資料－１３　最近のシンガポールにおける産業界の動向と訓練需要、職業訓練に係るシンガポール政府の政策及び計画並びにＥＤＢの動向

１９８３年に経済成長率７.９％を記録したシンガポールにおいては、建設業、製造業を中心に順調な成長をつづけている。製造業についてみると、その成長の中心は、エレクトロニクス、金属関係の分野であり、コンピューター関係の伸びもいちじるしい。これと同時に工作機械、エレクトロニクス、印刷などの分野で、生産工程の自動化が進んでおり、産業ロボットは約７００台ＣＮＣ機械が約５００台導入されているといわれる。

これに伴って、これら機械に係る新しい技術を身につけた技術者、技能者の需要が増加している。

シンガポール政府では、この要請にこたえるため、種々の施策を講じている。

すなわち、シンガポール大学の定員をコンピューター学部を中心に１７％増加させ、シンガポール、ニーアンの両ポリテクニックの定員を１８％増加させることを予定している。

ＥＤＢにおいては、　　を新設して先端技術の訓練の拡充を計画しており、すでにＣＡＤ－ＣＡＭ　Training Unit, 'ASEA-EDB Robotics Training Unit , Japax Group-EDB CNC Training Unit などを新設した。ＦＳＩ、ＧＳＩの新設、ＪＳＩＳＴについてもその拡充が計画されている。

またＶＩＴＢにおいても、エレクトロニクス関係を中心にＩＴＣレベルのＳＴＩの拡充が計画されている。シンガポールにおける主な教育訓練施設の定員と卒業生の推移は次のとおりである。

ENROLMENT AND OUTPUT OF GRADUATE, TECHNICAL AND SKILLED MANPOWER, 1981-1983

Number

	Enrolment			Output		
	1981	1982	1983	1981	1982	1983
National University of Singapore	9,950	11,090	11,940	2,190	2,400	2,900
Engineering	2,140	2,120	1,890	320	350	440
Science	1,890	2,100	2,300	460	580	660
Others	5,920	6,870	7,750	1,410	1,470	1,800
Nanyang Technological Institute	-	580	1,270	-	-	-
Engineering	-	580	1,270	-	-	-
Singapore Polytechnic	5,460	5,580	6,180	1,440	1,720	1,820
Engineering	5,320	5,430	5,990	1,260	1,690	1,750
Others	140	150	190	180	30	70
Ngee Ann Polytechnic	3,140	3,790	4,840	580	750	950
Engineering	1,990	2,310	2,910	430	460	560
Computer Studies	-	130	350	-	-	-
Others	1,150	1,350	1,580	150	290	390
Institutes of the Vocational & Industrial Training Board	10,090	10,690	10,320	5,820	6,650	6,780
Joint Industrial Training Centres/Institute	1,220	1,390	1,950	580	680	520
Centres	1,220	1,240	1,570	580	680	520
Institutes	n.a.	150	380	n.a.	n.a.	n.a.

Source: Various Educational Institutions and Economic Development Board

資料－１４　JSTF概要・パンフレット

日本シンガポール技術学院の概要

1. 名　　称　　日本シンガポール技術学院

2. 所在地及び電話番号

2985　Jalan Bukit Merah

Singapore 0315　Tel : 2731477

3. 日本政府の協力期間

昭和５８年６月２９日～昭和６３年６月２８日

4. 訓練開始　　昭和５８年１１月

5. 両国の協力分担

(1)日本側　　イ　日本人専門家の派遣　　９名

ロ　機材の供与　　約３億円

ハ　現地指導員の日本への受入研修

(2)シンガポール側

イ　土地の提供　　８６６１平方メートル

ロ　建物の提供　　７２００平方メートル

（管理棟　４階建、実習場　３階建）

ハ　運営費の負担

6. 到達目標

１０年教育修了者を対象として生産現場において基幹的な役割を果たすインダストリアル・テクニシャンを養成する。

7. 修業期間　　２年

8. 手当の支給　　月額Ｓ＄３００の手当が支給される。兵役修了者には更に月額Ｓ＄６０の附加手当が支給される。

9. コース及び定員

(1) メカトロニクス科（Mechatronics Engineering Course）　　１６０名

(2) 工業電子科（Industrial Electronics Engineering Course）　　２８０名

(3) プロセス制御科（Process Control Engineering Course）　　６０名

10. 訓練生及び指導員数（１９８４.９.４現在）　　計５００名

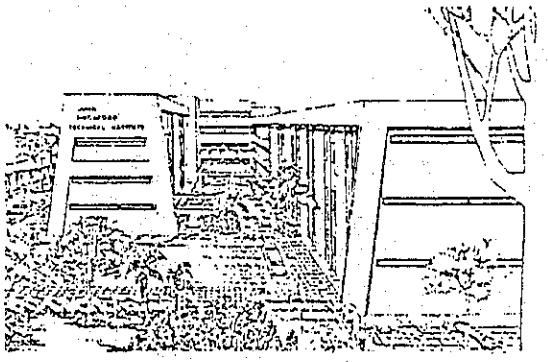
	訓練生数				指導員数	
	1期生 83.11～85.10	2期生 84.5～86.4	3期生 84.12～86.11	計	日本人	現地人
メカトロニクス科	37(2)	43(1)		80(3)	1	19
工業電子科	39(8)	60(7)		99(15)	2	25(9)
プロセス制御科	12(1)	14(4)		26(5)	1	10(2)
日本語科					1	4(4)
計	88(11)	117(12)		205(23)		58(15)

( )は女子の内数を示めす。

11. 修了時の資格

職業工業訓練局(Vocational and Industrial Training Board)からインダストリアル・テクニシャンの資格が与えられる。

日本・シンガポール技術学院の概要

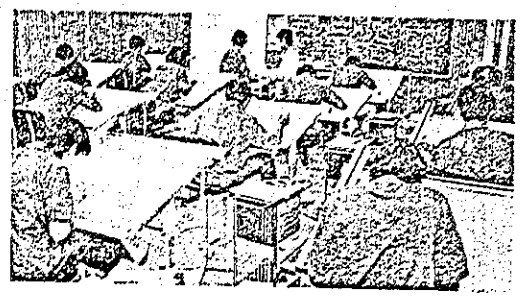


1. 概況

日本シンガポール技術学院は1978年に日本とシンガポール両国政府の協力により JICA のプロジェクトとして設置された日本・シンガポール訓練センターを母体に第2次プロジェクトとして1983年 6月29日に発足しました。この技術学院は最近におけるシンガポールの目覚ましい技術革新に対処するために最新の知識、技能を習得させるための施設として最新の機材が投入され、またカリキュラムも高度なものになっています。日本政府は約 13億円の機材を供与するとともに9 名の日本人専門家の派遣、約15名の現地指導員の日本への受入研修等技術的経済的援助を行います。なお、第1次プロジェクトである日本・シンガポール訓練センター時代にも日本政府は約 6 億円の機材を供与し、14名の日本人専門家を派遣するとともに現地指導員 50 名余の日本研修を実施しました。一方シンガポール政府は建物の建築費とセンターの運営費を負担しています。

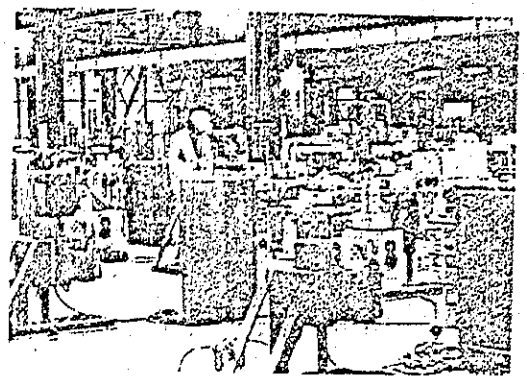
2. コース及び定員

本技術学院が開設しているコースは次のとおりで修業期間はいずれも2年間です。



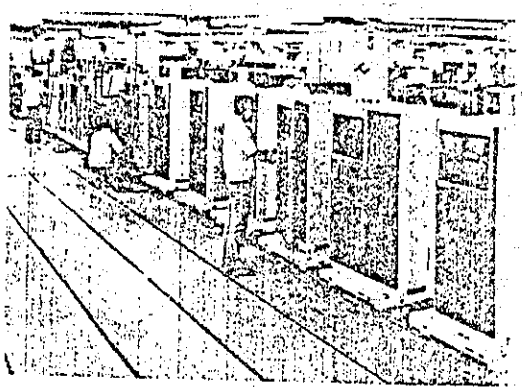
(a) メカトロニクスコース (総定員160名)

電子の知識と機械の知識を同時に身につけさせながら、機械加工を基礎に CNC 工作機械や産業用ロボットなどの自動化機械についての知識と技能を習得させます。



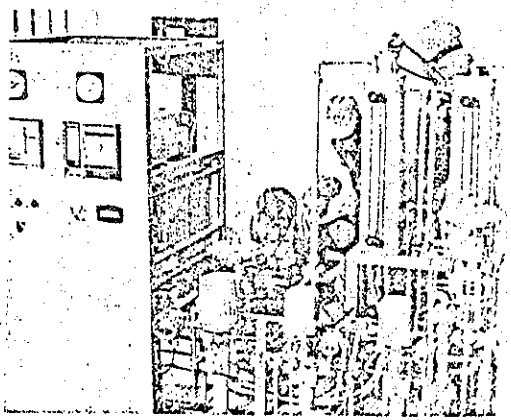
(b) 工業電子コース(総定員280名)

産業界で用いられているマイクロコンピュ
ター機器、自動化機械、産業用ロボット等の
気、電子制御回路の故障発見、修理、保守
に必要な知識と技能を習得させます。



(c) プロセス制御コース(総定員60名

石油精製、石油化学プラント、発電所、都
ガスプラントなど装置産業の計装システム
用いられているプロセス制御機器の据付、
作、保全等に必要な知識と技能を習得させ
す。



3 入校資格

１０年教育修了者でＧＣＥ "O" レベル試験において次の成績をおさめた者。

① 英語 － ＰＡＳＳ 以上
② 科学 － ＣＲＥＤＩＴ以上
③ 数学 － ＰＡＳＳ 以上

4 手当の支給

２年間の修業期間中、月額Ｓ $３００の手当が支給され、兵役修了者には同期間中月額Ｓ $６０の付加手当が更に支給されます。

5 修了時の資格

修了時に各専門分野のインダストリアル・テクニシャン（ＩＴＣ）の資格が与えられます。

6 就業義務

修了者は就職した企業に3年間就業する義務があります。

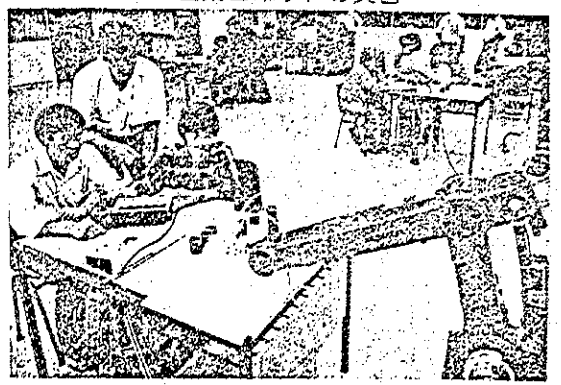
（照会先）

JAPAN-SINGAPORE TECHNICAL INSTITUTE
2985 Jalan Bukit Merah
Singapore 0315.
Tel: 2731477

OR

ECONOMIC DEVELOPMENT BOARD
World Trade Centre (Lobby D)
1 Maritime Square #10-40
Singapore 0409.
Tel: 2787200

産業ロボットの実習



課外活動

JAPAN-SINGAPORE TECHNICAL INSTITUTE

Introduction

The Japan-Singapore Technical Institute is a co-operation between the Japanese Government and the Economic Development Board under the Joint Industrial Training Scheme. The Institute serves to fulfil the needs of industries in Singapore for trained technicians in the fields of mechatronics, electronics and process control.

COURSES AVAILABLE

Training is offered at Industrial Technician Certificate Level in -

- Mechatronics Engineering
  (Electronics-Oriented Mechanical Engineering)
- Industrial Electronics Engineering
- Process Control Engineering

Mechatronics Engineering

This is a pioneer course in a new field of technology which involves the understanding of both Electronics and Mechanical Engineering. Trainees will be provided with the necessary skills and knowledge to handle relatively sophisticated machines like industrial robots, computerised numerical control (CNC) machines and other microprocessor-controlled machines.

Subjects taught in the Mechatronics Engineering Course include -

- Mechatronics Maintenance
- Computer Programming
- Industrial Robotics
- CAD/CAM (Computer-Aided Design/
  Computer-Aided Manufacturing)
- Electronics Engineering
- Pneumatics and Electrohydraulics

Industrial Electronics Engineering

Trainees will be provided with the necessary skills to maintain industrial electronics equipment widely used in the industries, e.g. sequential controlled equipment, automatic machines, pneumatic equipment, industrial robots and computer numerical control (CNC) machines.

The curriculum for the Industrial Electronics Engineering Course includes the following areas -

- Microprocessors
- Power Electronics
- Industrial Robotics
- Computer Peripherals
- Computer Programming
- Automatic Control Systems

Process Control Engineering

Trainees will be provided with the necessary skills and knowledge to operate, troubleshoot and maintain instruments and equipment which are used in process industries, such as oil refineries, petrochemical plants, power stations, gas plants, etc.

Subjects taught in the Process Control Engineering Course include -

- Process Instrumentation
- Control Engineering
- Digital Control Systems
- Industrial Instruments
- Electronic Measurements
- Process Systems Measurements

Entry Requirements

GCE 'O' Level with :

- Grade 1 to 8 in English (EL 1 or EL 2)
- Grade 1 to 8 in Physics, Physical Science or Engineering Science or Grade 1 to 6 in General Science
- Grade 1 to 6 in Elementary Mathematics or Additional Mathematics

Preference will be given to candidates who have attained Grade 1 to 8 in Metalwork, Additional Mathematics, Geometrical Drawing and Electricity and Electronics.

Training Awards

The Economic Development Board offers training awards to all selected candidates. These candidates will be admitted to the Institute as Bursary Holders. They will receive training allowances of $300 pm during the 2-year training as well as the course fee of $600 per year. (Reservists will receive an extra $60 pm VITB training subsidy). On completion of the course trainees will be required to serve a 3-year employment bond in a company assigned by the Board.

Certification

On successfully completing the 2-year course at the Institute, trainees will be awarded the Industrial Technician Certificate in their respective fields of training.

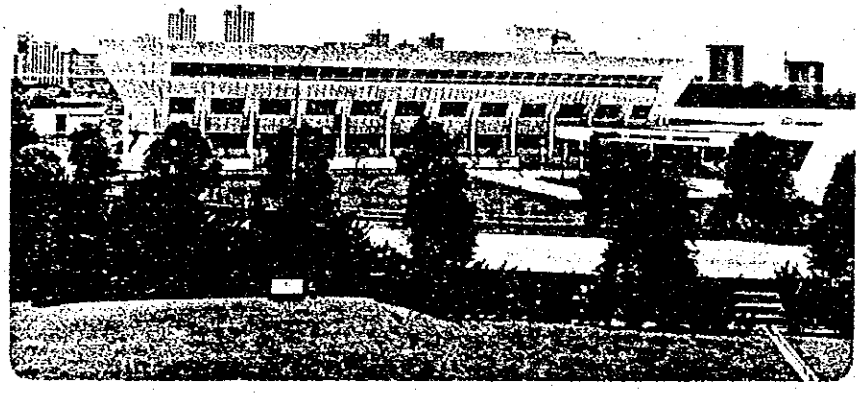
For more information, please contact :

Japan-Singapore Technical Institute
2985 Jalan Bukit Merah
Singapore 0315
Tel: 2731477

Economic Development Board
World Trade Centre (Lobby D)
1 Maritime Square #10-40
Singapore 0409
Tel: 2787200

GERMAN-SINGAPORE INSTITUTE

10 Science Centre Road, Singapore 2260. Tel: 5613866



PROFILE OF GSI

The German-Singapore Institute (GSI) is a technical cooperation project between the Governments of the Federal Republic of Germany and the Republic of Singapore.

The Government of the Federal Republic of Germany provides technical assistance to Singapore in the planning, establishment and operation of the Institute and financial contribution for the purchase of machinery and equipment, the secondment of thirteen experts and scholarships for the training of local staff in the Federal Republic of Germany. The Government of Singapore is responsible for the construction of the building and the operational costs.

The Courses

GSI currently conducts a 2-year full-time Diploma Course in Production Technology.

The Diploma course, run on 44-hour week basis, consists of three stages, i.e. Basic (6 months), Common Core (6 months) and Advanced Training (12 months). Students' recruitments are conducted twice a year, in February and August.

All students are required to carry out projects (each of 3 months full-time duration) before the end of the course.

The Facilities

To create an industrial environment for the training, GSI has been equipped with high quality industrial machinery and equipment for such areas as conventional and CNC machining, toolroom machining, heat treatment, plastic technology, surface treatment, metrology, material testing, control techniques, computer programming, industrial engineering, welding, design, etc.

In addition to the above, facilities for CAD-CAM and Industrial Robotics are available for the training of GSI students in modern technology.

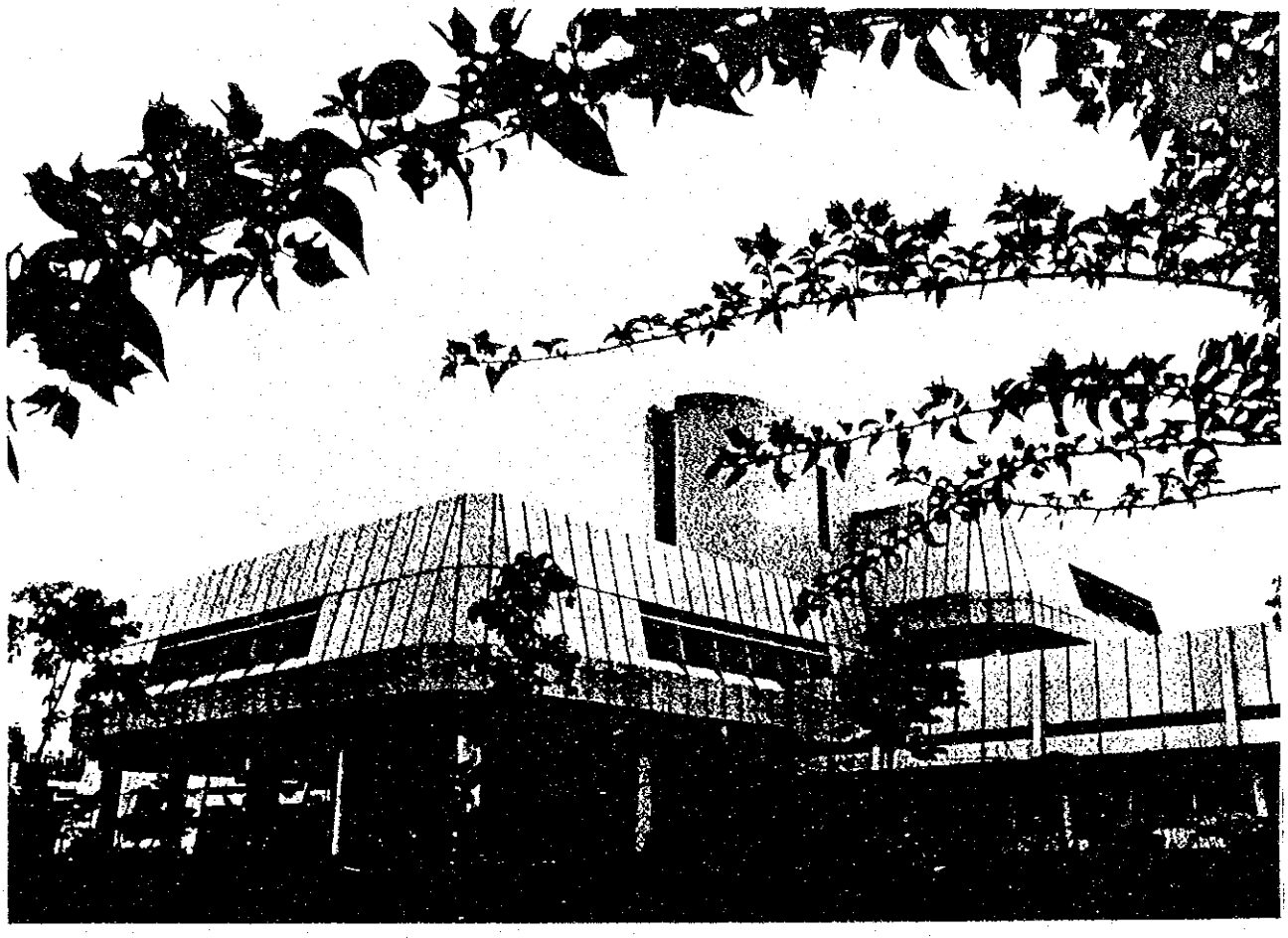
The Students

GSI takes in both 'A' – level holders as well as EDB Craftsmen or equivalent. The students may be:

(a) Company-sponsored (sponsoring companies may apply for SDF support), or
(b) On EDB study loan (for Craftsmen only), or
(c) On EDB bursary (for 'A' – level only), or
(d) self supporting

At the end of the training, students doing the Diploma courses will be practice-oriented enough to undertake jobs in areas like Production Planning and Control, Design, Process Planning, Shopfloor Supervision, Quality Control, Industrial Engineering, Low Cost Automation, etc.

FRENCH-SINGAPORE INSTITUTE



A DIPLOMA COURSE IN

ELECTRONICS AND INSTRUMENTATION

CONTROL AND AUTOMATION

INDUSTRIAL APPLICATION OF COMPUTERS AND MICROPROCESSORS

ROBOTICS

COMPUTER AIDED DESIGN AND MANUFACTURING

FRENCH-SINGAPORE INSTITUTE

INTRODUCTION

The French-Singapore Institute (FSI) is a joint project between the governments of France and Singapore. The FSI , besides being equipped with the latest in its laboratories and workshops, draws its expertise from the Ecole Superieure d'Ingenieur en Electro-technique et Electronique (ESIEE) of Paris, a higher Institute of electrotechnology and electronics known for its industry-oriented program.

In keeping with Singapore's policy of restructuring its industries by moving towards greater automation and computerisation, the FSI is geared specially to train a pool of technicians/technologists in the field of electronic technology with special emphasis on industrial electronics, instrumentation, industrial automation, control, power electronics, robotics, computer aided-design and manufacturing, microprocessor and computer applications.

Under the agreement signed in October 1980, the French Government provides technical assistance to Singapore in the planning, establishment and operation of the Institute, via a resident team of experts, provision of technical equipment for laboratories, and scholarships for the training of local lecturers in France.

The Institute enrolled the first batch of students in August 1983 for the 2 year Diploma course. When in full operation, the Institute will have an intake capacity of 200 students per year.

COURSE INFORMATION

AIMS OF THE TWO-YEAR DIPLOMA COURSE

The FSI training is aimed at producing graduates who will have a strong foundation in the broad field of electronics with emphasis on practical applications. In addition, they will have a sound theoretical background to enable them to keep up with, understand, and participate in the latest developments in the subjects covered by the FSI training. The training will provide them with knowledge and skills to contribute in areas of product design and development, manufacture, test and maintenance. They will be able to :

1) - Apply the latest techniques such as cad-cam, robotics numerical control etc. in engineering and manufacturing.

2) - Design, develop and improve on manufacturing equipment such as microprocessor-controlled production and test equipment.

3) - Analyse and solve design and manufacturing line problems with due consideration for technical, economic, time and human factors.

4) - Trouble-shoot, repair and maintain automation machinery and equipment.

THE FIRST 3 SEMESTERS

The first 3 semesters give the students a broad foundation in electronics, automation, instrumentation and applied computing including software and hardware. To ensure that students are developed with sufficient practical skills, there is a significant emphasis on practical work, which accounts for 50% of the total hours of lectures, tutorials and laboratory work. The high teacher/student ratio allows good interaction and effective training.

THE FOURTH SEMESTER

In the last semester, the students working in teams of three will undertake a full-time project work. During these 24 weeks, the students will have the entire responsibility of an industrial development project related, in most cases, to real-life industrial products. The knowledge acquired in the first 3 semesters will have to be applied to solving problems in real-life industrial situations. Guided by lecturers and engineers from industry, the students will have to plan their own work, organise and coordinate the work of the team; make extensive use of the books and magazines in the library and decide the approach, materials and components they will use for the implementation of their project. The purpose of this project is to provide the students with practical experience in the various stages leading to the manufacture of a product, which usually involve: product definition, feasibility study, design and development, prototype making, manufacturing and test. In the course of the project, the students will very likely find themselves in common situations in industry such as having to make decisions on cost, time and benefit tradeoffs; making studies on quality and reliability; making recommendations and writing technical reports. The full-time project work is thus a very important aspect of the Institute's program to prepare students for a career in industry.

CURRICULUM SUMMARY

The FSI training is divided into 4 semesters of 24 units. Each unit has 36 hours of lectures, tutorials and laboratory work. The 4th semester is devoted to a full-time project.

	SUBJECT	Total No.of Units	Number of Units In Each Semester			
			1st Semester	2nd Semester	3rd Semester	4th Semester
ELECTRONICS	Physics	2	1	1		FINAL PROJECT WORK (21 units)
	Instrumentation	7	2	3	2	
	Quality Control	1			1	
	PC Board	1	1			
	Basic Electronics	7	3	4		
	Applied Electronics	3			3	
	CAD-CAM	2		1	1	
	Signal Processing	1			1	
CONTROL	Mathematics	3	2	1		
	Basic Circuits	3	3			
	Engrg Physics	2	2			
	Elect Machines	2	1	1		
	Elect Technology	1		1		
	Static Convertors	2			2	
	Basic Automation	5	2	2	1	
	Robotics	1		1		
	Numerical Control	2			2	
	Applied MicroP.	2			2	
SYSTEMS	Microprocessors	1	1			
	Assembler	1		1		
	Computer Language	4	1	1	2	
	MicroP. Systems	1		1		
IND DEV	Projects	26	1	1	3	3
	workshop mgmt	3				
	Library Work	3	1	1	1	
	French	10	3	4	3	
	Total	96	24	24	24	24

TRAINING FACILITIES

GENERAL FACILITIES

7 Laboratories and 2 workshops

35 Project Rooms

230 Workbenches installed in 5 laboratories and equipped with modern electronic, electrical and control equipment.

1 Computer center equipped with a Honeywell Bull Computer (Mini 6/92) and 25 terminals

1 Industrial printed circuit board workshop

1 Mechanical workshop

1 Language Laboratory

SPECIFIC EQUIPMENT

- Oscilloscopes, signal generators, power supplies, multimeters for general electronics training
- Industrial and pedagogical robots
- Industrial programmable controllers and emulation console
- Pneumatic equipment for control
- Analog and logic simulators
- Data acquisition equipment for quality control tests
- 2 Universal Development systems for microprocessors
- 24 Stations for microprocessors studies/training

Apart from training purposes, FSI is fully equipped to design and construct prototypes of electronic and computer hardware including printed circuit board fabrication and microprocessor-based designs using all types of microprocessors common in the industry.

In addition to in-house facilities within the Institute, the latest specialised equipment and facilities in the areas of CAD/CAM (computer-aided design and computer-aided manufacturing) and Robotics are made available to the FSI through EDB training units, namely, the Computervision-EDB CAD/CAM Training Unit (CECTU) and ASEA-EDB Robotic Training Unit (AERTU). Part of the Institute's course in CAD/CAM and Robotics are conducted by FSI staff using the facilities in the two training units mentioned. With these facilities, FSI students will be able to undertake industrial projects requiring the application of the latest technology.

GENERAL INFORMATION

ADMISSION

Admission to the FSI is on a twice yearly basis in February and August each year and is open to students as follows :

1) persons awarded the EDB bursary, or

2) persons sponsored by their employers

ENTRY QUALIFICATIONS

The minimum requirements of admission to the FSI for the full-time 2 year diploma course are :

a) 2 passes at GCE Advanced Level (or equivalent) including a mathematics subject and,

b) At least a pass in English Language (minimum P7 for EL1 or P6 for EL2) at GCE 'O' Level, or a pass in General Paper in the English Medium at the GCE 'A' Level examination (or equivalent).

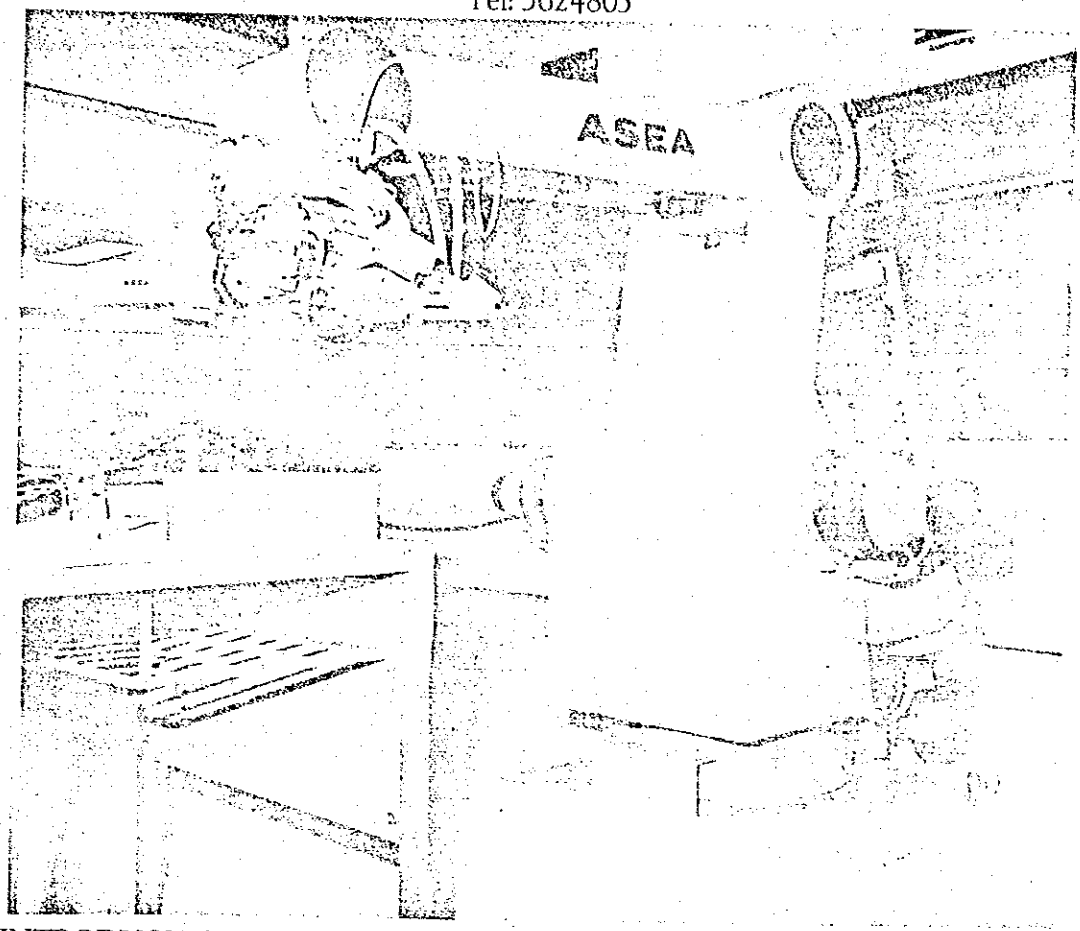
BURSARY

Students of the Institutes are either awarded the EDB bursary or are sponsored by companies. Bursary holders receive $300 per month for the 2 year duration of the course. In addition, they also receive the annual course fees in accordance with the bursary terms. On successful completion of the course, the Economic Development Board will place bursary holders in suitable industries to serve a 3 year bond.

ASEA-EDB ROBOTICS TRAINING UNIT (AERTU)

(A Unit of the Economic Development Board)

10 Science Centre Road
Singapore 2260
Tel: 5624805



INTRODUCTION

It is important that the training of skilled industrial manpower embraces the latest fields of applications in manufacturing. Among these, robotics technology stands out in its wide-ranging application and benefits. The AERTU was therefore established to fulfill this objective of providing training in robotics technology, its applications and maintenance to students/trainees of the EDB's Institutes/Joint Training Centres and for managers and technical personnel from industries.

THE UNIT

Operational since June 1983, AERTU is a joint co-operation project in training with ASEA AB Sweden. Technical support and consultancy in robotic applications at the Unit is supplemented by the presence of full-time expert(s) seconded from ASEA. In addition, ASEA provides for the training of the Unit's staff both in Sweden and in Singapore.

TRAINING PROGRAMMES/COURSES

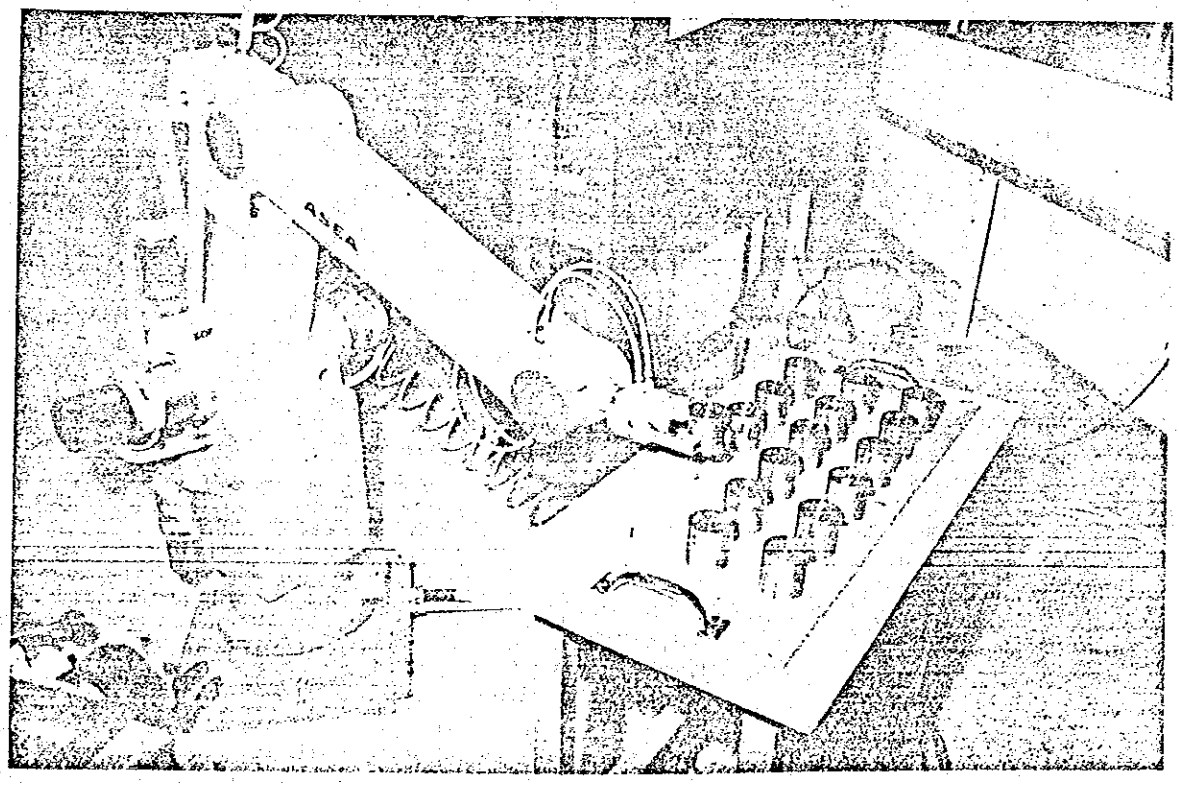
The training in the Unit provides students/participants with hands-on practice and related knowledge which will enable them to operate, program and maintain robots in the various application fields. As and when the need arises, the courses and seminars to be provided by the Unit cover the following:-

- Programming and operation of industrial robots
- Applications of industrial robots
- Project engineering for robotisation
- Mechanical maintenance
- Electronic maintenance

HARDWARE CONFIGURATION/APPLICATIONS

The Unit is equipped with 11 industrial robots and the necessary peripherals with latest control systems. A Robotic Application Laboratory is being set-up to demonstrate industrial applications such as:-

- Machine Group Tending
- Material Handling
- Deburring
- Polishing
- Arc Welding



ASEA-EDB

ROBOTICS

TRAINING UNIT

(AERTU, a unit of EDB)

offers

a course on

ROBOTICS-
PROJECT
ENGINEERING

Medium of instruction: English

Course Length : 2 Days

Commencing : - 3 SEP 1984

AERTU

ASEA-EDB ROBOTICS TRAINING UNIT

Operational since June 1983, AERTU is a joint co-operation project in training between the Economic Development Board and ASEA AB Sweden. The AERTU was established to fulfill the objective of providing training in robotics technology, its applications and maintenance.

The training in the Unit provides students/participants with hands-on practice and related knowledge which will enable them to operate, program and maintain robots in the various application fields. The training provided covers the following areas:-

- Introduction to Robotics and Programming
- Advanced Programming And Applications
- Robotics - Project Engineering
- Applications And Interface in Robotics
- Mechanical Maintenance
- Electronic Maintenance

AERTU

STAMP

ASEA-EDB ROBOTICS TRAINING UNIT
c/o German-Singapore Institute
10, Science Centre Road, Jurong
Singapore 2260

Course Objective:

To provide the participants with an overview on robotics, the knowledge on technical factors and planning procedures that have to be considered in the implementation of a robotic engineering project.

Suggested Participants:

This course is designed for technical managers and engineers involved in industrial engineering, production planning and project implementation.

Contents:

The course program covers the following topics in robotic project engineering:

a) Introduction to robotics

b) Principles of production

c) Considerations on robotic installation

d) Planning procedures

e) Demonstration on ASEA IRB industrial Robot System and hands-on practice

f) Technical considerations

g) Implementation considerations

h) Financial assistance schemes

Program Information:

Length of course: 2 days, full-time

Time: 0900 hrs - 1700 hrs

Please send Registration Form to:

AERTU
c/o German-Singapore Institute
10 Science Centre Road
Singapore 2260

For enquiries, please call Tel: 5624805

Course Fee:

To be paid when registration is confirmed.

REGISTRATION FORM AERTU REF:

Course: Robotics - Project Engineering

Name: Mr/Ms _____

Job Designation: _____

Company's Name: _____

Address: _____

Postal Code: _____

Tel. No.(O): _____ (H): _____

Sponsored by Company: YES/NO

*Do not send fee till your registration is confirmed. Cheques/postal orders should be made payable to:
GERMAN-SINGAPORE INSTITUTE

Date: _____ Signature: _____

ENQUIRY FORM AERTU REF:

Please check the following items you or your Company would like to receive.

- ☐ Introduction To Robotics & Programming
- ☐ Advanced Programming & Applications
- ☐ Robotics - Project Engineering
- ☐ Applications & Interface in Robotics

CANCELLED

JAPAX GROUP-EDB

CNC Training Unit

(A Unit Of The Economic Development Board)

INTRODUCTION

Industries in Singapore are increasingly turning to the lastest technologies in pursuit of higher productivity and automation, with CNC machines featuring prominently. The number of machines in use in Singapore leapt exponentially from about 53 in 20 companies in 1979 to more than 500 in 130 companies when last surveyed by the EDB. In line with this, training in CNC machining and programming need to be strongly emphasized. This had led to the establishment of the JECTU.

THE UNIT

JECTU is the third Training Unit to be set up by the EDB, coming into operations in October 1983. It was established in co-operation with 3 Japanese companies (Japax Incorporated, Hamai Co Ltd and Ikegai Corporation) and Taisei Machinery Services, their local representative.

The main objective of the Unit is to provide training in CNC machining and programming to assist craftsmen in industries to operate CNC machines effectively and optimise results in their own areas of application.

The Unit, located in the premises of the Brown Boveri Government Training Centre, is manned by experienced staff. There are also Japanese experts assisting in the initial period.

TRAINING PROGRAMME

The facilities and equipment in the Unit will be used to provide CNC training to 3 main groups, viz :

- Staff and students from the EDB Training Centres/Institutes.
- Trainees in the Advanced Craftsman Training Course (to be conducted in the Brown Boveri Government Training Centre in mid 1984).
- Personnel from relevant industries for part-time/specialised courses.

Courses are organised into a modular structure to afford flexibility in tailoring the training provided to the specific needs of the groups concerned. Training conducted by the Unit includes:

- CNC EDM PROCESSES
- CNC MILLING
- CNC MACHINING CENTRE APPLICATION
- CNC TURNING
- COMPUTER ASSISTED PROGRAMMING
- COMPUTERISED DESIGN AND MANUFACTURING SYSTEM (For Tool and Die)

MACHINES & EQUIPMENT INSTALLED IN JECTU

The machines and equipment listed below are provided as part of the first phase of the cooperation between the EDB and the Companies. In late 1984, additional equipment on Computerised Design and Manufacturing (CDM) System will also be installed by JAPAX INC.

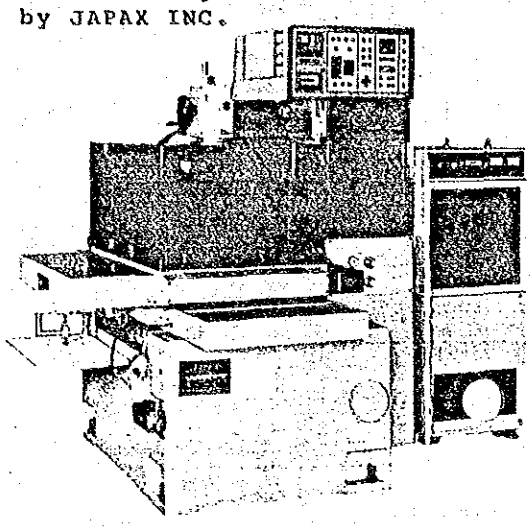
From JAPAX INC

2 units NC Die Sinking EDM model DP25NC and DP35BNC equipped with electrode changer.

2 units Wirecut EDM model LS350S and LS500S with automatic wire feeder and super drill.

2 units Automatic programming systems (JAPT-2F) with plotters, paper tape punchers and software.

4 units Automatic programming units (E-JAPT) with plotters, paper tape punchers and software.



WIRE CUT EDM

From HAMAI CO LTD

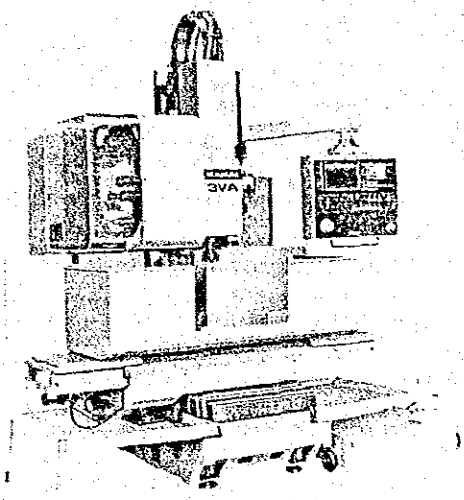
2 units CNC ram type vertical precision milling machine MAC-85N.

1 unit CNC vertical machining centre MC-3VA with automatic tool changer (ATC 24).

1 unit CNC horizontal machining centre MC-3HA with two shuttle-type pallet changers and automatic tool changer (ATC 40).

1 unit Machine control simulator.

1 unit Tool pre-setter.



VERTICAL MACHINING CENTRE

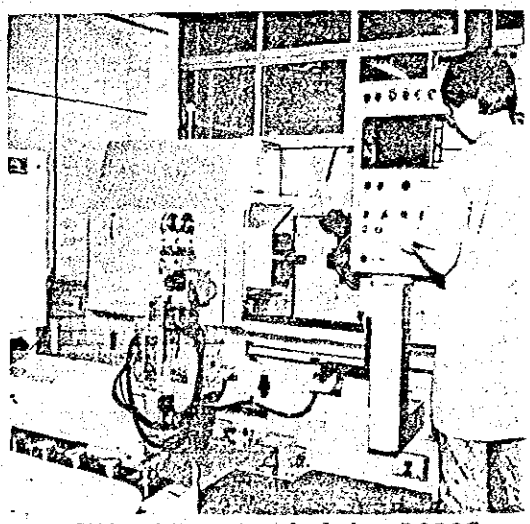
From IKEGAI CO

3 units CNC Lathes. One of each of the model FX25II, FX20II and AX25II including tool setting gauge and feedback gauging system.

1 unit CNC mill-turning centre (FT25U).

1 unit Self-standing robot.

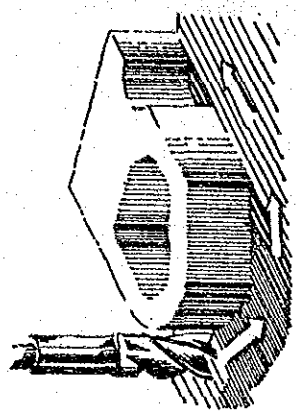
1 unit Workpiece conveyor with automatic indexing pallet.



CNC LATHE tended by ROBOT

JAPAX GROUP - EDB CNC TRAINING UNIT
and
BROWN BOVERI GOVERMENT TRAINING CENTRE
(Units Of The Economic Development Board)

modular courses on
COMPUTER AIDED PROGRAMMING
AND CNC MACHINING



PROGRAMME 2/1984

Course Contents	Prerequisite	Dates	Fees
CNC WIRECUT/PROGRAMMING			
* WC/P1 Course provides the basic proficiency on the use of Computer Numerical Control and Machining Processes in Wirecut EDM. Key topics: Fundamental of CNC Wirecut EDMing; Application of Wirecut EDM in Industries; Economical aspects of Wirecut EDMing; Function of power supply and CNC Unit in Wirecut; 2D programming; NC Tape preparation; Preventive maintenance.	Knowledge of machining processes on conventional EDMing	9–14 July 10–15 September 8–13 October	S$440 per participant
WC/P2 Course covers the application of CNC Wirecut EDMing of complex components. Key topics: Advanced programming of complex components; Economical aspects of Wirecut EDMing; Edgecut operation; Gradient changing; CNC Unit; Setting of machining conditions; Superdrill application; Program optimization; Trouble shooting; Preventive maintenance.	Completion of WC/P1 or equivalent	16–21 July	S$440 per participant
2 - DIMENSIONAL COMPUTER AIDED PROGRAMMING			
2D - CAP 1 Course provides the basic proficiency on the use of 2D Automatic Programming System. Key topics: Instruct and write basic Automatically Programmed Tools (APT) based languages; Use of Software and Hardware; Part structuring procedure; Definition of routines; Manual program writing; Program verification; Drawing of tool path; 2D-plot; Preparation of tool layout; NC Tape preparation.	General knowledge in cutting technology	16–21 July 17–22 September 8–13 October	S$200 per participant
3 - DIMENSIONAL COMPUTER AIDED PROGRAMMING			
3D - CAP 1 Course covers the application of 3D Automatic Programming System of complex components; Key topics: Instruct, write and verify APT based languages; Use of 3D Software and Hardware; Selection of cut pattern, tolerances, pickfeed, steps, optic angles; Drawing of tool path; 3D-plot; Preparation of tool layout; NC Tape preparation	Completion of 2D - CAP 1 or equivalent	15–20 October 17–22 December	S$200 per participant

Further Enquiries

Anyone wishing to obtain further information may call: 2967833 (3 lines) or write to: JAPAX GROUP-EDB CNC TRAINING UNIT, 15 Kallang Junction, Singapore 1233.

SDF "Approval –In–Principle

Courses marked with * have been Approved In-Principle for subsidy by the SDF

Postage Stamp

JAPAX GROUP-EDB CNC TRAINING UNIT

15 KALLANG JUNCTION

SINGAPORE 1233

JAPAX GROUP - EDB CNC TRAINING UNIT

MODULAR COURSES ON

Course Contents	Prerequisite	Dates	Fees
CNC TURNING			
• Turn 1 Course provides basic proficiency on the use of CNC Machining Processes in Turning. Key topics: Principle of NC/CNC machine tools; Economical aspects of NC/CNC machine tools; Codes and addresses used in part programming (2D principle); Manual program writing; Selection, setting and application of cutting tools; Program verification; Machine tool application; Program optimization; Preventive maintenance.	Knowledge of machining processes on conventional turning machines	9–14 July 10–15 September 8–13 October	S$440 per participant
• Turn 2 Course covers the application of CNC Machine Tool Operation for Turning Processes. Key topics: Economical aspects of NC/CNC machine tools; Review of 2D principle; Codes and addresses used in complex part programming (machining cycles); Manual program writing of complex components; Selection, setting and application of cutting tools; Program verification; Machine tool application; Program optimization; Preventive maintenance.	Completion of Turn 1 or equivalent	16–21 July 15–20 October	S$440 per participant
CNC MILLING			
• Mill 1 Course provides basic proficiency on the use of CNC Machining Processes in Milling. Key topics: Principle of NC/CNC machine tools; Economical aspects of NC/CNC machine tools; Codes and addresses used in part programming (2D principle); Manual program writing; Selection, setting and application of cutting tools; Program verification (Point-to-point and straight tool-path); Machine tool application; Program optimization; Preventive maintenance.	Knowledge of machining processes on conventional milling machines	9–14 July 10–15 September 8–13 October	S$440 per participant
• Mill 2 Course covers the application of CNC Machine Tool Operation for complex Milling Processes. Key topics: Economical aspects of CNC machine tools; Review of 2D principle; Codes and addresses used in complex part programming; Manual program writing; Selection, setting and application of cutting tools; Program verification (Continuous tool-path); Machine tool application; Program optimization; Preventive maintenance.	Completion of Mill 1 or equivalent	16–21 July	S$440 per participant
MACHINING CENTER			
VMC 1 Course covers the use of Vertical Machining Center for the machining of milled components. Key topics: Economical aspects of machining center; Review of 2D principle; Codes and addresses used in part programming; Manual program writing; Automatic Tool Change application; Tool pre-setting; Program verification; Machine tool application (2D/2½D principles); Program optimization; Preventive maintenance.	Completion of Mill 1 or equivalent	9–14 July 10–15 September 15–20 October	S$440 per participant
HMC 1 Course covers the use of Horizontal Machining Center for the machining of milled components. Key topics: Economical aspects of Machining Center; Review of 2D principle; Codes and addresses used in part programming; Manual program writing; Automatic Tool Change application; Tool pre-setting; Pallet Changer application; Program verification; Machine tool application (2D/2½D principle); Program optimization; Preventive maintenance.	Completion of Mill 1 or equivalent	16–21 July	S$440 per participant
CNC ELECTRICAL DISCHARGE MACHINING			
• EDM 1 Course provides the basic proficiency on the use of Computer Numerical Control and Machining Processes in Die Sinking EDM. Key topics: Principle of CNC EDMing; Economical aspects of CNC EDMing, Codes and addresses used in part programming; Manual program writing; Program verification; Setting of machining condition; Machine tool operation; Program optimization; Preventive maintenance.	Knowledge of machining processes on conventional EDMing	9–14 July 10–15 September 15–20 October	S$440 per participant
EDM 2 Course covers the application of CNC Die Sinking EDMing of complex components. Key topics: Economical aspects of CNC EDMing; Review of codes and addresses; Automatic Electrode Changer application; Manual program writing of complex components; Program verification; Setting of machining condition; Machine tool operation; Program optimization; Preventive maintenance.	Completion of EDM 1 or equivalent		S$440 per participant

DURATION/TIME: 44 TU/Monday to Friday: 0830 – 1700. Saturday: 0830 – 1200.

Registration Form

Name: Mr/Ms _____ Job Designation: _____

Company: _____

Address: _____

_____ Tel No. (Off) _____ (Res) _____

Sponsored by Company: Yes/No

Please register me for:

Courses	Dates

DO NOT send course fee till your registration is confirmed. Please call the Unit for detailed course brochures and enquiries. Tel: 2967833 (3 Lines)

THE COMPUTERVISION-EDB CAD/CAM TRAINING UNIT (CECTU)

(A Unit of the Economic Development Board)

INTRODUCTION

It is important that the training of skilled industrial manpower embraces the latest fields of applications in manufacturing. Among these, Computer-Aided-Design and Computer-Aided-Manufacturing (CAD/CAM) stands out in its wide-ranging application and benefits. The Computervision-EDB CAD/CAM Training Unit (CECTU) was therefore established to fulfil this need in training.

THE UNIT

Operational since February 1983, CECTU is a joint co-operation project in training with Computervision Corp. of the USA, the world leader in the technology. Technical support and consultancy in CAD/CAM applications at the Unit is supplemented by the presence of a full-time CAD/CAM expert seconded from Computervision. In addition, Computervision provides for the training of the Unit's staff both in the U.S.A. and in Singapore.

TRAINING PROGRAMMES/COURSES

CECTU provides training in CAD/CAM in the application areas of:-

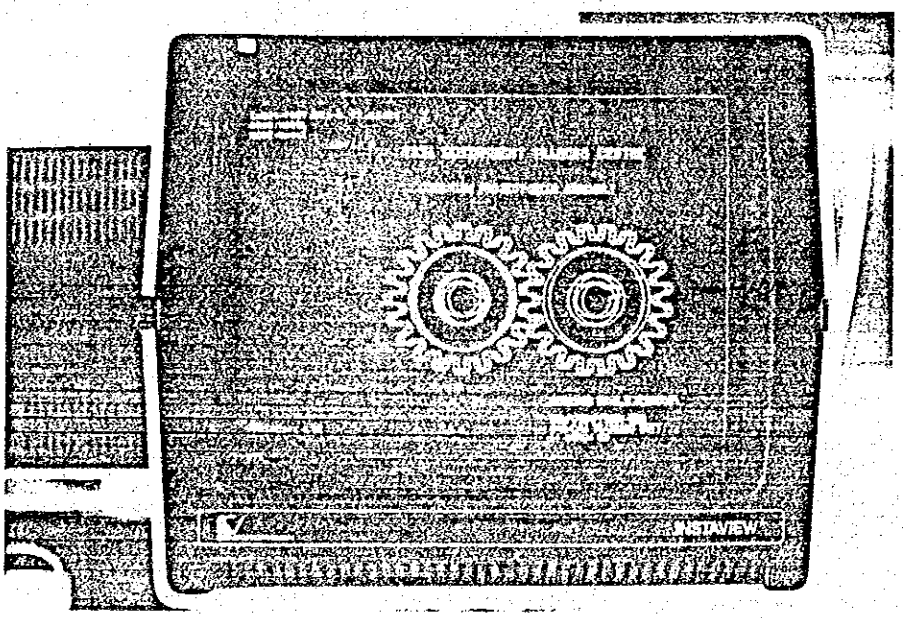
- mechanical design and drafting
- numerical control
- structural engineering/design
- printed circuit board design
- integrated circuit design

To enable the objective of propagating this new technology to be further pursued, modular courses and seminars on special application areas are also conducted for practising engineers and professionals in industry.

HARDWARE CONFIGURATION AT CECTU

The following lists out the hardware configuration for training at CECTU:-

1 x 32-bit CDS 4000 CPU
2 x Designer V CPU
2 x 300 MB Disk Drive
2 x Magnetic Tape Drive
11 x Monochrome Workstations
4 x Colour Workstations
1 x Drum Plotter
1 x Electrostatic Plotter
1 x NC paper Tape Punch and Reader



COMPUTERVISION-EDB

CAD/CAM

TRAINING UNIT

(A UNIT OF EDB)

offers modular courses on

COMPUTER-AIDED-DESIGN AND MANUFACTURING

ABOUT

COMPUTERVISION-EDB CAD/CAM TRAINING UNIT (CECTU)

Operational since February 1983, the CECTU is a joint co-operation project in training between the Economic Development Board and Computervision Corporation of the USA.

The objective of the CECTU is to provide training in the applications of CAD/CAM in design, drafting and manufacturing. Application areas covered include :

- mechanical design & drafting
- numerical control
- printed circuit board design
- integrated circuit design
- structural engineering/design
- architectural design & drafting

and industrial automation topics like robot programming, group technology and finite element methods. For the purpose of propagation and promoting the use of CAD/CAM in industry, managerial presentations and modular courses in the above topics are an integral part of the CECTU's activities.

REGISTRATION FORM

Application No. ____

Name : Mr/Ms _____ Job Designation : _____

Company : _____

Address : _____

_____ Tel No. (O) _____ Tel No. (H) _____

Sponsored by Company : Yes/No

Please register me for :

Courses	Dates
_____	_____
_____	_____
_____	_____
_____	_____

Send registration form to Computervision-EDB CAD/CAM Training Unit, #01-01, Jurong Town Hall, Singapore 2260. Do not send fee till your registration is confirmed as places are limited.
For further enquiries : Tel 9621188.

(MNG.1) CAD/CAM: INTRODUCTION & OVERVIEW

This course provides senior and technical managers an appreciation of CAD/CAM applications, potentials, and its integration into the production environment. Major topics covered are CAD/CAM Terminology, Applications, Benefits & Potential, Computers & CAD/CAM Systems: Mainframes, Minis & Micros, Turnkey CAD/CAM Systems, Evaluation & Selection of Systems, Justification of CAD/CAM Systems, Selection & Training of Personnel, Integration of CAD/CAM into production cycle.

DURATION : 2 days (14 hrs) FEE: S$100/-
DATES : 20 - 21 Jun, 27 - 28 Jun '84

(M.1) CAD/CAM: BASIC MECHANICAL APPLICATIONS

This practice-oriented course provides basic proficiency on a CAD/CAM system for the drawing and designing of mechanical parts and tools. Topics covered are Hardware introduction, CADDS4 philosophy, function, and operational modes, Command syntax and on-line aids, Part-structuring procedure, Graphics generation, Graphics editing and manipulation, Display control and information management, Input aids and menu use, Part concepts and parameters, Views and construction planes, Library parts and Data base maintenance.
This entry level module also provides the fundamental prerequisite for intermediate and advanced modules in the mechanical applications area.

DURATION : FEE: S$500/-
DATES : 17 Dec-15 Jan'85 (evening course)
*APPROVED – IN-PRINCIPLE FOR GRANTS FROM THE SKILLS DEVELOPMENT FUND.

Date: 7-12 Jan'85 , 11-16 Feb'85 (M.1)

(M.DR.1) CAD/CAM: DRAFTING AND DETAILING APPLICATIONS

Course provides hands-on training on the use of a CAD/CAM system in drafting and detailing operations and the creation of engineering/architectural drawings. Topics covered are Draw mode concepts, Draw entities, Detail process, Form parts, Drawing concepts, Multiple views, Scaled views, Section views, Detail views, Appearance modification, Size description and dimensioning, Associativity of dimensions, Size tolerance and Dimension editing.

DURATION : 4 days (32 hrs) FEE: S$300/-
DATE : 25-28 Feb'85
PREREQUISITE: Completion of M. 1 or equivalent

(M.DE.1) CAD/CAM: DESIGN APPLICATIONS

Practice-oriented course on the use of a CAD/CAM System in mechanical design. Topics covered are Model designing techniques, Design input aids, Ruled Surfaces, Surface of revolution, Tabulated cylinders, Surface graphics, B-splines, Blended surfaces, Fillet surfaces, Offset surfaces, Cross sections, Surface intersections and Mass property calculations.

DURATION : 4 days (32 hrs) FEE: S$300/-
DATE : 7 Jan-4 Feb'85 (evening course)
PREREQUISITE: Completion of M. 1 or equivalent

(M.NC.1) CAD/CAM: NC APPLICATIONS

Course provides practice-oriented training on the use of a CAD/CAM system for programming and control of numerical-control machines. Major topics covered are Introduction to NC application, Machine Point-to-Point routine, Machine Profile tool paths, Machine Pocket tool paths, Machine Absolute tool paths, Display, Editing, Regenerating tool paths, Constructing sets and supersets, Generating output files and Postprocessing.

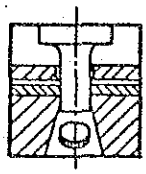
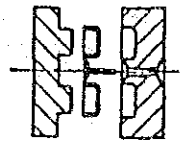
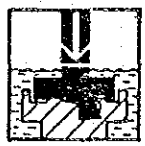
DURATION : FEE: S$300/-
DATE : 03-08 Dec'84
PREREQUISITE: Completion of M. 1 or equivalent

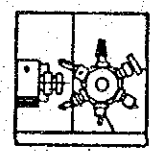
(M.NC.2) CAD/CAM: ADVANCED NC APPLICATIONS

Practice-oriented course on the use of a CAD/CAM system for advanced programming and control of numerical-control machines Major topics covered are Review of 2½-D principles, Machine profile and pocket to a surface, Machine surface routine, Machine surface of intersection routine, Machine absolute routine, 3 and 5 axes.

DURATION : 3 days (24 hrs) FEE: S$200/-
DATE : next session to be scheduled
PREREQUISITE: Completion of M.NC.1

Guide to Courses


Economic Development Board

Apprenticeship Scheme

TATA-GOVERNMENT TRAINING CENTRE (TGTC)
(a unit of the Economic Development Board)

Introduction

Tata-Government Training Centre was the first joint industrial government training centre to be set up in 1972. This joint effort is between the Tata Group, a leading enterprise in India with worldwide ranking in diversified manufacturing activities particularly in the engineering field and the Singapore Government.

Trade : (1) Precision Metal Machining
(2) Tool and Die Making.

Training Programme

In TGTC all apprentices will undergo a 4-stage practical training programme. After 1 year's basic training the apprentices will be streamed to either the Tool and Die Making trade or Precision Metal Machining trade.

Practical Training

The four stages of training are as follows:

1. Basic Operation	:	Fitting, turning, milling, grinding, sheet metalwork, arc welding, gas welding, wood working and electrical fitting.
2. Advanced Operation	:	Fitting, turning, milling and grinding.
3. Special Operation	:	Tool and die making, plastic mould making, machine tool building, precision machining including CNC* operations (turning, milling, grinding according to field of specialisation).

*CNC (Computer numerical controlled) operations.

4. Production Operation	:	Execution of contract work and services to industries, heat treatment, works preparation, planning and progress and quality control.

Theoretical Training

A total of 750 hours are spent on the following subjects:

Workshop Technology	- 300 hours
Workshop Calculation and Science	- 150 hours
Engineering Drawing	- 300 hours.

3

BROWN-BOVERI GOVERNMENT TRAINING CENTRE (BBGTC)
(a unit of the Economic Development Board)

Introduction

The Brown-Boveri Government Training Centre previously the Rollei Government Training Centre was established in 1973. BBC Brown Boveri (S), a leading electrical company in the Federal Republic of Germany engaged in electrical power engineering became the new partner in March 1982.

The centre has adopted the technical knowhow and training software of the German Apprenticeship Scheme under the guidance of qualified and experienced German expatriates as well as local staff. The training programme has been certified by the Association of German Chambers of Industry and Commerce, Bonn (DIHT) to be in accordance with the vocational training regulations in the Federal Republic of Germany.

Trade :
(1) Tool and Die Making (Press Tools)
(2) Tool and Die Making (Injection Moulds)
(3) Toolroom Machining
(4) Production Machining
(5) Precision Mechanics

Training Programme

Year I

1) Basic Training : All apprentices will undergo the same basic training in Metal Fitting and Machining for 6 months.

2) Elective Training : In the second half of the year they will be streamed to the respective trades and introduced to the basic trade task.

Trade Area

a) Precision Machining

b) Tool and Die Making

c) Precision Mechanics

With practical instructions in Precision Measuring and Testing, Welding, Brazing/Soldering, Fitting, Shaping, Turning, Milling and Grinding.

3) Specialised Training : In the second year of training, apprentices will undergo further specialisation with respect to their chosen trades.

Tool and Die Making

All apprentices undergoing the Tool and Die Making Course would be able to interpret blueprints and use toolroom machines and equipment.

a) Press Tool Making

Apprentices in the Tool and Die (Press Tools) Course will be able to manufacture and repair press tools, jigs and fixtures.

b) Injection Mould Making

The Tool and Die (Mould Making) Course will enable the apprentices to manufacture and repair injection moulds of different kinds.

c) Toolroom Machining

The Toolroom Machining Course will enable the apprentices to manufacture precisely machined single components for tools and moulds as well as operate conventional machines.

Precision Mechanics

Apprentices specialising in Precision Mechanics will be able to interpret blueprints, manufacture components for precision instruments and prototypes, make, assemble and repair jigs and fixtures using machine tools and equipment. The training also includes pneumatic and hydraulic applications.

Production Machining

Apprentices in the Production Machining Course will be able to interpret blueprints, set up and operate conventional machines as well as CNC machines/cam operated lathes for batch or mass production.

6

PHILIPS-GOVERNMENT TRAINING CENTRE (PGTC)
(a unit of the Economic Development Board)

Introduction

The Philips-Government Training Centre was the third Centre to be set up. This collaboration between the Singapore Government and Philips (Singapore) Pte Ltd started in 1974. Philips (Singapore) is a wholly owned subsidiary of NV Philips, Holland and manufactures an extensive range of electrical and electronic products and components.

Training Programme

The training programme is a modification of the Philips training system in Holland. All apprentices will undergo training in Precision Machining (including CNC operations). The 2-year programme comprises 3000 hours of practical training and 1400 hours of classroom lessons.

Practical Training

The practical hours in the 2 years' training are distributed equally among the 5 practical sections of 600 hours each.

1.	Toolmaking	: Benchwork, engraving, assembly, spark-erosion, machining
2.	Fine Sheet Metal Working	: Bending, cutting, punching, welding, finishing
3.	Milling	: Various milling operations
4.	Turning	: Various turning operations
5.	Other Machining	: Shaping, drilling, jig boring, reaming, tapping, surface and cylindrical grinding.

For each section, training is done in 3 phases:

a basic exercise phase (50% of total time), a second phase where more complicated workpieces are made (25% of the time) and a final phase to cater for repetition of unsatisfactory exercise and production jobs (25% of the time).

Theoretical Training

The classroom lessons are divided into four categories, each comprising 350 hours, as follows:

Category 1: Safety (40 hours), Workshop Mathematics (150 hours), Engineering Science (120 hours), Industrial Orientation (40 hours)

Category 2: Engineering Drawing (Sketching, drawing, blueprint reading, development)

Category 3: Engineering Materials and Heat Treatment, including Practical Applications (120 hours), Measuring Technique (230 hours)

Category 4: Workshop Technology.

INTRODUCTION

The BBGTC has over the last 10 years played a major role in the training of highly skilled manpower for the manufacturing industries in Singapore. The Centre, formerly known as Rollei Goverment Training Centre was established in 1973 under the Economic Development Board's Joint Industrial Training Scheme. It adopted and adapted the technical know how and training software of the German Apprenticeship Scheme under the guidance of qualified and experienced engineers. Today, the Centre's graduates can be found in a wide spectrum of Companies. Their qualifications and skills obtained from the Centre are widely accepted by employers.

In March 1981 the German Federation of Chamber of Industry and Commerce, Bonn (DIHT), certified that the Apprenticeship Training Programme at the Centre is in accordance with the vocational training regulations in the Federal Republic of Germany (FRG).

As from 1984 the Centre will introduce the ADVANCED CRAFTSMAN COURSE modelled along the lines of the Meister Course in West Germany.

Part-time courses in various engineering fields are being conducted for personnel from the industry on a regular basis.

THE TRAINING PROGRAMME

The Centre offers a 4-year full time Apprenticeship Programme which consists of 2 years In-centre followed by 2 years In-plant training.

The courses offered are:

*TOOL & DIE MAKING (PRESS TOOL MAKER)

*TOOL & DIE MAKING (INJECTION MOULD MAKER)

*TOOL & DIE MAKING (TOOL ROOM MACHNIST)

*PRECISION MACHINING (PRODUCTION MACHINIST)

*PRECISION MACHINING (CNC MACHINIST/PROGRAMMER)

*PRECISION MECHANICS

IN-CENTRE TRAINING

Apart from standard exercises and project work, all apprentices will be exposed to actual production work during their 2 years In-centre training. This will stimulate work enthusiasm and create a high sense of responsibility.

At the end of the specialised and intensive In-centre training, apprentices must sit for their final practical and theoretical examination which is equivalent to the German "Facharbeiter Pruefung".

IN-PLANT TRAINING

The 2 years In-plant training in selected companies is designed such that apprentices can reinforce their skills, increase work efficiency and be exposed to the industrial environment.

ELIGIBILITY

Applications are open to Singapore citizens, permanent residents and Malaysians:

- [redacted]
- Possess a GCE 'O' Level Certificate or hold a NTC 3 in Metal Machining.

ADMISSION CALENDER

Recruitment for Apprenticeship Training is twice a year.

1st February

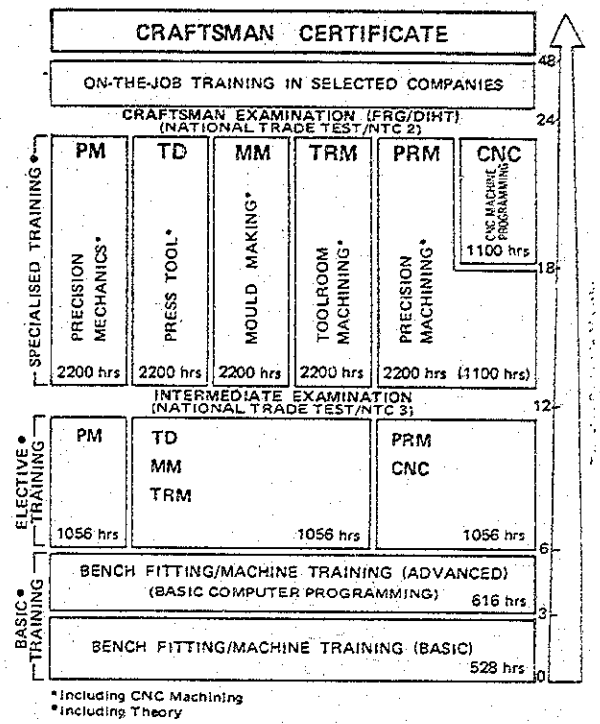
1st August.

CERTIFICATION

On successful completion of the 4 years Apprenticeship, the Craftsman Certificate will be awarded. This is on par with the German "Facharbeiter Brief" and is recognised for the purpose of further training in FRG.

During the In-centre training, the NTC 3 will be awarded at the end of the first year, and the NTC 2 at the end of the 2nd year.

TRAINING SCHEDULE FOR CRAFT COURSES



ADVANCED CRAFTSMAN TRAINING

The need to continually introduce new fields of advanced technology to meet the challenges of tomorrow's industry has created a profound impact on vocational education for shop floor personnel. The Centre will therefore introduce the ADVANCED CRAFTSMAN TRAINING PROGRAMME [redacted] The practice orientated Course Curriculum shall cover 4 major areas viz:

*SKILL DEVELOPMENT
*RELATED SCIENCE AND TECHNOLOGICAL SUBJECTS
*COMMUNICATION AND MANAGEMENT SUBJECTS
*WORKSHOP PEDAGOGY

BROWN-BOVERI GOVERNMENT TRAINING CENTRE (BBGTC)

INTRODUCTION

The Brown-Boveri Government Training Centre previously the Rollei Government Training Centre was established in 1973. BBC Brown Boveri (S), a leading electrical company in the Federal Republic of Germany engaged in electrical power engineering became the new partner in March 1982.

The centre has adopted the technical knowhow and training software of the German Apprenticeship Scheme under the guidance of qualified and experienced German expatriates as well as local staff. The training programme has been certified by the Association of German Chambers of Industry and Commerce, Bonn (DIHT) to be in accordance with the vocational training regulations in the Federal Republic of Germany.

Training Period: In-centre - 2 years
(In-plant attachment - 2 years).

Training Hours : 2200 hours/year for 2 years.

Trade : (1) Tool and Die Making (Press Tools)
(2) Tool and Die Making (Injection Moulds)
(3) Toolroom Machining
(4) Production Machining
(5) Precision Mechanics

Training Programme

Year I

1) Basic Training : All apprentices will undergo the same basic training in Metal Fitting and Machining for 6 months.

2) Elective Training : The second half of the year they will be streamed to the respective trades and introduced to the basic trade task.

Trades

a) Precision Machining
b) Tool and Die Making
c) Precision Mechanics

With practical instructions in Precision Measuring and Testing, Welding, Brazing/Soldering, Fitting, Shaping, Turning, Milling and Grinding.

3) Specialised Training : In the second year of training, apprentices will undergo further specialisation with respect to their chosen trades.

Tool and Die Making

All apprentices undergo the Tool and Die Making Course would be able to interpret blueprints and use toolroom machines and equipment.

a) Press Tool Maker

Apprentices in the Tool and Die (Press Tools) Course will be able to manufacture and repair press tools, jigs and fixtures.

b) Injection Mould Maker

The Tool and Die (Mould Making) Course will enable the apprentices to manufacture and repair injection moulds of different kinds.

c) Toolroom Machinist

The Toolroom Machining Course will enable the apprentices to manufacture precisely machined single components for tools and moulds as well as operate conventional machines.

Precision Mechanics

Apprentices specialising in Precision Mechanics will be able to interpret blueprints, manufacture components for precision instruments and prototypes, make jigs and fixtures as well as assembly and repair using machine tools and equipment. The training also includes pneumatic and hydraulic applications.

Production Machining

Apprentices in the Production Machining Course will be able to interpret blueprints, set up and operate conventional machines as well as CNC machines/can operated lathes for batch or mass production.

Training in all trades comprises 35 hours workshop training and 9 hours practical oriented theoretical subjects per week. Theoretical training includes job related Workshop Instruction, Engineering Science, Engineering Drawing and Workshop Calculation.

At the end of this specialised and intensive industrialised in-centre training, apprentices will sit for their final practical and theoretical examination which is equivalent to the German "Facharbeiter Pruefung".

EDB APPRENTICESHIP TRAINING UNDER THE JOINT INDUSTRIAL TRAINING SCHEME

Centre	:	Tata Government Training Centre
Intake Months	:	May and November
Training Period	:	In-centre (2 years) (In-plant attachment - 2 years)
Training Hours	:	2200 hours/year for 2 years.
Certification	:	End of 1st year - NTC Grade III End of 2nd year - NTC Grade II End of 4th year - Craftsman Certificate.
Trades	:	(1) Precision Metal Machining (2) Tool and Die Making

TRAINING PROGRAMME

The apprentices undergo one year of basic training before being streamed into either the Tool and Die Making Trade or Precision Metal Machining Trade. All apprentices will go through a four stage training programme as follows:

1) Basic Operation Training (BOT)	:	Fitting, turning, milling, grinding, sheet metalwork, arc welding, gas welding, wood working and electrical fitting.
2) Advanced Operation Training (AOT)	:	Fitting, turning, milling and grinding.
3) Special Operation Training (SOT)	:	Tool and die making, pattern model and mould making, machine tool building, precision machining (turning, milling, grinding according to field of specialisation).
4) Production Operation Training (POT)	:	Execution of contract work and services to industries, heat treatment, works preparation, planning and progress and quality control. Industrial visits to manufacturing companies are arranged to acquaint them with the actual working environment.

Theoretical Training

A total of 750 hours are spent on the following technical subjects:

Workshop Technology	- 300 hours
Workshop Calculation and Science	- 150 hours
Engineering Drawing	- 300 hours

Description of Trades

The Precision Metal Machinist will be trained to interpret blueprints, set-up and operate conventional machines as well as some specialised machines eg computer-numerically controlled machines.

The Toolrand Die Maker will be trained to interpret blueprints, manufacture and repair press tools, injection moulds and jigs and fixtures using toolroom machines and equipment.

EDB APPRENTICESHIP TRAINING UNDER THE JOINT INDUSTRIAL TRAINING SCHEME

Centre	:	Philips Government Training Centre
Intake Months	:	February and August
Training Period	:	In-Centre - 2 years (In-plant attachment - 2 years)
Training Hours	:	2200 hours/year for 2 years
Certification	:	End of 1st year - NTC Grade III End of 2nd year - NTC Grade II End of 4th year - Craftsman Certificate (received only after successful completion of 2 years in-plant attachment)
Trade	:	PRECISION MACHINING (including Computer Numerical Control Machining - CNC)

INTRODUCTION

Philips Government Training Centre was established in 1975 through the Economic Development Board and Philips Singapore Pte. Ltd.

It is aimed to train young people to attain skilled craftsmanship in Precision Machining and to be self-reliant so as to fulfil the requirements of the industries.

The Centre is managed by an expatriate from Philips Holland as well as overseas trained local staff.

TRAINING PROGRAMME

The 2 years in-centre training programme comprises of 3200 practical hours and 1200 theoretical hours. It is aimed to have a full integration of practical and theoretical lessons.

The Centre adopts a broad based training system which provides the apprentices with greater flexibility in pursuing his/her field of specialisation at a later stage, depending on his/her ability, interest and skills.

All apprentices undergo the same training in Precision Machining.

Practical Training

The practical sessions are as follows:

Mechanical Benchwork	:	Benchwork, Electrical arc & gas welding Sheetmetal Working, Fitting/Assembly.
Toolroom Machining	:	Copy Milling, Jig Boring, Electrical Discharge Machining.
Grinding	:	Surface Grinding, Cylindrical Grinding, Jig Grinding, Tool & Cutter Grinding.
Milling	:	Different milling operations.
Turning	:	Different turning operations.
CNC-Machining	:	Various milling & turning operations.

Attachments to various EDB training units

Control Techniques	:	Hydraulic, Pneumatic.
Micro-Computer Programming/Application	:	Basic Language.
Computer Aided Design/ Manufacturing (CAD/CAM)	:	Programming/Application
Industrial Robotics	:	Programming/Application

Theoretical Training

The theoretical lessons are divided into 4 areas, each comprising 288 hours, as follows:

Workshop Calculation	:	Workshop Mathematics (138 hrs), Engineering Science (105 hrs), Industrial Orientation (45 hrs).
Engineering Drawing	:	Sketching, Blueprint reading, Technical & Mechanical Drawing.
Engineering Material & Measuring Technique	:	Practical & Theory (108 hrs)
	:	Practical & Theory (180 hrs)
Workshop Technology	:	Safety (40 hrs)
		Mechanical Benchwork, Toolroom Machining, Milling, Turning, Grinding and CNC-Machining — (248 hrs)