

**Marine Electrotechnology I**  
Basic electricity and electrical units. Ohm's Law. Kirchhoff's Laws. The Wheatstone bridge. Electromagnetism and electrostatics. Faraday Law. Lehnz's Law. Fleming's right-hand rule. Inductance. AC theory. Single-phase AC circuits. Single-phase R-L-C parallel circuits. Phasor diagrams. Active and reactive power. Power factor. 3-phase AC theory. Star and delta connections. Electrical measuring instruments. Batteries. Lead-acid and nickel-cadmium cells. Maintenance and safety precautions. DC generators and motors. EMF equation. DC motor starter, speed and torque equations and characteristics. Single-phase and 3-phase transformers. EMF equation. Phasor diagrams of a transformer. Efficiency. Auto- and instrument transformers.

**Workshop Technology**  
Workshop safety regulations. Measuring and checking instruments. Marking-out practice. Fitting and assembly tools and processes. Portable powered tools. Sheet metal fabrication. Primary forming processes. Theory of metal cutting. Machining: drilling, turning, shaping, milling, grinding. Joining processes: adhesive bonding, riveting, soldering, brazing, fusion welding, gas cutting. Engineering materials: plain carbon and alloy steels, cast irons, important non-ferrous metals and alloys, bearing materials and plastics. Iron-carbon equilibrium diagram. Heat treatment of steels and hardenability.

**Workshop Practice I**  
Training and development of practical skills in benchfitting (using hand tools, marking out equipment and measuring instruments).

**Machining (using various machines like centre lathes, drilling, shaping, milling and grinding machines).**

**Welding (oxy-acetylene gas welding).**

**Inspection work (using various inspection equipment).**

**Engineering Mathematics II**  
Vectors. Further methods of integration and their applications. Numerical analysis. Maclaurin and Taylor series. Differential equations. Determinants and matrix algebra. Introduction to statistics.

**Engineering Drawing II**  
Computer-aided drafting, assembly drawing of intricate marine machinery.

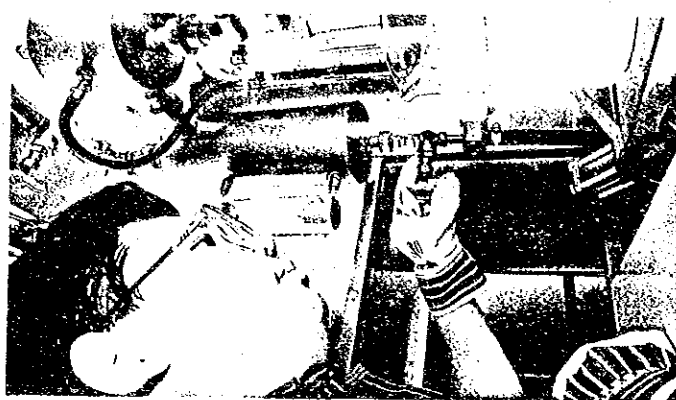
**Applied Heat II**  
Second Law of Thermodynamics. Determination of indicated power, brake power and mechanical efficiency of compression ignition engines. Dissolved solids in boilers. Theory of steam power cycles. Air compressors. Gas turbines. Heat transmission. Refrigeration.

**Applied Mechanics II**  
Shearing force and bending moments leading to bending stresses. Torsion of shafts and power transmission. Euler and Rankine theories for critical loads of struts. Friction in collar bearings and clutches. Hydrostatics — forces on submerged planes. Bernoulli's equation for orifices, venturimeters and nozzles, jet impacts, centrifugal pumps. Governors — Hartnell, Porter, Proell, effects of friction, isochronism. Vibration — simple harmonic motion, spring-mass system, lateral vibrations, whirling of shafts.

**Marine Electrotechnology II**  
DC machines. Construction, characteristics and testing. DC machine starters. Parallel operation of DC generators. Generator protection. AC generators — types, construction, characteristics. AC motors — types, construction, characteristics.

**Instrumentation**  
Pressure, level temperature and flow. Relays and signal selectors. Transducers/transmitters including LVDT, strain gauge, differential pressure transmitters, FN mechanism, photocells. Static testing, calibration and installation of transmitters and transducers. Compressed air production. Pneumatic and hydraulic circuits. Flow plan circuits of simple control systems. Design and servicing aspects of miscellaneous instruments.

**Marine Systems I**  
Introduction to merchant ships and systems. Materials — types, properties



*A Marine Engineering student working on a combined separating and throttling calorimeter in the Heat Laboratory.*

and uses. Introduction to propulsion plants and auxiliaries. Valves and cocks — types, uses and maintenance. Packings and jointings. Pumps. Mechanical seals, ball bearings and roller bearings. Heat exchangers. Oil pollution and oily water separators. Pollution by sewage and treatment plants. Corrosion and corrosion prevention. Evaporators and fresh water generators. Fire fighting and safety.

**Marine Power Plant I**  
Introduction and classification of internal combustion engines, engine cycles and timing diagrams. Constructional detail of structure, valve gear, running gear and bearings of marine diesel engines. Theory of steam generation, classification of boilers, constructional details of various marine boilers, boiler mountings, boiler combustion, fuel and feed water system.

**Marine Electrotechnology III**  
AC motor controls — fuses, circuit breakers, contactors, overload relays. Motor starters — full voltage and reduced voltage types. Transformers — single-phase and three-phase. Auto-transformers. Instrument transformers. AC generator — synchronizing, load sharing. The automatic voltage regulator. The A C B preferential tripping, generator protection. The main switchboard, the emergency switchboard. The complete electrical power distribution system.

**Marine Automation**  
Final control elements. Transducers. Process characteristics. Control action and controllers. Control systems. Electronic components. Logic circuits. Data processing. Electronic circuits. Power electronic. Waveform generators. Power supply units. Switching circuits. Optoelectronics. Linear integrated circuits. Control systems.

**Marine Systems II**

4371/ Knowledge and applications of air  
4372 compressors and receivers. Refrigeration and air conditioning. Fire fighting and safety. Deck machineries. Filters, purifiers and clarifiers. Steering gears. Shafting and shaft couplings. Shaft bearings and thrust block. Stern tubes and their seals. Drydocking. Non-destructive testing. General repairs.

4375

**Marine Workshop**

Students of both the Marine and Naval Engineering (SP/SAF) courses will be given instructions on the practical aspects of the operation and maintenance of a wide variety of machinery commonly found onboard ship.

4377

**Mechanical/Electrical Maintenance & Diagnostic Workshop**

Students will be given hands-on experience on basic overhauling and maintenance procedures, preventive maintenance work, troubleshooting and diagnostic skills using conventional and most up-to-date equipment on all the various mechanical and electrical equipment.

4381/

**Marine Power Plant II**

4382 Knowledge and applications to marine diesel engine maintenance, engine cooling systems, lubricants, lubrication principles and systems, fuels, combustion, and fuel injection systems, scavenging and supercharging, manoeuvring systems, speed governing, engine performance and operation, various marine diesel engine designs, gas turbines, operation of marine auxiliary boilers, boiler water chemistry. Theory, construction, operation and various systems of steam turbines. Reduction gearing and other gear drives.

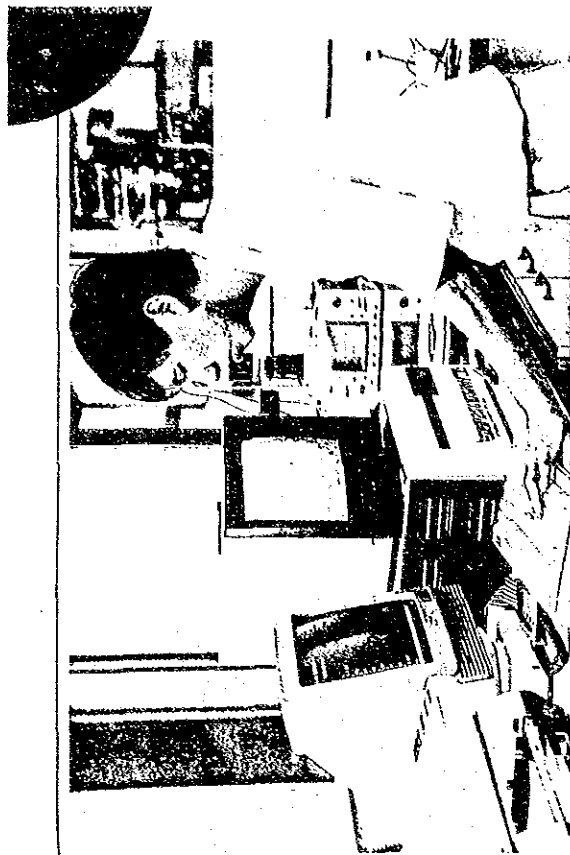
4392

**Naval Architecture**

Naval Architecture: application of Simpson's Rules to calculate areas, volumes, first and second moments. Calculation of hydrostatic data.

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Transverse stability at small and large angles of heel. Longitudinal stability and trim. Resistance and powering of ships. Fuel consumption calculations. Propeller theory. Rudder theory. Hydrostatic loading on bulkheads. Ship stresses. Strength of ships. Ship construction: framing systems, details of keel, bottom, double bottom, side shell, and deck construction. Construction of forward and aft sections of ships.



Final-year Mechanical Engineering students make use of the IRI vision system at the Industrial Automation Laboratory for checking the orientation of component parts.

## Department of Mechanical & Manufacturing Engineering

**Staff****Aeronautical Section****Section Head**

Ganesh, R  
B Sc (Aero) (Hons), C Eng, MRAS

**Lecturers**

S Narayanan  
BA, AMSLAET

Phua K P, David  
Tech Dip (Mech), Cert PPED, B S (Mech)  
(Magna cum laude)

**Senior Instructors**

Cheong Choon Kee  
Tech Dip (Mech), AFSLAET, AMRAS,  
T Eng (CEI)

Chiang Siok Fay  
AMSLAET, Sr MSME

**Head**

Quah Kok Wah  
PPA, B E (Met) (Hons)

**Deputy Heads**

Cheung Hong Man, Edmund (Dr)  
M Sc, Ph D, MIMechE, FIProdE, MBIM,  
Sr MSME

Kwa Tjong Liem  
M Sc (Mech Eng), MIES

Selvanayagam, K  
Ing (Grad), VDI, Ing (Postgrad), MINUCE,  
FIPD

Tu Myint  
B Sc (Mech) (Hons), M Sc (Mech)

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S N Sharma  
Tech Dip (Mech), Tech Dip (Technology),  
AMSLAET, AMRAES  
Wong Chong Kwong (on study leave)  
AMSLAET, AMRAES

### Automation & Control Section

#### Section Head

Ong Eng Chan  
B Eng (Mech) (Hons), M Sc (Aut. Cont.),  
AUMIST, SRMRISME

#### Senior Lecturers

Lee Hock Poh, Julian  
M Sc (Mech of Solids)  
Lee Yum Fun  
M Sc (Prod Eng & Mgt), C Eng, MIProdE,  
MBIM

#### Lecturers

Aung Myint  
B Eng (Mech), M Sc (Mech), MASME  
Chan Kok Yeong  
B Eng (Mech) (Hons), M Sc (Robotics)  
Chin Keng Fong  
B Eng (Mech)  
Lim Eng Wang  
Tech Dip (Mech), B Sc (Eng), MISA,  
Sr MSME

Lim Koon Hai  
B Sc, B Eng (Mech), M Sc (Aerodyn)  
K Pakthasivam  
B Sc (Eng) (Hons), M Eng, MISA

Tan Chin Heng  
B Eng (Mech) (Hons), M Sc (Mech)

Tan Leck Kee  
B Eng (Mech) (Hons), M Sc (Ind Eng), MISA  
Tan Pua Meng  
B Eng (Mech)

#### Lecturers

Teoh Lee Seong  
B E (Mech) (Hons), M Sc (Robotics)  
Than Myint  
B Sc Eng (Mech), Dip Ing (Grad) (Mech)

### Design Section

#### Section Head

Chan Yu Thye  
Prof Dip (Mech), First Class Eng (Steam),  
MCBS, MIES, P Eng

#### Senior Lecturer

Hung Man Fai, Raymond  
B Sc (Mech), P Eng (Can)

#### Lecturers

Chang Yir Lok  
B Sc (Mech) (Hons), C Eng, MIMechE  
Choy Fook Seng  
Tech Dip (Mech), B Sc (Mech) (Hons)  
Lo Sai Ho, Peter  
Dip (Mech), B Eng (Mech) (Dist), MCIBSE  
Rajaram, N  
Tech Dip (Mech), MNZIET  
Tan Chin Phur  
MIED  
Tan Gek Yeong  
Tech Dip (Mech), B Sc (Mech) (Hons)  
Tan Jong Kiang (Mdm)  
Tech Dip (Prod), M Sc (Prod Tech & Mgt),  
C Eng, MIProdE  
Wooi Kheng Eam  
Dip (Auto Eng), HNC (Mech)  
Yeong Hock Teck  
B Sc (Hons)

### Drawing Section

#### Section Head

Tan Yu Toh  
Dip (Mech), B Sc (Mech) (Hons), M Eng  
(Struct)

#### Lecturers

Chan Mui Hock, Albert  
Tech Dip (Mech), B Sc (Mech)  
Gan Poh Them  
Tech Dip (Mech), B Sc (Mech) (Hons)

### Principal Instructor

Ang Long Huak  
Adv Craft Dip (Mech Eng Prac)

### Senior Instructors

Choi Kok Leong @ Choy Kok Leong  
Adv Craft Dip (Mech Eng Prac), MSME

#### Kem Chak Kee

Tech Dip (Prod), Cert Ed (Tech)

#### Quah Thuan Seng

Dip Weld Eng, MAWS, FMSWS

#### Wong Kok Foo

### Instructors

#### Chen Fong Seng

Lee Kai Meng  
Craft Cert (Prec. Mach), C&GFTC (Mech  
Eng)

#### Tan Teck Kian

C&GFTC (Mech)

#### Tan Suan Hua

Craft Cert (Prec. Mach), C&GFTC (Mech  
Eng)

#### Tay Kok Choon

Craft Cert (Mech Eng Prac), C&GFTC  
(Mech), ITC (Mech)

#### Yip See Kwong

Craft Cert (Mech Eng Prac), MAWI, MSWS

### Management Section

#### Section Head

Chia Ah Lay  
B Sc, M Eng, MIM

#### Senior Lecturer

Goh Yong Guan, Alan  
B Eng (Hons), M Sc, C Dip F A, C Eng,  
FIMechE, MIProdE

#### Lecturers

S Arulanandam  
Dip Prod E (UK), C Eng, MIProdE, MBIM  
Chan Ah Kuen @ Chan Sik Pei  
Tech Dip (Mech), B Sc (Prod Tech & Mgt)  
(Hons), MIQA

**Chew Theng Yeow (Mdm)**  
Tech Dip (Prod), B Sc (Prod Eng & Mgt) (Hons)

**Darshan Singh**  
B Eng (Ind & System Eng) (Hons), Sr MSME

**Keh Poh Tin (Miss)**  
B E (Prod Eng & Mgt) (Hons)

**S Kumaresa Das**  
HND (Mech), Prod Dip (Prod), C Eng, MIPROE

**Kwek Seng Heng**  
Tech Dip (Prod), B Sc (Mech), M Tech, C Eng, MIPROE, MIE, FSIE

**Leong Kwek Wee, Christopher**  
Tech Dip (Mech), Cert QC, B E (Hons)

**Tay Chor Eng**  
B Eng (Mech)

**Wee Ai Hu (Mdm)**  
Tech Dip (Prod), Cert Ed, B Sc (Prod Eng & Mgt) (Hons), MBIM

#### Manufacturing Section

##### Section Head

**K Rajeswaran**  
B Sc (Mech) (Hons), C Eng, MIPROE

##### Senior Lecturers

**Ma Suenn, Stephen**  
B Sc, M Sc (Mech)

**Rakesh Sawhney**  
B Eng (Hons), M App Sc, Prof Engr, MSME

##### Visiting Lecturer

**Dennis J Lewis**  
B Sc (Mech Eng), M Ed

##### Lecturers

**Chan Wai Man**  
M Sc

**Chan-Sung Ying (Mrs)**  
M Sc (FMS)

##### Cho Mun Chow

Tech Dip (Mech), Postgrad Cert (Prod Tech), Cert Ed, M Sc (Mech), MCIT

**Goh Soon Huat, Robert**  
B Eng (Mech), Sr MSME

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**Yap Joon Chye**  
Tech Dip (Mech), B Sc (Mech) (Hons)

##### Instructors

**Chng Kai Peng**  
C&GFTC (Motor), Tech Dip (Mech), Cert Ed, Cert TESL, MIED, Dip MS

#### Plant Maintenance Section

##### Section Head

**Woo Chin Hoon**  
B Eng (Mech) (Hons), M Sc (Ind Eng)

##### Senior Lecturers

**Chng Ah Lart**  
B E (Mech), MIES, P Eng

**Lee Kok Koon**

Tech Dip (Mech), B E (Mech), MIES, P Eng

**Teo Chuan Seng**

Prof Dip (Mech), MIES

**Zabori, Miklos**

Dipl Ing, P Eng (Can), VdEH, MTAPPI

##### Lecturers

**S Balakrishnan**  
B Sc (Eng) (Hons), M Sc (Mech), C Eng, MIMechE, MIE (SL)

**S Ratnakumar**

M Sc, MBA

**P W K U I Rodrigo**

Dip Mech E (UK), C Eng, MIMechE, FIPROD E, MIE (SL), FIIM, FBIM

**Selva Raj Jeyaraj**

B Sc, B Eng (Hons)

**T Sivanantharajah**

B Sc (Eng) (Hons)

**Tan Liong Kiat**

Tech Dip (Mech), B Sc (Mech)

**Teo Kai Tee**

B Eng (Mech), P Eng, Dip (Bus Admin)

#### Second-Year Workshop Section

##### Section Head

**Tay Yoke Seng**  
Adv Craft Dip (Mech), C&GFTC (Tech Prod & Mech), T Eng (CEI)

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**Ho Sum Lim**  
B Eng (Hons), M Sc (Mech Eng)

**Lee Moi Keow (Miss)**

Tech Dip (Prod), CIM, B Sc (Hons)

**Lim Yong Kau**

B Sc (Prod Eng & Mgt) (Hons)

**Low Boon Meng**

Tech Dip (Mech), B Sc (Mech) (Hons), M Sc (Ind Eng), Sr MSME

**Mok Chai Pui**

Dip Eng (Prod Eng), M Sc (Prod Tech & Mgmt)

**Teng Chong Heng**

B E (Mech) (Hons), M Sc (IE)

**Wong Siew Kong**

Tech Dip (Prod), Cert Ed (Tech), B Sc (Prod) (Hons)

**Wong Tew Ken**

C&GFTC (Mach Shop Eng), Tech Dip (Mech), MAWI

##### Principal Instructor

**Goh Sin Choe**  
C Mig E, Chartered Member RISME, Sr MSME, MSWS

#### Materials Section

##### Section Head

**Tan Thiam Tong**  
B Sc (Met) (Hons), C Eng, MIM

##### Principal Lecturer

**Loh Peng Chum**  
M Sc (Met Eng), FAWI

##### Lecturers

**Bang Toong Kiang**

Tech Dip (Mech), B Sc (Hons)

**Boey Siew Yeng (Dr)**

B Eng (Hons), Ph D

**Chin Jeck Poh**

B E, P Eng, C Eng, MIMechE, MIE (M)

**Jugjeet Singh**

PTC, Tech Dip (Prod), Cert Ed (Tech), B Sc (Prod Eng & Mgt) (Hons), MBIM, M Inst Prof Nurs, MSMA, M I Manuf, NISME

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**Senior Instructors**

G Athimoolam  
Adv Craft Dip (Mech Eng Prac)  
Foong Mun Kee  
C&GFTC (Prod Eng), Tech Dip (Mech)  
Lim Cheng Gim  
C&G Adv Craft Cert (Welding), C&GFTC,  
Tech Dip (Prod)

**Instructors**

Chua Kia Hua  
Ho Soo Cheng  
C&GFTC (Mech)  
Lim Ah Chay  
C&G Adv Craft Cert (Welding), MSMS  
Tng Swee Huat  
Dip Tool Making, Dip (Ind Eng), CIM

Loh Chung Chiang  
Tech Dip (Mech), CIM, B Eng (Mech) (Hons)

Loh Hoo Chong  
B E (Mech), M Sc (Mech)

Loh Sin Foo (Dr)  
B Sc (Hons), Ph D

Ng Eng Hong (Dr)  
B Sc (Mech) (Hons), Ph D, M Inst R

Ng Geom Hah

Tech Dip (Mech), B Sc (Mech) (Hons),  
M Sc (Mech)

A P Palliyaguru

B Sc (Eng), M Sc, C Eng, MIMechE, MTR,  
MASME

**Teaching Assistant**

Neo Chwee Mok (on study leave)  
Tech Dip (Mech)

**Thermodynamics Section****Section Head**

Ong Kho Keng  
Prof Dip (Mech), C Eng, MIMechE, First  
Class Eng (Steam), MIES, P Eng

**Senior Lectures**

Khor Mee Kek  
B E (Mech), P Eng  
Lee Yow Fatt  
B Eng, MEI (Can), P Eng  
V K Pawa  
B Eng (Mech)

**Lecturers**

Ang Lip Tiong  
B E (Mech) (Hons), Dip (Air Poll. Con.),  
MIES, P Eng

Chay Yim Fan  
B Sc (Mech) (Hons)

Chong Toh Sum  
B Eng (Mech)

Er Seow Hong  
B Sc (Mech) (Hons)

ing technology with some degree of specialisation in the final year. The first year of both full-time and part-time courses is common for the Mechanical and the Manufacturing Engineering courses.

**Career Prospects**

As the Diploma course in Mechanical Engineering provides a broad technical education in mechanical engineering, graduates will have excellent prospects for employment in a wide range of jobs. Servicing and manufacturing industries, the Port of Singapore Authority, Public Utilities Board, Public Works Department, Singapore Airlines Limited, the oil refineries and the shipbuilding and repairing industries are among the major employers of our graduates. With the further industrialisation of Singapore, more job opportunities will be available for mechanical engineering graduates. The new curriculum provides for coverage of Computer-Aided Engineering (CAE) which will enhance the career prospects of graduates. Graduates of the SP-SAF Diploma Scheme will be employed by the SAF in the Air Force.

**Subjects of Study****Full-Time First Year**

1004 FORTRAN Programming  
1119/ Mathematics I (depending on 'O'  
level background)  
1131 Environmental Engineering  
1501 English for Academic Purposes  
3103 Electrical Technology  
5102 Applied Mechanics I  
5104 Engineering Drawing  
5113 Materials Technology I  
6102 Workshop Practice I

**SP-SAF Diploma Scheme (Air Force) — First Year**

1004 FORTRAN Programming  
1119/ Mathematics I (depending on 'O'  
level background)  
3103 Electrical Technology  
5102 Applied Mechanics I  
5105 Engineering Drawing  
5109 Aircraft Materials  
5110 Aeronautics  
5111 Aircraft Mechanical Workshop

The Department of Mechanical & Manufacturing Engineering offers courses in the discipline areas of mechanical, manufacturing, aeronautical maintenance engineering, industrial management and process plant engineering design. One of the courses is conducted in cooperation with the Air Force.

The Department, in conjunction with the Singapore Armed Forces, also offers GCE 'O' level school leavers, who are interested in a technical career with the SAF, the prospect of sponsorship during their training at the Singapore Polytechnic.

Full details on the SP-SAF Diploma Scheme may be found on Page 16 of the Prospectus.

**Practical Training**

In addition to the practical work during the session, full-time students will have eight weeks or more of practical training with industry during the long vacation at the end of the second year of their three-year course. Part-time students should normally be in employment relevant to their course of study, thus receiving the necessary practical training. Students in the SP-SAF Diploma Scheme are provided with full practical training during all the term vacations.

**Assessment**

Assessment during each year of the course will be by means of course work and written/practical tests and examinations. A satisfactory standard will be required in both course work and tests/examinations. Project work and assignments in Management Practice (DIM course) will be assessed by means of a seminar and/or viva examinations. Students in the SP-SAF Diploma Scheme are required to successfully complete the vacation training conducted at the respective SAF training schools.

**Diploma in Mechanical Engineering**

This is a three-year full-time or five-year part-time course. The course provides a broad technical education in mechanical engineering.



Second-year Manufacturing Engineering students learn how to write programs for the computerized numerical control machine at the Production Workshop.

**Full-Time Second Year**

- 1215 Mathematics II
- 5202 Applied Mechanics II
- 5203 Materials Technology II
- 5204 Engineering Drawing & Design
- 5205 Thermal Power
- 6202 Applied Workshop Technology
- 6204 Workshop Practice II
- 8271 Electronics

**SP-SAF Diploma Scheme (Air Force) —**

- Second Year**
- 1215 Mathematics II
- 5202 Applied Mechanics II
- 5203 Materials Technology II
- 5204 Engineering Drawing & Design
- 5206 Aircraft Powerplants I
- 5207 Aircraft Construction
- 5208 Aircraft Systems

**Full-Time Third Year**

In the third year of the course, full-time students are to opt for one of three options i.e. Plant Maintenance, Engineering Design or Fabrication Technology. The Plant Maintenance option discusses mechanical equipment especially concerning their operation and maintenance. The Engineering Design option covers engineering systems design and other related subjects, while the Fabrication Technology option covers industrial metallurgy, welding technology and manufacturing methods and processes. As several other mechanical engineering subjects will be included for all the options, there will still be a wide range of employment opportunities in mechanical engineering for all graduates irrespective of the option selected.

Students are to indicate their choice of option. Allocation will be by the Department based on vacancies and academic merit.

**Common (core) Subjects**

- 1502 English for Occupational Purposes
- 5302 Applied Mechanics III
- 5303 Instrumentation & Control
- 5304 Project (Mechanical)
- 6302 Supervisory Studies

**Plant Maintenance Option**

- 5305 Power Plant
- 5306 Plant Maintenance Engineering

**Evenings-Only Fifth Year**

- 5303 Instrumentation & Control
- 5305 Power Plant
- 5307 Fluid Power Technology
- 5308 Refrigeration & Airconditioning

**Engineering Design Option**

- 5307 Fluid Power Technology
- 5309 Engineering Systems Design
- 5310 Unit Operations/Piping Design
- 6313 Manufacturing Methods & Processes

**Fabrication Technology Option**

- 5306 Plant Maintenance Engineering
- 5311 Industrial Metallurgy
- 5312 Welding Technology/Non-destructive testing
- 6313 Manufacturing Methods and Processes

**SP-SAF Diploma Scheme (Air Force) —**

- Third Year**
- 1502 English for Occupational Purposes
- 5302 Applied Mechanics III
- 5307 Fluid Power Technology
- 5313 Aerospace Materials
- 5314 Project
- 5315 Aircraft Electrics & Instrumentation
- 5316 Aircraft Powerplants II
- 5317 Aircraft Maintenance Practice
- 6302 Supervisory Studies

**Evenings-Only First Year**

- 1133 Mathematics I
- 5102 Applied Mechanics I
- 5103 Materials & Processes
- 5104 Engineering Drawing

**Evenings-Only Second Year**

- 1131 Environmental Engineering
- 1225 Mathematics II
- 3103 Electrical Technology
- 6105 Workshop Practice

**Evenings-Only Third Year**

- 1327 Statistics & Computer Programming
- 5202 Applied Mechanics II
- 5203 Materials Technology II
- 5204 Engineering Drawing & Design

**Evenings-Only Fourth Year**

- 5205 Thermal Power
- 5302 Applied Mechanics III
- 5306 Plant Maintenance Engineering
- 8271 Electronics

**Diploma in Manufacturing Engineering**

This is a three-year full-time or five-year part-time course. The aim of the course is to provide a grounding in the basic mechanical engineering subjects followed by study of the typical aspects of manufacturing engineering such as machine tools and quality control. The first year of both full-time and part-time courses is common for the Manufacturing and Mechanical Engineering courses.

**Career Prospects**

Manufacturing engineering graduates are mainly employed by the manufacturing sector. The metal-working industries, electrical and electronics industry and aerospace industry also employ a large number of our graduates. The shipbuilding industry and several statutory bodies also employ them.

By virtue of their training, fresh graduates can expect to be involved in jobs in the areas of quality control, production methods, plant layout, material requirements planning, industrial design, CAD/CAM technology, robotics, industrial automation and the supervision of workers. After a few years, however, some graduates may aspire to middle management or higher positions in industrial and manufacturing engineering.

There is no doubt that with the continuing emphasis in industrialisation in Singapore, further job opportunities will be available to manufacturing engineering graduates.

**Subjects of Study****Full-Time First Year**

- 1004 FORTRAN Programming
- 1119/ Mathematics I (depending on 'O' level background)
- 1131 Environmental Engineering

- 1501 English For Academic Purposes
- 3103 Electrical Technology
- 5102 Applied Mechanics I
- 5104 Engineering Drawing
- 5113 Materials Technology I
- 6102 Workshop Practice

**Full-Time Second Year**

- 1219 Mathematics II
- 5202 Applied Mechanics II
- 5203 Materials Technology II
- 5204 Engineering Drawing & Design
- 6202 Applied Workshop Technology
- 6203 Industrial Engineering
- 6204 Workshop Practice II
- 8271 Electronics

**Full-Time Third Year**

In the third year of the course, full-time students are to opt for one of two options, i.e. Industrial Automation and Manufacturing Technology. The Industrial Automation option deals with industrial automation techniques and robotics while Manufacturing Technology covers Tool & Die Design, CAD/CAM Technology and Manufacturing Methods & Processes. As several other manufacturing engineering subjects will be included for both options, there will still be a wide range of employment opportunities in manufacturing engineering for all graduates irrespective of the option selected.

Students are to indicate their choice of option. Allocation will be by the Department based on vacancies and academic merit.

**Common (core) subjects**

- 1502 English for Occupational Purposes
- 6302 Supervisory Studies
- 6303 Machine Tools
- 6304 Metrology & Quality Control
- 6305 NC Technology
- 6306 Project (Manufacturing)

**Industrial Automation Option**

- 6307 Basic Automation
- 6308 Robotics Basics & Applications
- 6309 Robotics Mechanisms & Controls

**Manufacturing Technology Option**

- 6311 Tool & Die Design
- 6312 CAD/CAM Technology
- 6313 Manufacturing Methods & Processes

**Evenings-Only First Year**  
 1133 Mathematics I  
 5102 Applied Mechanics I  
 5103 Materials & Processes  
 5104 Engineering Drawing

**Evenings-Only Second Year**  
 1131 Environmental Engineering  
 1229 Mathematics II  
 3103 Electrical Technology  
 6105 Workshop Practice

**Evenings-Only Third Year**  
 1327 Statistics & Computer Programming  
 5202 Applied Mechanics II  
 5203 Materials Technology II  
 5204 Engineering Drawing & Design

**Evenings-Only Fourth Year**  
 6203 Industrial Engineering  
 6307 Basic Automation  
 6310 Robotics  
 8271 Electronics

**Evenings-Only Fifth Year**  
 6303 Machine Tools  
 6304 Metrology & Quality Control  
 6305 NC Technology  
 6313 Manufacturing Methods & Processes

If there are insufficient numbers to start a class, the Department may make alternative arrangements.

**Certificate in Industrial Management**  
 This is a two-year evenings-only course.

#### Subjects of Study

**Evenings-Only First Year**  
 6441 Industrial Management & Organisation  
 6442 Industrial Environment  
 6443 Production & Operational Management (A)  
 6444 Data Processing & Quantitative Analysis  
 6448 Communication Work Book I

**Evenings-Only Second Year**  
 6440 Case Studies in Personnel & Industrial Relations

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6445 Industrial Finance  
 6446 Production & Operational Management (B)  
 6447 Personnel & Industrial Relations  
 6448 Communication Work Book II

**Diploma in Industrial Management**  
 This is a one-year evenings-only course.

#### Subjects of Study

**Evenings-Only First Year**  
 6451 Industrial Management Policy  
 6453 Individual Assignment (Management Practice)  
 6454 Group Assignment (Management Practice)  
 6455 Individual Project (Management Practice)

A two-day residential period will be held at the end of the course but before the examinations.

**Advanced Diploma in Tool Engineering & Design**

This is a two-year evenings-only course. The aim of the course is to upgrade Polytechnic Diploma graduates with sufficiently broad-based knowledge of the latest design techniques so as to prepare them for advancement in their career in tool engineering.

The course will require attendance on three evenings per week for a maximum of ten hours per week. The course is conducted on a modular basis, where one module generally takes one term (about three months) to finish and about three modules are taken during the term.

#### Career Prospects

By virtue of their training, holders of this Advanced Diploma can expect to be involved in jobs in the areas of tool and die design, management and supervision of toolroom activities, planning and control of tool and die making, application of CAD/CAM software for the design of tools, dies, moulds and fixtures.

Tool and die design and manufacturing is the backbone of the manufacturing industry in Singapore. Many multi-national corporations as well as local job shops have set up tool and die design and fabrication facilities. The competition in tool and die making is increasingly keen, and the demand for good tool engineers and tool room designers and managers is great.

**Modules of Study**  
 (All modules last one term except Project which lasts two terms)

**Evenings-only First Year**  
 5501 Tooling Materials, Properties & Applications  
 5502 Properties of Plastics  
 5503 Tool Materials & Heat Treatment  
 6501 Jigs & Fixtures Design for Automation  
 6502 Manufacturing Tools, Moulds & Dies  
 6503 Polymer Engineering  
 6504 Basic Stamping Tools  
 6505 Modern Die Design  
 6506 Advanced Stamping Tools

#### Evenings-only Second Year

6600 Project (ADTD)  
 6601 Principles of Management  
 6602 Organisational Analysis  
 6603 Financial Analysis  
 6604 CAD/CAM Applications  
 6605 Small Tools Design  
 6606 Tooling for CAM-operated Automatic Lathes  
 6607 Introduction to Injection Moulding  
 6608 Complex Moulds  
 6609 Mould Flow

**Certificate in Process Plant Engineering Design**

This is a one-year evenings-only course. The aim is to train design technologists for companies engaged in the design and/or fabrication of mechanical plant and piping for the petrochemical and process industries.

**Career Prospects**  
 Piping/Process Plant Design Engineering is a challenging profession with good prospects.

Suitably trained and qualified design technologists are in great demand in Singapore, in multi-national companies engaged in the design of process plant for the surrounding region.

**Subjects of Study**  
 5378 Piping Design  
 5379 Unit Operations  
 5384 Project (Process Plant Design)

**Certificate in Aeronautical Maintenance Engineering**

This is a three-year part-time day-release course. The aim is to produce trained aircraft maintenance technologists in conjunction with the aircraft industry which provides complementary practical experience. The course is equipped to provide in-depth theoretical knowledge and sound grounding in practical skills in aircraft maintenance engineering. The department has a special arrangement with the Civil Aviation Authority of Singapore which will waive the practical experience requirements of some of the CAAS basic licence examinations. All students on the course must be employed and sponsored by an aircraft company.

The day-release course qualifies for training grants under the Skills Development Levy Act 1979.

On successful completion of the course, students in relevant employment may enrol into the second year of the part-time Diploma course in Mechanical Engineering or Manufacturing Engineering on an evenings-only basis.

#### Subjects of Study

**Day-Release First Year (revised course)**  
 1501 English for Academic Purposes  
 5102 Applied Mechanics I  
 5105 Engineering Drawing  
 5109 Aircraft Materials  
 5111 Aircraft Mechanical Workshop

**Day-Release Second Year (revised course)**  
 1133 Mathematics I

137

5114 Aircraft Systems  
5115 Theory of Flight  
5116 Aircraft Piston Engines

#### Day-Release Third Year

5705 Aircraft Construction  
5707 Avionics  
5733 Basic Gas Turbines

#### Laboratories/Workshops

The Department has well-equipped laboratories/workshops to deal with the practical aspects of the courses. The following is a list of the major items of equipment of several of the laboratories/workshops.

##### Aeronautical Workshop

Aircraft piston engines • Propellers • Aircraft hydraulic equipment • Variable pitch propeller, governor and gear box • Aircraft control system simulators • Fully-equipped bench fitting shop • Fully-equipped sheetmetal workshop • Basic electrical workshop • Avionics laboratory with aircraft instruments • Auto pilot • Dead-weight tester • Aircraft inverter installation simulator • Automatic response quiz box • Aero piston engine test stand.

##### Applied Mechanics III Laboratory

Tensile testing machines (2.20 tonne capacity) • Torsion testing machine (1500 Nm capacity) • Hardness testing machines (Rockwell, Brinell) • Strain indicators and balance units • Polariscope • Static and dynamic balancing machines • Gyroscope • Gear trains (simple, compound and epicyclic) • Vibration measurement equipment • Experimental measurement models for the study of strain, deformation, balancing and vibration • X-Y plotter/recorders • Computer with single disk drive, dot matrix printer and interface system.

##### Fluid Mechanics (Mechanical) Laboratory

Hydrodynamic lubrication investigation • Saybolt and Redwood viscometers • Bearing friction apparatus • Pump test sets for centrifugal, regenerative & positive displacement • Cavitation demonstration apparatus • Sectioned pumps and valves • Industrial

hydraulics trainers: basic, electro-hydraulic, proportional • Microcomputers for pumping system design.

##### Industrial Automation Laboratory

Robots (Industrial/Educational) • Vision systems • Microcomputers • Programmable controllers, CNC controller • Training units for motor control, sensors • Training sets for pneumatics and hydraulics circuitry design and troubleshooting • X-Y table • Bowl feeders, rotary tables, belt cylinders.

##### Industrial Engineering Laboratory

Time study equipment • Three-dimensional models for factory layout • Statistical sampling equipment • Ergonomics equipment • Examples of factory layout.

##### Industrial Metallurgy Laboratory

Induction melting and associated casting equipment • Induction heating equipment • Rolling mill, draw bench • Extrusion presses, hydraulic press • Heat treatment furnaces (general purpose, vacuum, controlled atmosphere) • Powder metallurgy equipment • Thermal spraying equipment • Plating and testing equipment • Microcomputers • Hardness testing equipment • Mechanical testing equipment • Metallographic equipment • Spectrometers • Carbon/sulphur detector.

##### Instrumentation & Control Laboratory

Temperature measurement • Plant model for temperature, pressure, flow and level control • Cascade control system, ratio control system • Process control computer • Industrial controller • Industrial robot • Micro-computer development system • Pneumatic/electronic recording controller • Valve positioners, pressure/level/temperature switches.

##### Machine Shop/Fitting Shop/Inspection Laboratory

Centre lathes • Shaping machines • Vertical, horizontal and universal milling machines • Bench and pillar type drilling machines • Surface grinders • Tool and cutter grinder • Engraving machine • Power presses • Sigma mechanical comparator • Electronic comparator • Precision height meter • Gauge block sets • Various measuring instruments.

##### Machine Tools Laboratory

Supermini computer and peripherals to run Unigraphics II CAD/CAM and APT softwares • McDonnell Douglas CAD/CAM workstations • CNC machines including machining centre, lathes, EDM-wirecut, and EDM-discing machine, swiss-autolathe • Microcomputers for NC tape preparation • Laser interferometer interfaced with micro-computer & plotter • CNC controller • Servo drives/motors interfaced with various hardware • Programmable logic controllers • Granite surface table, inspection equipment • Dynamometer with recorder • Cylindrical, surface and centreless grinders • Lathes and milling machines and other conventional metal cutting machine tools.

##### Manufacturing Methods & Processes Laboratory

Flexible manufacturing cell: CNC lathe, CNC machining centre, robot and conveyor system • Electrochemical machining (ECM) • Ultrasonic drilling equipment • Injection moulding machines • Photo-etching equipment • Abrasive jet machining • Cold forming machine • Pressure die casting machine • Vibratory finishing • Riveting machine • Metal forming machine • Laser drilling machine • CNC turret punch press • FMS simulation models.

##### Metallurgy Laboratory

Metallurgical mounting and polishing equipment • Microscopes and photomicrography equipment • X-ray radiographic equipment • Laboratory heat treatment furnaces • Hardness & micro-hardness testing equipment • Foundry equipment • Optical and radiation type pyrometers • Carbon determination apparatus • Radiation safety equipment • Electropolishing equipment • Ultrasonic flaw detectors • Eddy current crack detectors.

##### Metrology Laboratory

Tallysurf • Full range of length standards • Slip gauges, bars, plugs, etc • Various comparators, mechanical, pneumatic, optical and electronic • Interferometer • Optical projector • Universal comparator and various measuring instruments • Gear pitch measuring machine • Coordinate measuring machine.

##### Plant Maintenance Laboratory

Hydraulic simulator • Hydraulic test rigs for components, valves and piping systems • Energy control trainer interfaced with computer • Laser optical alignment system • Motor control troubleshooting trainer • Refrigeration trainer • Portable diesel-generator • Air compressors (reciprocating and screw type) • Materials handling equipment • Condition monitoring equipment.

##### Power Plant Laboratory

Steam boiler with superheater and demineralizer • Steam turbine sets • Gas turbine set • Heat exchangers for steam/water/air • Separating and throttling calorimeters • Pipe lagging apparatus • Continuous combustion apparatus • Conduction/radiation heat transfer apparatus • Boiling heat transfer apparatus • Energy conversion test set • Air and steam nozzles • Cooling tower.

##### Project Workshop

Centre lathes • Drilling, shaping, slotting machines • Milling machines (vertical, universal) • Cylindrical and surface grinders • Band saw, power saw • Welding machine • Engraving machine.

##### Refrigeration & Airconditioning Laboratory

Walk-in freezer and cooling unit • Thermoelectric heat pump • Room airconditioners • Ice-making machine • Airconditioning and refrigeration plant • Belt-driven condensing units • Electrical control equipment for refrigeration • Refrigeration control test equipment • Centrifugal fan test set • Freezers • Solar collector • Dual evaporator refrigeration system • Refrigeration fault simulator • Data acquisition system.

##### Thermal Power Laboratory

Diesel and petrol engines • Oil burners • Fuel pump test bench • Injector tester • Ignition demonstration sets.

##### Unit Operations Section (in Fluid Mechanics Laboratory)

Tray drier • Climbing film evaporator • Double effect evaporator • Gas liquid absorption column • Solids handling bench • Liquid/liquid extraction unit • Solid/liquid extraction unit.

## Welding Laboratory

Gas tungsten arc welding machines • Gas metal arc welding machines • Pulse gas tungsten arc welding machines • Programmable gas metal arc welding machines • Micro plasma arc welding machine • Plasma cutting machine • Automatic oxy/acetylene cutting machine • Submerged arc/tandem submerged arc welding machines • Resistance projection/spot welding machines • Stud welding machines • Programmable pulse gas metal arc welding machines • Orbital gas tungsten arc welding machine • Metallurgical microscopes • Bendoscope.

## Synopsis of Subjects

**1004 FORTRAN Programming**  
Introduction to computer systems. Problem solving procedure, logic flowchart/pseudocode. Fortran 77 constants, variables and expressions. Intrinsic functions. Stream and formatted I/O. Control statements. Looping statements. Arrays. Data statement and data file. Function subprograms and subroutines. Sequential file processing. Applications in computer programming. Use of selected application software packages.

**1119 Mathematics I**  
Operations of algebraic expressions. Factorisation and Remainder Theorem. Manipulation of fractions. Solutions of equations, including simultaneous linear equations. The straight line and its properties. Approximate roots of equations from graphs. Laws of Indices and Logarithms. Determination of Laws. Binomial Theorem. Trigonometric functions and applications. Operations and geometric representation of complex numbers. Differentiation of algebraic and simple transcendental functions and applications. Integration of simple functions and applications.

**1120 Mathematics I**  
Laws of Indices and Logarithms. Determination of Laws. Binomial

Theorem. Trigonometric functions, graphs, identities, equations and applications. Operation and geometric representation of complex numbers. Differentiation of algebraic and simple transcendental functions and applications. Integration of simple functions and applications.

## Environmental Engineering

Basic principles of lighting and the control of noise, air, water and solid waste pollution — effects, sampling and treatment. Legal aspects concerning the control of pollution. Emphasis on re-cycling of solid waste and industrial water.

## Mathematics I

Operations of algebraic expressions. Factorisation and Remainder Theorem. Manipulation of fractions. Solution of equations, including simultaneous linear equations. The straight line and its properties. Approximate roots of equations from graphs. Laws of Indices and Logarithms. Determination of Laws. Binomial Theorem. Trigonometric functions, graphs, identities, equations and applications. Operation and geometric representation of complex numbers. Differentiation of algebraic and simple transcendental functions and applications.

## Mathematics II

Differentiation of implicit functions and inverse trigonometric functions. Introduction to partial differentiation and its applications. Standard integration leading to inverse trigonometric or logarithmic functions. Integration by substitution, by parts and partial fractions methods. Numerical integration. Numerical method for solving equations. Introduction to matrices and applications. Solution of first order differential equations. Solutions of ordinary linear differential equations with constant coefficients by Laplace Transform method. Applications of differential elements of statistics including

measure of central tendency and dispersion. Basic rules of probability. Binomial, Poisson and Normal distributions. Sampling Theory.

## Mathematics II

Differentiation of implicit functions and inverse trigonometric functions. Introduction to partial differentiation and its applications. Standard integration leading to inverse trigonometric or logarithmic functions. Integration by substitution, by parts and partial fractions methods. Conics: equations and graphs. Introduction to matrices and applications. Solution of first order differential equations. Solution of ordinary linear differential equations with constant coefficients by Laplace Transform Method. Applications of differential equations. Elements of statistics including measure of central tendency and dispersion. Basic rules of probability. Binomial, Poisson and Normal distributions. Sampling Theory.

## Mathematics II

Integration of simple functions and applications. Differentiation of implicit functions and inverse trigonometric functions. Introduction to partial differentiation and its applications. Standard integration leading to inverse trigonometric or logarithmic functions. Integration by substitution, by parts and partial fractions methods. Numerical integration. Numerical method for solving equations. Introduction to matrices and applications. Solution of first order differential equations. Solution of ordinary linear differential equations with constant coefficients by Laplace Transform Method. Applications of differential equations.

## Mathematics II

Integration of simple functions and simple applications. Differentiation of implicit functions and inverse trigonometric functions. Introduction to partial differentiation and its applications. Standard integration leading to

inverse trigonometric or logarithmic functions. Integration by substitution, by parts and partial fractions methods. Conics: equations and graphs. Introduction to matrices and application. Solution of first order differential equations. Solution of ordinary linear differential equation with constant coefficients by Laplace Transform Method. Applications of differential equations.

1327

**Statistics & Computer Programming**  
Basic rules of probability. Binomial, Poisson and normal distributions. Sampling distributions. Introduction to computer systems. Principles of programming. Flowcharts. Fortran 77 language instructions. Sequential file processing. Applications in computer programming.

1501

**English for Academic Purposes**  
Skills required to function effectively in studies at the polytechnic. Core skills are intensive and extensive reading skills, listening and note-taking, summarising, answering examination questions and writing project reports.

1502

**English for Occupational Purposes**  
Skills required when applying for a job and those for functioning at work. The former includes reading and interpreting job advertisements, writing job application letters and attending job interviews. On-the-job skills include those for functioning at meetings, making oral proposals, telephone techniques and writing memoranda and business letters.

3103

**Electrical Technology**  
Resistance, induction and capacitance, DC circuits. Electro-magnetism. Magnetic circuits. Single-phase AC theory. Simple AC circuits. Power, power factor and power factor improvement. Three-phase theory. DC motors. Single-phase transformers. Single-phase AC motors. Three-phase induction motors. Measuring instruments.

- 5102 Applied Mechanics I**  
Two-dimensional force systems. Newton's laws of motion. Moment of inertia. Kinematics. Simple lifting machines. Work, energy, power. Stress and strain. Young's modulus. Shear force and bending moment diagrams. Bending stress. Torsion and shear stress. Hydrostatics. Friction and applications.
- 5103 Materials & Processes**  
Selection of materials for engineering applications based on function, manufacturing processes and relative cost. Review of steels, cast irons, copper, brasses and bronzes, aluminum and its alloys. Materials other than metals. Processes: uses of basic marking and measuring tools, applications of production processes — turning, drilling, milling, grinding, joining, forming and bending.
- 5104 Engineering Drawing**  
Introduction: Drawing office practice, drawing standards (ISO) and conventions. Basic geometrical constructions. Orthographic projection. Dimensioning. Sectioning. Pictorial drawing. Technical freehand sketching. Loci and mechanisms. Cams. Auxiliary projections. Surface intersections and developments. Screw threads, fasteners and locking devices. Working drawings: Assembly and detail drawings. Exploded assembly drawings.
- 5105 Engineering Drawing**  
Introduction. Drawing office practice, drawing standards (ISO) and conventions. Basic geometrical constructions. Orthographic projection. Dimensioning. Sectioning. Pictorial drawing. Technical freehand sketching. Loci and mechanisms. Cams. Auxiliary projections. Surface intersections and developments. Screw threads, fasteners and locking devices. Working drawings: Assembly and detail drawings. Exploded assembly drawings. Blueprint reading.
- 5106 Engineering Drawing**  
Introduction: Drawing office practice, drawing standards (ISO) and conventions. Basic geometrical constructions. Orthographic projection. Isometric and oblique drawing. Technical freehand sketching. Dimensioning. Sectioning. Auxiliary projections. Surface intersections and developments. Electrical drawings: Loci and mechanisms. Fastening methods. Assembly and detail drawings. Exploded views. Less emphasis on mechanical aspects.
- 5114 Aircraft Systems**  
Operation and characteristics of aircraft systems: hydraulic and pneumatic power systems, environmental systems, air conditioning, pressurisation and oxygen, fire detection and ice protection systems.
- 5115 Theory of Flight**  
Principles enabling the flight of heavier than air flying machines. Basics of aerodynamics at subsonic, transonic and supersonic levels and of helicopter flight. Problems faced during all stages of flight.
- 5116 Aircraft Piston Engines**  
Piston engine theory. Engine configuration and construction. Lubrication. Cooling. Fuel and fuel systems. Carburetion. Supercharging. Ignition. Propellers. Powerplant installations. Engine maintenance and overhaul. Powerplant operation.
- 5117 Aeronautics**  
Principles of aerodynamics of low speed, high speed and rotary wing flight. Functions and operating characteristics of aircraft control surfaces. Stability: longitudinal, lateral and directional. Performance. Basic propeller theory.
- 5118 Aircraft Mechanical Workshop Practice**  
Practical skills under controlled conditions and an awareness of acceptable airworthiness standards. Aircraft safety. Basic tools. Aircraft sheetmetal layout and precision measurements. Bending and forming work on aircraft sheetmetal. Aircraft solid rivets and riveting using pneumatic tools. Aircraft special fasteners. Locking devices and cable tensioning. Aircraft bolts and nuts. Pipe bending and fitting. Working with plastics and fibreglass. Aircraft repair schemes.
- 5119 Materials Technology I**  
Selection of materials for engineering applications based on function, manufacturing processes and relative cost. Review of steels, cast irons, copper, brasses and bronzes, aluminum and its alloys. Materials other than metals. Processes: uses of basic marking and measuring tools, applications of production processes — turning, drilling, milling, grinding, joining, forming and bending.
- 5120 Engineering Drawing**  
Introduction. Drawing office practice, drawing standards (ISO) and conventions. Basic geometrical constructions. Orthographic projection. Dimensioning. Sectioning. Pictorial drawing. Technical freehand sketching. Loci and mechanisms. Cams. Auxiliary projections. Surface intersections and developments. Screw threads, fasteners and locking devices. Working drawings: Assembly and detail drawings. Exploded assembly drawings. Blueprint reading.
- 5204 applications based on function, manufacturing processes and relative cost. Review of steels, cast irons, copper, brasses and bronzes, aluminum and its alloys. Materials other than metals.**
- 5205 Thermal Power**  
Working fluids. Systems. First law of thermodynamics. Steady and non-flow processes. Second law, entropy. Steam. Thermodynamic cycles. Fuels, combustion. Combustion engines: four- and two-stroke. Main engine parts, starting, cooling, lubrication. Carburetors, ignition systems. Fuels, injection systems, combustion chambers. Rating and performance. Scavenging, supercharging. Compression processes, compressor types, single- and multi-stage compression, intercooling. Compressed air uses.
- 5206 Aircraft Powerplants I**  
Working fluids. Systems. First law of thermodynamics. Steady and non-flow processes. Second law, entropy. Thermodynamic cycles. Actual processes. Aircraft fuels. Combustion. Engines. Four-stroke engines. Main aero engine parts. Starting, cooling, lubrication. Carburetors, ignition systems. Rating and performance. Supercharging. Propellers. Powerplant installations, maintenance, overhaul and operation.
- 5207 Aircraft Construction**  
Principles and aircraft structures and design concepts: truss and stressed skin. Characteristics and design requirements of principal parts of the aircraft: fuselage, wings, empennage, flight control systems and landing gear. Inspection. Maintenance and weighing procedures. Aircraft rigging. Regulations.
- 5208 Applied Mechanics II**  
Two- and three-dimensional force systems. Plane trusses and frames. Long and short columns. Torsion of compound shafts and close-coiled helical springs. Power transmission systems. Braking systems. Velocity and acceleration diagrams. Linear and angular momentum and impulse. Simple harmonic motion.
- 5209 Materials Technology II**  
Structure, strength and deformation of metals. Solidification and foundry practice. Precision casting processes. Equilibrium diagrams. Alloy steels, classification and applications. Transformation curves. Heat treatment of alloy steels. Surface hardening. Welding metallurgy. Corrosion and its prevention. Modes of metal failure. Non-destructive testing.

**Aircraft Systems**

Principles, function and operating characteristics of aircraft systems. Hydraulic and pneumatic power systems. Environmental and fire-protection systems. Ice-formation and de-icing methods. Cabin pressurisation and air-conditioning. Oxygen, anti-g, fuel systems.

**5202****Applied Mechanics III**

Stress and strain analysis for general two-dimensional stress systems. Theories of failure, combined bending, torsion and thrust in shafts. Statically indeterminate beams: slope and deflection. Vertical shear stress distribution in beams. Pressure vessels: stresses and strains. Kinematics and inertia in plane mechanisms. Balancing of rotating and reciprocating systems. Gear tooth geometry and gear trains. Basic vibration theory. Vibration analysis for condition monitoring of machinery.

**5303****Instrumentation & Control**

Basic control elements. Open loop and closed loop. Disturbance. Instrumentation of process variables. Pneumatic, electronic transmitters. Final control elements, positioners, sizing. Controllers, modes, tuning. Multi-loop system, cascade, feed-forward, ratio, selectivity, computer control. Control of steam plant. Servomechanisms, classifications, electrohydraulics, servovalves, stability. Microcomputers for control, architecture, software organisation, programming, interfacing, interrupts and peripherals.

**5304****Project (Mechanical)**

To be carried out jointly by a small group of students on an aspect of mechanical engineering. It may include design, calculations, manufacture, fabrication and testing, experimental work or analysis of an existing design or method of engineering interest or a combination of these. A formal report is to be submitted by the students.

**5305****Power Plant**

Heat transfer, conduction, convection (natural, forced) and radiation. Heat exchangers: boilers, fire- and water-tube. Package boilers. Draught and fuel systems. Feedwater treatment. Steam turbines, impulse and reaction, multi-stage turbines. Steam turbine parts. Condensers, ejectors and cooling systems. Regenerative feedwater heating. Gas turbines, open (and closed) cycle. Gas turbine parts.

**5306****Plant Maintenance Engineering**

Plant Maintenance. Industrial safety. Installation, operation, maintenance of prime movers, valves, steam traps, separators, piping systems. Maintenance of production machinery. Lubrication systems. Electric motor control and safety devices. Maintenance management and organisation. Planned maintenance systems. Maintenance documents. Control techniques. Condition-based maintenance. Inventory control and store-keeping. Plant investment considerations, engineering economy. Critical path analysis.

**5307****Fluid Power Technology**

Hydrodynamics. Bernoulli's equation. Types of flow, friction losses. Piping systems, components, branched pipes and pipes in series. Pumps: rotodynamic/centrifugal and positive displacement, construction, characteristics, operation, installation and selection. Specific speed. Cavitation and water-hammer. Viscometry. Friction and wear, lubrication and bearings (sliding, rolling). Lubricants. Hydraulic systems: pumps, valves, actuators, accessories. Hydraulic circuits.

**5308****Refrigeration and Airconditioning**

Refrigeration cycles. Compressors, condensers, evaporators, flow controls, other accessories. Operating cycle and safety controls. Heat load estimation. Psychrometry. Equipment selection. Air distribution, duct sizing.

**5309****Engineering System Design**

Selection of machine elements — bearings, seals, fasteners, gears, springs, V-belts, couplings, etc — and of materials, treatment process and finish for engineering components. Economy, ergonomics, aesthetics, safety and maintenance requirements. Vibrations: causes, estimation and prevention. System design based on applied mechanics, economics, properties of materials, heat transfer, hydraulics, ergonomics. Industrial design. Assignments including use of relevant CAD/CAM software.

**5310****Unit Operations/Piping Design**

Chemical unit operations e.g. distillation, absorption, scrubbing, calcination, crystallisation, drying, evaporation, filtration, size reduction, separation and mixing from a mechanical stand-point. Advanced theoretical treatment of aspects of physical chemistry kept to a minimum.

Selection and sizing of pipes for various services conform to codes of practice acceptable in Singapore. Arrangement drawings of piping systems including fittings, valves etc.

**5311****Industrial Metallurgy**

Foundry Technology. Melting, treatment of molten metal. Gates and risers. Computer software. Trends. Metal working. Plasticity, hot and cold working, rolling, forging, extrusion, drawing of metals, sheet metal forming. Heat treatment. Process furnaces, control, furnace atmospheres, quenching media. Powder metallurgy. Metal finishing, surface coatings, treatments, quality control. Metallurgical quality control, metallography, material defects, failure analysis, instrumental chemical analysis, materials testing.

**5312**

**Welding Technology & Non-Destructive Testing**  
Principles of the major welding processes. Properties of metals and of

metal alloys used in fabrication. Response to welding, brazing and adhesive bonding. Factors influencing the design of welded joints. Inspection techniques for non-destructive testing. Quality assurance. Standards of acceptance.

**5313****Aerospace Materials**

Properties and selection of materials for airframes and engines: aluminium alloys, steels, titanium alloys, super alloys, ceramics, plastics and fibre-reinforced composites. Materials processing: conventional and novel. Causes of failure. In-service monitoring. Refurbishment of aerospace components. Other military uses of advance materials.

**5315****Aircraft Electrics & Instrumentation**

Types, characteristics and troubleshooting of aircraft AC and DC electrical circuits and components: batteries, electric motors, ignition systems, fire detection and warning systems. Aircraft instruments: pressure gauges, pitot-static flight instruments, gyroscope, compass, instruments for synchronous data transmission and for engine performance monitoring. Digital electronics instruments. Auto-pilots.

**5316****Aircraft Powerplant II**

Gas turbine engine thermodynamics. Principle of operation and general arrangement of turbine engines: turbojet, turbofan, turboprop, and turbo-shaft engines. Factors affecting thrust, propulsive efficiency and specific fuel consumption. Thrust recovery. Operational characteristics of gas turbine engines. Fuel systems. Fuel control unit principles of operation and adjustment. Factors affecting engine overhaul life. Gas turbine powerplant installation and maintenance.

**5317****Aircraft Maintenance Practice**

Maintenance planning and procedures. Regulations: military regulations and civil air legislation. Airfield

procedures. Troubleshooting of aircraft, airframe and engine systems. Condition monitoring. Improved maintenance programme (IMP). Reliability. Documentation.

#### 5378 Piping Design

Selection and sizing of pipes for different services in accordance with codes of practice used by multinational companies in Singapore. Preparation of piping arrangements for petro-chemical plant, piping isometrics etc.

#### 5379 Unit Operations

Description of chemical plant and its operation from a mechanical standpoint. Advanced theoretical treatment of aspects of physical chemistry will be kept to a minimum. Describes and explains distillation, absorption and scrubbing, calcination, crystallization, drying, evaporation, filtration, size reduction and size separation, mixing, compression systems, cryogenic techniques, reactor types, etc.

#### 5384 Project (Process Plant Design)

To be carried out on an aspect of process plant design to demonstrate the student's ability to:

- (i) select equipment from catalogues
- (ii) prepare process piping arrangements
- (iii) design process equipment (where applicable)
- (iv) write specifications

The project report includes the necessary calculations together with engineering drawings of plant and piping.

#### 5501 Tooling Materials, Properties & Applications

Properties of tool steels. Effects of alloying elements on the properties of tool steels. Classification of tool steels. Composition, properties and applications of the AISI grades of tool steels. Properties and applications of sin-

tered carbides. Steels for blanking, forming and other pressworks.

#### 5502 Properties of Plastics

The structure and physical properties of polymers. Properties of different types of commodity thermoplastics, engineering thermoplastics and thermosets. Processing properties of thermoplastics and thermosets.

#### 5503 Tool Materials & Heat Treatment

Theory and processes of heat treatment. Non-equilibrium austenite decomposition. Hardenability of steels. Hardening. Rate of heating. Quenching and tempering.

#### 5705 Aircraft Construction

Aircraft structures, landing gear and flight control systems, design requirements and construction. Maintenance and weighing procedures. Certification requirements. Practical experience in the general practices of aircraft maintenance and repair.

#### 5707 Avionics

Electricity, DC circuits, magnetism, induction, inductance and capacitance, aircraft batteries, ignition systems, DC motors, DC power supply, AC theory, AC power supply, aircraft electrical circuits, synchro-mechanisms and pressure gauges, engines, pitot-static and gyroscopic instruments, compass, automatic pilots. DC and AC measuring instruments. Soldering, crimping, lacing, wiring and troubleshooting of avionics components, aircraft systems. Battery servicing, bonding tester. Magnetos, generators and motors. Functional tests on aircraft systems, compass swinging, electronics experiments.

#### 5733 Basic Gas Turbines

Aero gas turbine engine theory and construction. Thrust distribution. Turbo-jet and turbo-prop engines. Factors affecting thrust, propulsive efficiency and specific fuel consumption. Thrust recovery. Operational

characteristics of gas turbine engines. Factors affecting engine overhaul life. Gas turbine powerplant installation and maintenance.

#### Workshop Practice I

Producing components using lathes, milling and surface grinding machines. Metal joining techniques using oxy-acetylene and arc welding. Sheetmetal work using power presses. Dismantling, assembly and testing (including alignment testing) of mechanical equipment (pumps etc). Use of handtools, off hand grinding and wheel balancing. Inspection and dimensional control using measuring instruments and gauges.

#### Workshop Practice

Producing components using lathes, milling and surface grinding machines. Metal joining techniques using oxy-acetylene and arc welding. Using machine shop equipment and tools. Benchwork for marking, cutting and checking components to the desired accuracy, tolerances and finishes. Use of machine tools for metal cutting and surface finishing. Inspection and dimensional control using measuring instruments and gauges.

#### Applied Workshop Technology

Principles of operation, design features and application of machine tools, precision measuring instruments, welding equipment and their accessories. Metal cutting conditions. Concepts of non-conventional and computer numerical control (CNC) machining.

#### Industrial Engineering

Introduction to work study. Method study. Ergonomics and motion economy. Plant layout. Work measurement. Engineering economics. Production planning and control. Material requirement planning. Application of computers in production planning.

#### Workshop Practice II

Further skill practice on turning.

milling, tool and cutter grinding, inspection, welding etc. Preventive maintenance of machine tools. Hands-on experience on basic MDI/CNC machine tools, programming in ISO format etc. Individual assignments to manufacture to specifications.

#### 6302 Supervisory Studies

Useful concepts for supervisors:  
(i) the need for productivity improvement  
(ii) management systems  
(iii) people-centred management  
(iv) supervisory skills

#### Case studies

#### Machine Tools

Metal cutting, single-point tool and multiple-point tool machining processes. Machine tool structure. Kinematics and dynamic behaviour of machine tools. Gear-cutting methods and machines. Metal-forming machines and tools. Abrasive machining processes. Grinding. Control and automation. Copy turning, CAM automatic turret lathe. CNC machine tools. Production planning, preventive maintenance and trouble-shooting of CNC machines.

#### 6304 Metrology & Quality Control

Fundamentals of metrology, inspection and quality control. Choosing type of inspection and quality control for a particular process considering quantity, quality and cost. Automatic techniques for quality control. Coordinate measurement and roundness measurement. Special industrial measurement techniques. Calibration of standard measuring tools. The quality control needs for small- and medium-sized industries in Singapore.

#### NC Technology

Classifications and economic advantages of NC systems. Requirements on machine tool design for NC.

- 6310** Robotics  
Basic features of industrial robots. Robot anatomy, programming, end effectors, tools, matching. Performance and testing. Safety, maintenance and reliability. Economic justification, selection. Robot applications. Design elements and operation of industrial robots. Vision systems. Power transmission, types of drive and feedback transducers, microprocessors, control theory and robot vision.
- 6306** Project (Manufacturing)  
Students form small groups to carry out a project. It must be of manufacturing engineering nature and may include design, calculation, manufacture, fabrication and testing, experimental work or analysis of an existing design or method of manufacturing or a combination of these. A formal report is required.
- 6307** Basic Automation  
Mechanisation/automation of manufacturing using pneumatic, hydraulic, electrical or electronic means. Techniques for the design of fluid power circuitry for automation. Characteristics of common transfer, orientation, placement and escapement devices. Operation sequence control using programmable logic controllers and micro-computer systems. Case studies.
- 6308** Robotics Basics & Applications  
Classification of industrial robots. Robot anatomy. Programming methods. End effectors, tools, sensors. Performance and testing. Safety, maintenance and reliability. Economic justification; project appraisal techniques, selection procedure. Application studies: material handling, machine loading/unloading, welding, spraying, deburring and assembly.
- 6309** Robotics Mechanisms & Controls  
Design elements and operation of industrial robots. Principles of vision systems. Robot kinematics, power transmission types of drive and feedback transducers, microprocessors control theory applied to the control of machines and mechanisms.
- 6311** Tool & Die Design  
Jigs, fixtures and grippers for robots and other tools e.g. press tools. Planning, design approaches. Progressive, combination and compound dies. Alternative tools, materials and standard components. Plastic moulds including injection, compression and transfer moulds. Component rigidity, accuracy, machinability and surface finish considering ergonomics and safety requirements CAD/CAM software where applicable.
- 6312** CAD/CAM Technology  
Computer-aided product design and manufacturing, CAE, FMS and CIM. Workstations, graphics screens. Memory requirements. Input/output devices. Computer network systems. 2D drafting, 3D solid modelling. Wire-framing. Hidden-line removal, colour shading and zooming. Creation of 3D components. Commercial packages. Computer-aided process planning. Databases. Initial Graphics Exchange Specifications (IGES). Graphic tool libraries, post-processor. CL File. NC machining programmes. Integration of CAD and CAM.
- 6313** Manufacturing Methods & Processes  
Principles of a flexible manufacturing cell. Non-traditional machining methods: laser beam, abrasive jet, electro-chemical machining, ultrasonic machining, etc. Metal forming and finishing. Considerations for manufacture: procedures, design and material properties. Automated
- material handling. Selection of appropriate manufacturing method for a product. Re-design of a component to suit a production process.
- 6440** Case Studies in Personnel & Industrial Relations  
Relevant local cases in connection with personnel and industrial relations to apply the information obtained through Syllabus No. 6447.
- 6441** Industrial Management & Organisation  
Nature of managerial processes, organisational activity and managerial responsibility. Role of the industrial manager in his company, in society and within the profession.
- 6442** Industrial Environment  
The principal social, economic, legal and political aspects of industry and its environment. Methodology of economic analysis. Political factors affecting industrial management.
- 6443** Production & Operational Management (A)  
Major elements of an operations system. Work study, critical path analysis and PERT, process/operation planning. Factory layout and material handling. Applications of computers in production management.
- 6444** Data Processing & Quantitative Analysis  
Fundamental concepts of microelectronics. Data sources and data handling. Statistical tools. Hands-on experience on computers.
- 6445** Industrial Finance  
Analysis and interpretation of accounting statements. Use of cost data for pricing and future requirements. Solving problems on a financial basis.
- 6446** Production & Operational Management (B)  
Operations planning and control. Linear programming. Pareto analysis. Simulation. Quality and reliability.
- 6447** Personnel & Industrial Relations  
Personnel policy. Personnel function. Negotiating practice. Role of line managers in establishing good industrial relations. Economic and political background to the industrial relations in Singapore.
- 6451** Industrial Management Policy  
Case studies on policy decisions in the major operational areas of industrial management, i.e. manufacturing, marketing, finance and human resources.
- 6453** Individual Assignment (Management Practice)  
Individual assignment related to the Industrial Management Policy syllabus.
- 6454** Group Assignment (Management Practice)  
Group assignment on an aspect of current interest to the profession of industrial management.
- 6455** Individual Project (Management Practice)  
Individual project on the analysis of management practice in the student's company.
- 6448** Communication Workbook (I & II)  
Oral and written communication skills. Includes the following topics: oral presentations, telephone techniques and courtesies, meetings, business letters, memos and formal/informal reports.
- 6501** Jigs & Fixture Design for Automation  
Location and clamping in jigs and fixtures. The drill jigs. Design of milling fixtures. Indexing mechanisms and fixtures. Design of turning and of boring fixtures. Power actuated devices in tool design. Piezoelectric transfer in automated systems. Design of fixtures used in automation. Features

tures of inspection fixtures. Auxiliary equipment. Tooling for CNC machine tools.

**6502 Manufacturing Tools, Moulds & Dies**  
Principles and applications of precision toolroom machine tools and processes. Operation, programming and applications of CNC milling machines and electrical discharge machine (EDM). Operating safety of presses and press tools. Working principles of injection moulding machines, die-casting machines, and the deep-drawing processes.

**6503 Polymer Engineering**  
The processes of compression moulding, transfer moulding and injection moulding. The thermoset injection mould process. Comparison of thermoplastic and thermosetting processes.

**6504 Basic Stamping Tools**  
Design of blanking and piercing dies. Presses and press accessories. Design of bending and forming dies. Design of inverted, compound, combination and drawing dies.

**6505 Modern Die Design**  
Design of progressive, transfer and fine-blanking dies. Tool & die failure. Design techniques for special dies.

**6506 Advanced Stamping Tools**  
The application of CAD/CAM in die design. Design of casting, forging and extrusion dies.

**6600 Project (ADTD)**  
To be carried out on an aspect of tool and die design. It must be industrial-based. The project report is to include the relevant calculations together with detailed design drawings.

**6601 Principles of Management**  
Concepts, theory and practice of management. The selection and interview processes. Performance appraisal. Management by objectives. Management by results. The management philosophies.

**6602 Organisational Analysis**  
Structure of organisations. Types of business organisation. Intra-organisational behaviour. Transactional analysis. Team building. Conflict and its problems in an organisation.

**6603 Financial Analysis**  
Elements of costs. The breakeven analysis. Budgeting and budgetary control. Cost accounting. Analysis of variance, ratio and cash flow.

**6604 CAD/CAM Application**  
Computerized manufacturing sys-



CAD/CAM technology is taught to final-year Manufacturing Engineering students at the newly-set-up CAM centre.

linear IC's such as LM741, 78xx & 79xx. Digital electronics and common digital IC's such as the 7400 series gates, flip-flops and counters. Components of a digital computer including memory devices and interfacing devices.

Items. Examples of CAE/CAD/CAM. Components of a CAD/CAM system. Functions of CAD/CAM software. Interactive computer graphics. 3-D modelling. Automated drafting. Software packages for CAD. Computer-aided process planning and part programming for CNC machining.

**6605 Small Tools Design**  
Metal cutting. Cutting tool geometry. Design of boring tools, drills, milling cutters, broaches, form tools, gear-cutting tools. Selection of tools and tool materials for a job.

**6606 Tooling for CAM-operated Automatic Lathes**  
Principles of Swiss-type sliding-headstock automatic lathes and of fixed-headstock automatic turret lathes. Process planning for these two kinds of automatic lathes. Design of cam profile to mass-produce various components on automatic lathes.

**6607 Introduction to Injection Moulding**  
Principle of injection moulding. Design calculations of injection moulds. Mould cooling. Design of three-plate moulds.

**6608 Complex Moulds**  
Multi-daylight and unscrewing moulds. Collapsible cores for moulds. Split, side-core and undercut moulds. Hot-runner systems and insulated systems in a mould. Designing an injection mould.

**6609 Mould Flow**  
Prediction of polymer flow behaviour. Use of the MF PROGRAM and the MFL PROGRAM for design. Principles for the design of moulds. Mould-cavity analysis project.

**8271 Electronics**  
Use of cathode-ray oscilloscope and frequency counter. Characteristics and applications of semi-conductors and junction diodes. Operation of transistor amplifier circuits and oscillator circuits. Application of common



*Diploma in Nautical Studies students receiving instructions in tanker safety.*

## Department of Nautical Studies

### Staff

**Head**  
R F Short  
PPA, Extra Master, MPP, DPA, MCIT

**Deputy Head**  
R D Vardon  
Master (FG)

**Principal Lecturer**  
N S Advani  
Extra Master, MCIT, Compass Adjuster

**Senior Lecturers**  
S B Bhaman  
Master (FG)

Mok Chek Tong  
PMG (1st Class), Radar Maint

I M Mukri  
Extra Master, AMCIT  
Syed Manzur Ahmed  
Master (FG)  
Tan Swee Oon  
Master (FG), B Sc (Hons)

**Lecturers**  
Chew Kwok Tim  
Master (FG)

Ibrahim b Abdul Karim  
Master (FG), Dip (Comm Shipping)  
Jaafar b Sidin  
Master (FG), Dip Naut Sc, MCIT

Lye Hoong Wai  
Master (FG)  
John Pothen  
Master (FG)  
K S Nanthu Kumar  
Master (FG)

### Principal Instructor

Rosli b Ridwan  
Master (HT), Dip MS (Shpg Mgt)

### Senior Instructor

Khamis b Ahmad

### Instructors

Ko Kwai Fatt  
Wong Kok Kee

The objective of the Department of Nautical Studies is to provide education and training for deck officer personnel in accordance with the standards laid down by the Government of Singapore.

The Port of Singapore is at the heart of shipping activities in South-East Asia. Many ships are registered in Singapore. Employment in the shipping industry both at sea and ashore offers a challenging, interesting, rewarding career in one of mankind's principal economic activities.

For manning purposes, Singapore-registered ships are divided into three categories:

- Foreign-Going ships, which do not have restricted training limits.
- Home-Trade ships, which are restricted to the area within approximately 1,000 nautical miles of Singapore.
- Local-Trade ships, which are restricted to Singapore and near waters.

Students who obtain Foreign-Going certificates of competency are also able to obtain employment as masters or deck officers on ships registered in other countries.

### Deck Cadet Training

Pre-Sea training is the first step in a career development programme which leads to certificates of competency entitling the holder to sail as a deck officer or, eventually, as master of a Foreign-Going or Home-Trade ship. The training prepares students for life at sea and consists of a twenty-week induction course which emphasises safety training and includes training in lifeboat and liferaft handling, personal survival, fire-fighting and first aid. Two courses, commencing in June and January respectively, will be conducted during the 1987/88 Session.

The Pre-Sea Induction Course is Phase I of a comprehensive three-year training programme which prepares students for their first professional qualification, the Class 3 Certificate of Competency.

In Phase II, students serve at sea as Deck Cadets for two years and continue their education by means of a correspondence course.

In Phase III, students must study at the Polytechnic for six months, as full-time students in the Class 3 Course before being eligible to sit the certificate of competency examination conducted by the Marine Department, Singapore. At the end of Phase III and prior to sitting the Marine Department examination, students will be examined in General Ship Knowledge, Navigation and Chartwork, Meteorology, Physics and Mathematics. Students who successfully complete the full Deck Cadet Training Scheme will be awarded a Singapore Polytechnic Diploma in Nautical Studies.

### Correspondence Courses

Tuition by correspondence is available to students preparing to take either the Class 3 or Class 5 examinations. In each grade, the course is designed to be completed in two years by students serving on board ships. The curriculum adds to the basic knowledge

imparted during the Induction Course and prepares the student for full-time study at the Polytechnic. Although the Class 3 Correspondence Course is designed to be independent of text-books, references are given for further reading. The subjects covered are Mathematics, Physics, Navigation and Chartwork, Meteorology, Seamanship and General Ship Knowledge. Each course is designed to link with shipboard activities, so that the seafarer receives guided training while at sea.

Students enrol for the correspondence courses by calling at the Polytechnic, completing the application forms and paying the required fees. Students should also seek an interview with the Lecturer-in-charge of Correspondence Courses, Department of Nautical Studies, before commencing their studies.

### Short Courses

#### Short Courses for Marine Department Examination for Certificates of Competency

The Department of Nautical Studies offers a range of short courses to prepare students for examinations conducted by the Marine Department, Singapore, for Foreign-Going and Home-Trade certificates of competency.

A Class 1 (Master Foreign-Going) course will commence in June 1987. Class 2 (First Mate Foreign-Going) courses will commence in February and September 1987. Class 3 (Second Mate Foreign-Going) course will commence in February and July 1987. A Class 4 (Master Home-Trade) and a Class 5 (Mate Home-Trade) course will commence in January 1987.

The duration of the Foreign-Going and Home-Trade courses is 20 weeks.

Students may apply for enrolment in the above courses any time prior to the commencement date. However, enrolment will cease three weeks after the commencement date of the Foreign-Going and Home-Trade courses, or at an earlier date if all places are

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(in lieu of First Aid at Sea) and Shipboard Management certificates.

All candidates for Home-Trade certificates are to possess the following recognised certificates: Proficiency in Survival Craft; Fire-Fighting; Radar Interpretation & Plotting; First Aid at Sea; and Restricted Radiotelephone Operator. Students enrolling in the above courses are strongly advised to have their sea-service checked by the Marine Department, Singapore.

#### Electronic Navigation Systems, Radar Observer and Electronic Navigation Aids Courses

The Electronic Navigation Systems (ENS) Course is of five weeks' duration and is divided into two halves. Radar Observer and Electronic Navigation Aids (ENA). For enrolment in the ENS and ENA courses, an applicant must produce proof of sea service of at least two years in the deck department of a Foreign-Going or a Home-Trade ship. For enrolment in the Radar Observer Course, an applicant must produce proof of sea service of at least one year in the deck department of a Foreign-Going or a Home-Trade ship. Persons who use radar and/or electronic navigation aids, but are unable to produce proof of the required sea service, may be allowed to attend the course but will not be awarded certificates. The number of students in each course is limited to 15 and students who have not attended the full course may not be examined. It is planned that at least six courses will be conducted during the session. The ENS, ENA and Radar Observer certificates are recognised by the Marine Department, Singapore.

#### Radar Interpretation & Plotting Course

Applicants must produce proof of sea-service of at least one year on deck of a Foreign-Going or Home-Trade ship. Others who use marine radar but who cannot produce proof of the requisite sea-service may attend the course, but a certificate will not be awarded. The course is of two weeks' duration and students may not be examined if they have not attended the full course. The number of students on each course is limited to 10. At least four courses are planned for the Session.

The Radar Interpretation & Plotting Certificate is recognised by the Marine Department, Singapore.

#### Navigation Control, Radar Simulator and ARPA Courses

The Navigation Control Course is of two weeks' duration and comprises a one-week Radar Simulator course and a one-week ARPA course. Applicants must be in possession of at least a Class 2 or Class 4 certificate of competency or must be eligible to sit one of those examinations. An applicant who holds a valid licence as a Harbour Pilot will also be accepted. Assessment is continuous through the course and only students who have satisfactorily attended the course will be awarded certificates. The number of students accepted in each course is limited to 12 and it is planned that at least seven courses will be conducted during the session. The Navigation Control, Radar Simulator and ARPA certificates are recognised by the Marine Department, Singapore.

#### Restricted Radiotelephony Course

Admission to the course is normally restricted to persons who are, or have recently been enrolled in any of the Foreign-Going or Home-Trade courses. Applicants must have normal hearing and suffer no impediment of speech. The course prepares students for the Telecommunication Authority of Singapore examination for the Restricted Radiotelephone Operator Certificate. It is offered as a two-week full-time course. Students in the Class 3 Course receive instruction in radiotelephony during normal day classes. The Restricted Radiotelephone Operator Certificate is recognised by the Marine Department, Singapore, and by other Commonwealth authorities.

#### First Aid and Ship Captain's Medical Courses

Applicants for the First Aid at Sea Course must be eligible to sit for the examinations for Class 3 of Class 5. Applicants for the Ship Captain's Medical Course must hold either a Class 3 or Class 5 certificate of competency. At least three courses for each grade will be conducted during the session. First Aid at Sea

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is a full-time course of one week's duration and is conducted at the Polytechnic. Ship Captain's Medical is also a full-time course of one week's duration, but is partly conducted at the School of Nursing, Singapore General Hospital. Examinations are conducted by staff of the Ministry of Health. Both the First Aid at Sea and the Ship Captain's Medical certificates are valid for five years from the date of issue. These certificates are recognised by the Marine Department and by other Commonwealth authorities.

#### Personal Survival Course

Sea-going personnel who do not take the Proficiency in Survival Craft Course are required to undergo two days of instruction practice in the use of inflatable liferafts and general survival techniques. Courses are conducted at frequent intervals.

#### Fire-Fighting Course

All full-time students in the Department are required to undergo five half-days of practical instruction in fire-fighting conducted by the National Maritime Board. Courses are conducted at frequent intervals.

#### Proficiency in Survival Craft Course

Applicants are normally required to have at least six months' sea-service. Those without sea-service will be accepted. But if they pass the examination, their certificates will be withheld until proof of at least six months' sea-service is produced. The course for persons who have served in the deck department aboard ship is of one week's duration and students are examined on behalf of the Marine Department, Singapore.

#### Oil, Chemical & Liquefied Gas Tanker Familiarisation Course

Candidates for the examination for a Class 3 certificate of competency must have undergone training in tanker familiarisation. An examination is held at the end of the course, which is of two weeks' duration. A certificate will be issued to a student who has satisfactorily attended the course and passed the examination. The certificate is recognised by the Marine Department, Singapore. At least three courses will be conducted during the Session.

#### Specialised Courses in Tanker Safety

Short courses at basic and advanced levels of oil, chemical and liquefied gas tanker operation, including crude oil washing and inert gas systems, are conducted jointly by the Departments of Marine Engineering and Nautical Studies in response to requests from industry.

#### Shipboard Management Course

Candidates for the examination for Class 2 or Class 1 certificates of competency must have undergone training in shipboard management. The course is jointly run by the Departments of Marine Engineering and Nautical Studies and is of ten days' duration. A certificate of attendance will be awarded to a student who satisfactorily attends the full course. A number of modular tests must be taken during the course. The number of students in each course is limited to 16. The Shipboard Management Certificate is recognised by the Marine Department, Singapore. At least six courses are planned for the Session.

#### Subject Areas

Shipboard Management:  
Principles of Management  
Individual Motivation  
Group Behaviour  
Communication  
Leadership  
Problem-solving  
Decision-making  
Planning and Budgeting  
Computing

The training of ships' officers in the Shipboard Management Course demands the teaching of principles and concepts of personnel management through formal instruction and requires training activities to be conducted through discussions on case studies and personal experiences.

#### Laboratories/Workshops

The Boat & Radar Station on the Pasir Panjang waterfront is equipped with a range of sailing craft and has extensive facilities for training in general seamanship, in the use of lifeboats and liferafts and in the use of radar.

The Electronic Navigation Systems Complex is equipped with:

(a) Four own ship booths, each containing a true motion radar, ARPA, ship's controls and an electronic navigation aids readout panel. Each booth is provided with intercommunication and VHF systems. A quadruphonic sound system is also provided.

(b) A computer system for the generation of the playing area, electronic navigation aids readouts, ship model, targets and the movement of the ships.

(c) An instructor's console for the loading of information, setting, viewing and control of the exercises.

(d) A radar and a graphics monitor.

(e) Printout facilities and a graphics monitor for debriefing.

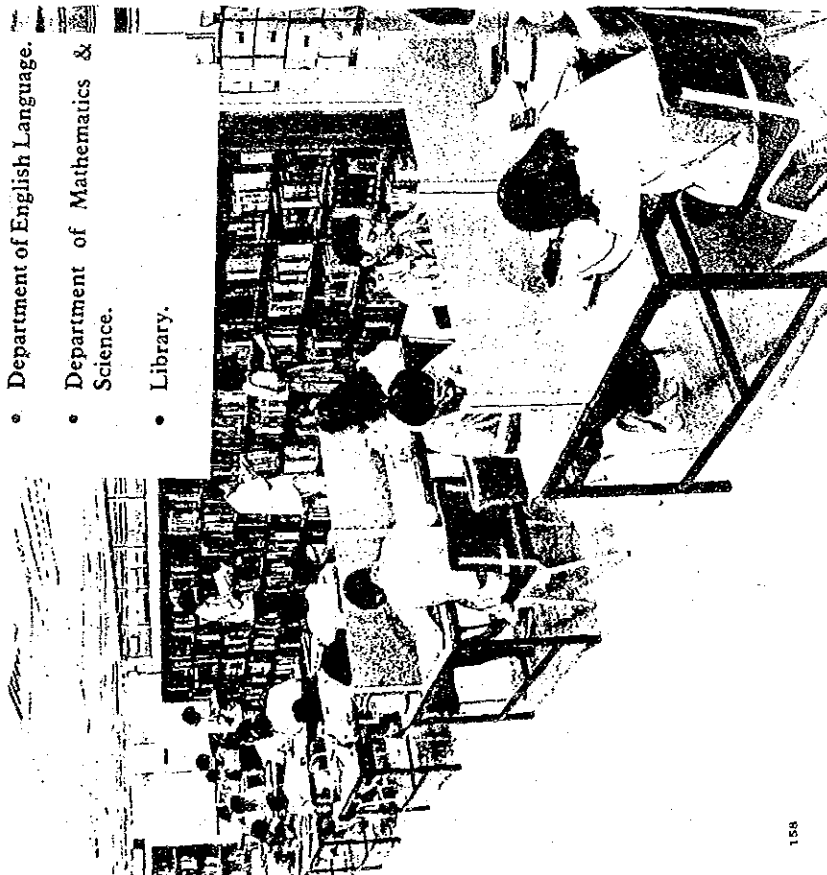
(f) An electronic navigation aids laboratory containing Loran C, Decca Navigator, ARPA, MF DF, Echo Sounder, Omega Navigator and Satellite Navigator. The readouts for this equipment are provided by the computer and may correspond to the information from Own Ship I or may be independent. An additional ARPA coupled to a target injector has been installed.

The Tanker Safety Room is provided with a number of teaching models, portable equipment commonly carried aboard tankers, a video tape recorder and a television monitor.

The Navigation Instruments Room is equipped with a wide range of navigation, seamanship and meteorological instruments.

## ACADEMIC SERVICES

- Computer Centre
- Department of Continuing Education.
- Department of Educational Technology.
- Department of English Language.
- Department of Mathematics & Science.
- Library.



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All engineering students are exposed to computer-aided design and drafting in the Polytechnic.

## Computer Centre

### Staff

#### Head

Peter John Bowyer  
M Sc, MBCS

#### CADD Centres

#### Analyst-in-charge

Koh Chin Guan, Jack  
M Sc, Cert Ed, Cert Dip Accountancy & Finance, Cert in Marketing Studies, Dip in Ind Mgt, Dip A (Dissertation Exam), AMBCS, MIIM

#### Analyst

Lye-Lee Siew Meng (Mrs)  
B Eng (Elect), M Sc (Information & Comp Science), MIEE, MACM

#### Visiting Lecturer

Adamo, Antonio Piero  
Dip in Civil & Structural Technology, B Sc (Maths), Engg Tech (BC)

### Lecturers (on secondment)

Cheok Beng Teck  
B Sc (Hons), M Sc (Ship Prod Tech), MSNAMES

Chew Sin Fye  
B Sc (Bldg)

Hui Mei Lin (Mdm)  
C&GFTC, Tech Dip (Prod), B Sc (Prod Eng & Mgt) (Hons), CEF (AES, INC)

Loh Chung Chiang  
Tech Dip (Mech), B Eng (Mech) (Hons), CIM, AIIM

Ng Geom Hah  
Tech Dip (Mech), B Sc (Mech) (Hons), M Sc (Mech)

Yu Yat Hong  
B Eng (Civil)

### Instructors (on secondment)

Hor Sui Cheng, Sally (Mrs)  
Tech Cert & Tech Dip (Arch D'ship)

Lee Wah Ling  
Dip (CPT), GPRI, MPRI, MSPE

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### Engineering Application Centre

#### Analyst-in-charge

Cheah Key Hock  
B Sc (Hons), AIBCS

#### Analyst

Chew Ng Sew, Peter  
B Sc (Maths), M Sc (Control Engg), MScS,  
MDECUS

#### Lecturers (on secondment)

Balakrishnan, S  
B Sc (Eng) (Hons), M Sc (Mech Eng), C Eng,  
MIME, MIE (SL)

#### Lai Wong Kuen (Mdm)

B Eng (Civil), M Sc (Civil)

#### Leong Chun Nam

B Eng (Mech), M Sc (Mech)

#### Leong Ng Geck Nai (Mrs)

B Eng (Civil)

#### Ng Man Choong

B Sc (Bldg) (Hons), Tech Dip (Bldg), MSIB

#### Instructor

Tan Hui Leong, William  
C&GFTC (Telecoms Tech), Dip in Mgmt  
Studies, AMIEEE, MSIM

### Management Information Support Centre

#### Analyst-in-charge

Ng Tan Li Hong (Mrs)  
B Sc (Hons)

#### Analysts

Lim Peng Choon, Victor  
Cert in Computer Data Processing, NPB  
Wong Yuen Chiu, Luke  
B Sc (Comp Sc & Stats), M Sc (Comp Sc)  
Wu Wen Sun (Miss)  
B Sc (Hons), Dip in Investment Analysis

The Computer Centre provides hardware management and software expertise in support of both the administrative and academic functions of the Polytechnic.

For the administration, the Centre manages a network of hardware and software to support maintenance of student, staff, and financial records and to support integrated office automation.

Two major provisions are made to aid the academic activities. Two CADD (Computer-Aided Design and Drafting) Centres are maintained and software expertise provided to support the objective of giving CAD training to all students of the Polytechnic, with the exception of those following nautical studies. Also, a Microcomputer Centre is similarly maintained to provide support in training for the use of computers in other applications within engineering and science.

In addition to the above, the Centre runs short courses for industry in the areas of Computer-Aided Design and Data Processing.



The teaching of software applications takes place at the Engineering Application Centre.



The Department of Continuing Education provides worthwhile continuing education programmes to allow technologists to update their knowledge.

## Department of Continuing Education

### Staff

#### Head

Maurice V Jarman  
M A, P Eng, C Eng, MICE, MIMech E

#### Programme Co-ordinators

Teoh Chin Koon  
B Sc (Eng), P Eng, C Eng, MIEE

#### Percival Jeyapal

B Eng, M S (Eng), P Eng, C Eng, MICE,  
AMIMechE, MASCE

The Department of Continuing Education has stepped up its continuing education programme in line with the recommendations of the Economic Committee. The expanded programme is orientated towards technology in all the academic disciplines.

The mission of the Continuing Education Department has now been redefined as follows:

To provide worthwhile continuing educational programmes that will enable the technologists to update and upgrade their knowledge, improve their capability to apply that knowledge and increase their contribution to the technological, economic and social development of Singapore.

The department caters both for individuals who wish to attend a part-time course, and employers who require courses for their employees in the public or private sectors.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Building and Energy Management<br>Building Maintenance<br>Energy Management<br>Energy Conservation in Buildings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Construction Management<br>Civil Engineering Contracts & Quantities<br>Construction Management<br>Project Management                                                                                                                                                                                                                                                                                                                                                                                            |
| Building Services<br>Airconditioning<br>Airconditioning and Ventilation Systems<br>Electrical Drafting, Building Services and Regulations<br>Fire Protection Technology<br>Measurement of Electrical Services in Buildings<br>Measurement of Mechanical Services in Buildings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Construction Technology<br>Concrete Technology<br>Construction Technology<br>Reinforced Concrete Design to BS 8110<br><br>Diesel Engines<br>Advanced Diesel Engine Principles and Practice<br>Basic Diesel Engine Maintenance (for Boat Owners)<br>Marine Diesel Engine Principles and Practice                                                                                                                                                                                                                 |
| Civil Engineering<br>Aircraft Flexible and Rigid Pavements<br>Highway Engineering<br>Retaining Walls<br>Practical Soil Mechanics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Electrical Machines and Power<br>Electricity Machinery and Control (Marine) - Operation and Maintenance<br>Electrical Machines & Power Cables<br>Power Electronics                                                                                                                                                                                                                                                                                                                                              |
| Computer Technology<br>Computer-Aided Drafting & Design Modules<br>1. Introduction to Computer-Aided Drafting (2-D)<br>2. Introduction to Computer-Aided Drafting (3-D)<br>3. Computer-Aided PCB Design<br>4. Architectural Production<br>Drawing on CADD System<br>5. Computer-Aided Mechanical Engineering Design and Application<br>Computer Programming in BASIC<br>Computer Programming in FORTRAN 77<br>Computer Programming in PASCAL<br>Installation, Testing & Maintenance of CNC Machine Tools<br>Introduction to Computer-Aided Plant Design<br>Introductory Unix for Programmers<br>LOTUS 1-2-3<br>Manual & Computer-Aided Part Programming of CNC Machine Tools<br>Microcomputer Applications for Commercial Users<br>Microprocessors/Microcomputer Systems<br>Microcomputers for Land Surveyors | Electronics & Communication Engineering<br>Fundamentals of Digital Communications<br>Industrial Electronics I (Basic Electronics)<br>Industrial Electronics II (Basic Digital Electronics)<br>Microelectronic Engineering<br>Microprocessors/Microcomputer Systems<br>Power Electronics<br><br>Food and Hygiene<br>Food Hygiene<br>Microbiological Examination of Foods<br>Sanitation & Pest Control in Food Establishments<br><br>Instrumentation<br>Instrumentation and Control<br>Instrumentation Technology |

|                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Management of Technology<br>Engineering Project Management<br>Project Definition, Evaluation and Investment Appraisal<br>Specification Writing for Machinery and Equipment<br>Successful Commissioning of Industrial Plant | Steam Generation<br>Boiler Operation and Maintenance<br>Safety and Relief Valves<br><br>Surveying<br>Basic Surveying and Underground Surveying Technology<br>Microcomputers for Land Surveyors<br><br>Tankers<br>Basic Tanker Safety for Engineers<br>Oil Tanker Technology and Safety<br>Advanced Liquefied Gas Tanker Operation<br>Liquefied Gas Tanker Familiarisation<br><br>Yacht and Power Boats<br>Advanced Seamanship/Navigation<br>Basic Seamanship/Navigation<br>Basic Diesel Engine Maintenance (for Boat Owners) |
| Manufacturing Engineering<br>Installation, Testing and Maintenance of CNC Machine Tools<br>Manual and Computer-Aided Part Programming of CNC Machine Tools<br>Pneumatics and Hydraulics                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Marine Plant and Systems<br>Marine Auxiliary Systems<br>Simulator-based Marine Power Plant Operation and Diagnosis                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Mechanical Engineering<br>Computer-Aided Mechanical Engineering Design and Applications<br>Introduction to Computer-Aided Plant Design<br>Industrial Hydraulics<br>Pressure Vessel Design                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Plastics<br>Atomic and Molecular Spectrometry<br>Plastics Materials and Processes (in Mandarin)<br>Polymer Characterisation by Thermal Analysis                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Production and Maintenance Management<br>Machine Health Monitoring Module 1<br>Operation/Production Management<br>Productive Maintenance in Process Industries                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Skills, Communicative and Mathematics<br>Basic Communicative Skills for Supervisors<br>Engineering Mathematics                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



The Continuing Education Department runs post-diploma courses together with the academic departments.

Formal part-time courses which lead to Singapore Polytechnic Diplomas, Post Diplomas, Certificates and Endorsement Subjects are described elsewhere in the Prospectus within the academic department sections.

### The Individual

The Department has a planned programme to conduct worthwhile courses which will enable technologists or engineering managers to update and upgrade themselves in a relevant technology and with the appropriate techniques of management.

It is the department's objective to assist the technologists or engineering managers to improve their ability in dealing with the challenge of rapidly advancing technology and the need to improve standards of management of technology.

Courses are also conducted for those who wish to upgrade themselves in their technological profession by acquiring formal qualifications.

Normally it is expected that those who enrol for courses would have received a tertiary education but some courses are designed for those who have not been so fortunate but who would nevertheless have experience in the workplace or relevant fields.

### The Employer

Tailor-made in-company courses are planned and conducted in response to enquiries from private companies and government departments. These courses are designed specifically to meet the employer's requirements and can be conducted in-house or at the Singapore Polytechnic.

After preliminary discussions with the employer, course contents are submitted together with a total course fee and proposed commencement date.

### Short Courses

The following courses are offered in conjunction with the academic departments and have a duration varying between one week and two months.

The courses are advertised in the press and enquiries about them, or any other subjects

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which would be of interest, should be made to the Department of Continuing Education.

### Tuition Courses

These study courses are offered for students wishing to take professional examinations and enquiries should be made to the Department of Continuing Education.

### Engineering Council, UK (EC, formerly CEI) Examinations, Part I and II

These courses are of one year's duration for each subject, the number of years taken to complete the examinations depending on how many subjects the student wishes to study in any one year. The courses are conducted in the evenings by the Department of Continuing Education.

Candidates for the courses are required to meet certain educational requirements before admission to the Part I course. They will also be required to confirm their eligibility to take the examinations for both Part I and II by obtaining the necessary application approval from the Engineering Council.

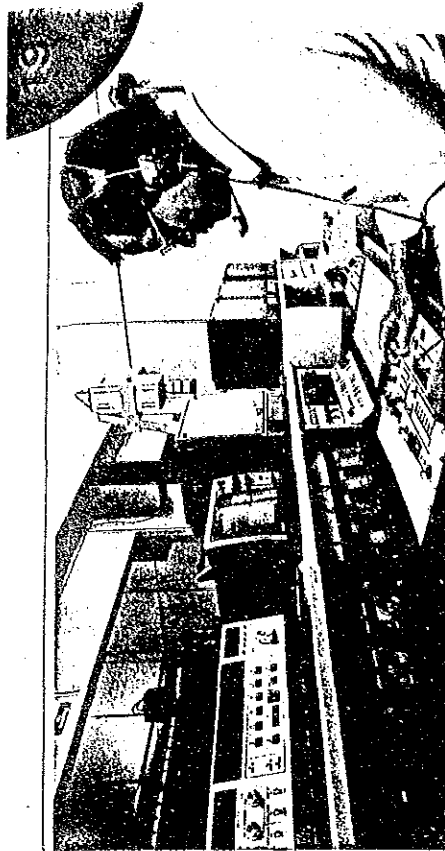
### British Computer Society/National Computer Board (BCS/NCB) Part I Examinations

These courses are of six to nine months' duration for each subject, the number of years taken to complete the examinations depending on how many subjects the student wishes to study in any one year. The courses are co-ordinated by the Department of Continuing Education but conducted by the Department of Mathematics and Science.

Candidates for the courses require a registration for the examinations issued by the Professional Examination Secretariat of the National Computer Board.

### Certificate of Competency Grade 2 Engineer (Steam) Examination

This course is of one year's duration. The course is co-ordinated by the Department of Continuing Education but conducted by the Department of Marine Engineering. The Ministry of Labour conducts examinations for the Certificate of Competency Grade 2 Engineer (Steam).



*The Department of Educational Technology is fully equipped with video production facilities.*

## Department of Educational Technology

### Staff

#### Education Technology Officer

Seo Wai Man  
HND Elect (Mar), ROGC, Radar Maint, ENEM

John Cable  
B Sc, Dip Ed, M Ed, C Eng, MIEE, MSIM

#### Lecturers

Chan Pak Hong  
Tech Dip (Arch D'ship)  
Margaret Chia-Watt Wong Chun (Mrs)  
Ing (Grad), Dip Ed, B Ed, VDI, MACE

#### Iain Ewing

B A (Hons)  
C Ken Meierdiercks (Dr)  
B A (Humanities), M S (Education), M S (Ed Tech), Ph D (Curriculum)

#### Teaching Assistant

Tay Boon Chwee (on study leave)  
Tech Dip (Elec), T Eng (CEI), MIE

#### Electronics Officer

Lee Siang Neng  
Tech Dip (EEE), DIM

The Department of Educational Technology supports the Polytechnic's curriculum development activities by conducting courses and seminars in teaching methods for staff new to teaching and for staff involved in course design and development.

The Department's Audio Visual Aids Unit includes a TV studio and portable TV recording facilities together with an extensive range of audio-visual equipment for use in the Polytechnic's classrooms and lecture theatres.

The Department provides assistance and guidance through its Teaching Resources Centre and Graphic Studio in the preparation and use of teaching materials and aids.

The computer-based Teaching Resource Centre is also under the direction of the Department.

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In the Language Laboratory

## Department of English Language

### Staff

#### Head

Ng Chee Hian  
B A, Dip PA, Dip TEFL, M A, Cert in Socio-  
Linguistics

#### Deputy/Section Head

Nelly Kwa (Mrs)  
B A, Dip Appl Ling

#### Section Head

Liang Mun Ling (Ms)  
Cert Ed, Cert TESL, M A

#### Lecturers

Cheong Thye Yuen (Mdm)  
B A (Hons), M A

Chin Kim Yoon  
B A (Hons), Cert Ed, Cert TESL, Cert in  
Dev. of Comm. Skills

Chng Suan Tze (Miss)  
B A, Dip Ed, M A

Graham D Colin-Jones  
B A (Hons), PGCE, Dip TEFL, M A in  
TEFL

Foong Wai Ping (Miss)  
B Soc Sc, Dip TESL

R M Gochioco (Ms)  
B S E, M Ed, Dip Adv Ling

Pearly Kwa (Mrs)  
B A (Hons), Dip Ed

Constance Lee (Miss)  
B A, Cert Ed, Dip TEFL

Lee Joo Choo (Mrs)  
B A, Dip Ed, M A

Leong Siew Lin (Miss)  
B A (Hons), Dip Ed, M A (FLE)

Lim Chen Chong  
Cert Ed, Dip TEO, M A

Lim Lee Hua (Mrs)  
B A (Hons), Cert Ed

Patrick Low (Mrs)  
B Soc Sc (Hons), Dip TESL, MA (Appl Ling)  
Nguyen Thi Binh (Miss)  
BA, Dip Ed

Lee Poh Ringrose (Mrs)  
Sec Tchg Cert, Dip TESL, M Ed with TEFL  
Seh Mee Gek (Miss)  
B A, M A (Hons)

Constance Singam (Mrs)  
B A (Hons)

Mahalakshmy Sripathy (Mrs)  
B A (Hons), Dip Ed, Cert TESL, Dip Appl  
Ling

Tan Kim Hook  
Cert Ed, Dip TESL, Cert TESL, Adv Cert  
(Mat Prod & Textbk Writing), M A (Ling)

Mary Tan (Mrs)  
B A (Hons)

Constance Wee (Miss)  
B Ed, Dip Ed, M A

Wong Kim Hoh  
B A (Hons)

The English Language Department conducts courses to help students from all academic departments develop communication skills in English. All first-year students take English for Academic Purposes which helps them develop study skills essential for their technical education at the Polytechnic. Third-year students take English for Occupational Purposes which equips them with communication skills necessary in a job situation.

Students attending the Pre-Sea course in the Department of Nautical Studies follow a specialised course emphasizing English as the international maritime language.

Students doing the Diploma course in Business & Communications take a two-year course which focuses on communication skills for business.

The Department also conducts an optional course, open to students who wish to improve their oral communication skills; a business communication course for part-time students doing the Certificate course in Industrial Management; a short course for supervisors wanting to improve their communication

skills and also some ad-hoc courses in response to requests.

In addition to the above programmes, the Department runs a Self-Access Learning Programme to help any student who wishes to improve his language ability. In this programme students can choose materials to work on in their own time and at their own pace.

### The Self-Access Centre

Materials designed to improve students' English are available in the Self-Access Centre, T4A53. Self-Access means that students can choose the materials they wish to work on to improve either their listening, reading or pronunciation skills, and work on them at their own time. They can choose materials at a level they are comfortable with as the materials, which cover a wide range of topics, are graded. There are cassette tapes and reading texts to choose from, and both are accompanied by worksheets at different levels.

On completion of the worksheet, the student checks his answers against the answersheet. If he has any questions he can consult a lecturer for help, or he can read the cross referenced grammatical explanations.

All first-year EL2 students are required to complete a minimum of four worksheets in the first term. For EL1 students, attendance at the Self-Access Centre is optional, but those with grade 7 at 'O' level are encouraged to use the facilities. If they are re-sitting 'O' level English, there is a section of materials devoted entirely to 'O' level reading comprehension. The Self-Access Centre is open from Monday to Friday, 9 am to 5 pm.

### Courses

#### Full-Time

- 0005 Communication, Pre-Sea Deck Cadet Course  
1501 English for Academic Purposes  
1502 English for Occupational Purposes  
1511 Business English I  
1512 Business English II

#### Evenings-Only

- 6448 Communication Workbook I & II

Optional Course  
Oral Communication

**Short Course**

Basic Communicating Skills for Supervisors.

**ARELS Oral Examination (Higher Certificate)**

The Department offers an oral communication course to prepare students for the Oral Examination (Higher Certificate) conducted by the Association of Recognised English Language Schools in the U.K.

Students receive 60 hours of training after which they take the examination. Areas tested are Social Responses, Intelligent Speech, Listening Comprehension, Fluency and Oral Accuracy.



*The Department of Mathematics & Science conducts computer programming classes for all engineering students.*

## Department of Mathematics & Science

### Staff

#### Head

Tan Guan Eng  
B Sc, M Sc, M A Sc

#### Deputy Head

Ng Ser Hong (Dr)  
B Sc, M Sc, Ph D, Cert Ed

#### Section Heads

Chia Chee Liong  
B Sc (Hons), M Sc (Comp Appl)  
Liao Kuo Tang  
B Sc (Hons), M Sc (Mech Eng)

Loh Sai Mee (Mrs)  
B Sc, M Sc

Ow Ee Nah (Mrs)  
B A (cum laude), M S, Cert TESL

Sim Chor Hee  
B Sc, Cert Ed

#### Senior Lecturer

Kan Yew Kok  
B Sc, Postgrad Dip (Environ Control)

#### Lecturers

Chan Kah Leong  
B Sc, M Sc (Computing)

Chan Ksiong Chee  
B Sc

Chao Yunn Chyi  
B Sc (Hons), Dip Ed

Chee Lim Cheung  
B Sc (Hons), M Sc

Cheng-Wong Lee Ling (Mrs)  
B Sc

**Lilian Chew (Mrs)**  
B Sc (Hons), Tech Dip (Elec & Comm),  
M Sc (Comp Sc), DIC (Comp Sc)  
**Chuah Ban Keat** (on study leave)  
B Sc  
**Goh Bee Lan (Mrs)**  
B Sc, Tech Dip (Elec & Comm)  
**Kandiah Sivaruban**  
B Sc (Hons), M Sc, AMBCS, MORS  
**Kok-Mak Chew Pheng (Mrs)**  
B Sc (Hons), Dip Ed, M A  
**Lam Kim Loy**  
B Sc, M Sc  
**Law Kim Seng**  
B Sc, Tech Dip (Civil)  
**Lee Hock Chew**  
B Eng (Mech) (Hons)  
**Leow-Yeo Lee San (Mrs)**  
B Sc (Hons)  
**Liew Beng Keong**  
B Sc (Joint Hons), GIMA  
**Lim Kah Jin**  
B E (Elec)  
**Lim Fung Chai**  
B Math (Hons), Tech Dip (Elect & Comm),  
MIEE  
**Lim Seow Koon**  
B Sc (Hons), M Sc (Software Dev & Anal),  
Tech Dip (Elect & Comm)  
**Loh Yoke Leong (Mrs)**  
B Sc, Tech Dip (Mech)  
**Ng-Lee An Chee (Mrs)**  
B Sc (Hons) (Mathematical Sciences & Com-  
puting)  
**Ong Chwee Sim (Mdm)**  
B Sc (Hons)  
**Ong Ee Heng**  
B Sc, CGFTC (Elect), Tech Dip (Elect &  
Comm), Dip Ed, Postgrad Dip (Computing),  
MBIM  
**Ong Joo Ling (Mrs)**  
B Sc (Hons)  
**Ong Siew Khim (Mrs)**  
B Sc (Hons), Tech Dip (Elect & Comm),  
M Sc (Computation), Assoc UMIST

## Laboratories

The Microcomputer Laboratories are equip-  
ped with clusters of microcomputer systems.  
Each cluster consists of hard disk drive, a  
cartridge tape drive, floppy disk drives, dot-  
matrix printer and terminals. The microcom-  
puters run on a multi user operating system.  
The systems support BASIC, FORTRAN,  
COBOL, C and PASCAL compilers and  
Mathematics/Statistics application packages.

The Microcomputer Laboratories cater for  
the practical training on computer program-  
ming for first and second-year engineering  
students. They are also used by final-year  
students for computer-based projects.

The Environmental Science Laboratory is  
equipped with facilities for the study of air  
pollution and water pollution. The equipment  
includes pH meters, SCT Meters, dissolved  
oxygen meters, carbon monoxide testers, high  
volume air samplers, tape samplers and  
Dräger multi-gas detectors.

The Engineering Physics Laboratory is used  
by first-year Civil Engineering, Land Survey-  
ing and Mechanical Engineering students for  
practicals in Mechanics, Heat, Lighting,  
Sound and Electricity. It is equipped with  
modern light sources and facilities to conduct  
lighting appraisals.

**Yap-Oh Eng Wee (Mrs)**  
B Sc (Hons) (Chem Eng)  
**Yeo Soo Ngoh nee Lim (Mrs)**  
B Sc (Hons), M Sc, Dip Ed  
**Yip Chun Ho (Mrs)**  
B Sc, Tech Dip (Mech)  
**Yu Sing Shyr**  
B Sc (Hons), Tech Dip (Elect & Comm),  
Dip Ed

**Principal Instructor**  
**Louis Chee Fook Hin**

The Department of Mathematics & Science  
provides instruction and conducts practical  
and laboratory classes in Mathematics, Com-  
puter Programming, Engineering Physics,  
and Environmental Engineering for students  
of the engineering departments. These sub-  
jects form an important part of many full-time  
and part-time courses as they constitute the  
theoretical basis for engineering studies.

A close liaison with the engineering depart-  
ments ensures that instruction in these sub-  
jects is relevant to their courses.



A Microcomputer Laboratory.

### Courses for British Computer Society/National Computer Board Part I Examination

The Department offers part-time evening courses to prepare students for the Part I Examination conducted by BCS/NCB. Prospective students are advised to obtain a valid registration for the Examination issued by the National Computer Board before enrolment.

Students will sit for the General Papers I and II after the first year of study. In the second year, they have to select two of the following three options offered by the Department:

Option 1A - Fundamentals of Computer Technology

Option 1C - Analysis, Design and Development of Information Processing Systems

Option 1E - Computer Management

Courses for April 1988 Examination will commence in June 1987. Please contact the Department for further enquiries.

### Short Courses

#### (A) Engineering Mathematics

This course is designed for Diploma graduates who intend to pursue an engineering degree course. The contents and level of instruction are similar to those found in first-year engineering courses of most universities.

#### (B) FORTRAN Programming

This course is to equip participants with sufficient knowledge and skill in FORTRAN Programming.

#### (C) Introductory UNIX for Programming

This course is intended for computer users, programmers and professionals who wish to learn and use UNIX as a tool for software and system development.



The Library subscribes to 1,100 current periodicals.

## Library

### Staff

#### Librarian

R D Yeap (Mrs)  
FLA, ALAA

#### Deputy Librarian

Teo Koon Neo (Mrs)  
ALA

#### Assistant Librarians

Mary Goh (Miss)  
ALA

Ng Say In (Mrs)  
ALA

Poh Guan Huat  
B A (Hons), Grad Dip Lib

Willie Tham (Mrs)  
ALA

#### Library Assistants

Malnaveley Chelladurai (Miss)

Chia Wei Fun (Mrs)

Post-grad Dip in Lib & Info Science

Fong Lai Mei (Miss)

Post-grad Dip in Lib & Info Science

Lee Hok Fai

B A Post-grad Dip in Lib & Info Science

Ambika Raghavan (Miss)

Post-grad Dip in Lib & Info Science

Seah P Poh (Miss)

B Sc

Tan Sin Guek (Miss)

B A (Librarianship)

Toh Kian Tiong (Mrs)

Wong Chee Wah (Mrs)

ALA

Yeoh Seok Kwan (Miss)

B A

The Singapore Polytechnic Library contains a collection of approximately 155,000 volumes. The main collection consists of books on engineering, science, technology and business related to the curriculum in the various departments of the Singapore Polytechnic.

The Library provides staff and students of the Singapore Polytechnic with facilities for reference and study. All students enrolled in courses at the Singapore Polytechnic may register at the Library, and borrow books from the Library.

The Library is open to visitors only by permission. Senior executive staff of government departments, statutory bodies, professional associations and industrial and commercial firms may apply for permission to use the Library for reference purposes.

The Reference Department contains encyclopaedias, dictionaries, bibliographies, abstracts and indexes, and a complete collection of British Standards, ASTM Standards and SISR Standards. There is also a collection of trade literature on engineering products, and

a newspaper clippings file on technical education and industry.

The Learning Resource Centre contains a large collection of audio-visual materials. Viewing facilities include television monitors, video cassette recorders and tape/slide projectors.

The Serials Department displays the latest periodicals on engineering, technology and business. The Library subscribes to 1,100 current periodicals.

Members of the Library staff will be pleased to answer readers' enquiries, and to help them in using the resources of the Library.

### Opening Hours

#### During Term

Mondays to Fridays : 8.00am to 9.00pm

#### Saturdays

: 8.00am to 5.00pm

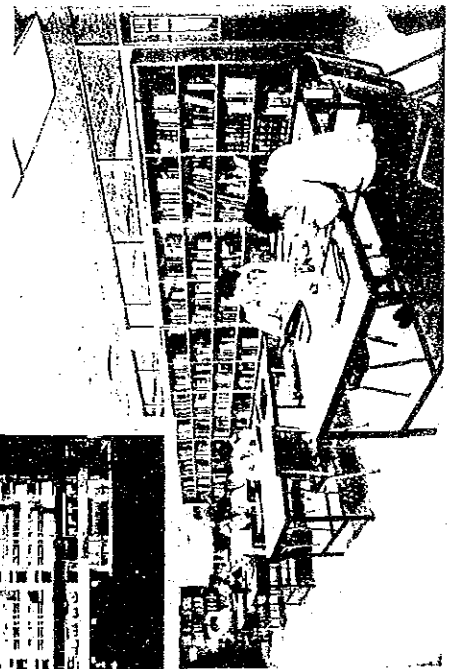
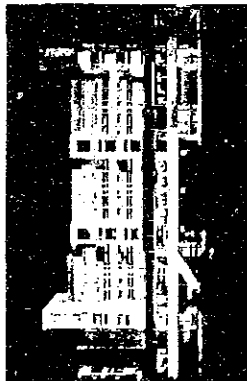
#### During Vacation

Mondays to Fridays : 8.30am to 5.00pm

#### Saturdays

: 8.30am to 1.00pm

## APPENDICES



The Reference Department

# Appendix I

## BURSARIES, SCHOLARSHIPS AND LOANS

### Bursaries and Scholarships

The bursaries and scholarships administered by the Department of Student & Public Affairs are:

- BP Singapore Bursary
- Chew Boon Lay Bursary
- City Developments Ltd Bursary
- CONTECH Bursary
- Hongkong & Shanghai Banking Corporation Centenary Scholarship
- Hong Leong Foundation Scholarship
- Institution of Engineers, Singapore Scholarship
- Insurance Corporation of Singapore Scholarship
- James Raper Trust Fund Scholarship
- Keppel Shipyard Ltd Scholarship
- Kwan Im Thong Hood Cho Temple Scholarship
- Lee Foundation Bursary
- Lim Kah Nagm (S) Pte Ltd Bursary
- Lim Song Scholarship
- McDermott SEA Scholarship
- Nam Hoe & Co Pte Ltd Scholarship
- Otis Elevator Company Bursary
- Pesi B Davar Memorial Scholarship
- Resources Development Corporation Scholarship
- Reuben Meyer Trust Fund Scholarship
- Rotary Club of Singapore (East) Soh Chuan Sweet Memorial Scholarship
- Rotary Club of Queenstown Scholarship
- Sembawang Shipyard Ltd Bursary
- Singapore Association of Shipbuilders & Repairers Scholarship

- Singapore Computer Systems Bursary
- Singapore Hokkien Foundation Scholarship
- Singapore International Chamber of Commerce & Rubber Association Scholarship
- Singapore Masonic Scholarship
- Singapore Polytechnic Students' Union Bursary
- Tan Lian Boh Bursary
- Tan Sri Dr Runme Shaw Scholarship

Other types of bursaries and scholarships administered by donor organisations are normally advertised in the local press before the commencement of the new session. Application forms for these awards are available from the organisations at the addresses given below:

- Fairchild Scholarship Programme**  
11, Lorong 3  
Toa Payoh  
Singapore 1231
- Majlis Ugama Islam Singapore Prophet Mohammed's Birthday Memorial Scholarship**  
Majlis Ugama Islam  
Ministry of Community Development  
Empress Place  
Singapore 0617  
Republic of Singapore
- Ngee Ann Kongsi Scholarship**  
Ngee Ann Kongsi  
97 Tank Road  
Singapore 0923  
Republic of Singapore
- NTUC COMFORT**  
383 Sin Ming Drive  
Singapore 2056
- NTUC Fairprice Co-operative Ltd**  
Zone 4, East Entrance  
National Stadium  
Kallang  
Singapore 1439

### Study Loans

- OCBC Scholarship**  
Overseas-Chinese Banking Corporation Ltd  
OCBC Centre  
65 Chulia Street  
Singapore 0104  
Republic of Singapore
- Polytechnic Study Loans**  
The Polytechnic offers interest-free study loans to full-time students who encounter financial difficulties in the course of their studies.
- Details and application forms are available from the Student Counsellor.
- Rotary Students' Loan Trust Fund**  
c/o Rotary Club of Singapore  
Orchard Point P.O. Box 184  
Singapore 9123

- OCBC Scholarship**  
Overseas-Chinese Banking Corporation Ltd  
OCBC Centre  
65 Chulia Street  
Singapore 0104  
Republic of Singapore
- People's Scholarship Fund Board**  
c/o Central Pay Office  
CPF Building  
Robinson Road #31-00  
Singapore 0106  
Republic of Singapore
- PMBM Scholarship Fund Board**  
583 Geylang Road  
Singapore 1438

- Singapore Chinese Chamber of Commerce & Industry Foundation Scholarship**  
Public Service Commission  
3rd Floor City Hall  
St Andrew's Road  
Singapore 0617  
Republic of Singapore

- Singapore Government Merit Bursary/Special Malay Bursary/Singapore Labour Foundation**  
Public Service Commission  
2nd Floor City Hall  
St Andrew's Road  
Singapore 0617  
Republic of Singapore

- Singapore Indian Education Trust**  
2 Balestier Road  
Singapore 1232  
Republic of Singapore

- \*United Overseas Banking Corporation Group Scholarship**  
United Overseas Bank Ltd  
1 Bonham Street  
Singapore 0104  
Republic of Singapore

\* Open only to children of the UOB group staff.

## Appendix II

### SINGAPORE POLYTECHNIC GRADUATES' GUILD

#### Formation

The Singapore Polytechnic Graduates' Guild was formed and registered with the Registrar of Societies in 1970. The place of operation is the Singapore Polytechnic campus.

#### Objectives of the Guild

The objectives of the Guild are:

1. To promote the interests and development of the Singapore Polytechnic and of its graduates by channelling the accumulated experience of past students into constructive activities as members of the Guild.
2. To facilitate the exchange of information and ideas related to all branches of industrial technology and for these purposes:
  - (a) to hold meetings, exhibitions and visits and such other activities the Guild may deem incidental or conducive to the promotion or attainment of the above objective, and
  - (b) to uphold the character and raise the status and to advance the interests of Singapore Polytechnic graduates.
3. To promote the interests of the members of the Guild.

4. To communicate to members information on all matters affecting the members of the Guild and to print, publish, issue and circulate such publication as may seem conducive to any of the objectives of the Guild.

5. To disseminate any formed opinion of the Guild to the widest extent.

6. To verify any action taken on behalf of the members of the Guild.

#### Membership

The Guild shall consist of Ordinary, Associate and Honorary Members. Ordinary Membership shall be open to all graduates of the Singapore Polytechnic. Associate Membership shall be open to persons who would contribute to and further the objectives of the Guild. Honorary Membership may be conferred on distinguished persons in public life by virtue of their services to the Singapore Polytechnic.

All Singapore Polytechnic graduates are welcome to join the Guild.

Enquiries should be directed to:

The Honorary General Secretary  
Singapore Polytechnic Graduates' Guild  
c/o Singapore Polytechnic  
500 Dover Road  
Singapore 0513  
Republic of Singapore  
Tel: 7788847

## SINGAPORE POLYTECHNIC MAP







Millions of dollars have been invested so that our students get hands-on training on the best terminals available.



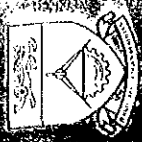
The Computer Centre also attends to the Poly's administrative computing needs.



Computer-Aided Design & Drafting is taught in all engineering courses.

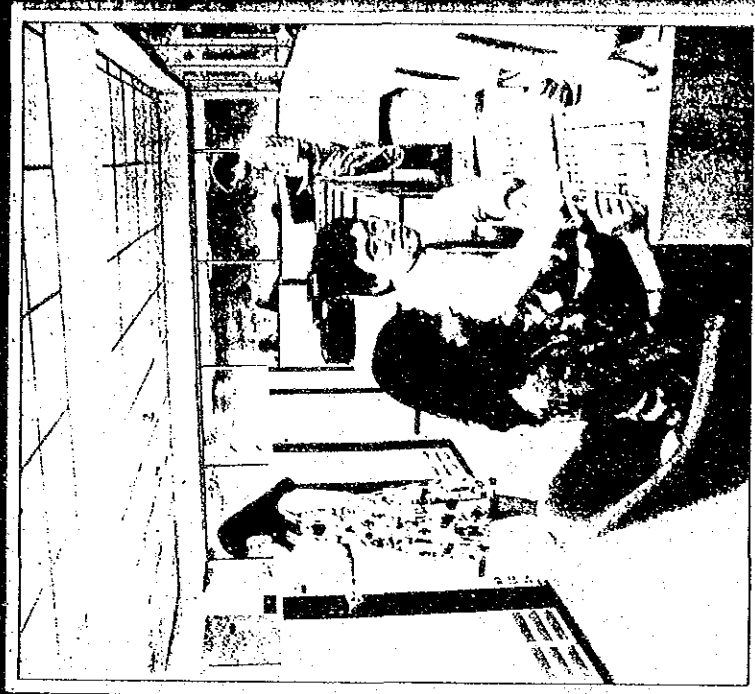
Diploma courses available at Singapore Polytechnic  
 Architectural Technology • Business & Communications • Building • Chemical Process  
 Technology • Civil Engineering • Electrical Engineering • Electronics & Communication  
 Engineering • Land Surveying • Manufacturing Engineering • Marine Engineering • Mechanical  
 Engineering • Nautical Studies • Quantity Surveying

**SINGAPORE POLYTECHNIC**  
 Training technologists for tomorrow



**SINGAPORE POLYTECHNIC**

**Computer Centre**



## COMPUTER CENTRE

### INTRODUCTION

The Computer Centre is an academic services department. It does not have its own students. However, it provides supporting services to students coming from all the various departments of the Singapore Polytechnic, be it in engineering or business. All students spend a considerable amount of their time learning and using computers in their courses of studies and project work.

The Centre also attends to the administrative computing needs of the whole Polytechnic. The latest and most advanced computers can be found within our Computer Centre. One of our CADD centres is the largest and most sophisticated of its kind in one educational site in the world. There are 363 computers and terminals within the Centre.

The Computer Centre is organised into three sections, namely the Computer-Aided Design & Drafting Centre, the Engineering Applications Centre and the Office Automation Centre. It is currently managed by 24 administrative staff and 13 lecturers.

### COMPUTER-AIDED DESIGN & DRAFTING CENTRE (CADD)

The CADD Centre is equipped with powerful super-mini computers. This is made up of three VAX 11/780 and four Prime 9955. Together they drive 110 colour Tektronix graphic workstations, 35 colour/BW inter-graphic workstations and 26 alphanumeric terminals. A host of other peripherals like HP, Calcomp, Versatrac plotters and printers are also attached to the super-minis. The software includes special design applications on electronic circuits, mechanical engineering, tool designs, structural designs, architectural floor-planning and modelling and graphical databases.



Singapore Polytechnic has the most advanced Computer-Aided Drafting and Design facilities of any tertiary institution in the world.



There are two CADD Centres in the Poly, with a total of 145 workstations.



The Engineering Applications Centre where the teaching of software applications takes place.

### ENGINEERING APPLICATIONS CENTRE (EAC)

The EA centre is equipped with 63 Apollo engineering workstations and 43 IBM AT micro-computers. These are spread out in 5 well-constructed classrooms and are networked together using the latest DOMAIN token-ring networking technique. Students are able to access their working files from any of the computers in any of the classrooms. There are also many plotters and dot-matrix printers attached to the network.

### OFFICE AUTOMATION CENTRE (OA)

As the name implies, this Centre is responsible for the Polytechnic's Office Automation project and administrative computing needs which includes student records, examination systems, fee collections, staff payroll, inventory, fixed assets and personnel records. A super-mini HP3000/series 48 forms the backbone. A total of 87 HP Vectra micro-computers are networked into 20 sub-groups, making up the various academic and administrative departments, via the Polytechnic's digital ROLM telephone switching system.

### OTHER ACTIVITIES

The Centre also helps in the running of the student's CADD Club, conducts regular training programmes for industry on CADD, micro-applications, engineering applications and provides consultancy services to industry.

### INVITATION

We invite you to come to visit any of our Departments to look at our extensive educational and recreational facilities or to ask questions of our lecturers. Bring your friends.

For details on application procedures, please call

The Admissions Office  
Telephone: 7721882

# SINGAPORE POLYTECHNIC

ANNUAL REPORT 1985-86



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# Singapore Polytechnic Ethos

An ethos is a system of values and beliefs that acts as the guiding principle for all our actions and decisions. The ethos is the spirit behind the corporate philosophy and culture, and provides the ethical framework that helps to achieve the mission and corporate goals.

Our ethos at SP reflects our belief in the importance of the individual, his capacity for growth and achievement, and his desire to serve society.

## 1. BELIEF IN OUR STUDENTS

We believe that:

- our students want to learn and achieve;
- our students have the ability to succeed;
- our students will excel given the right encouragement and environment.

We value:

- their contributions to SP and society.

## 2. BELIEF IN OUR PEOPLE

We believe that:

- our people are our most valuable resource;
- our people can realize their potential given the opportunity, challenge and environment;
- our people will carry out their duties effectively given proper guidance and training.

We value:

- commitment to SP;
- creativity, open-mindedness and initiative;
- pride in work;
- integrity and self-discipline;
- teamwork.

## 3. BELIEF IN THE IMPORTANCE OF LEARNING

We believe that:

- SP's business is the promotion of learning by all;
- quality teaching contributes to effective learning;
- learning 'how to learn' is an essential preparation for life and work;
- learning should be enjoyable for students and staff.

We value:

- the quest for knowledge and personal development.

## 4. BELIEF IN SERVICE TO SOCIETY

We believe that:

- we all make a valuable contribution to the social and economic growth of society;
- we have an important role to play in the upgrading of the workforce;
- we should and can meet the changing needs of society.

We value:

- our close links with industry.

## 5. BELIEF IN EXCELLENCE

We believe that:

- we should strive towards excellence in everything we do.

We value:

- quality work;
- achievement;
- effective and efficient systems.



# SINGAPORE POLYTECHNIC

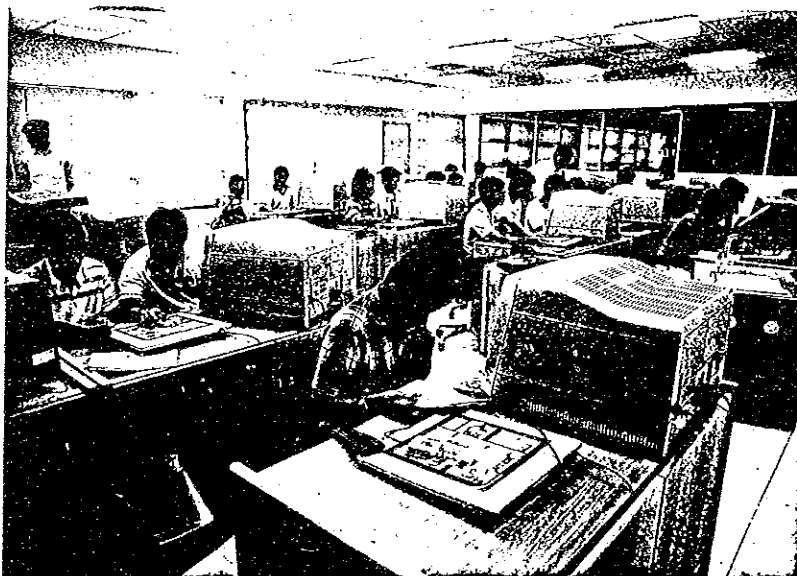
ANNUAL REPORT 1985-86

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Cover and left:  
From computer-aided drafting and  
design workstations to supermicros  
for the teaching of software  
applications, the Singapore  
Polytechnic has some of the most  
advanced teaching aids in the world.

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# The Board of Governors and its Standing Committees

## The Board

### Chairman

Mr Chua Chor Teck  
(up to 13 January 1986)  
Group Managing Director  
Keppel Shipyard Group

### Deputy Chairman

Mr Lee Keh Sai  
Principal Consultant  
K S Lee & Associates

### Members

Mr Peter Chia  
Managing Director  
Singapore Engineering &  
Consultancy Services Pte Ltd

Prof Choo Seok Cheow  
Head, Electrical Engineering  
Department  
National University of Singapore

Mr Eric Gwee Teck Hai  
Marketing Director  
Esso S'pore Pte Ltd

Dr David F Haines  
Managing Director  
Industrial & Offshore Computer  
Services (S) Pte Ltd

Mr Khoo Kay Chai  
Principal  
Singapore Polytechnic

Mr Koh Yong Guan  
Director  
Administration Division  
Ministry of Education

Mr Lai Chun Loong  
Managing Director  
Chartered Industries of S'pore  
Pte Ltd

Mr Lam Sheung Lim  
Director  
SM Motors Pte Ltd

Prof Brian Lee  
Dean, School of Electrical &  
Electronic Engineering  
Nanyang Technological Institute

Mr Lim Boon Heng  
Assistant Secretary General,  
NTUC & Member of Parliament  
for Kebun Bahru

Mr M F Morrisette  
Managing Director  
Fairchild S'pore Pte Ltd

Col Ng Jui Ping  
Chief of Staff, General Staff &  
Asst Chief of General Staff  
(Operations)  
Ministry of Defence

Mr Yutaka Ohtsuka  
Managing Director  
Chiyoda S'pore (Pte) Ltd

Mr Soe Aung  
General Manager  
Fleet Management Division  
Neptune Orient Lines Ltd

Mr Tan Chin Nam  
General Manager  
National Computer Board

Dr Guido Zargani  
Managing Director  
SGS Semiconductor Pte Ltd

### Secretary

Mr Teh Yap Cheng  
Head (General Administration)/  
Registrar  
Singapore Polytechnic

## Administration Committee

### Chairman

Mr Lee Keh Sai

### Deputy Chairman

Prof Choo Seok Cheow

### Members

Mr Eric Gwee Teck Hai  
Dr David F Haines  
Mr Khoo Kay Chai  
Mr Koh Yong Guan  
Mr Yutaka Ohtsuka  
Mr Tan Chin Nam

### Secretary

Miss Caroline Hu

### Assistant Secretary

Mrs Cheng Cheng Lin

## Development Committee

### Chairman

Mr Chua Chor Teck  
(up to 13 January 1986)

### Deputy Chairman

Mr Lee Keh Sai

### Members

Mr Peter Chia  
Mr Khoo Kay Chai  
Mr Lai Chun Loong  
Mr Lam Sheung Lim  
Prof Brian Lee  
Mr Lim Boon Heng

### Secretary

Mr Mok Tuck Yee

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## Board of Studies

### Chairman

Mr Khoo Kay Chai

### Deputy Chairman

Dr N Varaprasad

### Members

Mr John Cable  
Mrs Goh Mui Cheng  
Mr M V Jarman  
Mr Richard Jay  
Mr Graham Colin-Jones  
Dr Khoo Poon Tong  
Mr Kwa Tjong Liem  
Mr Liew Beng Keong  
Mr Mok Chee Ho  
Mr Ng Chee Hian  
Mr Ng Man Choong  
Mr Ong Boon Ling  
Mr Ong Kho Keng  
Mr Quah Kok Wah  
Mr J B Senanayake  
Capt R V Seshamani  
Capt R F Short  
Mr Tan Guan Eng  
Mr Tan Yu Toh  
Mr Teo Chye Poh  
Dr Teo Teck Moh  
Mr J C Thompson  
Mr Tu Myint  
Mrs R D Yeap  
Mr Yee Fook Hwa  
Mr Yeow Kian Peng

### Member-cum-Secretary

Mr Teh Yap Cheng

## Management Team

### Principal

Mr Khoo Kay Chai

### Deputy Principal (Academic)

Dr N Varaprasad

### Deputy Principal (Planning)

Mr Cheng Huang Leng

## Administration

### Project Director

Mr Mok Tuck Yee

### Head, Finance/Bursar

Mrs Cheng Cheng Lin

### Head, General Administration/ Registrar

Mr Teh Yap Cheng

### Head, Personnel

Miss Caroline Hu Wei Choo

### Head, Student & Public Affairs

Miss Ann Chiang

## Academic Departments

### Head, Chemical Process Technology

Mr Yeow Kian Peng

### Head, Civil Engineering & Building

Mr Ong Boon Ling

### Head, Electrical Engineering

Mr Teo Chye Poh

### Head, Electronics & Communication Engineering

Dr Khoo Poon Tong

### Head, Marine Engineering

Mr J C Thompson

### Head, Mechanical & Manufacturing Engineering

Mr Quah Kok Wah

### Head, Nautical Studies

Capt R F Short

## Academic Services

### Head, Computer Centre

Mr Peter J Bowyer

### Head, Continuing Education

Mr M V Jarman

### Head, Educational Technology

Mr John Cable

### Head, English Language

Mr Ng Chee Hian

### Head, Mathematics & Science

Mr Tan Guan Eng

### Librarian

Mrs R D Yeap

# The Year Under Review

The year under review was the fourth year of the Polytechnic's five-year expansion programme. As the physical expansion programme moved towards completion, the Polytechnic looked towards establishing qualitative changes in its internal operations through a corporate planning exercise.

**Corporate Plan.** The need for a corporate planning programme was identified in late 1984 with the major physical planning for the campus expansion completed. Management felt it an opportune time to examine administrative systems, systems of communication among staff and students and human process skills.

As a result, a consultant was hired to facilitate the corporate plan. The formulation of Singapore Polytechnic's mission, corporate goals, ethos, departmental and unit objectives and individual tasks came about. Staff were trained in interpersonal skills through in-house courses which were seen as critical to the success of the corporate plan.

All senior administrative and academic staff underwent in-house courses in Transactional Analysis, Team Building, Job Analysis Techniques and Integrated Team Building. The courses were aimed at achieving better communication and a clearer definition of the roles and responsibilities of staff.

Arising from the corporate plan has been a greater emphasis on student-centred teaching, which focuses on the student, his needs and abilities, how he learns and how he applies his knowledge and skills. Student-centred teaching has resulted in a review of curriculum, teaching and assessment methods.

To achieve excellence in management, the structure of all departments was reviewed. A corporate management team, consisting of the Principal and his two Deputy Principals, was set up; Section Heads of various departments were identified in an attempt to rationalise the departmental span of control and clarify roles, procedures and responsibilities.

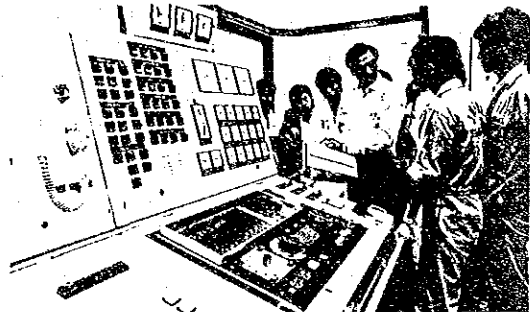
In line with the call for excellence in management, the Polytechnic embarked on a \$2.5 million office automation programme to increase the efficiency of its internal operations. Each department, whether administrative or academic, was allocated its own cluster of microcomputers, networked together, to provide data processing, word processing and electronic filing services. In addition, a computerised PABX and digital telephones with the latest features, were purchased.

To provide relevant programmes, the Polytechnic reviewed all courses offered, testing their content and relevancy to the needs of industry and Singapore. Advanced diploma courses were developed for graduates looking for an avenue to upgrade

themselves in specific skills and in the application of new technology and techniques so that they could perform better in their jobs. The first three courses offered were Tool Engineering and Design, Building Maintenance Management and Food Technology.

Attention was also paid to the provision of a conducive learning environment for students. Study areas and recreational facilities were developed and enhanced to increase staff-student rapport and promote cohesion. Wednesday afternoons were set aside for all students and members of staff to participate in mass events, sports and recreational activities.

Another outcome of the corporate plan was the evolution of the Singapore Polytechnic Ethos, to reflect the corporate culture and philosophy of the institution. The Singapore Polytechnic Ethos reflects a belief in the importance of the individual, whether student or staff, his capacity for growth and achievement and his desire to serve society.



Learning what to do in the Engine Control Room of a ship in the Marine Engineering Department's new simulator complex, CAESER.



Much emphasis is placed on student projects for a well-rounded Polytechnic education. Here, Benjamin Tan, a mouth artist, is trying out a motorised easel created for him by students from the Department of Mechanical and Manufacturing Engineering.

**Administration.** To cope with the increasing demands of an expanding Polytechnic, a Deputy Principal (Academic) was appointed, a new position. In addition, the Departments of Student and Public Affairs were merged under one banner.

**Innovation Development Fund.** An Innovation Development Fund was set up in April 1985, in keeping with the Polytechnic's corporate goal of encouraging the innovative development and practical application of engineering technology relevant to the needs of industry.

The objectives of the Fund were firstly, to support the inherent innovativeness of staff and students and secondly, to encourage the application of skills to the solution of practical, shop-floor problems.

The Fund was envisaged to support and expedite application of known technology through process or product development. Identified among its possible uses were student projects involving the design and development of prototypes; staff projects arising from the perceived needs of industry; studies identifying problem areas in industry; funding assistance for the application of patents and provision for any project in applied technology taking place within the Polytechnic.

During the year under review, nine projects, totalling \$137,200 in value, were approved for development. These included a low-cost automated surveying system (Civil Engineering & Building), a process control simulator (Electrical Engineering), and a microprocessor-based non-intrusive flow meter (Electronics & Communication Engineering).

In view of the encouraging response from staff members, the Polytechnic decided to increase the Innovation Development Fund from \$260,000 in April 1985 to \$640,000 in February 1986.

**Graduate Advisory Committees.** In December 1985, a proposal for the setting up of Graduate Advisory Committees for each of the full-time regular courses of the Singapore Polytechnic was approved. The first committee was established on 5 March 1986.

Graduate Committees were meant to complement the existing Advisory Committees serving the Polytechnic on which managers from industry and government and statutory boards sit. The Graduate Committee, comprising graduates with three to ten years of relevant industrial experiences in technological practice, would provide feedback from the perspective of practising technologists, thus enabling students to gain an insight into the working experiences of their predecessors and further enhance the linkage between the Polytechnic and industry.

**Computer Centre.** In the year under review, the Computer Centre expanded its role from a purely administrative department to a service department with increasing emphasis on support for academic activities. With staff numbers rapidly in-

creasing from 17 to 37, the department focussed on three main activities: Computer-Aided Design and Drafting, Engineering Applications and Administration Support Services.



For the new Advanced Diploma course in Building Maintenance Management, sound-testing practicals form part of environmental studies.



Part of the training on the Medical Laboratory Technology option of the Chemical Process Technology diploma course is learning how to do chemical analysis at the Department of Pathology.

**New Facilities.** A highlight of the year was the completion of the long-awaited sports complex with its Olympic-size swimming pool and adjacent staff centre. The complex, built at a cost of about \$9 million, also houses a large sports hall, gymnasium and fitness rooms and a fifth canteen for students. Adjoining the complex is a new Student Affairs Centre which houses the Department of Student and Public Affairs.

**Milestones in Curriculum Development.** A new direction in curriculum took place with the introduction of a new Diploma course in Business & Communications. A non-engineering diploma, the course was intended to meet the demand of Arts-stream students looking for training in areas

vital to the servicing of the economy. The first planned elective of the course was in Transport and Distribution. The course replaced the former Diploma in Maritime Studies (Shipping Commerce) course under the Management Section of the Nautical Studies Department.

The 1985-86 session saw the launching of a joint Singapore Polytechnic-Singapore Armed Forces diploma scheme aimed at 'O' level school-leavers wishing to make a career in the technical services of the armed forces. 220 students joined the Republic of Singapore Air Force and Navy courses in the electronics, electrical, mechanical (Air Force only) and Marine (Navy only) disciplines. The Army planned to offer an electronics course for the 1986/87 session.

Students recruited by the SAF under this scheme are sponsored by the Ministry of Defence throughout their three-year diploma course and receive an allowance for this duration. Upon graduation they would serve the SAF for a period of six years.

Academically, the year also marked the completion of upgraded syllabuses for the Departments of Chemical Process Technology and Electronics & Communication Engineering.

The Chemical Process Technology Department finalised a new option for students in Medical Laboratory Technology. Developed in collaboration with the Ministry of Health, the option would answer the need for trained technologists in a field which formerly had to employ fresh 'O' level graduates and train them on-the-job.

The Electronics & Communication Engineering Department completed the preparation of four new options for its final-year students, to be offered in the 1986/87 session. The options were Computer Engineering, Instrumentation and Control, Integrated Electronics and Telecommunication Engineering.

It was projected that the Computer Engineering option could take in a slightly higher number of students due to its popularity and the demand from industry. The first intake was projected to be 160 students for the Computer Engineering option and 120 students for the other three options.

In line with the emphasis on hands-on training in the curriculum, the Marine Engineering Department installed a \$1.5 million simulator called CAESER (Computer-Aided Electronic Systems Engineering Resource) in a specially-designed building. Simulating control and engine room machinery found on board ships and in process plant environments, CAESER could be used to enact real life crises so that students would study different approaches in handling emergency situations.

English proficiency for academic and occupational purposes was given special emphasis. For the

*A lecturer of the Electronics and Communication Engineering Department shows students how to start up the three new super minicomputers in the Computer Operations laboratory.*



*Land Surveying students logging data from an electronic theodolite and distance meter into a computer for surveying computations.*

technology-based subjects, the use of CAI (Computer-Aided Instruction) was actively explored with the aim of producing an overall strategy for CAI in the near future.

**Career Guidance Activities.** Career guidance activities continued to receive special attention by the Polytechnic. Regular discussions were held with secondary school principals as this was seen as a most effective means of communicating with secondary school pupils. Two major events were organised in conjunction with career guidance; an Open House in December, during which the teaching facilities of the campus were viewed by an estimated 2,500 visitors over the two-day period, and on-campus pre-enrolment talks, which were conducted on a departmental basis from 19 to 21 February, attracting 1,600 secondary school-leavers.

# Student Enrolment & Output

**I**ntake. In the 1985 Admissions Exercise, the Singapore Polytechnic admitted 4,973 students comprising 3,081 full-time and 1,892 part-time students, (Table 1):

Table 1 : 1985 Student Intake

| Type of Course | Certifi-<br>cate | Diploma | Post<br>Diploma | Endorse-<br>ment | Total |
|----------------|------------------|---------|-----------------|------------------|-------|
| Full-time      |                  |         |                 |                  |       |
| 'O' Level      | —                | 2,987   | —               | —                | 2,987 |
| 'A' Level      | —                | 94      | —               | —                | 94    |
| Total:         | —                | 3,081   | —               | —                | 3,081 |
| Part-time      |                  |         |                 |                  |       |
| Day-release    | 24               | —       | —               | —                | 24    |
| Evenings-only  | —                | 1,481   | 367             | 20               | 1,868 |
| Total:         | 24               | 1,481   | 367             | 20               | 1,892 |
| Overall Total: | 24               | 4,562   | 367             | 20               | 4,973 |

This intake of 3,081 full-time students, which represented a 1.8% increase over the previous session, also saw increased intakes in our Electronics & Communication Engineering, Electrical Engineering and Mechanical & Manufacturing Engineering courses.

The Singapore Polytechnic, in conjunction with the Singapore Armed Forces, launched the joint Singapore Polytechnic-Singapore Armed Forces Diploma Scheme with an intake of 220 students. Whilst the Republic of Singapore Air Force had 129 students in the Electronics, Electrical and Mechanical Engineering courses, the Republic of Singapore Navy had another 91 students in the Electronics, Electrical and Marine Engineering courses.

**A**pplications Received. Full-time courses: 5,001 'O' level school-leavers applied for admission to

our full-time courses. 4,644 applied through the Joint Admissions Exercise and 357 through the joint Singapore Polytechnic-Singapore Armed Forces Diploma Scheme. Another 450 applications were also received from Asean applicants.

Response to our 'A' level courses was generally quiet with applications being received from 126 Singaporeans and 196 Asean applicants.

**Part-time courses:** The Polytechnic's part-time courses continued to be a popular avenue for upgrading and attracted 3,275 applications; 2,606 applications for our wide variety of engineering courses, and 669 applications for our Post-Diploma and Advanced Diploma courses.

**Course Popularity.** Our engineering courses continued to be attractive to Joint Admissions applicants, attracting 3,419 or 73.6% of the 4,644 applications received. Our Electronics & Communication Engineering course, in particular, was the most popular engineering course in the Joint Admissions Exercise with 1,713 applicants. Our other engineering courses attracted another 1,706 applications: Mechanical & Manufacturing Engineering — 520; Architectural Technology — 312; Chemical Process Technology — 291; Electrical Engineering — 252; Building & Quantity Surveying, Civil Engineering, Land Surveying — 286; and Marine Engineering — 45 students.

**E**nrolment. The 1985/86 Academic Session commenced on 10 June 1985 with 12,866 students, representing a 31.2% overall increase in enrolment since the commencement of our Expansion Plan in 1982/83, as shown in Table 2 which also illustrates this expansion on a departmental basis:

These 12,866 students were enrolled in the academic levels of the various courses (Table 3):

Table 2: Growth in Student Enrolment

| Department       | 82/83 |       | 83/84  |       | 84/85  |       | 85/86  |       | % increase over 1982 |        |
|------------------|-------|-------|--------|-------|--------|-------|--------|-------|----------------------|--------|
|                  | FT+PT | FT    | FT+PT  | FT    | FT+PT  | FT    | FT+PT  | FT    | FT+PT                | FT     |
| Mech/Mfg         | 3,180 | 1,890 | 3,385  | 1,940 | 3,793  | 2,195 | 3,939  | 2,422 | 23.9%                | 28.1%  |
| Civil/Bldg       | 3,139 | 1,551 | 3,578  | 1,817 | 3,662  | 1,925 | 3,324  | 1,869 | 5.9%                 | 20.5%  |
| Electronics/Comm | 1,447 | 728   | 1,571  | 823   | 2,054  | 1,163 | 2,417  | 1,476 | 67.0%                | 102.7% |
| Electrical       | 987   | 576   | 1,102  | 578   | 1,352  | 658   | 1,559  | 763   | 58.0%                | 32.5%  |
| Chem Process     | 509   | 400   | 606    | 470   | 708    | 535   | 820    | 630   | 61.1%                | 57.5%  |
| Marine           | 291   | 291   | 360    | 360   | 434    | 434   | 438    | 438   | 50.5%                | 50.5%  |
| Nautical         | 252   | 147   | 340    | 216   | 375    | 279   | 369    | 312   | 46.4%                | 112.2% |
| Total            | 9,805 | 5,583 | 10,942 | 6,204 | 12,378 | 7,189 | 12,866 | 7,910 | 31.2%                | 41.7%  |

FT: Full-time Enrolment

PT: Part-time Enrolment

Table 3 : 1985/86 Enrolment Breakdown by Year

| Year  | Full-time | Day-release | Evenings-only | Total  |
|-------|-----------|-------------|---------------|--------|
| 1st   | 2,972     | 28          | 1,152         | 4,152  |
| 2nd   | 2,593     | 23          | 1,232         | 3,848  |
| 3rd   | 2,345     | 35          | 923           | 3,303  |
| 4th   |           | 52          | 858           | 910    |
| 5th   |           | 39          | 614           | 653    |
| Total | 7,910     | 177         | 4,779         | 12,866 |

Females comprised 22.3% of the overall student enrolment with 1,924 in our full-time courses and 955 in our part-time courses. In our full-time courses, females preferred the following courses: Civil Engineering & Building — 753, Chemical Process Technology — 390, Mechanical & Manufacturing Engineering — 277, Electronics & Communication Engineering — 255 students.

**Continuing Education courses.** For our graduates to meet the ever-changing needs of industry, our Continuing Education Department, in conjunction with the various teaching departments, also expanded its courses. In 1985/86, 51 such courses were conducted for 1,634 students as compared to 22 courses for 652 students in the previous session.

**Nautical & Marine Short courses.** Whilst the majority of these courses were designed to prepare students for the Certificate of Competency Examinations conducted by the Marine Department of Singapore, other short courses were also conducted to meet the special needs of the shipping and marine industry. 990 students enrolled for short courses and another 470 for correspondence

courses conducted by our Department of Nautical Studies.

Another 184 enrolled for our Marine Department's short courses and 83 for its correspondence courses.

The detailed enrolment statistics for the 1985/86 Academic Session, as at the sixth week of the first term, is given in Appendix I.

**Graduate Output.** The graduate output in the 1984/85 academic session was 2,867. This was 3.8% higher than the previous session's graduate output of 2,763.

1,887 (65.8%) graduates were from the full-time courses while 980 (34.2%) were from the part-time courses. Compared to the previous session, these represent increases of 5.1% for the full-time courses and 1.3% for the part-time courses. Of the 2,867 graduates, 2,607 received Diplomas while 260 received Certificates.

644 (22.5%) of this year's graduates were females. Courses in which females predominate were Quantity Surveying (94.4%), Architectural Technology (61.2%), Chemical Process Technology (57.7%) and Structural Engineering (56.8%).

Table 4: Comparison of Graduate Output by Department

| Department                              | 1984  | 1985  | % Change |
|-----------------------------------------|-------|-------|----------|
| Chemical Process Technology             | 193   | 191   | -1.0     |
| Civil Engineering & Building            | 888   | 957   | +7.8     |
| Electrical Engineering                  | 225   | 243   | +8.0     |
| Electronics & Communication Engineering | 278   | 319   | +14.7    |
| Marine Engineering                      | 107   | 87    | -18.7    |
| Mechanical & Manufacturing Engineering  | 901   | 945   | +4.9     |
| Nautical Studies                        | 171   | 125   | -26.9    |
| Total                                   | 2,763 | 2,867 | +3.8     |

Diploma in Nautical Studies students receiving instructions in the practice of tanker safety.



# Courses and Curricula

**Academic Trends and Developments.** In FY85 there were several important developments affecting the academic programmes offered at the Polytechnic. As the five-year expansion programme drew to a close, intake reached a peak of 3,209, nearly exhausting the pool of students available for training. This was in line with Government objectives to provide every person with education and training to the highest level he or she is capable of.

With the quality of the intake becoming less homogeneous and more average than before, Polytechnic diploma courses were being revised to provide more broad-based training, with the stress on fundamentals. Advanced Diploma courses were being prepared to provide specialised areas of training after the Polytechnic graduate has worked in industry for a few years. Such courses would be conducted according to demand and developments in technology.

While the pool of Science-stream students was being adequately catered for, there was still a large group of Arts-stream students looking for training places. To meet the demands of this group, the Polytechnic aimed to provide training in areas vital to the servicing of the economy. A Diploma in Business & Communications, with various electives meeting specific needs, was drawn up, replacing the existing Diploma in Maritime Studies (Shipping Commerce). The first elective planned was Transport and Distribution, with Marketing, Information Systems and General Administration as future electives being considered.

The Polytechnic also focussed on providing more opportunities for continuing education for technologists. Training and retraining is seen as intrinsic to every technologist's development, and the Polytechnic was geared to meet this need.

Teaching methodologies were also being reviewed. Lecture-theatre teaching was restricted to second- and third-year students, with first-year students being given more attention in a classroom setting. The need for more hands-on training was recognised, with 50% of instruction hours being practice-based. In line with this, the Polytechnic moved towards continuous assessment as the major means of assessment, together with termly tests. The final Sessional Examination was reduced in weighting.

**Chemical Process Technology.** As the new curriculum completed its second year of implementation, the Chemical Process Technology Department geared itself for the final year of the course structure, in which five course options would be offered by the following session: Polymer Technology, Food Technology, Process Engineering, Industrial Chemistry and Medical Laboratory Technology. These course options were designed in close consultation with the various sectors of the chemical process industry.



*For the Advanced Diploma in Tool Engineering and Design, experience in precision polishing will enable students to appreciate design problems in press tools.*

A Medical Laboratory Technology option, developed jointly with the Ministry of Health, would provide institutionalised training both at the Singapore Polytechnic and the Singapore General Hospital, for technologists to be capable of providing essential back-up laboratory services in the diagnosis, study and treatment of diseases and promotion of health in general. The course would also train students in biotechnology-related activities.

A part-time Advanced Diploma course in Food Technology was finalised for introduction in the 1986/87 session. It was developed to help improve the quality of the existing workforce in the food industry. Emphasis was placed on areas such as food processing, food quality, product development, sensory evaluation, biotechnology and process automation.

The main thrust of the department's laboratory expansion programme was to provide students with more hands-on experience on equipment similar to those used by industry, such as microcomputer-controlled pilot plants, on-line analytical instrumentation and pneumatic circuitry. New laboratories included the Biotechnology and Electroplating laboratories.

Short courses conducted covered areas in food hygiene and microbiological examination of foods. Some of the courses to be offered in 1986 include plant sanitation and pest control, plastics materials characterisation, spectrophotometric techniques and a course (in Mandarin) on plastics materials and processes for the local plastics industry.

As part of the Department's plans to build up in-house expertise in selected areas of specialisation, in-house workshops were organised with industry in such areas as microprocessor-based control of injection moulding machines and ultra-filtration. Overseas attachments were also arranged for staff to be updated on biotechnology, bioreactor design, electroplating and food packaging.

**Civil Engineering & Building.** The Board of Governors approved the amalgamation of two courses, Civil Engineering Construction and Civil Engineering Design, into a single course, the Diploma in Civil Engineering. The new curriculum for the course was oriented towards the broad-based requirements of industry. The course was introduced in the 1986/87 session.

In the 1985/86 session, computer-aided design and drafting was introduced to all second- and third-year students in Architectural Technology, Civil Engineering and Land Surveying. The students were trained to appreciate the scope, potential and application of CADD technology in the production of industrial drawings. The teaching of commercially available application packages to final-year students was slated to commence in the following session.

An Advanced Diploma in Building Maintenance Management was planned for the following session. The course arose from findings of surveys conducted by the Singapore Polytechnic and the Construction Industry Development Board, pointing to an increasing need for building maintenance personnel in the following five years as existing buildings are growing older thereby requiring more maintenance.

The Department continued to receive recognition from professional institutions in the United Kingdom for three of its diploma courses: exemption from Part One of the Institution of Structural Engineers exams for the Diploma in Civil Engineering and from Part One of the Chartered Institute of Building examinations for both the Diplomas in Building and Quantity Surveying.

Five graduate committees corresponding to the department's five courses in Architectural Technology, Building, Quantity Surveying, Civil Engineering and Land Surveying were formed in February 1986. The committees were formed to provide feedback on the relevance of curricula to industry.

Two third-year full-time Building students won first prize in the Technology Fair '86 for their project entitled "Water Saving Service System for Buildings". The project was based on a concept of revolutionised water service systems for buildings, developed by a lecturer.

**Electrical Engineering.** The 1985/86 session saw the introduction of two final-year options in the

Electrical Engineering diploma course, namely, the Electrical Power Engineering Practice and Electrical Installation Design and Practice options. The options were introduced to dovetail with the specific needs of different sections of the electrical engineering industry. The subject content of the two options has been chosen with due regard to the current widespread applications of electronics and computer technology in every field of electrical engineering.

An extensive review of the curricula for the first and second years of the course was undertaken, as well, with changes in the course structure and subject contents to be implemented at a later stage.

Two new laboratories were set up, in Power Electronics and Design Office & Energy Conservation. In addition, new equipment purchased included a Digital Process Control System costing \$98,000, and used for demonstration and hands-on training of final-year students on advanced control techniques and computer control and a universal microprocessor development system costing \$68,000, to be used by final-year students and staff in their project work.

**Electronics & Communication Engineering.** The second-year curriculum was completely revamped and implemented. New subjects introduced included Analog Systems, Linear Networks and Systems and Microprocessor Technology. Subjects such as Analog Communication Systems, Electrical Engineering and Mathematics underwent major revisions.

These revisions were aimed at providing students with a better understanding of the general areas of electronics and preparing them for more in-depth study in one of the four new specialised options, namely, Computer Engineering, Instrumentation and Control, Integrated Electronics and Telecommunication Engineering.



A lecturer instructs third-year Electrical Engineering students in the use of a digital process control computer to operate a model plant.

Extensive preparation was carried out for the introduction of the four final-year options. Activities included the purchase of new equipment as well as the setting up of ten new laboratories which included Software Engineering, Computer Operations, Data Microprocessor Systems Design, Product Communications and Microelectronics.

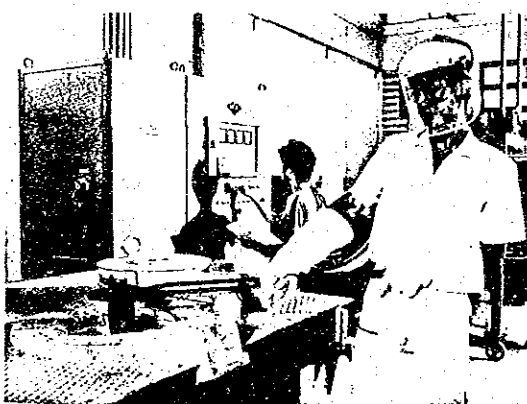
Equipment purchased for the laboratories included a microprocessor development system for training students on microprocessor-based systems design and development; an automatic test system for electronics components testing and test program generation; and microcomputer systems for input/output interface, applications software and local area network training.

**Marine Engineering.** The Marine Engineering Department extensively upgraded its facilities for the hands-on training of its students.

A new purpose-designed building was completed to house a Computer-Aided Electronic Systems Engineering Resource (CAESER). The complex, consisting of a control room, engine room and bridge-cum-instructors' room, was built at a cost of \$600,000 and houses \$1.5 million worth of equipment. It was intended to provide students with practical training and exposure to emergency situations before they encounter a real-life emergency at sea.

A new marine boiler, costing some \$80,000, was installed for training the students in boiler plant operations and maintenance. In addition, a safety laboratory was established and a full range of fire safety and personal protection equipment commissioned, making this laboratory the most comprehensive of its type anywhere.

Other new pieces of equipment were installed to demonstrate and analyse energy conservation techniques and applications.



In the Fabrication Technology option of the Mechanical Engineering course, an induction melting system melts cast iron and non-ferrous alloys.

A number of special courses conducted for industry and outside bodies found very good support. These included Marine Diesel Engine Principles and Practice and Second Grade Steam Engineers' Certificate of Competency (for British Petroleum Co Ltd).

**Mechanical & Manufacturing Engineering.** The new curricula for the second-year of the Mechanical Engineering and the Manufacturing Engineering diploma courses were introduced in June 1985 after the revised curriculum for the first-year common course was successfully implemented during the last session. To prepare our students to face the widespread use of computers in manufacturing and in process control, electronics was introduced into the second-year curriculum of both courses. This is a feeder subject for such subjects as Instrumentation & Control, Robotics and Automation, taught in the third year. In the Manufacturing Engineering course, Work Study was replaced by Industrial Engineering which is more comprehensive and general. In line with the recommendation of the National CAD/CAM Training Committee, Computer-Aided Drafting was introduced as a module in the Engineering Drawing and Design subject which is taken by second-year students.

The session saw the final batch of full-time students taking the Production Engineering diploma course which was being phased out and replaced by the Manufacturing Engineering diploma course. Since its introduction in 1984/85 session, the Manufacturing Engineering diploma course proved to be popular and the trend continued.

The Department also planned an Advanced Diploma in Tool Engineering and Design for SP graduates in the manufacturing industry. The course was given formal recognition by the Singapore Tool and Die Association and the Singapore Die-casting Society. It was conceptualised for graduates working in large companies with a significant role in the designing of tools and fixtures for production.

Laboratory facilities continued to expand. An Industrial Metallurgy Laboratory was set up to supplement an optional subject of the same name offered in the final year. A Vacuum Heat Treatment Furnace, 2-high Rolling Mill, 75-tonne Extrusion Press and Induction Melting Furnace were some of the major equipment acquired for the laboratory to provide students with a thorough grounding in the technology used in fabricating components from metallic materials.

A major event for the department was its annual Project Exhibition of third-year students' projects. A motorised easel for the handicapped artist, radio-controlled ceiling painter and ribbon-bow-making machine were some of the 161 projects featured, which ranged from industrial applications to projects for civil defence.

In cooperation with Heidenhain Pacific Pte Ltd and Leblond Makino Asia Pte Ltd, the department conducted a comprehensive short course on "Installation, Testing and Maintenance of CNC Machine Tools" for maintenance personnel dealing with CNC machines.

The Singapore Polytechnic was elected to chair the Singapore Robotics & Automation Association. The Head of the Mechanical & Manufacturing Engineering Department represented the Polytechnic on the Council.

**Nautical Studies.** As mentioned in earlier sections, the Board of Governors approved the introduction of a Diploma in Business & Communications for the 1986/87 academic year, with the first elective in Transport and Distribution.

These changes were made to reflect the needs of the industry and also to improve the job opportunities and mobility of graduates.

Students of the Diploma in Maritime Studies, evenings-only course, organised a seminar on "A New Approach to Shipping Management". The seminar attracted capacity participation from many sectors of the shipping industry.

Under the Deck Officers' Training section, the Department conducted special short courses for the Republic of Singapore Navy, Esso (S) Pte Ltd, Neptune Shipmanagement Services Pte Ltd and other shipping organisations.

A seminar on Modern Techniques of Safe Tanker Operation was organised and conducted jointly by the Department of Nautical Studies, Esso, Mobil and Shell at the World Trade Centre on 19 and 20 April 1985.

**Computer Centre.** In the period under review, the Computer Centre changed its role from a purely administrative department to a service department with increasing emphasis on support for academic activities.

The year saw the first students undergoing computer-aided design and drafting training using the CADD Centre facilities acquired in late 1984/early 1985. In the first year of operation, approximately 3,000 full-time students received basic training. In addition, Computer Centre staff conducted short courses for industry, training about 300 personnel. Staff training also continued throughout the year and about 250 members went through the courses.

To make it possible for more advanced training to be given, a second CADD Centre was planned for the 1986/87 academic session, to be equipped with four super mini-computers, 110 colour workstations and various printers, plotters, and disc storage devices. The cost to the Polytechnic for this equipment



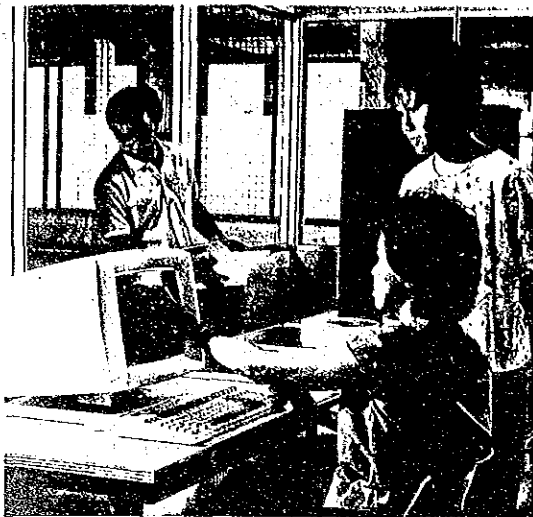
Part of the training on the Medical Laboratory Technology option of the Chemical Process Technology diploma course is learning how to perform urgent biopsies for patients in the operating theatre.



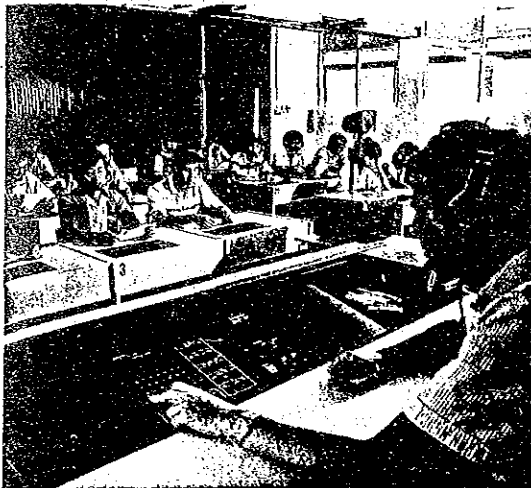
In the Colour Graphics Room of the Marine Engineering Department's simulator complex, a lecturer gives students exercises in starting up the various systems on-board ship.

would be approximately \$3.5 million.

Another development in academic services was the purchase and installation of nearly \$3 million worth of equipment under the project known as Module Three, aimed at teaching students to use applications software and computers, thus reinforcing the learning gained through more conventional teaching methods. The centre housing the equipment is called the Engineering Applications Centre. Equipment purchased consists of 63 Apollo DN300 super-micros, 42 IBM PC-AT microcomputers, printers, plotters and file storage devices, with hardware capable of running a number of popular standard operating systems.



Students learn fault diagnosis and hardware maintenance as part of their computer engineering training in electronics.



English for academic as well as occupational purposes is taught to students of the Singapore Polytechnic.

For the purpose of developing software, and spreading computing expertise throughout the academic departments, a scheme of academic staff secondments to the Computer Centre was introduced. 12 staff members were selected for one-year secondments to enable them to build up computer knowledge. It is felt that this scheme will gradually spread computing expertise throughout the academic departments.

**C**ontinuing Education. The first quarter of the year witnessed a threefold increase in continuing education activities, followed by an intensive review of the needs of industry through a newly-formed standing committee on continuing education.

As a result of the review, the Continuing Education Department offered some 51 courses in the 1985/86 session and made plans to conduct some 100 tuition and short courses during the following session.

The department established a dialogue with public and private bodies to develop and provide retraining programmes.

**E**ducational Technology. Two consultants, from the Seneca College of Applied Arts and Technology, Canada, were based in the Educational Technology Department (ETD), for a total of six months. One, whose area of expertise is in educational video, established a procedure which promotes video production to be initiated and largely carried out by teaching departments. The other consultant provided guidance and instruction in the relatively new and potentially powerful field of learning through interactive video, a new medium in which students interact with computers to further their understanding of a subject. The ETD is now providing teaching staff with the skills to produce software on interactive video learning for students.

A total of 140 staff including 96 staff who were new to teaching completed a three-week course in teaching methods, audio-visual production and course design. In addition, 73 staff attended an educational technology course in the use of wordprocessors.

A contract was placed to complete the provision of video projection systems in the 19 lecture theatres on the Polytechnic campus. This equipment, costing \$230,000, was to be installed by September 1986.

**E**nglish Language. The year saw the opening of the Self-Access Centre in the English Language Department. Response to the programme was encouraging as approximately 500 students came to the Centre during their spare time to improve their English by working on the materials prepared by the staff.

A newly-structured English Language programme was implemented. Under the programme, English was no longer confined to the first year but extended to the third. As a result, the number of students attending English Language courses almost doubled.

Major changes were made to English Language courses. Modules A and B were replaced by English for Academic Purposes (EAP), which was taught to first-year students. The new course emphasized study and communication skills necessary for the preparation of laboratory, project and workshop reports and the writing of examination answers using a task-based cyclical approach. The course is now being revised to provide for a wider selection of teaching/learning materials. A materials bank and a test bank are being set up to supplement the set of revised core materials.

Module C was replaced by English for Occupational Purposes (EOP), which was taught to third-year students. The course resulted from a survey on the communication needs of Polytechnic graduates. Oral communication skills such as speaking on the telephone, making oral presentations, and conducting/participating in meetings were taught for the first time. Oral skills accounted for 40% of the EOP grade.

**L**ibrary. The year was a period of settling into the new building. The new Learning Resource Centre, the Reference Section and the Serials Section were able to give increased services to staff and students because of the new facilities, equipment and extended space. The Library's new VTLS (Virginia Tech Library System) computer system resulted in increased efficiency and productivity. The students and lecturers also used the on-line public access terminals for information retrieval.

There was a large increase in the number of books catalogued, after the computer system was installed. During 1985/86, 11,233 new books were catalogued. The number included 7,777 new titles, 1,139 new editions and 2,317 duplicate volumes. A growth rate of 8.5% was recorded with the addition of 11,633 books to the collection during the report year. By the end of March 1986, the total collection stood at 145,422 volumes.

There were 12,684 registered members as at 31 March 1986, an increase of 89 members.

**M**athematics and Science. In the year under review, the Department continued to focus its activities on the development and improvement of computer education and training. Another major activity for the year was the consolidation and fine tuning of instruction in the subject of Engineering Mathematics for the various engineering courses.

48 microcomputer workstations were acquired at a cost of \$350,000 for the teaching of computer programming. The purchase marks the third and final phase of a \$1.5 million acquisition programme under the Polytechnic's five-year development plan. The department now has 136 workstations, located in its six computer laboratories.

The department continued to offer a number of popular short courses for industry. Courses for the British Computer Society/National Computer Board Part I Examination, considered the first step towards an internationally-recognised professional qualification in computing, attracted about 100 participants. Courses were conducted for two general papers and two optional papers.

A short course in Energy Management was organised together with staff members from the Mechanical & Manufacturing and Electrical Engineering Departments. This was the sixth time that courses in

this area were conducted in conjunction with the Public Utilities Board.

Short courses in Engineering Mathematics and FORTRAN Programming were also organised, primarily for graduates of the Polytechnic, as well as for teaching assistants intending to go for further studies in engineering. In addition, a short course in "Introductory UNIX for Programmers" was organised for computer users, programmers and professionals using UNIX as a productive tool for software and systems development.

**V**acation Training Programme. The number of second-year full-time students liable for the Vacation Training Programme (VTP) increased from 1,789 in 1984 to 2,313 in 1985. The Programme began on 1 April 1985 and lasted between six weeks to eight weeks. Compared with the 1984 Programme, there was an increase of 13% or 240 places offered.

Ninety-six per cent of eligible students were found training places. Most courses, except for Electrical, Electronics & Communication Engineering and Mechanical Engineering had all their students placed.

A total of 621 establishments participated in the Programme, registering an increase of 86 establishments over 1984. Of the 621 participating establishments, 24 or 4% were from the public sector and 597 or 96% were from the private sector. One establishment from Brunei and 11 from Malaysia participated.

342 students or 17% were placed in the public sector and 1,710 or 83% of them were placed in the private sector.

Students from the Maritime Studies course participated in the Programme for the first time.

95% of the students on attachment indicated that they had benefitted from the Programme as compared with 93% in the previous year.

Appendix V gives a list of the participating establishments in the Vacation Training Programme.

**O**ther Matters. The Polytechnic continued to foster academic linkages with tertiary and professional institutions. These linkages provide a valuable channel of assistance for the Polytechnic in enhancing the status of its existing courses and establishing recognition of its new courses. A list of academic linkages is given in Appendix IV.

# Staff

**In-Service Establishment.** As at 31 March 1986, the Polytechnic had an in-service staff establishment of 1,127. Of these 620 were academic, 70 senior administrative and 437 non-academic staff members. These figures represent 97.8%, 92.1% and 90.2% respectively of the approved establishment in these categories.

Table 5 : New Academic Staff, by Department

| Department                              | No. |
|-----------------------------------------|-----|
| Chemical Process Technology             | 9   |
| Civil Engineering & Building            | 13  |
| Educational Technology                  | 1   |
| Electrical Engineering                  | 5   |
| Electronics & Communication Engineering | 21  |
| English Language                        | 3   |
| Marine Engineering                      | 2   |
| Mathematics & Science                   | 4   |
| Mechanical & Manufacturing Engineering  | 11  |
| Nautical Studies                        | 3   |
| Computer Centre                         | 2   |
| Total                                   | 74  |

**New Appointments.** A total of 74 academic, 9 senior administrative and 50 non-academic staff members were appointed. Of the 74 academic staff members, 61 (82.5%) were appointed as Lecturers, 8 (10.8%) Instructors and 5 (6.7%) Teaching Assistants.

82.5% of the academic staff members were appointed on local terms while 17.5% were offered expatriate terms of service.

**Promotions.** Two promotion exercises were carried out in the year under review. In April 1985, of a total of 242 junior staff reviewed, 27 (11.2%) were promoted.

In October 1985, the work performance of all academic and senior administrative staff were reviewed. 21 (3.9%) out of 544 were promoted.

**Resignations & Expiry of Contracts.** Nine academic, 3 senior administrative and 21 non-academic staff members resigned. In addition, 7 academic staff members left the Polytechnic on expiry of their contracts. The turnover rates for the three categories of staff are 2.6% (Academic), 4.3% (Senior Administrative) and 4.8% (Non-Academic). For the organisation as a whole, the turnover rate was 3.6% as compared to 5.4% in the previous year.

**Staff Members Serving on External Committees.** Several staff members served on committees in



Part of the corporate planning process included workshops for staff members on Transactional Analysis and Teambuilding.

government departments, statutory bodies and professional organisations. These staff members were either nominated to represent the Polytechnic in the committees or were appointed in their personal capacities. A detailed list is given in Appendix III.

**Staff Training & Development.** To upgrade the skills of staff and help them keep abreast of the latest developments in technology, arrangements were made for 123 staff members to be attached to industry for practical training or to proceed on further studies, and also study tours/visits.

Industrial attachments lasting between two weeks and six months were arranged with both local and overseas establishments. Overseas training programmes were funded by the Singapore Polytechnic and international agencies, the major ones of which included the United Nations Development Programme and the Japanese Government. 77 staff members completed their training under these development programmes.

A list of those who have undertaken staff consultancy work may be found in Appendix II.

The Polytechnic also sponsored 461 staff members for a total of 260 courses, conferences, seminars and workshops. The majority of the programmes were held locally. A breakdown of the attendance by department is given in Table 6.

A sum of \$745,598 was granted by the Skills Development Fund towards meeting the Polytechnic's staff training and development costs.

**Technologist Diplomate Scholarship Scheme.** Five Teaching Assistants were recruited under the Technologist Diplomate Scholarship Scheme. Under this Scheme, Diploma holders with working

experience are appointed as Teaching Assistants and are required to teach for a year before being considered for an undergraduate course. They proceed for studies either overseas or locally.

**Child Care Services.** In support of government policy to encourage women to join the employment market, the Singapore Polytechnic started a Child Care Centre in June 1985 for the benefit of staff who want quality care for their children. The Child Care Centre was registered with the Ministry of Community Development and aims to provide a congenial environment for the physical, social, intellectual and emotional development of children between the ages of two to six years. Both full-time and part-time care was provided.

Besides offering physical care for the children, programmes appropriate to the age groups and abilities of the children were planned and implemented by staff trained in child care.

Table 6 : Staff Training Statistics by Department

| Department                              | No. |
|-----------------------------------------|-----|
| Principal's Office                      | 1   |
| Planning                                | 7   |
| Dy Principal (Academic)                 | 1   |
| Finance                                 | 11  |
| General Administration                  | 15  |
| Personnel                               | 4   |
| Student & Public Affairs                | 12  |
| Internal Audit                          | 3   |
| Estates & Development                   | 6   |
| Library                                 | 9   |
| Computer Centre                         | 6   |
| Continuing Education                    | 2   |
| Chemical Process Technology             | 35  |
| Civil Engineering & Building            | 70  |
| Electronics & Communication Engineering | 50  |
| Electrical Engineering                  | 28  |
| English Language                        | 24  |
| Educational Technology                  | 7   |
| Marine Engineering                      | 20  |
| Maths & Science                         | 21  |
| Mechanical & Manufacturing Engineering  | 110 |
| Nautical Studies                        | 19  |
| Total                                   | 461 |



At the Polytechnic's new Child Care Centre, the programme for pre-schoolers combines care with instruction and development to make learning an exciting and stimulating experience.



**In-house training programmes.** The Singapore Polytechnic embarked on a massive in-house training programme for staff in support of the Corporate Plan. Training commenced in 1985, and will be an ongoing process. Initially the main thrust of the training programme was towards the development of "people skills", as this had been identified as one of the major training needs of the staff. Workshops on "Transactional Analysis" and "Team-building" were conducted for 680 academic and senior administrative staff. In addition, "Integrated Teambuilding" was conducted on a departmental basis. This latter module enables staff members to put into practice the skills learned in the workshops. Similar workshops have been planned for another 443 non-teaching staff.

Other workshops have been designed for the top management and those holding supervisory positions. They are "Job Analysis Techniques" and "Performance Management & Coaching/Counselling".

A management consultant appointed by Singapore Polytechnic conducted the workshops together with 14 senior staff members who were trained to be facilitators. These facilitators were selected from the various departments within the Polytechnic.

## Student Affairs & Services

**Student Organisations.** A Computer-Aided Design and Drafting Club was formed to promote and enhance interest on the uses and applications of CAD/CAM systems. This brings to 28 the number of clubs on campus which have been set up to cater to different student interests.

The fourth Commex Exhibition, aimed at introducing the electronics course to the public and potential students, was organised by the Electronics and Communication Engineering Club from 10 April to 13 April 1985. The exhibition was opened to schools, industries and the public and attracted about 1,200 visitors.

The Singapore Polytechnic Students' Union organised a Ministerial Talk by Mr Goh Chok Tong, First Deputy Prime Minister and Minister for Defence, on 29 January 1986. The topic was "Economic Recovery, Education and Jobs". More than 900 students attended the talk including about 200 who had to watch it on closed circuit television in an adjoining lecture theatre because of insufficient room in the packed Auditorium. The talk was televised by the Singapore Broadcasting Corporation and aired twice for public viewing.

The Department of Student and Public Affairs organised two six-day leadership training courses at the National Youth Leadership Training Institute, and two Transactional Analysis workshops. These courses, for student leaders, were aimed at improving their leadership and interpersonal skills so that they would be able to contribute more effectively to student life on campus.

**Student Counselling and Guidance.** The Centre assisted students, individually and in groups, with personal problems, career decisions, course choices, financial difficulties, physical and mental health, study problems, accommodation, relationship difficulties and studies overseas.

381 students visited the Centre for counselling and guidance sessions. Some came for extended sessions, making a total of 522 contacts.

Graduates continued to visit the Centre to discuss their career and personal problems.



Students can always approach our Student Counsellors with personal problems or for financial assistance.



The student activities of the various clubs within the Polytechnic range from band performances for the public to adventurous excursions to destinations such as Gunung Tahan.



Students organise drama activities which are staged in our brand new auditorium.

Talks and a workshop of general interest to students were organised and included such topics as further studies in UK and USA, effective interpersonal relationships, stress management, feminine health education and girl-boy relationships.

A 14-hour Youth Skills Workshop was conducted for 29 students on personal awareness, listening and communication, problem solving and decision making and stress and relaxation.

Participants were encouraged to verbalise feelings and thoughts and interact freely with one another to create self-awareness and develop skills in coping effectively with daily situations and issues.

**Personal Tutorship Network.** 134 teaching staff acted as Personal Tutors to 2,631 first-year students from the Departments of Chemical Process Technology, Civil Engineering & Building, Electrical Engineering, Electronics & Communication Engineering and Mechanical & Manufacturing Engineering. Students were encouraged to look upon their Personal Tutors as their friend and mentor and approach them with study and personal problems.



The Deputy Prime Minister, Mr Goh Chok Tong, receives a memento from the President of the Singapore Polytechnic Students' Union, Mr Jason Wong, for giving a talk to students on "Economic Recovery, Education and Jobs."

Personal Tutors attended a two-day workshop which included role-playing and case studies. The workshop assisted the Personal Tutors in coming to grips with a wide range of human problems encountered by students. Some of the topics included counselling skills, dealing with conflicts, solving problems, making decisions and transactional analysis.

The workshop enhanced the effectiveness of the Personal Tutors in helping and understanding students with problems and equipping them with additional knowledge and skills to fulfil their role as Personal Tutors.

**Financial Assistance.** 321 students were awarded various scholarships, bursaries and study grants amounting to \$333,900. In addition, 77 students received study loans amounting to \$74,790. Details of the various awards are given in Appendix VI.

**Physical Education.** Polytechnic students participated in the Institute-Varsity-Polytechnic competitions in 14 different sports. The Singapore Polytechnic team came in first in badminton and were runners-up in several events. Some teams also competed in national tournaments. Coaching sessions were conducted for students who were keen on badminton, basketball, hockey, netball, soccer, softball, squash, tennis, volleyball and waterpolo. Beginners' courses for canoeing, squash, swimming, and tennis were also organised for students and staff members.

The Sportsman-of-the-Year was Wong Shoon Soo, a first-year student in the Diploma in Maritime Studies (Shipping Commerce) course.

The Esso Sports Scholars Awards worth \$800 each were awarded to three of our sportsmen. They were Charlie Goh Yong Koom (table-tennis), Ivan Hoe Wan Seng (tennis) and Lee Kok Hwa (volleyball).

**Student Health Clinic.** The year saw an upgrading of the Student Health Service, expansion of clinic activities and training of clinic staff.

The objectives, scope and programme of the Student Health Service were redefined and accepted by the Corporate Management Team and the Development Committee in late 1985.

Plans were approved for a new clinic and piling commenced in April 1986. The Student Health Clinic was temporarily re-sited at Engineering Block 7 (above the Child Care Centre) pending completion of the new building.

To attend to a full-time student population of about 8,000, a second full-time doctor was appointed.

In addition, new emergency equipment was purchased. To help the clinic staff plan its future activities in health education, a survey of the students' medical and health interests was carried out in late October 1985.

Clinic attendance averaged at least 100 cases per day during term time, making a total of 12,872 student visits during consultation hours.