted several manpower surveys to gauge the need for InfoComm personnel. Their surveys showed that one of the top five skills most required is in the Computer and Networking Technology areas. The survey also concluded that there is a lack of such manpower in these areas.

The Specialist Diploma in Computer Networking offered by the School seeks to address this industrial demand. The course intends to train graduates with practical knowledge and skills in the following areas:

- Networking Technologies  
To assist in the recommendation, operation and use of Computer Networks
- Network Administration  
To set-up, configures, operate and maintain users and computers on a Computer Network

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

Graduates are expected to carry out work related to installation, administration, maintenance and troubleshooting computer networks and equipment. They can also provide technical support for marketing and sales of networking equipment software.

Specifically, graduates will be able to:

- Plan and implement the installation of small scale Computer Networks.
- Supervise and oversee the set-up of Computer Networks.
- Maintain and improve the quality, reliability and productivity of Computer Networks.
- Provide technical support for Network users.
- Administer users and user accounts on Servers on a Computer Network.

### Course Assessment

Assessment in all of the modules will take the form of in-course assessments (70%) and a semestral examination (30%). The project/dissertation module is an in-course assessment (100%) module.

### Course Duration

This is a one-year long, evenings-only course which requires attendance two times per week (up to eight hours per week). Students will also need to complete a project after the one year study.

### Course Structure

There are five modules representing 300 hours of course work, spread over one year with two semesters of 15 weeks each. Students will take two modules per semester.

#### Course Modules

<b>Stage A</b>		<b>Hours</b>
ET0201	Network Server Administration	60
ET0202	Computer Communications	60
<b>Stage B</b>		
ET0203	Computer Networking	60
ET0204	Networking	60
ET0210	Project	60

#### Specialist Diploma in Energy Efficiency & Management (SEEM)

The electricity industry in Singapore has recently been de-regulated, thus giving many more options to the industrial consumers. This could translate into a lower energy bill and more innovative and market driven energy products for consumers, like competitive energy prices and energy saving devices, etc.

The National Energy Efficiency Council (under the National Environment Agency) has been encouraging more efficient energy utilisation in Singapore. The Building Construction Authority (BCA) is in the process of conducting a benchmarking exercise for the building sector to determine patterns of energy usage.

It is envisaged that in order to assist the industry with the impact of these changes as well as to promote greater energy efficiency, there is a need for trained personnel in this area who will have transferable skills across the industry.

The Singapore Association for Environmental Occupational Health & Safety Companies (SAFEco) and the Singapore Polytechnic have jointly designed and launched the Specialist Diploma in Energy Efficiency & Management from July 2003.

This course is the first of its kind in Singapore, and is supported by the Energy Market Authority and the National Environment Agency.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

Graduates can apply knowledge gained from the course into the work place of such organisations like energy technology & services companies, manufacturing companies, electronics & engineering companies, hotels etc. They would also be able to use the knowledge gained from the course, for taking appropriate examinations required for certified energy managers/engineers, offered by professional institutions. They may also apply for module exemptions or seek advanced standing for relevant advanced or higher diploma courses on a case-by-case basis.

### Course Assessment

Assessment for all the modules will be a combination of in-course assessments (70%) and a semester examination (30%).

### Course Duration

This is a one-year long, evenings-only course which requires attendance three times per week (up to nine hours per week). Students may have to spend a few Saturday mornings on site visits or seminars. The course must be completed in not more than two years.

### Course Structure

There are six modules representing 270 hours of course work, spread over one year with two semesters of 15 weeks each. Students will take three modules per semester.

#### Course Modules

<b>Stage A</b>		<b>Hours</b>
ET0228	Energy Management	45
ET0229	Energy Auditing	45
ET0230	Alternative Energy Resources & Environmental Issues	45
<b>Stage B</b>		
ET0231	Building Automation System	45
ET0233	Lighting, Power Quality & Electrical Drives	45
MM6071	Air-Conditioning & Building Envelope	45

#### Specialist Diploma in Hard Disk Media Technology (SHDMT)

Singapore contributes towards a significant percentage of the world's disk drive manufacturing capacity. The Singapore Economic Development Board (EDB) has targeted Disk Media

Manufacturing as a high tech investment that offers high growth potential. This business sector complements Singapore's dominant position in the disk drive industry.

This course aims to equip participants with broad-based, structured and fundamental knowledge required by the industry. Students will be taught practical knowledge and skills in the following areas: Applied Magnetic Theory, Basic Magnetic Recording Principle, Physical and Material Science relating to Disk Media, Precision Production and Manufacturing Process, Vacuum Techniques and Deposition, & Chemical Process Control and Analysis.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

Graduates of this Specialist Diploma can work in areas such as manufacturing, research and development, maintenance, marketing and servicing organisations related to the disk media or data storage industries.

### Course Assessment

Assessment in all of the modules will take the form of in-course assessments and a semestral examination. The project/dissertation module is an in-course assessment (100%) module.

### Course Duration

This is a year-long, evenings-only course which requires attendance two times per week (up to eight hours per week). The course must be completed in not more than two years.

### Course Structure

There are five modules representing 300 hours of course work, spread over one year with two semesters of 15 weeks each. Students will take two modules per semester and a year-long project.

### Course Modules

<b>Stage A</b>		<b>Hours</b>
ET0223	Disk Drive Technology	60
ET0224	Magnetic Head & Head Disk Interface	60
<b>Stage B</b>		
ET0225	Disk Media Manufacturing Technology	60
ET0226	Chemical Process & Surface Analysis Techniques	60

### Stages A - B

ET0227 Project / Dissertation (year-long) 60

### Specialist Diploma in Mobile Communications (SMC)

This year-long course provides practising technologists from preferably the electronics, computer and communication engineering disciplines with up-to-date training in the area of mobile communications. The course aims to provide training in areas such as GSM, GPRS, 3G systems, multimedia communications and protocols.

For details on entry requirements, please refer to the Academic Information Chapter of this prospectus.

### Career Prospects

For practising technologists involved in the areas of servicing, maintenance, marketing, R&D in mobile communications, this course provides them with a solid foundation for further enhancement in their careers.

### Course Assessment

Assessment in all of the modules will take the form of in-course assessments, which include practical work, assignments and class tests, and a semestral examination.

### Course Duration

The course consists of six modules of 45 hours each, and one e-learning module of 30 hours.

### Course Modules

<b>Stage A</b>		<b>Hours</b>
ET0213	Communication Architecture & Protocols	45
ET0218	Cellular Communications	45
ET0219	Mobile Communication Systems I	45
<b>Stage B</b>		
ET0216	Multimedia Communications	45
ET0220	Mobile Communication Systems II	45
ET0221	RF Circuit Design	45
ET0222	Wireless Data Networks	30

### Laboratories / R&D Centres

#### Aerospace Electronics Laboratory I

Used to support 3rd year modules in the area of aircraft instruments systems and aircraft electrical systems. The laboratory is equipped

with standalone training aids that uses actual aircraft components as well as computer simulation software. Students will be able to see and touch real aircraft instruments like altimeters, gyroscopes, aircraft electrical machines and many other instruments and perform experiments on them.

### **Analog Communication Systems Laboratory**

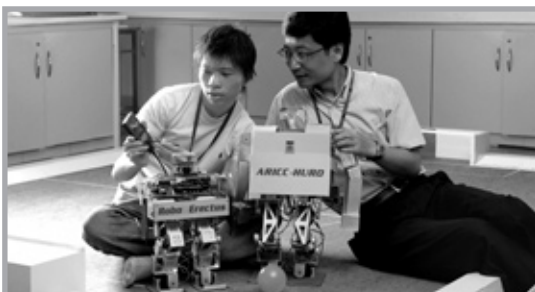
Students learn to use equipment such as spectrum analyzers, oscilloscopes and electronic counters to verify the theory of signal representations in time and frequency domains and investigate the principles of AM and FM. They will participate in exercises that integrate theories with practical experience to enhance their critical and creative thinking skills.

### **Analog Systems Laboratory**

Students investigate the characteristics of bipolar junction transistors and operational amplifiers. Students also perform work on the applications of these devices in various electronic circuits such as small signal transistor amplifiers and power amplifiers.

### **ARICC (Advanced Robotics and Intelligent Control Centre)**

Dedicated for activities involving robotics projects. The School of EEE's expertise in areas such as Machine Vision, Autonomous Robots, Adaptive Control, Fuzzy Control and Multi-agent collaboration, are brought together under this centre. Categories of projects involved are those for international and national competitions, industry-sponsored projects, consultancy projects, and entertainment robots. Robots built here have done very well in many competitions held abroad.



Great stride in robotics research made by staff and students working at the Advanced Robotics & Intelligent Control Centre.

### **Biomedical Electronics Laboratory**

Equipped with 11 computers with Internet access, general laboratory equipment such as oscilloscopes, function generators, power supplies

and trainer kits, as well as medical instruments such as oximeter, blood pressure apparatus, Spiro meter and medical transducers and amplifiers. This laboratory also has physiological models, anatomical charts, complete Biopac instrumentation system, Biobench software and hardware. Students will be doing experiments related to physiology and instrumentation modules and they will also be able to do their project work.

### **Biomedical Engineering Laboratory**

Equipped with 12 computers with Internet access, microscopes, digital cameras, electronic virtual instruments, ventilator tester, electrical safety analyser, ECG, EEG, treadmill, colour ultrasound system, scanoscope, Defibrillator and Ventilators. The laboratory also has a collection of CDs, VCDs, and videotapes on medical teaching topics. Students will be carrying out experiments related to the signals, system, equipment, practices, imaging and image processing topics and they will also be able to do their project work.

### **Broadband Communication Laboratory**

It provides second and third-year DICT students with practical experience in configuration, troubleshooting, and maintenance of computer and broadband networks. Students will be able to work on networking devices like hubs, Ethernet switches, ATM switches, DSLAM, media gateways, and routers.

### **Broadband Communication Technology Centre**

It provides a nucleus for technical education and R&D activities in the area of Broadband Technologies and Applications. Industrial training courses on ATM network are conducted at the centre, and final-year project students develop applications for collaborative work, information delivery systems, and Next Generation Broadband Networks here.

### **Building Automation Systems Laboratory**

Equipped with direct DDC controller, simulator boards and building automation networks and equipped for experiments on building automation systems, energy conservation systems and central air-conditioning systems. The experiments will complement topics learned during lectures.

### **Centre for Fieldbus Technology**

Equipped with a wide range of fieldbus equipment installed onto Foundation Fieldbus, Profibus and ASi model plants. In this centre, students can design various control algorithms and man-machine interface through hand-on experiments.

## **Circuit Analysis Laboratory**

Used by second-year students of DECC for hands-on training. Students verify experimentally the circuit theorems, analysis and simulation results during lab sessions. They examine transient response of first and second-order RLC circuits, frequency response of low pass and high pass filters, design and test low pass Butterworth, Chebyshev and Bessel filters.

## **Circuit Theory Analysis Laboratory**

Used by second-year students for carrying out experiments to complement the understanding of theories and concepts taught. Experiments on more advanced topics of electrical engineering include three-phase circuits, three-phase power measurements, power factor correction, series and parallel resonance, network analysis and star-delta transformation.

## **Communication Electronics Laboratory**

Used by second-year DICT students, it is equipped with telecommunication experimental test panels such as filters, analog and digital modulators and amplifiers. Virtual instrumentation software enables experiments to be conducted using the personal computers.

## **Computer Hardware 1 Laboratory**

First-year DICT and DCNT students have full hands-on sessions in assembling and maintaining their own personal computers. They are taught how to configure computer systems with different peripheral equipment and devices. Computer troubleshooting and simple repair services are also taught in this laboratory.

## **Computer Hardware 2 Laboratory**

This laboratory supports two modules – Computer Interfacing and PC Technology. Students are taught how to use the computer to interface, obtain information, and control devices using the different interfaces of a personal computer. Students configure their own personal computer with a variety of devices and interfaces, and investigate the effects of different computer motherboards, CPUs and storage interfaces on the performance of the personal computer.

## **Computer Networking 1 Laboratory**

Used by first-year DCNT students for experience on different services available on a network. They construct their first working LAN from basic equipment, learn to share computer and network services, connect to dial-up and online systems and practise interconnecting computers using basic network equipment.

## **Computer Networking 2 Laboratory**

Used by second-year DCNT students, it houses Cisco routers and switches set up as a 5-router/2-switch configuration. Each group of students undertakes to set up routing and switching strategies on the equipment, emulating the transfer of information over a small network or across networks spanning several offices. Students also develop routing strategies to block or allow access to information.

## **Computer Networking 3 Laboratory**

Students are introduced to different computer and network configurations here. They learn how to set up network servers and a local area network comprising of routers and switches. The laboratory is also designed to provide students with the necessary exposure to transferring multimedia information across networks. This laboratory is set up to support the networking requirements of the Diploma in Electrical and Computer Engineering.

## **Computer Networking 4 Laboratory**

Students are introduced to different computer and network configurations here. They learn how to set up network servers and a local area network comprising of routers and switches. The laboratory is also designed to provide students with the necessary exposure to transferring multimedia information across networks. This laboratory is set up to support the networking requirements of the Diploma in Electrical and Computer Engineering.

## **Computer Operations 1 Laboratory**

Used by first-year students, the laboratory supports the teaching of basic workstation operations. Students are exposed to different operating systems, which they will use in their three-year long course. They learn how to install, configure workstation operation systems, and understand the utilities offered by the different operating systems.

## **Computer Operations 2 Laboratory**

With a one-to-one ratio of workstation and server, each student sets up his/her own computer server and workstation. Students learn how to install and configure their own computer server and understand how to set up the necessary server operations and services for users. In order to check that the services are set up correctly, students then use the attached workstation clients to access and verify the set-ups.

## **Computer-Aided Design Laboratories**

Equipped with high-speed SGI W2K workstations, students learn how to use a suite of packages for printed circuit board design.

### **Data Communication Systems Laboratory**

Used by first-year DICT students, the laboratory work are designed to enhance their understanding of data communication systems through the use and operation of communication software and equipment such as modems, protocol analysers and BERT.

### **Data Communication 2 Laboratory**

Provides practical training for second-year students on the usage and operation of communication software and equipment typically used in data communication systems, such as protocol analysers, modems, and BERTs.

### **Design & Fabrication Laboratory**

Used by second-year DMA students to learn how to design and fabricate a mechatronic project. Tasks carried out in the laboratory include the assembly of printed circuit boards, soldering, testing and troubleshooting of electronic circuits as well as integrating mechanical and electronic parts.

### **Digital Circuits Laboratory**

Students use LogicWorks 4.0 for computer simulation of basic gates operation and typical digital electronics circuits ranging from combinational logic to sequential logic, multiplexer, decoder and others. Hands-on experience is an important aspect of this laboratory which also focuses on the competency of the students to actually set up a working circuit on a digital trainer, using real components and jumper wires. Logic probes are provided for troubleshooting.

### **Digital Communication Systems Laboratory**

Investigation of various digital communication concepts and techniques including signal sampling, pulse code modulation, digital signaling, digital carrier modulation and channel coding are undertaken here.

### **Digital Electronics Laboratory**

Equipped with PCs and digital trainers that are used for experimentation on various digital devices like logic gates, decoders, multiplexers, flip flops, counters and shift registers.

### **Digital Signal Processing Centre**

Provides the technical resources and a conducive environment for staff and students to be involved in applied research and development work in the area of digital signal processing.

The present research foci of the DSPC are in the areas of:

- Image analysis and processing
- Speech and audio signal processing
- Biomedical signal processing
- Real-time DSP hardware implementation

It houses some 15 PC workstations, each loaded with simulation software like Labview and MATLAB, and hosts numerous real-time DSP imaging and development systems. An acoustic chamber, which is used in some of the audio projects, is also located at the centre.

### **Digital Signal Processing Fundamentals Laboratory**

Fundamental concepts and knowledge on digital signal processing (DSP) are reinforced through the practical sessions in the laboratory. Structural and interactive learning are emphasised through the use of simulation software packages such as MATLAB and Simulink. As a solid foundation for learning more advanced DSP theories, the students analyse the different conceptual blocks of a simulated DSP system.

### **Digital Signal Processing Laboratory**

Equipped for conducting experiments on various digital signal processing concepts including sampling, quantization, real-time digital filter analysis and discrete and fast Fourier transform.

### **EIB Laboratory**

Electrical Installation Bus (EIB) is an innovative building technology which is being used increasingly in electrical installations to provide intelligent building management, ease of network expansion/reprogramming and can be remotely controlled via a mobile phone or the internet.

This lab is used by students to perform their hands-on electrical designs based on EIB technology. It is computer-based hands-on using the ETS software that allows the students to learn and appreciate the ease to program and re-program the sensors, switches and actuators to meet the design needs.

### **Electrical Transportation Laboratory**

Used for experiments on the control of ac, dc and special machines. The laboratory is equipped with advanced educational control equipment to study the methods of controlling dc, induction and synchronous motors. Students also learn the characteristics and control of special machines such as brushless dc motors, stepper motors and servomotors.

## **Electrical Installation Laboratory**

Used by students to perform hands-on experiments in various areas: measurement, testing and troubleshooting of final circuits in mimic domestic electrical installation; industrial wirings using relays, contactors and timers; project-based design on traffic light control and motor sequential circuits; various motor starters like direct-on-line starter, forward/reverse starter and star-delta starter, and new technology in electrical installation such as EIB system.

Students will also learn the use of various test instruments as part of the hands-on sessions. Circuit protective devices, switchgears, fire alarm equipment, standby generator, motor control centre and equipment for use in hazardous locations are on display so as to help students to understand electrical systems.

## **Electrical Power Laboratories**

Equipped for conducting work on power system operation and control, testing of protective relays, power transformers and circuit breakers. A Power System Simulator with computerised control system is used for experimentation in areas of microcomputer-based protection and control of power systems, as well as the traditional operational and testing related principles and concepts. Safe operational, fault diagnostic and problem-solving skills are fine tuned and perfected through extensive practice on the simulator.

## **Electromagnetic Devices Laboratory**

Used for practical sessions on various electromagnetic devices. It is well equipped with all types of ac, dc machines and stepper motors used in industry. There are also cut-away models of those machines. The experiments have been designed to give a complete knowledge on the various characteristics of electrical machines and transformers. Students also carry out experiments on the basic methods of controlling these electrical machines.

## **Electronic Circuits Laboratory**

Students learn how to use equipment such as ammeters, voltmeters, digital multimeters, RLC meters, power supply, oscilloscope and signal generator. Students also learn to connect components together from schematic diagrams, and perform experiments to verify the various laws and theorems.

## **Electronics Laboratory**

Equipped with digital training systems for experimentation on various digital devices like

logic gates, flip flops and counters. Students also learn to use power supplies, function generators and oscilloscopes.

## **Electrotechnology Laboratory**

Used by first-year Aeronautical, Mechanical, Manufacturing and Mechatronics students for experiments on Electrical Engineering Fundamentals. It is equipped with ammeters, voltmeters, multimeters, regulated power supply, signal generators, oscilloscopes, resistors, inductors and capacitors.

## **Embedded Systems Laboratory**

Equipped with personal computers, microcontroller emulation board, board level Internet controllers, I/O target boards and network remote control emulation board. Students learned to interface the microcontroller with input/output peripherals and assemble embedded Internet systems.

## **Energy Conservation Technology Centre (ECTC)**

ECTC aspires to be a Centre of Excellence in the learning and development of energy conservation technology.

ECTC focuses its research and development work in the following technology areas:

- Renewable Energy
- Energy Storage and Fuel Cells
- Energy Management

## **Final-Year Project Laboratory**

Provides basic components and tools, as well as more sophisticated computers and machines needed by full-time final-year students to construct and realise their final-year projects. With SPICE connections for Internet access, a conducive IT environment for learning, teaching and managing the final-year projects by students and staff is provided.

## **Final-Year Project (Multimedia) Laboratory**

Provides sophisticated computers needed by full-time final-year students to construct and realise their final-year projects. With SPICE connections for Internet access, a conducive IT environment for learning, teaching and managing the final-year projects by students and staff is provided.

## **Final-Year Project (Computer) Laboratories**

These labs provide basic components and tools, as well as machines needed by full-time final-year students to construct and realise their final-year projects.

### **HIFIS (High Speed Intelligent and Flexible Inspection System) Laboratory**

Part of the Centre for Fieldbus Technology, it houses several models of manufacturing plants that use Profibus Technology, one of which is the High Speed Intelligent and Flexible Inspection System, a staff tote board project that demonstrates the integration of various technologies used in factory automation.

### **Intelligent Systems Laboratory**

The facility is used by the Industrial and Building Automation technology group, and also conducts laboratory/tutorial session for the modules Intelligent Systems, Advanced Computer Control and Systems & Control. Equipment in this laboratory includes a complete range of PLC with intelligent modules, fault tolerant control system, robotic system, pneumatic components, sensors and instrumentation.

### **IC Design Centre**

Houses various integrated circuit CAD tools for both front-end and back-end flow of IC design process, such as FPGA Advantage, Synopsys, Cadence and Xilinx. These CAD tools are used by third-year DECC students for IC Design module and project. Staff development, consultancy services and training courses are also carried out here. Students perform experiments and mini projects using different design methodologies such as HDL design, Full-Custom and Standard Cell.

### **IC Testing Laboratory**

Students will have the opportunity to apply what they have learnt in their lectures to write programs that run on an automated test system to test various standard TTL digital devices. They will learn to set up the test system to perform DC/AC parametric tests and functional tests on these devices.

### **Instrumentation and Photonics Laboratory**

Equipped with various state-of-the-art measurement instruments, transducers and industrial PLCs which give students practical hands-on experience in implementing measurement and control techniques. Experiments are designed to enable the students to comprehend modern measurement technology used in industry and the role these techniques play in control and instrumentation. The lab is Web-enabled for e-learning as well.

The lab also consists of an elaborate laser-optics arrangement to record holograms. Final-year students are involved in projects investigating

the engineering applications of holography. Apart from this, there are a number of experiments to expose students to the different applications of lasers such as musical laser display, interferometry, pressure sensing, and different fiber optic applications.

### **Logic Design Laboratory**

Installed with 23 sets of Pentium PCs (Window 2000-based) running FPGA-advantage software. Students learn how to design logic circuits and implement their designs using programmable logic devices (PLDs).

### **Microcontroller Systems Laboratories**

Provides hardware and software development tools for developing microcontroller-based systems. The hardware consists of microcomputers, microcontroller evaluation module (EVM) boards and I/O boards. The software includes editor, assembler and simulator. Students learn the techniques of writing microcontroller programs and ways of interfacing microcontroller to external devices or circuits.

### **Microwave Technology Laboratory**

Well-equipped with facilities to measure various parameters of the transmission lines and understand the behaviour of transmission lines under different terminations. The lab also provides facilities to plot antenna radiation patterns of different antennas and obtain relevant parameters, make measurements on waveguides and microstrip components and understand the phenomenon of standing waves. There is also a set up for LOS measurement using reflex klystrons.

### **Multimedia Development Laboratory**

Set up for DICT students to learn various techniques in developing multimedia through interactive practical sessions. In this laboratory, students gain hands-on practice in editing images and videos, which are the two important elements of multimedia. The curriculum set up for this lab also provides students with an insight of digital signal processing (DSP) that forms the infrastructure of multimedia. The laboratory is equipped with 23 Pentium III PCs with multimedia accessories, two scanners and a digital camera. Software packages in use are: Adobe Photoshop, Adobe Premiere, MATLAB, Sound Forge, QuickTime, PowerPoint and Microsoft FrontPage.

### **Network Infrastructure Laboratory**

This laboratory is designed to emulate a five-storey building in which the point-of-presence

is transferred to a Main Distribution Facility (MDF) and then to Intermediate Distribution Facilities (IDF) on each floor. Students learn how to design and implement vertical and horizontal cabling strategies using cable, fibre and wireless media. Students will also learn how to implement redundant network strategies and practical LAN implementation and interconnection into WAN.

### **Network Operations 1 Laboratory**

This is a third-year laboratory. Students learn how to manage and monitor networks with various tools and monitoring services. They learn how to interpret reports and analyse data from network probes. With such data, students will be able to optimise data transfer across networks. The laboratory is equipped with servers, routers and network monitoring equipment.

### **Network Operations 2 Laboratory**

In this laboratory, students learn how to implement and enforce computer and network security across servers and LANs. As part of their practicals, they will set up physical security and authorisation systems, configure network firewalls and firewall appliances. Students will also have hands-on experience in configuring and maintaining Cisco PIX Firewalls and Intrusion Detection Systems.

### **PCB Technology Laboratory**

Houses equipment use for the teaching of printed circuit board fabrication such as PCB exposure, developing, etching, plated-through holes, and drilling. All full-time students make use of this laboratory for their mini projects and final-year projects.

### **Power Electronics & Drive Laboratory**

It is a modern facility to provide update training in power electronics drives and systems.

The laboratory is equipped with the state-of-art equipments and instruments necessary to impart practical knowledge on power electronic systems and drives. Students can easily build various power electronics systems and converters on the power electronic trainer using plug-in type passive and active components. The laboratory is mainly used by final DECE students and final-year DMA students.

### **Power System Analysis Laboratory**

It is used for experiments on electrical power systems, which involve both hardware and software. Final-year students undertake practical experiments on harmonics, imbalanced three-phase supply, three-phase transformer connection and supply voltage distortion. The software, with

rich multimedia-based components, covers power flow analysis studies, system fault analysis and electrical generators transient stability.

### **Principles of Electrical & Electronic Engineering Laboratories**

Used by first-year DASE, DECC and DECE students to acquire practical skills and knowledge in the area of electrical and electronic engineering, which include learning the use of basic test equipment like DC Power Supply, Digital Multimeter, Function Generator and Oscilloscope. The laboratories are also used by the students to verify circuit theorems and principles by conducting experiments as well as to apply their theoretical knowledge in practical situations as required during the practical-based independent learning (PBIL) assignments.

### **Project 1 - Electronic Workshops**

Students learn the practical skills of electronic component identification, soldering, correct wiring methods, various techniques of construction of electronic projects and the use of measuring instruments for their testing and troubleshooting. These labs are equipped with a range of basic electrical/electronic equipment like power supplies, function generators/counters, multi-meters and oscilloscopes. First-year full-time students use this laboratory to construct mini projects.

### **Project II (DECE and DECC) laboratories**

Equipped with a range of basic electrical/electronic equipment like power supplies, function generators/counters, multi-meters, oscilloscopes and computers. Second-year full-time students use these laboratories to construct mini projects and learn how to design and produce prototype circuits in the field of analogue/digital electronics. Some projects involved the use of programmable logic controllers (PLC) or micro-controllers.

### **Quality and Reliability Laboratory**

Students are given practical work on SQC and SPC. This is done using software packages that perform the various statistical calculations, plotting of distribution curves and control charts used in quality control. Also included are assignments on TQM, ISO9000, SPC, DOE, COQ and Environmental Stress Testing.

### **Satellite Communication and CATV Technology Laboratory**

Helps to reinforce students' understanding of optical fibre transmission systems, satellite communication systems and CATV networks. The optical experiments introduce students

to the basic principles of light propagation and attenuation in optical fibre. Test and measurement techniques used in practical optical fibre system are also covered in these experiments.

The satellite experiments will provide students with an understanding of geostationary satellite systems by allowing them to experiment with TVRO systems, the global positioning system and remote sensing satellite systems.

The CATV experiments focus on CATV system measurements and alignment. Both RF and video measurements are undertaken with specialised CATV spectrum analysers and signal level meters. The students will learn how to perform CATV proof of performance measurements to the Singapore CP-39 standards requirements.

### **SRG (Singapore Robotic Games) Centre**

Provides a place where synergies of mechanical and electronic design, sensor validation and integration, & motion control can be achieved. It is dedicated for activities involving robotics projects like Robot Colony, Intelligent Robot, Micro-mouse, Robot Sumo, Gladiator Robot and Pole Balancing Robot, to name a few. Besides, many other interesting projects like underwater robot, biped robot and running robot are also being worked on in this lab. These projects provide excellent opportunities for students to ensure that the robots that they have built, can walk, run, or balance as the case may be. The completed robots are used for competitions held during the Singapore Robotic Games, organised annually by the Robotic Games Society of Singapore.

In addition to basic equipment like computers and oscilloscopes, there are also robot colony maze, intelligent robot platform, micro-mouse maze, robot sumo and robot gladiator arenas, and pole-balancing platforms. Basic mechanical fabrication facilities are also provided here. Five PCs with Veribest PCB routing software have also been provided for students' use.

### **Systems and Control Laboratory**

It is equipped with a wide range of equipment including various type of model plants, control systems and control software. In this laboratory, students can model, simulate, analyse and design various control systems as well as study various control techniques through hands-on experiments.

### **Technology Centre for Nanofabrication and Materials**

Serves as the focal point for all activities related to Wafer Fabrication, Micro Electro-Mechanical

Systems (MEMS) and Display (OLED) technologies. It is equipped with wafer fabrication, MEMS processing and design software tools. Some of the processing tools are LPCVD, Diffusion/oxidation furnace, ICP, RIE, Sputtering systems, SEM and many more. It provides resources for staff and students to conduct applied R&D work in Wafer Fabrication, MEMS and Display (OLED) technologies. It also caters to students for their laboratory sessions in the following modules: Wafer Fabrication, Microdevices & Materials and Biomedical Microdevices.

### **Technology Centre for Wireless Communications**

This is the focal point for all wireless technology and application development within the poly-technic. It provides test facilities and services, as well as test bed for wireless applications. Expertise development includes areas of wireless technology such as RF measurement & simulation, device characterisation, transceiver design, RFID, RFIC, and areas of application development such as J2ME, HDML/WML, wireless network and personal or private network.

Projects of interest include development of RF transceivers, Bluetooth products and applications for PDAs, handheld devices and mobile phones. In addition, the centre provides training and education for students and staff, & technology transfer and consultancy services for industry in wireless communications.

## **Synopses of Modules**

### **BAxxxx**

For a description of the modules, please refer to the chapter on the School of Business.

### **EC1166 Design & Fabrication Project**

Equips Mechatronics students with the essential human and practical skills and prepares them for their final-year project work. Students will go through the design and fabrication process to build an electromechanical project. Students will learn to prepare their design, produce engineering drawing, fabricate mechanical parts (milling, turning and fitting), make printed circuit board, test and troubleshoot electronic circuit and integrate mechanical and electronic parts.

### **EC1233 CAD (Electronics)**

Aims at introducing students to the use of computers in industrial environment for computer-aided design of electronic circuits and printed circuit boards, and provides them the hands-on

experience in using Electronic Design Automation systems for design of electronic circuits.

## **EC1250 Engineering Management**

Covers three essential areas of engineering management, namely, Principles of Management, Total Quality Management (TQM) and Project Management. Students are first taught the foundations of effective management as well as the importance of leadership, teambuilding, positive attitudes and human relations. In the area of TQM, important topics covered include core concepts, learning from quality 'gurus', cost of quality, tools and techniques and case studies. In Project Management, students learn the project management process which includes project definition, planning, leading, monitoring and completion.

## **EC1254 Integrated Electronics**

Introduces the semiconductor energy bands theory and its transport phenomena. Device physics and characteristics of pn junction, bipolar and MOS transistors are introduced. IC fabrication processes and characteristics are studied. Optoelectronic devices and their applications are also introduced.

## **EC1259 Control Engineering**

Reviews basic concepts in Control Engineering. In classical control, areas include mathematical modelling, time domain analysis, process stability, frequency response, compensator design and PID controller tuning are taught in detail. In the field of computer control, fundamentals of digital control and Z-transform techniques are taught.

## **EC1274 Power Electronics & Motion Control**

Introduces the devices, circuits, and systems used in modern motion control applications. Covers mainly power switching devices including power transistors, thyristors and IGBTs. AC controllers, DC choppers, controlled rectifiers, inverters and cycloconverters are among the power converters discussed. The control aspects of different types of motors such as DC/AC motors, steppers, brushless drives and AC/DC servos are included.

## **EC1275 Programmable Controllers & Industrial Applications**

Covers the basic concepts and examples to understand the operation and capabilities of PLCs as an important tool for factory automation in industries. Emphasis is on using function chart as a tool for program design. Practical examples will be used for case studies. At the end of the module, the students will have sufficient knowledge to handle jobs in manufacturing and process control environment involving PLCs.

## **EC1278 Industrial Power Supplies**

Covers circuit analysis, design and application areas of switched mode power supplies, uninterruptible power supplies, resonant power converters, high frequency induction and dielectric heating, electronic welding techniques.

## **EC1282 Digital Signal Processing**

Covers two areas: Fundamental theory of digital signal processing and the applications of digital signal processing. Under the Fundamental theory of digital signal processing topics covered includes digital filter design, discrete Fourier Transform, Fast Fourier Transform, finite word length effects, random signal processing and multirate digital signal processing. In the application aspects, emphasis is given to digital speech and image coding.

## **EC1283 Digital Communications**

Emphasises the three main functional blocks of a digital communications system: source coding, bandpass modulation & demodulation and channel coding. Under the section of source coding, sampling, quantisation, PCM, intersymbol interference, pulse shaping, line coding, matched filter, digital equaliser and redundancy reducing coding will be covered. The bandpass modulation and demodulation sections will cover digital carrier modulation techniques (e.g. FSK, PSK, DPSK and other multi-level shift keying techniques) and detection & error performances. The last section on channel coding will cover topics on coding techniques, error control coding and spread spectrum techniques.

## **EC1284 Optical Communications**

Covers both the theoretical and practical aspects of optical fibre communications. Topics to be discussed are: lightwave propagation in optical fibres, main devices used in optical communication link including the working principle of laser and wavelength division multiplexers, system budgeting, measurement, fibre splicing and fault location techniques. The module will also introduce the latest technology in optical fibre communications such as the Coherent communication system. Students will be given the opportunities to construct and perform experiments on optical fibre link in the optical communication laboratory.

## **EC1285 Integrated Services & Digital Network (ISDN)**

Provides the basic understanding and definitions of ISDN, network architecture, area of standardisation such as user-network interfaces and services, call control architecture and some aspects of user-network interface operating principles.

### **EC1286 Microwave & Satellite Communications**

Starts with the basics of microwaves like transmission lines and semiconductor components. Typical microwave communication components are studied with the block diagrams. The basics of antennae will be followed by the introduction to satellite communications. Satellite communications will be studied in depth with the block diagrams.

### **EC1297 Project**

Students will engage in project work during their final year of study. Project areas must be relevant to the course of study. Students are allowed to finish their project work within three years before they graduate. Assessment includes a typed-written report, presentation, degree of complexity and success of project, and punctuality.

### **EC1379 Computer Programming**

Structured programming is an integral part of information system technology and this module attempts to introduce the basic principles of programming. Students are introduced to the concepts of program design with the use of the latest software techniques. 'C' language is then introduced as a means of translating the software design which can be interpreted by the computer. The student is also trained to write programs to solve problems in various fields of Electronic Engineering.

### **EC1380 Communications & Signals**

Starts with the revision of the dc circuit analysis followed by the ac analysis using the Fourier series. Excitement by non-periodic signals are then analysed by using Fourier & Laplace transform techniques. Design techniques of passive, active and digital filters will be covered. A brief discussion on the characterisation of the noise will conclude the module.

### **EC1381 Fuzzy Logic & Control**

Covers the theory and applications of fuzzy logic for process control, and the design of a controller using fuzzy logic and conventional control. The relative merits and limitations of fuzzy logic controllers.

### **EC1385 Machine Vision & Image Processing**

Equips students with sufficient theoretical and practical knowledge to understand and to manipulate images for industrial and office applications such as factory automation, medical image analysis, vision security systems,

document imaging etc. Topics include the concept of image acquisition, formats, mapping, digital sampling, filtering, noise and image reconstruction. Methods of image enhancement to facilitate segmentation and classification will be included. Commercial applications such as pattern recognition, bar coding, document imaging and image compression will also be taught.

### **EC1386 Sensor Technology**

Covers the working principles and applications of sensors used in robots and automation. Topics include signal conditioning circuits, data acquisition systems, and smart sensors.

### **EC1390 Wireless Communications**

Covers the basics of the wireless communication systems with emphasis on digital systems. Topics such as transmission media, digital modulation techniques, spread spectrum, atmospheric effects and link analysis will be covered. Details of the present day mobile communication systems like GSM, DECT, PHS, and PCN will be emphasised.

### **EC1392 Disk Media Technology**

Covers topics such as magnetic disk media, magnetic materials, tribology, surface properties and characterisation, head/disk interface, stiction and friction, lube coating, failure mechanisms & analytical techniques.

### **EC1393 IC Failure Analysis & Reliability**

Covers failure mechanisms & modes, failure analysis techniques, FA flow, accelerated life testing, case studies, quality control & reliability, FMEA, product and process development.

### **EC1394 HDL Chip Design**

Covers the basic design technique necessary for ASIC. HDL will be used for the abstract description of the circuit's behaviour.

### **EC1395 IC Wafer Fabrication Process**

Review of semiconductor physics, IC wafer fabrication process, IC assembly, thin film technology, vacuum system technology, clean room technology, ultra high pure water technology, process control, chemical & analytical methods, and chemical & gas safety.

### **EC1396 Full Custom IC Design**

Covers topics such as MOS physics, MOS Inverter, basic gates, stick diagrams, ASIC design flow, EPLD, gate array and full-custom design & device scaling.

## **EC1397 Electronics Component Testing**

Overview of analog and digital testing PCB testers, digital and analog IC testing is provided. Basic knowledge of the concepts and methodology of digital, analog and mixed-signal testing of ICs such as DRAM, Op-Amps and ADC/DAC is given.

## **EC1403 Electronics**

Provides students with an understanding of the basic concepts of digital electronic devices and analog devices. Topics to be covered include logic gates, flip flops, counters, shift registers, diodes and transistors. It aims to provide students with the fundamentals in analog devices, circuits and applications and prepares students for the third year of the course.

## **EC1405 Electronic Devices**

Provides Mechatronics students with an appreciation of analogue & digital electronic devices, circuits and applications as used in the Mechatronics area. The module prepares students for the third year of the course.

## **EC1406 Circuit Theory**

Builds on the fundamentals covered in the Electrical Technology module and aims to provide students with the understanding and application of advanced theorems to solve complex electrical circuits efficiently. Basics on three-phase systems are also covered as an introduction to third year course.

## **EC1407 Microcontroller for Mechatronics System**

Teaches the basic concepts of microcomputer and the programming and application of microcontroller. Upon completing the module, students should be able to use microcontroller to perform simple control functions of a real world system.

## **EC1408 Electromechanical Devices**

Introduces electric motors used to convert electrical power into mechanical power. It covers concepts of electromagnetism, ac power, power triangle, significance of power factor and power factor correction. The module also discusses operation principles of common types of stepper, dc and ac motors and outlines measurement concepts of ac electrical power, dc electrical power and mechanical power.

## **EE3115 Electrical Technology**

Provides students with an understanding on basic electrical principles. Students can use this knowledge in their practical work; relate the

use of electricity to electrical equipment and machines and the proper use of the instruments for measurements.

## **EE9116 Computer Programming**

Provides students with a broad background in solving problems using a computer program. Also teaches good programming techniques using a high level programming language. It will provide the students with an understanding and usage of a C compiler on an IBM PC environment.

## **EE9117 Circuits & Fields**

Teaches the analysis of one-port and two-port networks, and studies the response of networks due to repetitive and non-repetitive disturbances. Synthesis of one-port networks is also introduced and examples given. Studies on AC and DC electric and magnetic fields and their relations in Maxwell's equations make up the later part of this module. Computer methods of solution of field problems are also discussed.

## **EE9118 Dynamics & Control**

Introduces the basic principles of automatic control and illustrate the application of these principles in modern control systems. Topics include mathematical models, dynamic analysis, stability analysis, frequency response analysis, s-plane analysis and compensation techniques.

## **EE9119 Engineering Management**

Teaches the significance of economic aspects of engineering and how to evaluate the feasibility of engineering projects in terms of cost and benefit.

## **EE9120 Artificial Intelligence & Applications**

Provides students with the basic principles of expert systems in engineering environment for diagnostics and control purposes and their applications in Instrumentation and Control. In addition to the basic structure of the expert system, this subject will also cover the topics on neural networks and fuzzy logic and their applications.

## **EE9215 Power Transmission & Distribution**

Provides students with an insight into the areas of designs and roles of electricity transmission and distribution. Also enables them to understand the principles of operation of various types of bus bar arrangements, network configurations and high voltage equipment including switch-gears, cables and reactive power and voltage compensation devices. Over voltages and voltage

transients in power systems and the concept of insulation coordination for high voltage equipment are introduced. The application of computer and CAD software packages to carry out electrical design and drafting will also be included.

#### **EE9216 Computer Methods for Power System Analysis**

Students will learn techniques and algorithms for the formulation of network matrices for power system analysis such as power system fault studies for symmetrical and unsymmetrical faults, load flow studies and transient stability analysis. Emphasis is on the application of computer methods for solution of these problems. Interpretation and use of results to specify circuit breaker ratings and relaying systems, methods of reinforcing and improving system security and stability will be included.

#### **EE9217 Power System Protection**

Teaches the fundamental principles of relay operation and shows how they are applied to the protection of specific system elements. Over current, directional, differential, pilot and distance protective relays will be described. Calculation of relay settings for the different types of relays will be explained. Also included are the fundamental application principles, special requirements of the various system elements, application practices, and methods of testing and commissioning protective schemes.

#### **EE9218 Power System Planning & Control**

An introduction to the engineering and economic factors involved in planning, operating and controlling power systems. Topics include planning procedures for large utilities and industrial power systems, reliability and contingency analysis, economic studies and financial analysis & computerised Supervisory Control and Data Acquisition (SCADA) systems. Developing trends and the use of Artificial Intelligence in a computerised power system will also be discussed.

#### **EE9219 Project**

Enables each student to apply his knowledge to solve practical problems. Students sponsored by companies are encouraged to seek industry-sponsored projects related to problems found in their working environment. A report must also be submitted. Alternatively student can choose to write a dissertation on a topic or subject approved by the course coordinator.

#### **EE9220 Digital & Advanced Control**

Teaches modern control theories and the role of digital computers in process control systems. Topics include sampled-data control, direct digital control, supervisory control, distributed control, state-space method, multivariable, optimal, stochastic and adaptive systems.

#### **EE9222 Automation & Programmable Controller Applications**

Introduces the basic concepts and latest development in programmable controller technologies used in automation applications. Topics include structure of PLC, ladder diagram programming, control system design, advanced instruction sets, intelligent I/O modules, local area networks, supervisory control and data acquisition in PLC systems.

#### **EE9223 Process Control Engineering**

Provides an integrated system approach to the understanding of behaviour of process control systems. Operation and behaviour of practical process control systems are emphasised. Topics include controller characteristics, dynamic behaviour of process control loops, multi-loop control and non-linear system.

#### **EE9224 Power Semiconductor Devices & Converter Technology**

Introduces the characteristics and operation of power semiconductor devices like thyristor, GTO Power transistors, Power MOSFETs & IGBT and their applications to naturally commutated and self-commutated converters. The methods of control and effects of harmonics will be studied.

#### **EE9226 Power Supply Application of Converters**

Introduces the various types of power supplies for residential, industrial and utility applications. Optimising of the interface with power electronic systems will also be covered.

#### **EE9228 Computer Control Theory**

An introduction of computer control systems. Topics included are control system hardware and architecture, control system software, communication facilities, operator interface and engineering interface.

#### **EE9229 Computer-Aided Analysis of Power Electronics Systems**

Introduces the concepts of computer-aided circuit simulation and the use of standard software package for designing electronic circuits. Various

simulations techniques such as the DC sweep, DC sensitivity analysis, transfer function analysis, frequency response analysis, transient analysis and device models will be introduced.

## **EE9230 Digital Signal Processing & Computer Relaying**

Teaches digital signal processing (DSP) and protective relaying concepts and practices followed in electrical power industries. Principles and concepts of computer relaying will be introduced. DSP techniques including sampling process and digital filtering will be explained. Computer relaying algorithms and their applications in power system protection will be discussed. Students learn these concepts by developing relay software. Methods for testing and commissioning microcomputer based relays, recent developments in computer relaying, adaptive relaying and Artificial Intelligence (AI) based relaying will be reviewed.

## **EE9231 Robotics & Vision Systems**

Teaches the basic principles of robotics control and image processing techniques. Concepts of robotics, mathematical descriptions of objects, relative transformation, co-ordinate systems, modelling, image acquisition, illumination and processing of image are covered.

## **EE9234 Power Distribution System in Buildings**

Aims to provide students with working and in-depth knowledge on the planning, design and commissioning of high and low voltages (230V - 22 kV) electrical installation and distribution systems in commercial, residential and industrial buildings. Relevant Acts and Regulations, Code of Practices and Standards together with the operation, selection and sizing of various system components such as standby generator, switchgear and transformer will also be included in this module.

## **EE9235 Building Automation Systems**

Provides an integrated system approach to understanding Building Automation Systems and their applications to building services where computerised control is a key technology implemented to ensure effective building operation. It covers the architecture of equipment and zone level computer control in building automation, communication and networking with computer control systems, application software of modern building automation systems, & provides good working knowledge of how to specify, design, install, commission, operate,

and maintain a Building Automation System. Application areas will include air-conditioning systems, fire detection and alarm systems, security systems & other essential building services. The lectures will be complemented by hands-on training sessions in the Building Automation Application Centre.

## **EE9237 Industrial Drives & Motion Control**

Aims to provide a comprehensive knowledge to students on the practical aspects of industrial drives and an overall view of the motion control system. The topics cover DC Drives, AC Drives, Step Motor Drives and their applications, Motor sizing, protection & drive system installation. The module also introduces to students motion control techniques and elements of a closed loop system.

## **EE9238 Digital Control of Drives**

Gives students good background knowledge of microprocessor systems used to control ac and dc industrial drives. The module will describe basic digital control algorithms used in dc and ac drive systems. The various stages in the design of digitally controlled drives will be explained. The topics will cover the basic principles of digital control systems, Z-transforms, digital control system hardware, microprocessor-based dc drive, microprocessor-based ac drive, and data acquisition for closed-loop control.

## **EE9240 Intelligent Instrumentation & Measurement Systems**

Provides students with a comprehensive coverage on the area of instrumentation and measurement systems, with an emphasis on computer-based modern instrumentation systems. In addition to the traditional areas of instrumentation like sensors and transducers, controllers and control valves, signal conditioning & recorders, this module will also cover some major developments in intelligent instrumentation including GPIB interfaced instruments, discrete signal conditioning and data conversion board & bus-based instruments.

## **EE9241 Real-Time Computer Control Systems**

Provides students with fundamental knowledge of real-time computer control systems. This module will cover digital implementation of PID control, computer system design by pole-placement, dynamic system identification and optimum control, fuzzy logic and neural network

applications as well as the hardware and software used for computer control including intelligent instrumentation systems and the Matlab software environment.

### **EE9242 Electrical Services Design**

Aims to provide students with an in-depth understanding and design methodology of the various electrical building services. In particular, the module will cover the design, specifications and selection of lighting system, lightning protection system, fire control and fire fighting system & lift system. Relevant Acts and Regulations governing the design of these various electrical services will also be discussed in detail in the module.

### **ET0001 Networking Essentials**

Prepares students to meet the needs of the industry by providing a general overview of computing networking. It also provides students with an overview of the different network cabling, hardware, devices, functionality, topologies, client-server concepts and standards required for computer networking.

### **ET0002 Computer Hardware**

Aims at providing students with the fundamental hardware knowledge necessary to understand and assemble a modern day computer. Students will be introduced to the basic hardware configuration of a computer including CPUs, motherboards, chipset circuitry, memory, mass storage, I/O devices, bus interface and connections. This module uses command prompt-based operating system to understand the workings and functions of various hardware components. Installation of A GUI-based operating system will also be demonstrated. Topics related to emerging technologies in personal computer will also be introduced.

### **ET0004 Digital Circuits**

Teaches the basic concepts of digital circuits starting from number systems, basic logic gates, and combinational logic circuit design to more complex logic functions covering multiplexers, decoders and computer memories. Upon completion of this module, students should be able to apply digital techniques in circuit design and analysis.

### **ET0005 Computer Communications**

Provides students with the basic concepts in data communication. It also provides the necessary understanding of essential equipment and techniques used in the implementation of data

communication systems. In addition, examples of applications of data communication in the industry are also included with extensive hand-on operations using data communication equipment.

### **ET0006 Workstation Operations**

Aims to provide students with the necessary knowledge of the functions and components of operating systems in a standalone workstation. Students will learn how to install, configure, troubleshoot and solve software problems in computer workstations. Students will be able to use the workstation confidently and efficiently for their computing needs.

### **ET0008 Electronic Circuits**

Provides an introduction to fundamentals of electricity and electronics. It covers the concepts, laws, theories and their applications to electrical and electronic circuits. It provides students with a good foundation in the understanding of electrical and electronic circuits, which are useful in understanding and synthesis of more complex electronic networks in the later course of studies and work.

### **ET0009 Technology Project**

Aims to provide students with the knowledge of basic electronic design and project through the use of CAD, PCB fabrication, assembly and testing of electronic circuits. The module also equips students with the relevant practical skills such as electronic component identification, correct wiring methods, electronic prototyping, soldering and use of equipment such as the DC power supply and multimeter.

### **ET0010 Computer Networking**

Provides an understanding of computer network with routers and switches. Students will learn how to configure routers and know the concepts of network addressing, router modes and components, routing protocols, LAN switching & VLAN. Students will also be equipped with network troubleshooting skills and able to discuss LAN design issues.

### **ET0011 Computer Interfacing**

Illustrates the integration of software and hardware of peripherals to create a computer system. It provides students with basic understanding of common peripherals interfacing techniques in a computer system.

### **ET0012 Network Infrastructure**

Aims to teach students how to physically implement an enterprise-wide network for

academic or commercial organisation. The network will include Local Area Networks (LANs) at each site and a Wide Area Network (WAN) to provide data connectivity between all sites of the organisation. The module covers design, installation and testing of structured cabling system & provides an overview of LANs and WANs technology, devices, network design components and methodology.

### **ET0013 Ethics & IT Law**

Provides students with an understanding of the ethical and moral aspects of information management, as well as the basic and general aspects of the law arising from information technology. Upon the successful completion of this module, students will become aware of the ethical and moral aspects of Information Management and be able to formulate their own set of ethical codes for use in the Information Technology industry. They will also learn, understand and be able to apply general aspects of the law of Information Technology to their work in future or daily use.

### **ET0014 Internetworking**

Provides theoretical and practical introduction to internetworking technologies. Topics covered in the module are routing and routing protocols, traffic management, point-to-point protocol (PPP), Integrated Services Digital Network (ISDN), frame relay and other wide area network (WAN) technologies. Students will be able to design, install and trouble-shoot inter-networks at the completion of the module

### **ET0015 Server Management**

Introduces students to the principles, concepts and techniques in managing servers. Upon successful completion of this module, students should be able to understand how to install servers, manage users over a network, how to avoid problems through fault tolerance, & how to recover from problems through disaster recovery and how to troubleshoot network/server problems. Students should be able to evaluate and select the appropriate tools to manage the network with emphasis on server management and administration.

### **ET0016 Digital Systems**

Introduces design and analysis methodologies for digital systems including finite state machines and PLD (Programmable Logic Devices) implementations of digital circuits. Students will also be exposed to HDL (Hardware Description Language), methods to analyse and eliminate race

glitches and static hazards, as well as simulation and testing techniques for digital circuits. A CAD (computer-aided design) software package for digital design entry, simulation, synthesis, place and route will be covered in the experiments.

### **ET0017 Internet Programming**

Equips students with the knowledge of programming over the Internet. Students will learn to create Client side applications to access information from Servers as well as writing Server side applications, CGI programs to provide data. Students will be able to build well-structured, friendly and robust programs to access the Internet on completion of this module

### **ET0018 Computer Networking Project**

Provides students with opportunity to plan, design and implement a project as a team. This will prepare students to work in teams to achieve a common goal and to enhance their skills on working on real-life problems and objectives on a computer network system.

### **ET0019 Wireless Networking**

Introduces students to the basic knowledge of Wireless Networking. It focuses on the system aspects of the mobile network.

### **ET0021 Computer & Network Security**

Provides students with the fundamental concepts on the need for Computer and Network security. Students will be able to identify the threats and vulnerabilities of computer systems & networks and recommend the appropriate action to be taken to counter-act such activities.

### **ET0022 Final-Year Project**

Students work in a team to complete a project in the area of computer and network technology.

### **ET0023 Operating Systems**

Introduces students to the inner workings of Operating Systems for computers. It provides a clear description of the concepts that underlie operation systems. Topics covered include OS's management system - memory, devices & I/O; Distributed Systems; and Protection & Security.

### **ET0024 Software Engineering**

Focuses on Object-Orientated approach in the process of software development. It starts from the introduction of the Object-Oriented Programming (OOP) using Java and Unified Modelling Language (UML) to the modern approach in design methodology. It provides

students with an understanding of the software requirement, problem-solving using OOP and design techniques leading to the production of quality software. The theory and concepts introduced in the lecture will be reinforced with lab exercises and a mini-project.

### **ET0025 Embedded Systems**

Provides students with a knowledge and understanding of what is an Embedded Computer System. The practical use of such systems is shown by how the Internet is used to control common devices.

### **ET0026 Network Management**

Aims to provide students with the network management functions, protocol and standards. It explains how the network management functions are achieved through a practical approach. It gives student an overview of network management system and tools currently available so that students can relate to them as they are deployed in an organisation. The module also covers ways to optimise network performance through traffic distribution and introduce student to the concept of Quality of Service.

### **ET0028 Internship**

In the second semester of the final year, students will complete 22 weeks of Internship with an external establishment. The Internship will be in a related field of computers and networking. This internship will allow students to apply the knowledge they have learnt during the course and to have a feel for the areas in which they would like to work upon graduation.

### **ET0029 Computer Programming**

Provides an introductory course in fundamentals of programming, object-oriented programming and GUI programming. Students will grasp the essential programming skills, like declaration of data types, control logics, and fundamentals of good program designs. On completion of this module, students will be able to develop software with modularity, reusability using object-oriented approach.

### **ET0040 Principles of Electrical & Electronics Engineering**

Provides students with an integrated knowledge of electrical and electronic engineering fundamentals. The topics covered are electrical components, electrical signals, series/parallel/series-parallel dc/ac circuits analysis, voltage/current source,

voltage/current divider, Ohm's Law, Kirchoff's Laws, Superposition Theorem, magnetism/electromagnetism, Faraday's Law, Lenz's Law, Junction Diode, Zener Diode, voltage rectification, voltage-regulator integrated circuits, LED, use of Bipolar Junction Transistor as an electronic switch, sensors and operational amplifiers.

### **ET0041 Digital Electronics**

Introduces the basics of digital electronics to a level such that with the acquired knowledge, understanding and techniques necessary, the students are able to design simple combinational and sequential circuits using commercial SSI & MSI integrated circuits. Topics covered in the module include: number systems and codes, Boolean Algebra, logic gates, combinational logic circuits, flip-flops, counters, shift registers, MSI logic circuit ICs and Logic families.

### **ET0042 Project 1**

Equips students with relevant practical skills such as electronic components identification, correct wiring methods, soldering and the use of power supplies, multimeters, function generators and oscilloscopes. Students will then use these skills to work on mini-projects designed to reinforce and integrate the knowledge acquired from the modules: Electrical & Electronic Principles and Digital Electronics. Students will receive hands-on training in using a Windows-based Computer-Aided Design software for printed circuit board design and circuit simulation. In the course of this module, basic occupational safety and health practices will be infused and students will be taught Workplace Productivity and Plan- Do - Check-Action (PDCA) Cycle so as to help them improve the workflow or the environment in which they live in.

### **ET0043 Structured Programming**

Teaches students to write programming a structured way. It emphasises on good programming techniques and covers topics on simple data types, input/output, selection and loop constructs, functions and basic data structures such as arrays using C as the programming language. Programming assignments and hands-on-training in computer laboratory will be emphasised.

### **ET0045 CADD**

Equips students with the knowledge of drawing office practice, ISO drawing standards and acquiring of drawing skills using latest AutoCAD software. It aims to teach students the ability to read and produce good technical sketches &

projection drawings as a form of engineering communication. The module shall cover basic 2D drawings, isometrics and orthogonal projections, & the use of workstation based CAD/CAM software for computer-aided drafting.

## **ET0046 Electronic Design Automation**

Students will receive hands-on training in using Windows-based Electronic Design Automation (EDA) software for printed circuit board design and circuit simulation.

## **ET0047 Microcontroller & PC Technology**

Covers the basic concepts and applications of two categories of computer systems:- microcontroller & microprocessors and personal computer systems. Students will learn software and hardware development on microcontroller development systems and understand how to interface them to microprocessor-based applications and projects. The students will then be taught PC-based interfacing concepts, as well as learn how to troubleshoot and repair PC systems. Development of input/output interfacing solutions will be taught, using a high level language such as C.

## **ET0048 Systems & Control**

Aims to provide students with an understanding of the basic concepts of control theory in both time and frequency domains. This module serves as the foundation for more advanced modules introduced later in the course. Topics to be covered include systems characteristics, modelling transient response analysis, frequency response analysis, s-plane analysis, modes of control and stability analysis.

## **ET0049 Sensors & Instrumentation**

Aims to provide students with an adequate knowledge and basic foundation in the understanding of various sensors and actuator devices used in measurement and control. This module covers topics on the principles of different types of sensors, actuator elements, data acquisition, calibration, aspects, programmable logic fundamentals and data communication in instrumentation & control.

## **ET0050 Electrical Installation Design**

Covers the basic knowledge and practical skills in the application and safe use of electrical energy and services in domestic, commercial and industrial buildings. The main topics to be covered include an overview of the power generation, transmission and distribution system, types of energy sources, electrical safety and protection

principles based on the relevant codes of practices, control circuit design using relays, & the principles on the testing and troubleshooting of electrical installation circuits. New technology in electrical installation, such as the EIB system, will also be covered.

## **ET0051 Project 2**

Provides students hands-on practical experience in project construction and inculcates the students with an appreciation in the design, control and safety features of the common domestic or industrial systems. In addition, there is an open-ended project which incorporates many disciplines. The practical experience and skills gained through designing and building the open-ended project from conception to actual implementation and final testing would lay a good foundation for the students in their final-year project work.

## **ET0052 Electromagnetic Devices**

Introduces the operation and applications of conventional and special electrical machines commonly used in the industry. Conventional machines include dc generators/motors, transformers, three-phase and single-phase induction motors. Special machines covered are servomotors, stepper motors, permanent magnet dc motors, brushless DC motors and their applications.

## **ET0053 Circuit Theory & Analysis**

Provides students with an understanding of circuit theory, which includes mesh analysis, nodal analysis, circuit theorems and applications. The student will also be introduced to three-phase circuits, covering three-phase supply and loads. This module provides the basic foundation leading to final-year subjects - Power Distribution & Electrical Services and Power System Analysis.

## **ET0054 Object Oriented Programming**

Equips students with the knowledge of basic-oriented programming concepts through the use of the C++ programming language. They will understand the VC++ development environment; its features and learn how to build object-oriented applications.

## **ET0055 Power Distribution & Electrical Services**

Provides students with knowledge and understanding of main equipment such as cables, transformers, circuit breakers and associated protective devices involved in the distribution of electrical energy. Importance and requirements

for effective delivery of electrical energy through HV & LV distribution networks for various types of industrial consumers and associated testing will be emphasised. Principles, characteristics and applications of various types of protective relays will also be covered. Students will also learn the technical knowledge and skills in designing various electrical services for high-rise residential/commercial buildings and industrial buildings. Students are trained to carry out design calculation, system design and equipment selection in accordance with good engineering practices as required by the Codes.

#### **ET0056 Power System Analysis**

Aims to equip students with the ability to analyse and solve problems commonly encountered in electrical power systems. The main topics include harmonics and power quality issues, symmetrical components theory and the knowledge of using computer techniques in the understanding and solution of load flow, fault analysis & stability problems.

#### **ET0057 Project 3**

Aims to provide students with the opportunity and responsibility for innovating/creating, finding or selecting, formulating, planning, carrying out and reporting on a challenging piece of work that can provide a solution to the engineering problem. The module also aims to provide students with the opportunity to use, develop & integrate their knowledge and skills acquired during their polytechnic and industrial attachment periods.

#### **ET0058 Computer Networks**

Prepares students to meet the needs of the industry by providing a general overview of computer networking. It also provides student with an overview of the different network cabling, hardware, devices, functionality, topologies, client-server concepts and standards required for computer networking.

#### **ET0059 Computer Control Systems**

Provides students with the knowledge and practical experiences in intelligent instruments and systems that are employed in the instrumentation and control fields. This module aims at providing an integrated system approach to the understanding of computer control systems and their applications in process control. After understanding the concepts of digital control and process control behaviour, students will then proceed to study computer control systems such as the DCS and fieldbus systems.

#### **ET0061 Intelligent Systems**

Covers the use of modern digital communication networks for integrated control in industries. This module aims to provide students with a theoretical and practical knowledge of the design of computer-based monitoring and control systems. Student will learn about the use of networked smart devices for providing information to create an intelligent system. It covers different industrial applications; ranging from industrial, process to building automation.

#### **ET0062 Electrical Transportation Systems**

Introduces the principles of electrical transportation systems. Various topics such as system configurations, power transferring, parameters and ratings calculation, traction drives, signalling and train control, protection and supporting systems, etc are covered. At the end of this module, student will understand the electrical principles needed to control, operate and maintain the electrical mass transportation system.

#### **ET0063 Electrical Power**

Designed to provide the students an enhanced knowledge and understanding of principles & concepts of power system operation and control, power system protection and their applications in power system. Students will be given assignments to study and experiment with different devices implemented in industry so as to enhance their understanding of different subjects. Case studies and open-ended experiments will be incorporated for infusing creativity and thinking.

#### **ET0064 Power Electronics & Drives**

Introduces students the knowledge of control and conversion of electric power for applications in variable speed drives. The topics include the characteristics and applications of power semiconductor devices, various power converters such as AC controllers, phase controlled rectifiers, choppers and inverters. The student will then be introduced to the principle of operation of AC drives, DC drives, variable speed drive systems and their applications.

#### **ET0066 Digital Signal Processing**

Aims to endow students with the fundamentals of digital signal processing. In addition, implementation of essential algorithms on digital signal processors and various real-life applications will be introduced. Topics to be covered include techniques of interfacing analog signals, fundamentals of digital signal

processing, design and implementation of digital filters, discrete Fourier transform, digital signal processor architecture and introduction to DSP applications.

## **ET0067 Project 2 (EO)**

Provides students hands-on practical experience in project construction and inculcates the students with an appreciation in the design, control and safety features of the common domestic or industrial systems. In addition, there is an open-ended project which incorporates many disciplines. The practical experience and skills gained through designing and building the open-ended project from conception to actual implementation and final testing would lay a good foundation for the students in their final-year project work.

## **ET0068 Project 3 (EO)**

Designed for part-time students of the Diploma Course in lieu of final-year (open-ended) projects for full-time students and as an extension to the Project module. It provides the opportunity for implementing theories and ideas in mini-projects. Valuable practical skills and teamwork will be acquired in the process. The project areas include analog, digital, microcontroller applications and power electronics.

## **ET0070 Internet Control Technology**

Introduces the fundamentals of Internet technologies that may be applied to control applications. Students will be introduced to the two very important components to this module: Internet and control technologies. As this is an ICA module, students will have extensive hands-on experiments to implement Internet control applications using the digital camera to monitor a process and a web browser such as the Internet Explorer/Netscape Navigator for controlling a remote process. Topics to be covered include Internet theories, fundamentals of instrumentation, hardware and software to be used for implementing Internet control.

## **ET0071 Project 1 (EO)**

Equips students with relevant practical skills such as electronic components identification, correct wiring methods, soldering and the use of power supplies, multimeters, function generators and oscilloscopes. Students will then use these skills to work on mini-projects designed to reinforce and integrate the knowledge acquired from the modules: Principles of Electrical & Electronic Engineering and Digital Electronics. In the course of this module, basic occupational safety and health practices will be infused.

## **ET0072 Telecommunication Principles**

Provides students the concepts and foundations in the transmissions, receptions and characteristics of signals as well as the important aspects of communication technologies, with emphasis in digital and wireless communications. A system approach is adopted to learn the basic principles and applications, and be able to apply the knowledge in industry. Students will also learn basic test and measurement equipment used in communication engineering, such as spectrum analyser and RF signal generator.

## **ET0073 Biomedical Signal & Image Processing**

Provides students with the fundamental concepts of analysis processing, extraction of diagnostic features and automated diagnosis of bio signals and images. DSP principles such as sampling, quantisation coding, Z-transform, FIR filtering and DFT will be introduced. Introduction to image display and processing will be covered. At the end of the course, the students will be equipped with the basic tools in signal and image processing and reconstruction and will have a general idea about these systems in clinics.

## **ET0074 Biomedical Equipment & Practices**

Familiarises students with medical tools and equipment used in medical and rehabilitation engineering departments. The equipment used in 'Operating Room', 'Intensive Care Unit', 'Radiotherapy', 'Cardiology', 'Neurology' sections, physiotherapy and rehabilitation departments will be covered. A brief overview of laboratory equipment will also be given. In this module, the students will learn the nature of biological information measured by these systems. A brief explanation of circuits, mechanical and biochemical parameters involved in the measurements will be explained. Students will learn about the common medical equipment characteristics, the nature of data measured and the general concept of designing equipment will be discussed.

## **ET0075 Biomedical Instrumentation**

Introduces the principles and concepts of biomedical instrumentation. Theory and application of sensors, biosensors, biopotential electrodes, measurements of biopotential signals including electrocardiogram (ECG), electroencephalogram (EEG), electromyogram (EMG) will be taught. Use of operational amplifiers, instrumentation amplifiers and filters in the context of biomedical instruments will be discussed. Principle of operation of various monitoring instruments will

be introduced. Medical safety standards and medical instrumentation certification regulations will also be covered in this module.

#### **ET0076 Physiology for Engineers**

Provides students with knowledge in structures and function of the human body. The gross anatomy and physiological processes of major organs is taught in order to enable students to correlate structure with function. This module will cover the functional aspects and the various vivo signals generated from skeletal & muscular, cardiovascular nervous, respiratory and urinary systems. Heat generation in the human body system is also covered. Histology of different type of tissues viz muscle, connective, nerve and epithelial tissue are included in the practical.

#### **ET0080 Principles of Electrical & Electronic Engineering**

Provides students with an integrated knowledge of electrical and electronic engineering fundamentals. The topics covered are electrical quantities, electrical signals (waveform types, peak, peak to peak voltage, frequency and period), resistors, Ohm's Law, capacitors, series/parallel R & C, voltage/current source, voltage current divider, KCL, KVL, Superposition, Junction Diode, Zener Diode, power in dc and ac circuits, LED, use of Bipolar Junction (BJT) as electronic switch, Rectification (with smoothing capacitor), transistor switch, magnetic circuits, inductors, impedance, transformers (step up/down), ideal operational amplifiers characteristics and some application, use of Voltage Regulators ICs.

#### **ET0081 Digital Electronics**

Introduces the basics of digital electronics to a level such that with the acquired knowledge, understanding and techniques necessary, the students are able to design simple combinational and sequential circuits using commercial MSI integrated circuits. Topics covered in the module include: number systems and codes, Boolean Algebra, logic gates, combinational logic circuits, flip-flops, counters, shift registers, MSI logic circuit ICs and Logic families.

#### **ET0082 Project**

Aims to equip students with relevant practical skills such as electronic components identification, correct wiring methods, prototyping, soldering and use of DC power supply and multimeter. Students will then use these skills to work on mini-projects designed to reinforce and integrate the knowledge acquired from the modules:

Principles of Electrical & Electronic Engineering and Digital Electronics. Students will receive hands-on-training in Circuit Simulation, using a Windows-based software that will reinforce the essential principles that the students learned in the Principles of Electrical & Electronic Engineering, Digital Electronics as well as circuits used in Electronic Workshop Practice. In the course of this module, basic occupational safety and health practices will be infused and students will be taught Workplace Productivity and Plan-Do-Check-Action (PDCA) Cycle so as to help them improve the workflow or the environment in which they operate in.

#### **ET0083 Structured Programming**

Teaches students to write programs in a structured way. It emphasises on good programming techniques and covers topics on simple data types, input/output, selection control and loop constructs, functions & basic data structures such as arrays.

#### **ET0085 CADD**

Equips students with the knowledge of drawing office practice, ISO drawing standards and acquiring of drawing skills using latest AutoCAD software. It aims to teach students the ability to read and produce good technical sketches & projection drawings as a form of engineering communication. The module shall cover basic 2D drawings, isometrics & orthogonal projections, and the use of workstation based CAD/CAM software for computer-aided drafting.

#### **ET0087 Analog Communication Systems**

Introduces the principles and techniques used in analogue communication systems. A systems approach is used, with the main emphasis being on the understanding of principles. Topics include signals and their spectrums, filters, band-limiting, noise sources, SNR, radiated and conducted interference, need for EMC compliance, noise reduction, necessity of modulation, AM, DSBSC, SSB, FM and basic operation of superhet radio receivers.

#### **ET0088 Circuit Analysis**

Provides students with the principles of network analysis and the basic concepts of control theory in both time and frequency domains. Topics covered include Mesh & Nodal Analysis, RLC Circuits (Transients), Network Functions (s-domain), Filter Design (RC, Butterworth, Chebyshev and Bessel Characteristics), Basic Control Systems, Frequency response plots and Decibels.

## **ET0089 Data Communication**

Introduces the basic concepts and techniques used in data communication systems. Topics include data transmission basics, transmission media, switching techniques, common DTE-DCE standards, basic modem operations, data link performance and measurements, & layered network architecture.

## **ET0090 Application Programming**

Further to the coverage in Structured Programming, pointers and dynamic variables will be introduced and concepts of structure and file will also be taught to equip students to solve more complex engineering problems. Programming exercises and assignments chosen will be related to what students learnt in other engineering modules.

## **ET0091 Analog Systems**

Covers transistor basics and analysis of transistor circuits. Topics include Network Theorems (Thevenin and Norton), maximum power transfer theorem, Bipolar Transistors, BJT Amplifiers, Power Amplifiers (Class A, B, AB) and Practical Op Amp Characteristics.

## **ET0092 Logic Design**

Introduces an importance area of digital circuits - the design of synchronous sequential circuit with emphasis on the finite state machine design approach. To further their knowledge on the design methodology, students will undertake a mini-project towards the end of the course using Programmable Logic Devices.

## **ET0093 Microcontroller Technology**

Introduces programming and application of a microcontroller as a single-chip computer for a system. Students learn to use assembly language to program the microcontroller for input/output operations and for interfacing with external devices like the LEDs switches and motor. Serial communication interface and reset features will also be covered.

## **ET0094 Project 2**

Provides a structured practical experience in project construction. Work includes PCB fabrication and assembly, testing and trouble-shooting of assembled systems & report writing. Circuit chosen for project will be related to what is taught in first-year module and Analog Systems.

## **ET0095 Computer Networks**

Covers the introduction of network protocols using TCP/IP, routing, bridging and acquiring an understanding of router components &

routing protocols. Students will be taught how to configure access lists and packet filtering using IOS software.

## **ET0096 Digital Signal Processing**

Provides students with an understanding of digital processing of signals and their implementations in basic digital signal processing systems. Topics covered include sampling & quantisation, impulse response, discrete linear convolution, analysis using z-transform, design of FIR digital filters, discrete Fourier transform & fast Fourier transform, and practical implementation of digital signal processors.

## **ET0097 Digital Communications**

Teaches the principles and techniques used in digital communication systems. Topics covered include signal analysis, digital pulse modulation (PCM, DPCM), digital modulation (ASK, FSK, PSK), transmission problems such as ISI, AWGN, BER & eye diagram, detection techniques, information theory and coding.

## **ET0098 Satellite Communication & CATV**

Provides knowledge of Cable TV (CATV), optical fibre communication system and satellite communications. Topics covered include CATV networks and head ends, CATV co-axial distribution systems, CATV measurements, satellite up-link and down-link power budget, multiple access techniques, light-wave propagation in optical fibres, devices used in optical communication links & optical communication system budgeting.

## **ET0099 IC Testing**

Provides an understanding of automated test equipment used in industry to verify the correct operation of digital integrated circuits. Topics covered include the importance of testing, hardware modules of a test system, digital test methodologies (AC, DC parametric and functional tests) and memories testing.

## **ET0100 Quality & Reliability**

Provides the fundamentals of two very important fields in the area of product design and manufacture. These refer to quality and reliability. Topics include SQC, SPC, control charts, reliability concepts, accelerated testing and system reliability. There will also be assignments on TQM, ISO9000, SPC, DOE, COQ and environmental stress testing.

## **ET0101 IC Design**

Provides a basic knowledge of integrated circuit design. Students will learn the design of digital

system adopting the flow from behavioural synthesis to layout and verification. Topics include Verilog Hardware Description Language (HDL) design, synthesis, operation and characteristic of MOS devices, different design methodology such as, full-custom IC design, and semi-custom IC design. Simulation techniques and design verification will be included.

### **ET0102 Wafer Fabrication**

Provides knowledge on the various processes involved in the fabrication of semiconductor. Topics include semiconductor physics, wafer fabrication processes, integrated circuit devices, clean room management, ultra pure water production and vacuum systems technology.

### **ET0103 Client-Server Systems**

Provides an understanding of Client-Server architectures in LAN, Internet and mobile platforms. Topics covered include database include and modelling techniques, SQL, transaction processing, XML concepts and web application development.

### **ET0104 Embedded Computer Systems**

Provides an understanding of low cost and small size, but powerful embedded processors, used commonly for industrial and home devices. Students will learn to develop smart devices with remote control and monitoring functions. Topics covered include parallel input/output, serial communications, timing functions, communication protocol/HTTP and trouble-shooting equipment.

### **ET0105 PC Technology**

Provides an understanding of computer operation. PC hardware as well as software and their maintenance are covered. Students also learn how to configure, upgrade and trouble-shoot PCs with a variety of computer diagnostic tools.

### **ET0110 Software Engineering**

Extends the use of an Object-Oriented Programming Language in the analysis and design of software using the Unified Modeling language. Students will learn the Software Development Process i.e. Requirement Analysis and Development, Project Design and Management, Testing & Evaluation.

### **ET0111 Project 1 (EO)**

Aims to equip students with relevant practical skills such as electronic components identification, correct wiring methods, prototyping, soldering and use of multimeter. Students will then use these skills to work on mini-projects designed to

reinforce and integrate the knowledge acquired from the modules, Principles of Electrical & Electronic Engineering and Digital Electronics.

### **ET0112 Biomedical Microdevices**

Provides students with knowledge and understanding in the fabrication, applications design and testing of Biomedical Microdevices (Biosensors and BioMEMS)

### **ET0113 Circuit Simulation**

Equips students with hands-on training in Circuit Simulation, using a Windows-based software that will reinforce the essential principles that the students learned in the Principles of Electrical & Electronic Engineering, Digital Electronics as well as circuits used in Electronic Workshop Practice.

### **ET0117 Microwave Technology**

Provides knowledge of various wave-guiding structures and common components used in microwave communication systems. The theoretical and practical aspect of a variety of transmission media are studied. These include 2-wire transmission lines, antennas, radio waves, and line-of-sight propagation. Microwave waveguide systems and simple radar systems are also covered.

### **ET0118 Project 3 (EO)**

Designed for part-time students of the Diploma Course in lieu of final year (open-ended) projects for full-time students and as an extension to the Project 2 module. It provides the opportunity for implementing theories and ideas in mini-projects. Valuable practical skills and teamwork will be acquired in the process.

### **ET0119 Project 3**

Provides students with the opportunity and responsibility for innovating/creating, finding or selecting, formulating, planning, carrying out and reporting on a challenging piece of work that can provide a solution to the engineering problem. The module also aims to provide students with the opportunity to use, develop and integrate their knowledge and skills acquired during their polytechnic and industrial attachment periods.

### **ET0120 Digital Circuits**

Teaches the basic concepts of digital circuits starting from number systems, basic logic gates, and combinational logic circuit design to more complex logic functions covering multiplexers and decoders. Upon completion of this module, students should be able to apply digital techniques in circuit design and analysis.

## **ET0121 Data Communication Systems**

Provides an introduction to data communications and the understanding of the concepts and techniques used in data communication systems. Topics include functional block of a data communication system, data transmission basics, synchronisation techniques, transmission media, the RS232 interface, modem basics, and network architecture.

## **ET0122 Computer Hardware**

Provides students with the fundamental hardware knowledge necessary to understand and assemble a modern day computer. Students will be introduced to the basic hardware configuration of a computer including CPUs, motherboards, chipset circuitry, memory, mass storage, I/O devices, bus interface and connections. This module uses command prompt based operating system to understand the workings and functions of various hardware components. Installation of A GUI based operating system will also be demonstrated. Topics related to emerging technologies in personal computer will also be introduced.

## **ET0124 Electronic Circuits**

Introduces fundamentals of electricity and electronics. It covers the concepts, laws, theories and their applications to electrical and electronic circuits. It provides the students with a good foundation in the understanding of electrical and electronic circuits that are useful in understanding and synthesis of more complex electronic networks in the later course of studies and work.

## **ET0126 Workstation Operations**

Provides students with the necessary knowledge of the functions and components of operating systems in a standalone workstation; to enable students to use the workstation confidently and efficiently for their computing needs and to enable students to install, configure, troubleshoot and solve software problems in workstations.

## **ET0130 Networks & Protocols**

Covers the introduction of network protocols using TCP/IP, routing, bridging and acquiring an understanding of router components and routing protocols. Students will be taught how to configure access lists and packet filtering using IOS software.

## **ET0131 Digital Signal Processing Fundamentals**

Basic concepts of digital signal processing are introduced in this module. It includes the understanding of discrete-time signals and systems and their analyses in both time and

frequency domains. Some DSP applications in info-communications will also be covered.

## **ET0132 Communication Electronics**

Covers the operations and characteristics of different blocks of a communication system. Samplers, quantizers, filters, modulators, detectors, and communication devices are some of the topics covered in this module. Emphasis will be on the usage and the integration of blocks into systems.

## **ET0134 Digital Systems**

Introduces design and analysis methodologies for digital systems including finite state machines and PLD (Programmable Logic Devices) implementations of digital circuits. Students will also be exposed to HDL (Hardware Description Language), methods to analyse and eliminate race glitches and static hazards, as well as simulation and testing techniques for digital circuits. A CAD (computer-aided design) software package for digital design entry, simulation, synthesis, place and route will be covered in the experiments.

## **ET0135 Digital Communication Fundamentals**

Provides knowledge of the fundamentals of digital communication systems. Students learn signal analysis, base-band and modulation systems.

## **ET0140 Info-communication System Implementation**

This is the most important final-year activity. Students work in groups of 2 to 4 on a major practical project where they progress from feasibility study, to design, and then to the realisation of the project.

## **ET0141 Broadband Communications**

Provides students a fundamental understanding of various broadband networks and services. Topics include ATM, Gigabit Ethernet, SONET, Broadband access technologies and other emerging broadband technologies.

## **ET0142 Multimedia Signal Processing**

Covers the various signal processing techniques used in the compression of audio and video signals. Techniques like JPEG and MPEG in image and video compressions; MP3 in audio compression are covered. Constraints of multimedia on Internet, wireless communication, storage media and DVD are also highlighted.

## **ET0143 Mobile Communication Systems**

The first half of this module covers topics such as propagation of waves, multi-path fading,

antennas, and cellular network concepts. In the later half, the second and third generation systems like GSM, CDMA are dealt with. Advanced topics like WAP, GPRS, and Bluetooth technology are also introduced in the module.

#### **ET0148 Broadband Network Technology**

Provides student with sufficient knowledge and operational hands-on experience to install, configure and maintain ATM switches and network.

#### **ET0150 Embedded Systems**

Introduces embedded systems as the intelligent building blocks of most electronic devices and complex machines and includes embedded internet as the connectivity solutions. The course materials progresses from the most common components of embedded system to connectivity of appliances directly through internet via Ethernet, remote communication and monitoring of appliances. Topics covered include display, keypad, I/O interfaces and communications with the processor, serial communication and timing requirements. At the end of the course, the students should have the knowledge and experience to design and integrate embedded systems from readily available commercial components.

#### **ET0152 RF Fundamentals & Measurement**

Provides fundamental knowledge of circuits operating at radio frequencies (RF) and measurements at these frequencies. Topics covered include signal reflection, characteristic impedance, S-parameter, use of Smith chart, impedance matching, behaviour of components at RF, basics of RF measurement and measurement uncertainty. Usage of common RF equipment such as spectrum analyser, noise measurement, power meter, vector network analyser and impedance analyser are included in the practical

#### **ET0153 Satellite & Optical Communications**

Covers both theoretical and practical aspects of optical fibre and satellite communications. Topics covered in the module include light-wave propagation in optical fibres, main devices used in optical communication link including the working principle of lasers and wavelength division multiplexers, satellite subsystems, earth stations, satellite communication applications and system budgeting.

#### **ET0154 Bluetooth Technology**

Provides an in-depth knowledge on Bluetooth technology. Students will learn RF measurements used in Bluetooth radio, Bluetooth protocol stack and design an application using Bluetooth technology.

#### **ET0155 Wireless Applications Development**

With the improvement in wireless mobile devices technology (such as mobile phones and PDAs), users are now able to write programs (e.g. commercial transaction application, games etc.) for their own devices. This elective is about writing such software. Students will learn to develop and test software applications for wireless mobile devices. Topics include user interface development, persistent storage and networking of mobile applications.

#### **ET0156 IP Telephony**

Provides students with fundamental concepts of IP Telephony architectures and components used in IP Telephony solution. Students will learn how to install, configure and maintain Enterprise IP Telephony network. Service provider VoIP solutions will also be covered.

#### **ET0161 Biomedical Electronics**

Introduces the principles and concepts of biomedical electronics. Theory and application of sensors, biosensors, bio potential electrodes, operational amplifiers, instrumentation amplifiers and filters in the context of biomedical instruments will be discussed. Measurements of bio-potential signals including electrocardiogram (ECG), electroencephalogram (EEG) and electromyogram (EMG) will be taught. Students will be introduced to computerised biomedical instruments. Medical safety standards and medical equipment certification regulations will be covered in this module.

#### **ET0162 Power Electronics & Drives**

Imparts students the fundamentals of high current power circuit and how they can be used to start up and control the speeds of different motors.

#### **ET0163 Systems & Control**

Provides students with an understanding of the basic concepts of control theory in both time domain and frequency domain. Topics to be covered include systems characteristics, transient and frequency response analysis, s-plane analysis, modes of control and system stability analysis.

## **ET0164 Avionic Systems**

Introduces mechanical engineering students to modern aircraft avionics systems. It will provide an overview and operational principles of avionics systems and their display units. At the end of the module, students should be able to explain the basic working principles as well as able to interpret and to read the relevant indicators.

## **ET0166 Microdevices & Materials**

Provides the students with the knowledge and understanding of electronic materials integrated circuits fabrication technology, Microelectromechanical Systems (MEMS) and display technology. Students are exposed to the practical applications of electronic materials in processing of micro devices in the laboratory. Various fabrication processes such as sputtering, RIE, photolithography and wet etching are carried out in laboratory to reinforce the concept of electronic materials used in microdevices fabrication.

## **ET0167 Microdevices & Materials**

Aims to provide the students with the knowledge and understanding of electronic materials, integrated circuits fabrication technology and Microelectromechanical Systems (MEMS). Students are exposed to the practical applications of electronic materials in processing of micro devices in the SP Technology Centre for Nanofabrication and Material. Various fabrication processes such as sputtering, oxidation, RIE, photolithography and wet etching are carried out in laboratory to reinforce the theoretical concepts taught in the classroom.

## **ET0201 Network Server Administration**

Teaches the installation, configuration, application and use of Network Server Operating Systems. Students are taught how to install, configure and manage users and computers over a network. Topics covered include server installation, configuration, management of accounts & resources, troubleshooting and network security.

## **ET0202 Computer Communications**

Provides the basic concepts in data communication. It covers the necessary understanding of essential Networking equipment and techniques used in the implementation of data communication systems. In addition, examples of applications of data communication in the industry are also included with extensive hands-on operations using data communication equipment.

## **ET0203 Computer Networking**

Covers the introduction of network protocols using TCP/IP, routing, bridging and acquiring an understanding of router components and routing protocols. Topics include routing protocols, configuration and management of access lists and packet filtering.

## **ET0204 Internetworking**

Covers LAN switching and design, the concept of VLANs, Wide Area Network technologies and design, protocols used to transport voice and data over wide areas. Students are also taught Network planning, managing, network load sharing and network security techniques.

## **ET0205 Project**

Students will be given an opportunity to plan and design a network project. This project will be based on the knowledge and skills learnt from their course of study. Students will be able to learn how to integrate their knowledge from their course into a practical application in Computer Networking.

## **ET0206 Medical Imaging & Image Processing**

Provides students with the knowledge and fundamentals of multi-dimensional digital signal processing. Acquisition, processing, reconstruction and archiving of medical and radiological images require understanding of the concepts and knowledge of the systems operation, X-ray, Tomography, ultrasound, magnetic resonance, and other new imaging modalities will be covered by the course. The student will learn about the fundamental of image processing in order to achieve above knowledge and enhance the diagnostic features in those images.

## **ET0207 Biomedical Signals & Systems**

Teaches students the fundamentals of digital signal processing. In order to extract diagnostic information from vivo-signals, the students will know about acquisition, digital processing, transformation and feature detection and classification techniques. EEG, ECG, EMG, respiratory and cardiovascular signals will be explained and used as examples. Handling biological, medical and biotechnological information using computerized and automated systems will be discussed briefly.

## **ET0208 Biomedical Instrumentation**

Introduces interdisciplinary approaches of the engineering and design aspects of detection, acquisition, processing and displaying the biosignals in living systems. Theory and application

of sensors, biosensors, biopotential electrodes, measurements of biopotential signals including electrocardiogram (ECG), electroencephalogram (EEG), electromyogram (EMG) will be discussed. Use of operational amplifiers, instrumentation amplifiers and filters in the context of biomedical instruments will be discussed. Principles of operation of common medical and clinical equipment will be introduced. Students will be introduced to computerised biomedical instruments. Medical safety standards and medical equipment certification regulations will be covered.

### **ET0209 Physiology**

Provides students with knowledge in structure and function of the human body. The gross anatomy and physiological processes of major organs will be taught in order for students to correlate structure with function. This module will cover the functional aspects and the various vivo signals generated from skeletal & muscular, cardiovascular, nervous, respiratory and urinary systems. Heat generation in the human body system is also covered. Histology of different type of tissues viz muscle, connective, nerve and epithelial tissue are included in the practical.

### **ET0210 Project / Dissertation (year-long)**

Enables student to apply the knowledge and skills to solve practical problems or research on a current and emerging related topic. Students will be given an opportunity to plan and design a project on related biomedical engineering application. The project can be one proposed by staff member or a sponsored project (approved by the course coordinator) from their work place. Students may also select to do a detail study and submit a dissertation on a current or emerging topic approved by the course coordinator.

### **ET0211 Broadband Communication Networks**

Provides students fundamental understanding of various broadband networks and services. Topics include ATM, Gigabit Ethernet, SONET, Broadband access technologies and other emerging broadband technologies.

### **ET0212 Fiber Optic Communications**

Covers both theoretical and practical aspects of optical fiber communications. Topics covered in the module include light wave propagation in optical fibers, main devices used in optical communication link including the working principle of lasers and wavelength division multiplexers, and system budgeting.

### **ET0213 Communication Architecture & Protocols**

Covers network protocols using TCP/IP, routing, bridging and acquiring an understanding of router components and router protocols. Topics include routing protocols, configuration and management of access lists and packet filtering

### **ET0214 Optical Networks**

Introduces the basics of the optical networks. Wavelength division multiplexing, single and multihop networks, network topologies and optical routers are some of the topics covered in the module.

### **ET0215 Enterprise Networks**

Covers topics such as company networks, PBXs, virtual networks, data security and privacy.

### **ET0216 Multimedia Communications**

Covers audio and video coding techniques. Topics include multimedia signal compression, introduction to multimedia communications, multimedia information representation, and standards for multimedia communications.

### **ET0217 Voice over IP**

Covers topics such as protocols for voice over IP, interactive applications and basic call control for voice telephony.

### **ET0218 Cellular Communications**

Deals with the basics of cellular communications. Topics covered include frequency reuse concepts, cell configurations, cluster size and interferences.

### **ET0219 Mobile Communication Systems I**

Introduces the architecture and the basic operation the GSM, GPRS and CDMA systems.

### **ET0220 Mobile Communication Systems II**

Covers some of the emerging systems such as 3G, Bluetooth, WAP, WLAN and WLL.

### **ET0221 RF Circuit Design**

Covers the fundamentals of RF Circuit Design. It focuses on the practical aspect of RF circuit design with use of CAE and simulation tools to reduce design cycle and to ensure manufacturability of designed circuits.

### **ET0222 Wireless Data Networks**

Covers the characteristics of the wireless data networks, public terrestrial packet & circuit switched networks, hybrid networks, CDPD and ARDIS.

## **ET0223 Disk Drive Technology**

Provides a general overview of the Hard Disk Drive Technology covering from the fundamentals knowledge of magnetism to the most recent advances in the magnetic hard disk technology. Students learn what is happening inside the hard drive, how the media and head work together with other components in a disk drive.

## **ET0224 Magnetic Head and Head Disk Interface**

Provides a comprehensive understanding of the head related technology. This module covers the basic magnetic recording principal and technology, and the current MR technology and also the transition of the GMR concept and GMR Head design. It also covers the advance slider design & GMR media technology. In the second part, it provides fundamental knowledge of Tribology and its mechanics. It covers the disk tribology, basics of the HDI, flying height and media surface texturing. It also covers the surface characterisation techniques, the friction and wear behaviour in the disk-drive environment, the surface measurements and few types of the microscope generally use in the industry.

## **ET0225 Disk Media Manufacturing Technology**

Students learn about the basic hard disk media structure and the media manufacturing process. Detailed explanation on media manufacturing process from substrate preparation to finish product will be given. This module discusses the equipment, production problems, quality issues and critical parameters involved in disk media manufacturing. Related vacuum technology and disposition techniques will be discussed. Emphasis is given to the current disk media manufacturing industrial practice and technology. Advanced disk media technology will also be discussed.

## **ET0226 Chemicals Process and Surface Analysis Techniques**

This module aims to provide students with a good understanding of principles and laboratory skills in various chemical & surface analytical techniques used for failure analysis works as well as used for quality control in disk media industry. Surface imaging techniques including scanning electron microscopy and atomic force microscopy will be covered. Hands-on experience in analysing the chemical contents of chemicals, ultra-pure reagents analysis and surface micro-contamination/corrosion studies is emphasised.

## **ET0227 Project/Dissertation**

Students will be given an opportunity to plan and design a project based on the disk media manufacturing process. This project will be based on the knowledge and skills learnt from their module of study. Students will be able to learn how to integrate their knowledge from their modules into a practical application in disk media manufacturing industry.

## **ET0228 Energy Management**

Provides students with the knowledge of the main features of energy management in order to know how to make the best use of our present and future energy sources. At the end of this module, students will learn applications of energy efficient equipment, study of capacity de-rating problems and measures for enhancement, operation of distributed generator, energy monitoring system and codes of practice and standards.

## **ET0229 Energy Auditing**

Covers objectives and the techniques of energy auditing. The various ways to reduce energy cost of facilities, understanding and assessing the historical energy usage pattern will be outlined. The module will identify the main energy intensive areas of a facility such as air conditioner, water heating and lighting and their impact in reducing the operating cost in the facility. Additionally, studies will focus on techniques to estimate the economics of audit (e.g. annual savings, payback period, rate of return etc) and develop an appreciation of the environmental impact of a facility.

## **ET0230 Alternative Energy Resources & Environmental Issues**

Provides theoretical and practical aspects of renewable energy sources, conversion technologies, power conditioners and energy storage technologies. The emerging concepts of district cooling systems, thermal storage and ice storage technologies, which can be applied to improve off peak load demands and decrease peak load demands, are included in the module. A discussion on the global environmental issues and international environmental guidelines are also covered. Case studies and computer simulations are included to facilitate a better understanding of the topics covered in the module.

## **ET0231 Building Automation Systems**

Provides an integrated system approach to understanding Building Automation Systems and

their applications to building services. It covers the architecture, communication methods, and application software of modern building automation systems, & provides good working knowledge of how to specify, design, install, commission, operate, and maintain a Building Automation System. Application areas will include air-conditioning systems, fire detection & alarm systems, security systems and other essential building services. Hands-on training sessions in the Building Automation System will also be conducted.

### **ET0233 Lighting, Power Quality & Electrical Drives**

Design and selection of energy efficient lighting, lighting technology and terminology, types of lamps & lamp selection criteria and lighting layout will be covered. Participants will learn about causes of power quality problems, voltage dips and their effects on sensitive process and facilities, harmonics & distortion and its effects on motors and power equipment, mitigation methods and power quality monitoring. Working principles/ configurations of DC, AC and Chopper drives, and various application areas of electrical drives will be covered. Energy efficient drives, soft starters for AC motors, generation of harmonics due to drive operation and harmonic reduction/elimination techniques will also be discussed.

### **ET0300 Advanced Programming and Networking**

Provides students with an introduction to data communications and computer networking, with emphasis on TCP/IP based networks. Students will also be taught practical computer interfacing techniques using the peripheral ports available on the computer. Case studies and practical examples of developing client/server network applications are also discussed and students will learn to develop such applications on completion of the module.

### **ET0400 Principles of Electrical & Electronic Engineering**

Provides students with an integrated knowledge of electrical and electronic engineering fundamentals. The topics covered are electrical quantities, electrical signals (waveform types, peak, peak to peak voltage, frequency and period), resistors, Ohm's Law, capacitors, series/parallel R & C, voltage/current source, voltage/current divider, KCL, KVL, Superposition Theorem, power in dc and ac circuits, magnetic circuits, inductors, impedance, transformers (step up/down), Junction Diode, Zener Diode, LED, use

of Bipolar Junction Transistor (BJT) as electronic switch, Rectification (with smoothing capacitor), ideal operational amplifiers characteristics and some simple applications, use of Voltage Regulators ICs.

### **ET0401 Digital Electronics**

Introduces the basics of digital electronics to a level such that with the acquired knowledge, understanding and techniques necessary, the students are able to design simple combinational and sequential circuits using commercial SSI and MSI integrated circuits. Topics covered in the module include: number systems and codes, Boolean Algebra, logic gates, combinational logic circuits, flip-flops, counters, shift registers, MSI logic circuit ICs, and Logic families.

### **ET0402 Project 1**

Aims to equip students with relevant practical skills such as electronic components identification, correct wiring methods, prototyping, soldering, use of DC power supply and multimeter. Students will then use these skills to work on mini-projects designed to reinforce and integrate the knowledge acquired from the modules, Principles of Electrical & Electronic Engineering and Digital Electronics. Students will receive hands-on training in using Windows NT-based Electronic Design Automation software for the layout of the Printed Circuit Boards for their mini-projects. In the course of this module, basic occupational safety and health practices will be infused and students will be taught Workplace Productivity and Plan-Do-Check-Action (PDCA) Cycle so as to help them improve the workflow or the environment in which they operate in.

### **ET0403 Structured Programming**

Teaches students to write programs in a structured way. It emphasises on good programming techniques and covers topics on simple data types, input/output, selection control and loop constructs, functions and basic data structures such as arrays, & using C as the programming language.

### **ET0404 CADD**

Equips students with the knowledge of drawing office practice and ISO drawing standards. Students will acquire drawing skills using the AutoCAD software. Students will learn how to read and produce good technical sketches and projection drawings as a form of engineering communication. Topics covered include basic 2D drawings, isometrics and orthogonal projections.

## **ET0405 Analog Communication Systems**

Introduces the principles and techniques used in analogue communication systems. A system approach is used, with the main emphasis being on the understanding of principles. Topics include signals and their spectrums, filters, band-limiting, noise sources, SNR, radiated and conducted interference, need for EMC compliance, noise reduction, necessity of modulation, AM, DSBSC, SSB, FM and basic operation of superhet radio receivers.

## **ET0406 Circuit Analysis**

Provides students with the principles of network analysis and the basic concepts of control theory in both time and frequency domains. Topics covered include Mesh & Nodal Analysis, RLC Circuits (Transients), Network Functions (s-domain), Filter Design (RC, Butterworth, Chebyshev and Bessel Characteristics), Basic Control Systems, Frequency Response Plots and Decibels.

## **ET0407 Applications Programming**

Further to the coverage in Structured Programming, pointers and dynamic variables will be introduced and concepts of structure and file will also be taught to equip students to solve more complex engineering problems. Programming exercises and assignments chosen will be related to what students learnt in DASE 1FT modules and DASE 2FT Stage 2A modules.

## **ET0408 Aircraft Servomechanisms & Electronics**

Covers the working principles of aircraft devices: synchros, resolvers, E and I transformers, and inductive/capacitive transmitters. The concept of using error signal to sense rate of movement, position and control of system will be introduced. This module also helps students to understand signal processing devices such as integrators, differentiator, modulators and demodulators. Topics like the working principles and characteristics of various control systems, semiconductor devices operation, functions and application, electronic circuits on various applications of operational amplifiers and digital test & equipment will be taught.

## **ET0409 Microcontroller Technology**

Introduces programming and application of a microcontroller as a single-chip computer for a system. Students learn to use assembly language to program the microcontroller for input/output operations and for interfacing with external devices like the LEDs, switches and motor. Serial

communication interface and reset features will also be covered.

## **ET0410 Aircraft Systems Maintenance Practices**

In this module, students will also learn how to read wiring diagram manuals, interconnection charts and schematic diagrams for aircraft equipment installation. The skills of using aircraft maintenance and measuring tools will be imparted. The correct usage of common aircraft parts such as fasteners, washers, rigid/flexible pipes, adhesives and greases with safety precautions will be practised in the workshop. Aircraft maintenance practices like torque loading, earthing and bonding of aircraft electrical systems, crimping, making of cable looms and harnesses will be part of students' workshop training. Topics on atmosphere composition, effect of humidity, temperature and pressure on density, Newton's Laws of Motion, Archimedes's Principle, Bernoulli's Theorem, Dalton's Law and general gas laws will be taught.

## **ET0411 Aircraft Radio Fundamentals 1**

Provides a good engineering foundation to the students in radio theory, covering topics on propagation of radio wave, polarisation, radiation pattern, transmitter, receiver, modulator, RF power amplifier, filters and tuned circuits. The principles and methods used to minimise the effect of conducted and radiated interference, methods used to minimise the effects of lightning strikes and static on aerials and type of aerials and feeders will be taught. Communication circuits and audio system will be introduced.

## **ET0412 Aircraft Instrument Systems 1**

Gives the students a good understanding of terminology and basic concepts related to hysteresis, parallax, correction, tolerance, calibration, sensitivity and absolute/differential/gauge pressure. The module will also cover the working principles and the functions of the following aircraft instrument systems: pilot-static systems/instruments, gyroscopes, vacuum systems, compass systems, electronic display systems, flight recorders and ground proximity warning system.

## **ET0413 Aircraft Electrical Systems 1**

Students will be able to learn different types of batteries and types, characteristics and working principles of a whole range of aircraft electrical systems and devices that include direct current machine, direct current generation, power conversion equipment, landing gearing systems,

starting and ignition systems, auxiliary power units, alternating current machines, alternating current power generation, & alternating current power distribution systems.

#### **ET0414 Aircraft Radio Fundamentals 2**

Covers topics on aircraft cockpit voice recorders, VHF/HF communications systems, VOR/ILS systems, marker systems, automatic direction finding systems, VLF and Hyperbolic systems, flight compartment electronic display systems, microwave landing systems, primary & secondary radar systems and Morse code.

#### **ET0415 Aircraft Instrument Systems 2**

Students will be taught the working principles and the functions of the following aircraft instrument systems: oxygen system, pressurisation system, single axis automatic pilot and inertial navigation & reference systems. Topics on measurements of the following aircraft parameters will be included: pressure, temperature, rotational speed, position, quantity, flow and vibration. Knowledge on compass compensation, air data computation, and flight path computation will also be impacted to the students.

#### **ET0416 EMI/EMC**

Provides fundamental knowledge in electromagnetic interference (EMI) and electromagnetic compatibility (EMC) needed to achieve EMI/EMC compliance in electronic products. Topics covered include cabling, grounding, balancing, filtering, electrostatic discharge and digital circuit emission control.

#### **ET0417 Project 3**

Provides students with the opportunity and responsibility for innovating/creating, finding or selecting, formulating, planning, carrying out and reporting on a challenging piece of work that can provide a solution to the engineering problem. The module also aims to provide students with the opportunity to use, develop and integrate their knowledge and skills acquired during their polytechnic and industrial attachment periods.

#### **ET0418 Aircraft Electrical Systems 2**

Students will be able to learn different types of aircraft systems and types, characteristics and working principles of a whole range of aircraft electrical systems and devices that include lighting systems, pneumatics & hydraulic systems, air-conditioning systems, ice and rain protection systems, combustion heaters, fuel transfer systems, centralised warning & indication systems and galley/toilet services.

#### **ET0419 EMI/EMC**

Provides students with basic knowledge of electromagnetic interference (EMI) and electromagnetic compatibility (EMC). Topics relevant to the aerospace industry, in particular, cabling, grounding and digital circuit emission control will be covered. This module also provides an appreciation of the various important EMI/EMC standards and related test procedures to achieve EMC compliance in electronic products.

#### **LCxxxx**

For a description of the modules, please refer to the chapter on the Language & Communication Department.

#### **MMxxxx**

For a description of the modules, please refer to the chapter on the School of Mechanical & Manufacturing Engineering

#### **MSxxxx**

For a description of the modules, please refer to the chapter on the Mathematics & Science Department.

#### **STxxxx**

For a description of the modules, please refer to the chapter on the School of Info-Communications Technology.

	General Elective Modules
<b>SP0301</b>	Character Development
<b>SP0302</b>	Innovation, Design & Enterprise in Action

For a description of the modules, please refer to the chapter on Curriculum Structure.