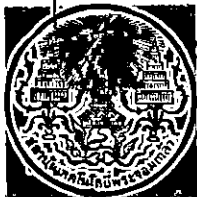
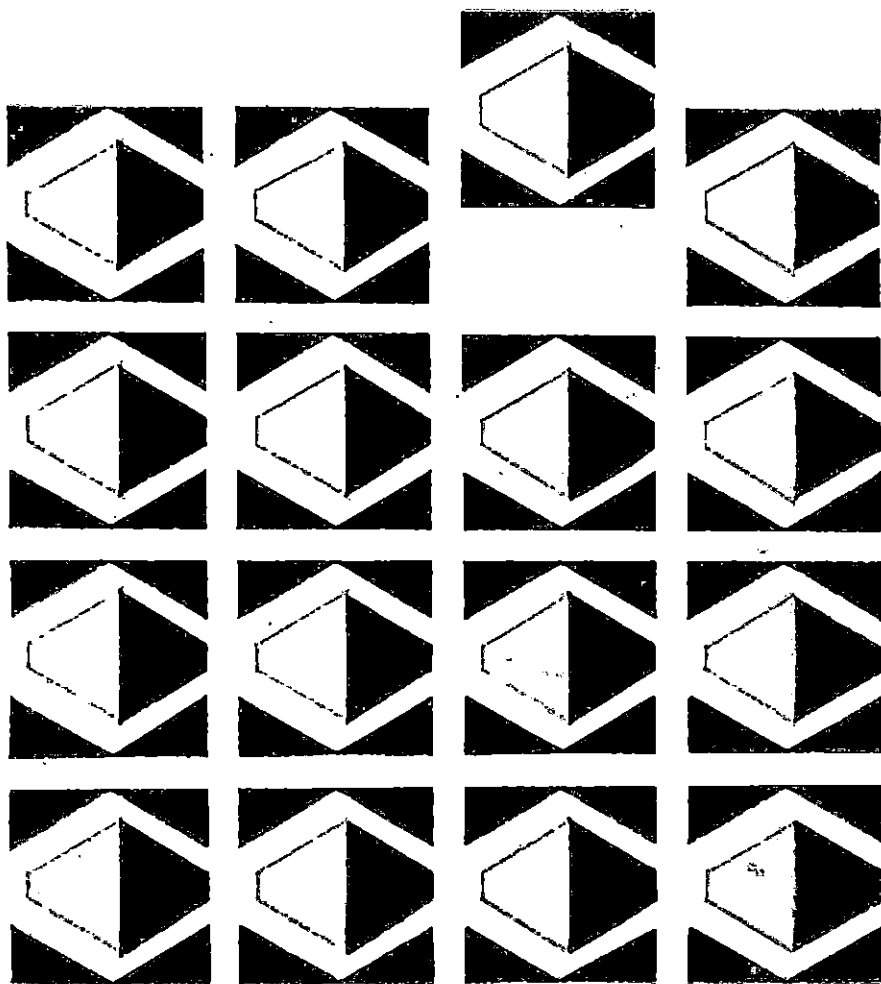


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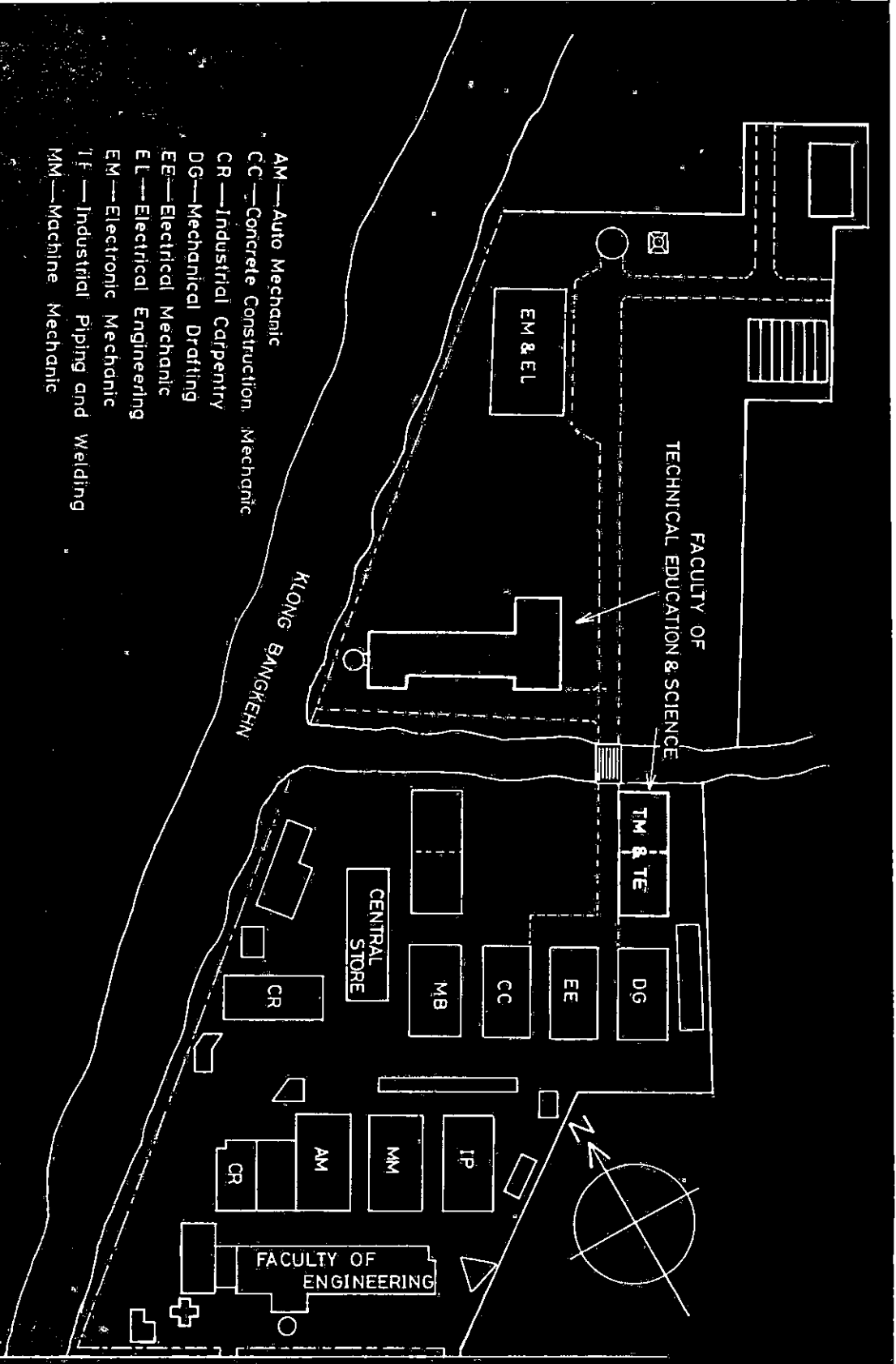


King Mongkut's Institute of
Technology North Bangkok

Faculty of Technical Education and Science



- AM—Auto Mechanic
- CC—Concrete Construction, Mechanic
- CR—Industrial Carpentry
- DG—Mechanical Drafting
- EE—Electrical Mechanic
- EL—Electrical Engineering
- EM—Electronic Mechanic
- IP—Industrial Piping and Welding
- MM—Machine Mechanic

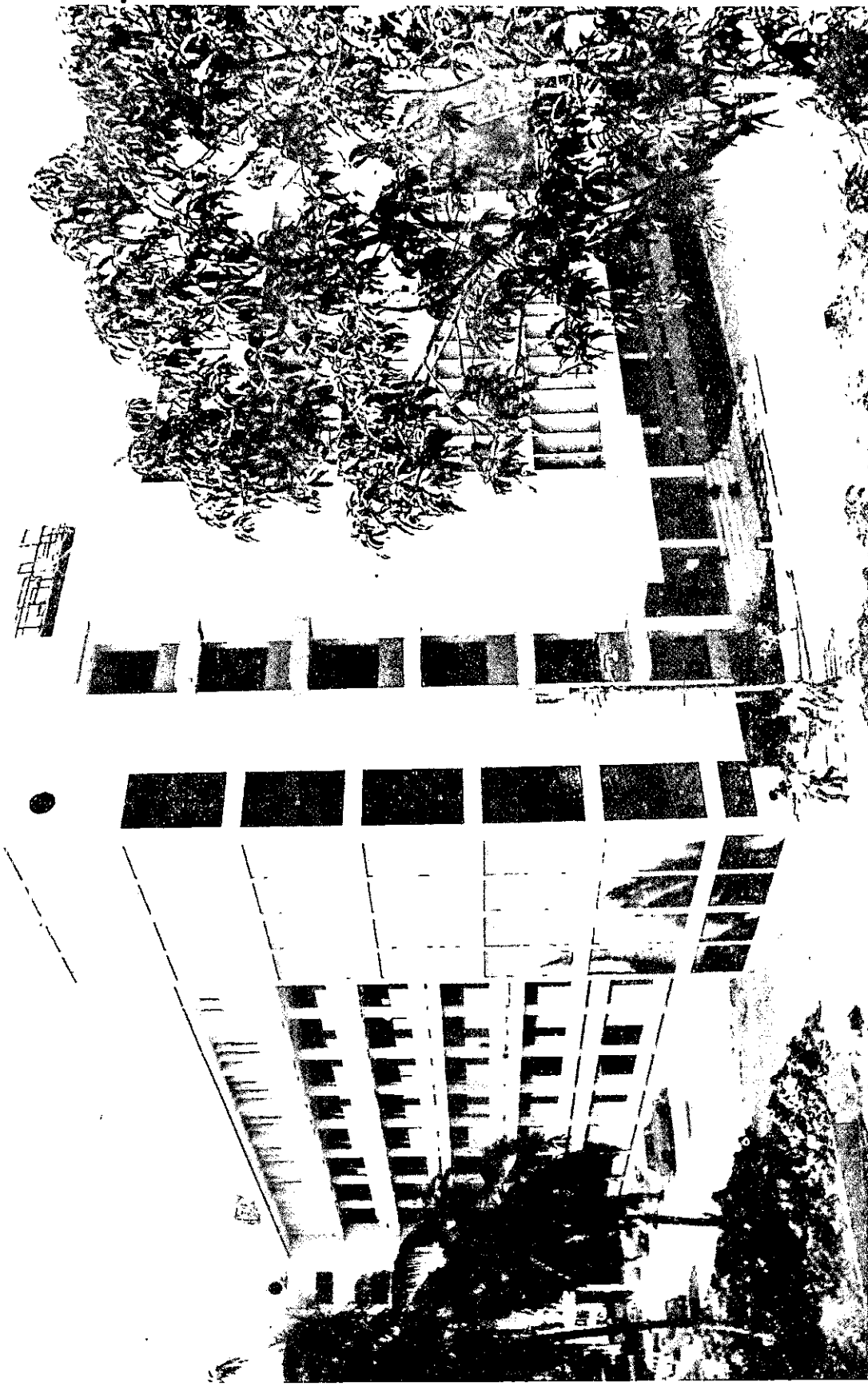


PHIBUN SONGKHRAM ROAD

Faculty of Technical Education and Science

Tel : 850691, 850693
852111-5

Bangson
Bangkok 8
Thailand



Main Faculty Building

CONTENT

	<i>Page</i>
GENERAL INFORMATION	
A Short History of King Mongkut's Institute of Technology North Bangkok Campus	1
Aims of the Faculty	4
Courses of Instruction	5
Conditions of Admission	6
Fees	7
Grading, Examination and Graduation Regulation	8
SYLLABUS OF COURSES	12
Department of Teacher Training in Electical Technology	13
Department of Teacher Training in Mechanical Technology	47
ACADEMIC AND ADMINISTRATIVE STAFF	84
GERMAN EXPERTS	90

General Information

A SHORT HISTORY OF KING MONGKUT'S INSTITUTE OF TECHNOLOGY NORTH BANGKOK CAMPUS

The King Mongkut's Institute of Technology came into being as a result of an Act, promulgated on 23rd April 1971, which combined and upgraded the three former technical institutes, namely Thai-German Technical Institute, Thonburi Technical Institute and Nondhaburi Institute of Telecommunication, into one Institute of Technology. One of the main aims of the new Institute is to provide courses of instructions for training skilled workers, industrial technicians, technical teachers and practical engineers with qualifications that are relevant to the needs of various technical institutions and manpower requirement of industrial development of the country.

The North Bangkok Campus, situated at Pibulsongkram Road, Bangson, Bangkok 8, was formerly known as the Thai-German Technical Institute. It was first established as a result of an agreement, signed on 16th March 1959, between the Government of the Kingdom of Thailand and the Government of the Federal Republic of Germany, which stated that the two governments would jointly establish a technical school at Bangson, a northern district of Bangkok, with the purpose of training young Thais to become skilled workers in various industrial trades. At that time the Institute offered only four trades, namely Auto Mechanic (AM), Electrical Mechanic (EE), Industrial Piping and Welding (IP) and Machine Machanic (MM). In the first session fifty students were admitted.

On 14th December 1961, another agreement was signed between the two governments to establish two more trades ; Carpentry (CR) and Electronic Mechanic (EM).

In 1963 another trade, Technical Drafting (DG), was added. One more trade, Concrete Construction (CC), has been opened in the session 1972.

At first the Institute's aim was to train Thai students who pass grade 10 with good records to become skilled workers which the country is badly in need of. This training program was, and still is, quite unique among the Technical Institutes or other Trade Schools in Thailand, in the sense that the emphasis is more on practical training as evidenced by the fact that about 75% of the trainee's time is devoted to practical work. This is a 3 year-course, in which the first two years consist of basic skill training, based on stepwise systematic method as practised in Germany. In the final year, the students will practise their skills in actual production work within the Institute's workshops.

Also in 1963, the Institute expanded the courses further to a two-year course for training industrial technicians. Only graduates from the skilled worker level with good records are admitted to the technician level. Technician training is available in all eight trades mentioned above. The training program for this level is similar to that in the skilled worker level. However, the theoretical training is more extensive and the practical work requirement is fulfilled by apprenticeships or journeyman with factories in the Bangkok area or by actual production work in the Institute's workshops.

There is still some shortage of industrial technicians in Thailand, hence in 1969 the Institute opened the evening school for those who obtained the trade certificate (13th grade) and already work in the industries. The course lasts for 3 years with

15 hours a week for theoretical subjects in the evening and 8 hours a week every Saturday for practical work.

Thailand still needs a lot of good skilled workers. In 1970, the Institute opened an Apprentice school with the co-operation of the industries for those who have completed grade 10. The students study theoretical subjects, which are the same as for full time students, for 13 hours a week in the evening and on Saturday at the Institute. For the first year the Institute trains these apprentices the basic practical work in the Institute workshops and the last two years of the course the students work during daytime in the approved and appropriate factories in Bangkok area.

Realising that Thailand also needs a high numbers of practical engineers, the Institute in 1964 introduced a new program similar to those conducted by the engineering schools in Germany. This course is a five-year one, for students who have completed 12th grade general education. However since 1969, the Faculty of Engineering has accepted instead the students who have obtained trade certificate (grade 13) with very good academic records i.e. they must have at least 70% mark for Shop maths and Engineering science subjects and 75% for practical work. The reason is that a student must have some practical experience before he can make an application to enter the Faculty of Engineering. The course is now a four-year one. Students who have completed the first two years of the course are qualified to become engineering technicians. Only students with good standing are allowed to continue their studies to become practical engineers.

Expansion of Technical Institutes in Thailand at present is not feasible owing to the lack of qualified technical teachers. Hence, on 30th March 1971, another agreement with the Government of the Federal Republic of Germany was signed

providing a four-year course to train grade 13 students, with trade certificates and qualifications like those who want to apply for the engineering courses, to become theory and workshop teachers. The curriculum used in this so called Faculty of Technical Education and Science is adapted from the German one under the close supervision of the German experts. Hence a new method of training technical teachers is being tried for the first time in Thailand.

The King Mongkut's Institute of Technology, North Bangkok Campus, now comprises of two faculties, namely Faculty of Technical Education and Science and Faculty of Engineering.

AIMS OF THE FACULTY

It is recognised that Thailand still needs quite a number of good technical teachers for Vocational schools and Technical Colleges. It is therefore the aim of the Faculty to give a sound education and training in the fundamental technical principles with practical skills, and in the proper methods of teaching both technical subjects and workshop practice. The students will be suitable to work as theory teachers or workshop teachers in the technical schools or colleges, and will be able to produce teaching aids for technical subjects using available local materials. It is also the aim of the Faculty to teach the students to dedicate themselves to the teaching profession. Furthermore the Faculty aims to produce Master degree graduates to work as lecturers in higher institutes of learning and as administrators in vocational schools, technical colleges or other technical education concerns.

COURSES OF INSTRUCTION

The Faculty provides courses of instruction for :

- 1) The Technician Diploma in Mechanical Technology and Electrical Technology,
- 2) The Degree of BS in Industrial Education in the field of Mechanical and Electrical Technology,
- 3) The Degree of MS in Industrial Education in the field of Mechanical and Electrical Technology.

The courses for the Technician Diploma extend over two years. Three days a week are used for technical and general subjects and the students must spend two days a week doing laboratories and workshop practice.

The courses for the BS. I. Ed. last for two years for a full-time student and at least two and a half years for part-time or twilight students. The students must learn more advanced technical theory so that they will have a good background of "what to teach". At least one day a week is spent in the workshop to improve practical skills by doing special projects such as teaching aids and laboratory equipments. The students must also study educational subjects. The teaching practice in the first semester is done as micro-teaching, i.e. the student practises teaching in front of his own group (sometimes in front of TV camera) to learn "how to teach". For the remaining one and a half year they teach vocational or technician classes. The student must prepare a lesson beforehand, discuss it with his own group and his supervisor and teaches in a real class under the close supervision of his supervisor. His group also attends the class. Afterwards they discuss the performance and the mark that should be given to each of them. A student may teach poorly in the beginning but if he is

open to criticism, sees his own mistakes and corrects them in the next lesson of teaching practice, he will get a good mark. In this way the students learn a proper way of teaching and gain a lot of confidence and stimulation to improve themselves.

It cannot be too strongly stressed that the professional education of a young technical teacher is not completed in the Institute, but requires a period of appropriate practical and professional experience after graduation during which the graduate usually develops interests of a more specialised nature and gains more confidence in teaching. It is the graduate with a sound knowledge of the fundamentals, practical skills and proper teaching methods who is best prepared not only to become a successful technical teacher but also to maintain his effectiveness throughout his career.

The courses for the MS. I. Ed. consist of 48 credits and extend over a minimum period of two years. The subjects taught include both educational and technical ones; and the student must present one thesis at the end of the course.

CONDITIONS OF ADMISSION

REQUIREMENTS FOR ADMISSION TO TECHNICIAN DIPLOMA COURSE

Candidates must have Skilled Worker Certificates (MS 6) with marks of higher than 70% for Shop Maths and Engineering Science and 75% for Workshop Practice. They must take written and oral entrance examinations.

REQUIREMENTS FOR ADMISSION TO BACHELOR DEGREE COURSE

Candidates must have Technician Diploma in Mechanical or Electrical Technology with good academic records. For part-time or twilight course they must work as a technical teachers in Vocational Schools or Technical Colleges. Candidates must also take entrance examinations.

REQUIREMENTS FOR ADMISSION TO MASTER DEGREE COURSE

Candidates must have honours bachelor degree either in Industrial Education or in Engineering and must work as teachers in technical schools or institutes for at least one academic year. Candidates who do not graduate with honours can be accepted only by special approval of the Faculty Board.

The dates for application, examinations, interviews etc. will be announced at least two months in advance.

FEES

Students will be charged upon registration the following fees, which has been approved by the Board of the Institute :

1. Education Supporting Fee, annually	250 Bht.
2. Registration Fee:	
Course Registration per cr-hr.	50 Bht.
However, this fee shall not exceed per semester	600 Bht.
Registration fee for less than 3 cr-hr. per semester	200 Bht.
Late Registration	50 Bht.
3. Other Fees:	
Application fee for entrance examination	50 Bht.
Medical examination	10 Bht.
Studentship registration	100 Bht.
Special Examination per subject	50 Bht.
Transcript per copy	10 Bht.
Registration fee for Degree or Postgraduate Diploma	200 Bht.

Registration fee for Diploma or Certificate		100 Bht.
Library Fee :	regular semester	50 Bht.
	summer session	25 Bht.
Health Service Fee :	regular semester	50 Bht.
	summer session	25 Bht.

For postgraduate courses the fees will be as above except

1. Course registration per cr.-hr.		75 Bht.
However, this fee shall not exceed per semester		900 Bht.
2. Library Fee :	regular semester	100 Bht.
	summer session	50 Bht.

GRADING, EXAMINATION AND GRADUATION REGULATION

1.1 Grading system is as follows :

Grade	Point	
A	4	Excellent
B	3	Good
C	2	Fair
D	1	Poor but passed
F	0	Failed
Fa	0	Failed-insufficient attendance
Fe	0	Failed-absent from examination
Fw	0	Failed-late withdrawal
W	-	Withdrawal
I	-	Incomplete
S	-	Satisfactory
U	-	Unsatisfactory

Note : The result of each subject must be submitted by using alphabets. Grade points are used only for calculating semester and cumulative indices.

- 1.2 Minimum attendance of 80% is required for each subject, otherwise the students will not be permitted to sit for the examination of that subject and will be given Fa and this must be counted in the calculation of semester index.
 - 1.3 A student who is absent from the examination without adequate reason will be given Fe and this must be counted in the calculation of semester index.
 - 1.4 Procedure for withdrawal, changing or adding of any subject.
 - 1.4.1 Withdrawal of any subject must be done within six weeks, otherwise it will be given Fw and this must be counted in the calculation of semester index.
 - 1.4.2 Changing or adding of any subject must be done within two weeks. The actual subject taken are used for calculating the semester index.
 - 1.5 Incomplete (I) is given to a student whose assigned work has not been completed in time because of inevitable circumstances and this is not counted in the calculation of semester index. An incomplete grade must be changed to others after the student has submitted his assigned work.
 - 1.6 The result of any subject without credit will be given Satisfactory (S) or Unsatisfactory (U).
2. Grading calculation.
- 2.1 Grade point average is obtained by dividing the total number of grade points accumulated by the grade point base which is equivalent to the total credit hours including those subjects in which the student repeats.
 - 2.2 There are two types of indices.
 - 2.2.1 Semester index : this is the grade point average for each semester.

2.2.2 Cumulative index : this is the total grade point average for the whole course taken up to the time of calculation.

3. Requirements for graduation.

3.1 The student must complete all the prescribed or equivalent subjects.

3.2 The cumulative index obtained must not be less than 2.00.

3.3 The student must have honour or moral according to the Moral Codes of the Institute.

4. Honours for bachelor degree students.

4.1 First class honours will be given to a student who obtains cumulative index above 3.50 within the time of the prescribed course and has never failed in any subject.

4.2 Second class honours will be given to a student who obtains cumulative index above 3.00 within the time of the prescribed course and has never failed in any subject.

5. Academic standards.

5.1 Any student who has a cumulative index below 1.00 will be dismissed from the Institute.

5.2 Any student who has a cumulative index below 2.00 will be placed on probation. If his semester index falls below 2.00 during the probation period, he will be dismissed from the Institute.

5.3 The probation period will be over if the student obtains the cumulative index above 2.00 after any semester.

5.4 If the student has completed all the prescribed courses but fails to acquire the cumulative index of 2.00, he will be permitted to continue up to two

semesters to raise his cumulative index to 2.00. If he still fails, he must be dismissed.

6. Repeating.
 - 6.1 The student who fails in any subject, must repeat in that subject or other subject that the institute approves.
 - 6.2 The student who is weak in any subject can ask for permission to repeat that subject again.
7. Full-time student must register at least 12 credit-hours for each semester except in the final year in which the remaining courses may be less than 12 credit-hours.
8. The student who cheats in the examination must be punished by one or more of the followings :
 - 8.1 He must be dismissed.
 - 8.2 The result of the examination for that semester will not be valid and the registration for the following semester will not be accepted.
 - 8.3 The result of the examination for that semester will not be valid.
 - 8.4 He will be given F for that subject.
9. There should be at least two examinations for each semester.
10. The results of all the examinations and gradings at all levels must be approved by the Faculty Board and the Dean of that Faculty.

Syllabus of Courses

DEPARTMENT OF TEACHER TRAINING
IN ELECTRICAL TECHNOLOGY
TECHNICIAN DIPLOMA COURSE

Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
1	SS 4003	Social Science	1	0	1
	LA 4183	Technical English	2	1	2
	MA 4025	Mathematics	3	1	3
	SC 4053	Engineering Science	2	0	2
	SC 4075	Chemistry	2	0	2
	TE 4431	Technical Drawing	0	2	1
	TE 4901	Electrical Fundamentals	2	1	2
	TE 4903	Network Analysis	2	0	2
	TE 4971	Signal and Control Circuits	2	0	2
	TE 4991	Laboratory	0	7	3
	TE 4993	Workshop Practice	0	7	2
			16	19	22
2	SS 4004	Social Science	1	0	1
	LA 4184	Technical English	2	1	2
	MA 4026	Mathematics	2	0	2
	SC 4054	Engineering Science	2	0	2
	TE 4902	Fundamental Electrical Technology	3	1	3
	TE 4904	Network Analysis	2	1	2
	TE 4962	Industrial Electronics	2	0	2
	TE 4972	Contactless Control	2	0	2
	TE 4974	Electrical Measurements	2	0	2
	TE 4994	Electrical Workshop Practice	0	7	2
	TE 4692	Mechanical Workshop Practice	0	7	2
			18	17	22

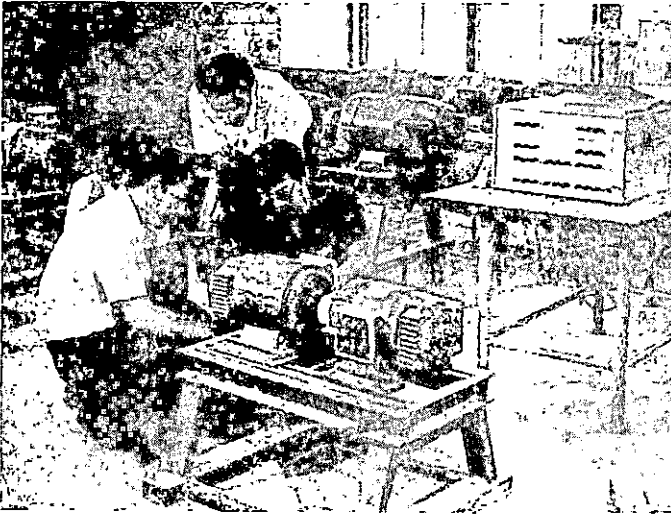
Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
3	LA 5183	Technical English	1	1	1
	MA 5025	Mathematics	2	0	2
	SC 5053	Engineering Science	2	3	3
	TE 5903	Network Analysis	2	0	2
	TE 5921	Electrical Machines	3	1	3
	TE 5941	Electrical Installations	2	1	2
	TE 5961	Industrial Electronics	2	0	2
	TE 5971	Signal and Control Circuits	2	0	2
	TE 5973	Electrical Measurements	2	0	2
	TE 5991	Laboratory	0	4	2
	TE 5993	Workshop Practice	0	7	2
			18	17	23
4	BU 5098	Shop Management and Cost Estimation	2	0	1
	LA 5184	Technical English	1	1	1
	MA 5026	Mathematics	2	0	2
	SC 5054	Engineering Science	2	0	2
	TE 5922	Electrical Machines	3	1	3
	TE 5942	Electrical Installations	2	1	2
	TE 5962	Industrial Electronics	3	1	3
	TE 5972	Signal and Control Circuits	2	0	2
	TE 5992	Electronic Laboratory	0	7	3
	TE 5996	Electrical Machine Laboratory	0	7	3
			17	18	22

BACHELOR DEGREE COURSE

Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
1	LA 6183	Technical English	2	0	0
	MA 6025	Applied Mathematics	3	0	3
	TE 6901	Advanced Electrical Technology	3	1	3
	TE 6921	Electrical Machines	2	0	2
	TE 6941	Electrical Installations	2	0	2
	TE 6961	Industrial Electronics	2	0	2
	TE 6991	Laboratory	0	7	3
	TE 6993	Workshop Practice	0	6	2
	ED 6801	Teaching Methods	2	0	2
	ED 6841	Educational Measurements	2	0	2
	ED 6891	Teaching Practice	0	3	2
			18	17	23
2	LA 6184	Technical English	2	0	0
	MA 6026	Applied Mathematics	2	0	2
	TE 6902	Advanced Electrical Technology	2	0	2
	TE 6922	Electrical Machines	2	0	2
	TE 6942	Electrical Installations	2	0	2
	TE 6962	Industrial Electronics	2	0	2
	TE 6992	Laboratory	0	5	2
	TE 6994	Workshop Practice	0	7	2
	ED 6804	Conditions of Learning	2	0	2
	ED 6862	Teaching Aids	2	0	2
	ED 6892	Teaching Practice	0	7	4
			16	19	22

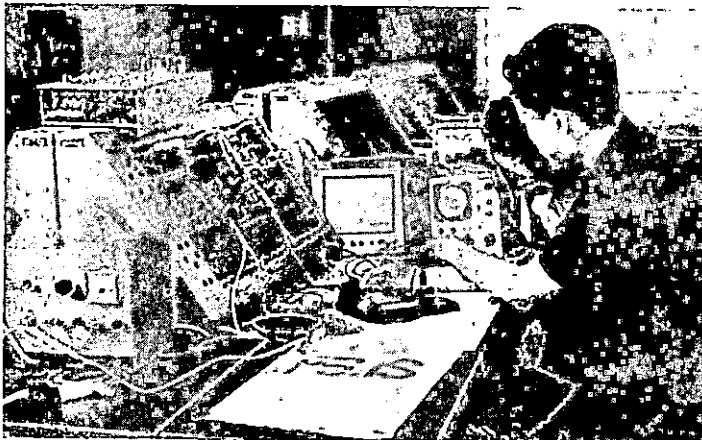
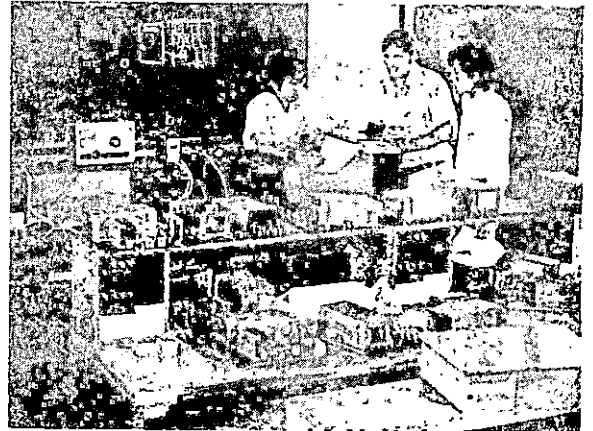
Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
3	SS 7003	Social Science	1	0	1
	TE 7561	Workshop Technology	2	0	2
	TE 7971	Principles of Feedback and Control Systems	2	0	2
	TE 7973	Electrical Measurements	2	0	2
	TE 7981	Data Processing	1	0	1
	TE 7991	Laboratory	0	6	3
	TE 7993	Special Project	0	7	3
	ED 7831	Educational Psychology	2	0	2
	ED 7871	Course Developments	2	0	2
	ED 7891	Classroom Teaching Practice	0	6	3
	ED 7895	Workshop and Lab. Teaching Practice	0	4	2
				12	23

Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
4	SS 7004	Social Science	1	0	1
	BU 7098	Shop Management and Cost Estimation	2	0	1
	TE 7942	Electrical Installations	2	0	2
	TE 7974	Electrical Measurements	2	0	2
	TE 7982	Data Processing	2	0	2
	TE 7992	Laboratory	0	7	3
	TE 7994	Special Projects	0	7	3
	ED 7802	Teaching Methods	2	0	2
	ED 7852	Vocational Education and Administration	0	0	2
	ED 7892	Classroom Teaching Practice	0	4	2
	ED 7896	Workshop and Lab. Teaching Practice	0	4	2
				13	22



Installation of the Electronic Machine Laboratory

Setting up the Electronic Laboratory



Experiment in Electronic

COURSE DESCRIPTION

Technician Diploma Course (TE)

First Semester

- SS 4003 Social Science 1-0-1
- Introduction to Thai culture, etiquette and manner. The civics and ethics for Thai people in a democratic society. The role of the economic and social development plans.
- LA 4183 Technical English 2-1-2
- Fundamental technical terms and their usage. Basic patterns used frequently in technical English. Explanation of difficult terms and patterns taken from books or sheets, used in lectures about electrical technology. Pertinent exercises. Pronunciation drills.
- MA 4025 Mathematics 3-1-3
- Scientific notations, conversion of units, application of the slide rule, functions and graphs, quadratic equations, simultaneous equations, graphical solutions. Fundamental trigonometric functions and functional notations, radian system, trigonometric equations, trigonometric theorems. Complex numbers and their fundamental relations. Natural logarithm.
- SC 4053 Engineering Science 2-0-2
- Equilibrium of forces, tensile and compressive strength, stress and strain, Hooke's law, Young's modulus, linear expansion of solids and liquids,

thermal stress, stresses in beam and shaft. Hydraulic pressure, Archimedes principle, atmospheric pressure, manometers. Introduction to vectors, addition of forces graphically and analytically, resolution of forces, moments, forces on levers, forces on supports, simple machines. Applications.

SC 4075 Chemistry 2-0-2

Physical and chemical changes, periodic table, Bohr's model of atoms, acids, bases and salts, synthesis, analysis and crystallization of molecules, ionic and covalent bonds, colour reaction of indicators, pH-values, composition of air, electrolysis, oxyhydrogen gas, reduction, stoichiometrical calculations.

TE 4431 Technical Drawing 0-2-1

Geometrical constructions, introduction to technical drawing. Standard lettering. Drawing in 3-views, first angle projection, dimensioning according to ISO. Simple prismatic workpieces. Sections on cylinders, penetration on cylinders. Full section and half section, surface finishing signs or machining symbols. Dimensioning of tapers and standard threads. Representation of rivets, screws, and welding seams. The 4 conical sections compound bodies, development of prisms cylinders, pyramids and cones. Workshop adequate detail drawing. List of parts, bill of material.

- TE 4901 Fundamental Electrical Technology 2-1-2
 Electron flow, conduction in gases, neon glow lamp. Electrical field, capacitors. Magnetic field. Electromagnetism, permeability and hysteresis. Motor principle, induced e.m.f. Alternator. Transformer. Single and three phase system. Inductors at D.C. and A.C.. Eddy current and skin effect.
- TE 4903 Network Analysis 2-0-2
 Review : SI units resistivity, kirchhoff's laws, voltage rise and voltage drop, power and energy, heat and mechanical equivalent, voltage sources and current sources, internal resistance, maximum power-transfer theorem, group connections, unloaded and loaded voltage dividers, bridge circuits, mesh method. Superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem, two-port networks, star-delta transformations.
- TE 4971 Signal and Control Circuits 2-0-2
 Introduction to motor control diagrams, full voltage starting, motor protection, fault-indication, pressure control, relays diagrams, temperature control, heavy load starting, reverse starters, interlocking circuits, speed control, star-delta starting, reversing star-delta starter, consequent pole reversing starter, diagrams for a machine tool. (e.g. milling machine)
- TE 4991 Laboratory 0-7-3
 Laboratory course covering the subject-matter of the lecture courses in electrical fundamentals.
- TE 4993 Workshop Practice 0-7-2
 Refining of bench work techniques, installation of different electrical circuits, transformer winding.

Second Semester

- | | | |
|---------|--|-------|
| SS 4004 | Social Science | 1-0-1 |
| | Fundamental principle of economics and their applications to modern society, national income, employment and economic growth. Money and banking system. Demand, supply and prices. Competition and monopoly. Current economic problems. | |
| LA 4184 | Technical English | 2-1-2 |
| | Continuation of the first semester programme using more complex structures of technical English. | |
| MA 4026 | Mathematics | 2-0-2 |
| | Matrices and determinants, Cramer's rule, review of the use of logarithmic tables and slide rule, exponential and logarithmic function, arithmetic progressions, harmonic and geometric progressions, powers of multiple terms, binomial theorems. Analytic geometry of the straight line, intersecting lines, circle, systems of axes, parabola, ellipse and hyperbola. | |
| SC 4054 | Engineering Science | 2-0-2 |
| | Equilibrium of a rigid body, Friction. Motion in the straight line and under gravity, projectiles, circular motion. The laws of motion. Centrifugal forces. Work, power and energy. Law of conservation of energy applied to simple machines, friction and heat. | |
| TE 4902 | Fundamental Electrical Technology | 3-1-3 |
| | Electrorefining and electroplating, primary cells, storage batteries. Thermal effects. Electrical and mechanical power and work, power factor | |

correction. Linear and nonlinear resistors. Harmonics, fourier-series, square wave voltages. Magnetic circuits, strength of electro and permanent magnets.

TE 4904 Network Analysis 2-1-2

Phasor notations, complex impedance of parallel and series connections, equivalent circuits, group connections, frequency response, resonant circuits, quality factor and bandwidth, locus diagrams.

TE 4962 Industrial Electronics 2-0-2

Atomic structure and valencies, conduction and doping. Semiconductor diodes, diodes in rectifiers, filters in power supplies, voltage doubling and multiplication, series and parallel connection of diodes, DC and AC resistances, Z-diodes as stabilizers. Semiconductor triodes (transistors). DC-behaviour in CE circuits, CE characteristics, current and voltage notations, loadline and Q-point.

TE 4972 Signal and Control Circuits 2-0-2

Impulse switching, automatic door opener, plug-stop control, dynamic braking, crane single-phase motors, step by step control, program control, high-voltage motor control, transformer substation, Buchholtz protection, sequence control, starting of slip ring motors.

TE 4974 Electrical Measurements 2-0-2

Measurement principles and errors, moving-coil instruments, moving iron instruments, moving magnet and hotwire instruments, electrostatic instrument and cross coil instrument, extension of ranges and multimeter,

current and voltage transformers, Recording instruments. Oscilloscopes and their application. D.C. bridges, testing of cables and wires.

TE 4994 Electrical Workshop Practice 0-7-2

This course provides the practical techniques for motor winding, motor control circuitry and refrigeration.

TE 4692 Mechanical Workshop Practice 0-7-2

This course provides the practical techniques for arc-welding, gas welding, as well as lathe works.

Third Semester

LA 5183 Technical English 1-1-1

Grammatical practice of phrases, clauses and sentence structure. Practice in using and building up vocabulary. More difficult patterns used in technical subjects. Developing the ability to understand and interpret technical texts. Review of the morphology of English.

MA 5025 Mathematics 2-0-2

Function and limits, slope of a curve, derivative of a function, velocity and rates, formulas for differentiation, higher order of derivative, the differentials, implicit functions and parametric functions with their derivative, chain rule, approximation by differentials, related rates, maxima and minima, points of inflection. The indefinite integral with applications, differentiation and integration of trigonometric functions.

- SC 5053 Engineering Science 2-3-3
- Review : Temperature and heat, latent heat of fusion and vaporization, heat transfer, thermal resistance, Boyle's law, and Charles' law, general gas law. Saturated and superheated vapour, humidity, air conditioning, principles of refrigeration, typical vapour-compression cycle, food preservation, freezing methods, commercial refrigerators : controls, cooling load calculations. Laboratory work is conducted to illustrate engineering science principles given in the lecture courses.
- TE 5903 Network Analysis 2-0-2
- AC circuits : Matrix form of mesh current equations and node voltage equations with their applications, Three phase systems, filter circuits, bridge circuits, Thevenin's and Norton's theorems, superposition and reciprocity theorems.
- TE 5921 Electrical Machines 3-1-3
- Transformer principle, transformer cores, autotransformer, variable-ratio transformers, three-phase transformer, Star-, Delta-, T-, and V-connection, transformer phasor diagrams, simplified diagram, equivalent resistance and reactance, open-circuit and short-circuit test, regulation, efficiency. Alternator construction, winding diagrams and alternator regulation. Parallel operation and synchronizing. Voltage regulators.
- TE 5941 Electrical Installations 2-1-2
- Kinds and standards of conductors, construction and applications of several conductors. Planning of low voltage power distribution system, radial

feeder network, looped network, meshed network, short circuit protection. Fundamentals of lighting engineering, design principles, technical data and properties of lighting equipment.

TE 5961 Industrial Electronics 2-0-2

Transistor biasing, rating, identification of transistor terminals, transistor as switch, voltage regulation, A.C.-C.E. amplifier, simplified equivalent circuit, the 3 fundamental transistor-configurations, power amplification, negative feedback in transistor circuits. Sinusoidal oscillators. Nonsinusoidal oscillators. Trigger circuits.

TE 5971 Signal and Control Circuits 2-0-2

D.C. contactor and relays. d.c. generators, compound generators in parallel, voltage regulation, battery charging, three-phase rectifiers, d.c.-motors starters with speed control, Ward-Leonard control, counter e.m.f.-acceleration, series-relay acceleration, reactive definite-time acceleration, braking of d.c.-motors, hoist and crane controllers, two motor drives.

TE 5973 Electrical Measurements 2-0-2

Measurement of magnetic properties, inductances, capacitances, frequencies and power. Dynamometer, Watt-hour meter. Power measurement in three phase circuits. Power factor measurement. Measurement of nonelectrical quantities.

- TE 5991 Laboratory 0-4-2
 Laboratory course covering the subject-matter of the lecture course in power measurement.
- TE 5993 Workshop Practice 0-7-2
 Fabrication of related projects such as teaching-aids etc.

Fourth Semester

- BU 5098 Shop Management and Cost Estimation 2-0-1
 Introduction and the art of book keeping organization of factory, types of organizations, job evaluation, wage payments, storing and flow of material, inventory control, store room operation, production control, purchasing department, sales department, technical and commercial side of an enterprise, public relations.
- LA 5184 Technical English 1-1-1
 A continuation of the third semester programme with the emphasis on developing the ability to read and speak. Practice on writing business letters and technical reports.
- MA 5026 Mathematics 2-0-2
 Area under and between curves, the inverse trigonometric functions with their derivatives, derivatives and integrals of special functions. Several methods of integration. Basic differential equations and their technical applications.

sistors. Photoelectric devices. Special nonlinear devices. Intergrated circuit amplifier. operational amplifiers.

TE 5972 Contactless Control 2-0-2

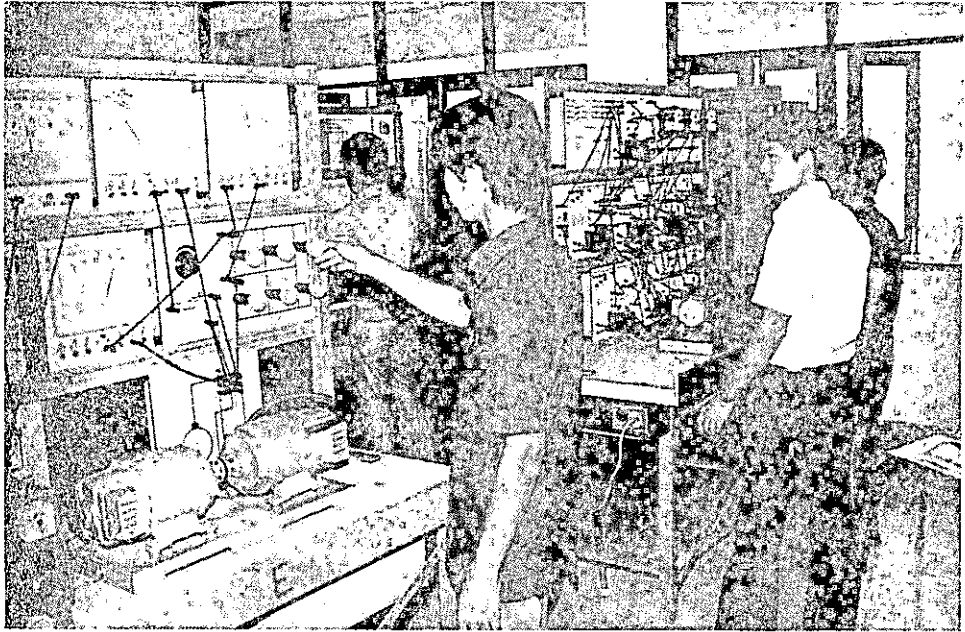
Fundamentals of logic algebra, AND, OR, NOT-functions; Nand-, Nor-function, logic rules, analyzing and synthezising, of logic circuits, Karnoughs mapping static electronic circuits of logic functions. Differentiation and integration of signals, dynamical logic circuits. Bistable, monostable, astable multivibrator. Binary numbers, counters and registers. Application of contactless controls.

TE 5992 Electronic Laboratory 0-7-3

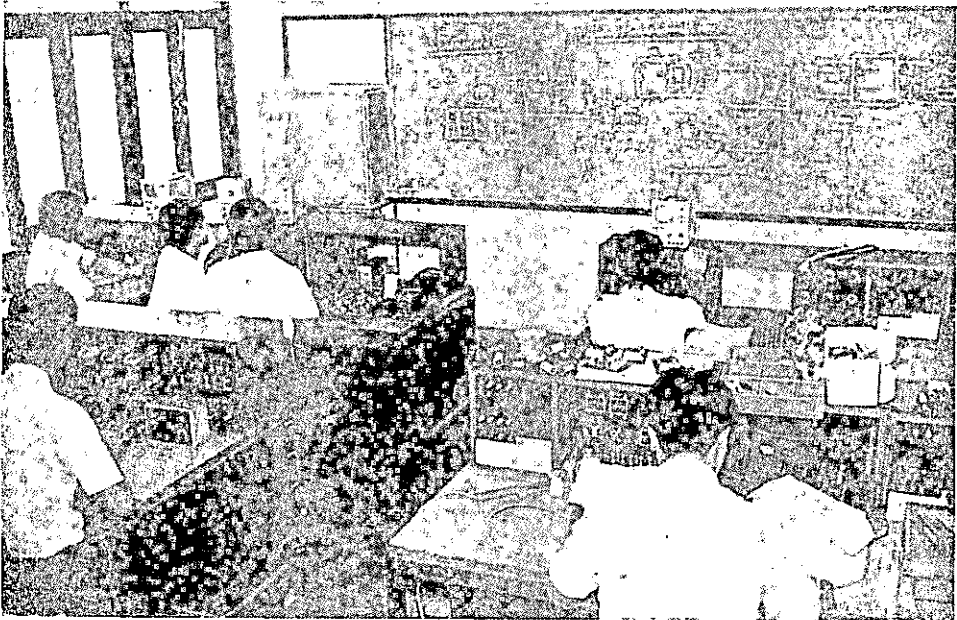
Laboratory course covering subject-matter of the lecture courses in electronics

TE 5996 Electrical Machine Laboratory 0-7-3

Laboratory course covering subject-matter of the lecture courses in electrical machines.



Fundamental laboratory for Electrical Machines



Electronic Laboratory

- | | | |
|---|--------------------------------|-------|
| TE 6901 | Advanced Electrical Technology | 3-1-3 |
| <p>Appearance of electric fields, electric field strength, electric flux density and related properties. Gauss' theorem and its applications. Capacity and capacitors, connection of capacitors, losses of capacitors. Energy and forces in electric fields. Charge and discharge curves of capacitors. Magnetic fields, theory of permanent magnets. Energy and forces in magnetic fields. Magnetic circuits. Advanced theory of induction-law. Advanced theories of self and mutual inductance.</p> | | |
| TE 6921 | Electrical Machines | 2-0-2 |
| <p><i>DC-machines:</i> Construction, voltage-generation, torque, various kinds of armature windings, magnetic circuit, main and armature fields, armature reaction, current commutation, interpole and compensation windings, series and shunt machines with their characteristics. <i>Transformers:</i> Construction, cores and windings, magnetic circuits, equivalent circuits and vector diagrams, No-load and short circuit operation, losses and efficiency. Parallel operation. Single phase and three phase transformers. Special transformers, auto transformers, instrumental transformers.</p> | | |
| TE 6941 | Electrical Installations | 2-0-2 |
| <p>Review of components and appliances of electrical installations. Characteristics and application of fuses. Automatic circuit breakers, lighting switches, heavy current switches and switchgear, high tension switches and switchgear. Relays, contactors, their characteristics and applications, electrothermally and electromagnetically operated tripping devices. Overload release, undervoltage release. Protective devices for electrical</p> | | |

Machines. Buchholz protective relay for transformers, Lightning protection. Protection against short circuits, thermal overload internal faults. Protection of high-tension distribution networks.

TE 6961 Industrial Electronics 2-0-2

General properties of two-port networks operation, characteristics of two-port networks, equivalent circuits of two-port networks. Advanced theory about the three transistor arrangements, practical simplifications for transistors at lower frequencies, AC-multistage amplifiers and their analyses, AC-multistage amplifiers as two-ports. Frequency response of untuned amplifiers, tuned amplifiers and their applications. Advanced theories of feedback amplifiers. Operational amplifiers and their application. Advanced investigations of power amplifiers.

TE 6991 Laboratory 0-7-3

This laboratory course covers various experiments, mainly of the different fields of electrical techniques. A sound record and discussion of the results must be performed. Through this course the students improve their theoretical background as well as the skill of measuring techniques.

TE 6993 Workshop Practice 0-6-3

Advanced training in important skills, the aim is to equalize the standard of the students coming from different institutes. Special techniques needed for teaching aid productions and applications. Production work, e.g. a series of teaching aids that can be distributed to other technical schools in the country.

- ED 6801 Teaching Methods 2-0-2
- The learning process and the purpose of teaching. Basic condition of communication, media combination in teaching. Conditions of understanding, sequence rules in information. Meaningful learning in view of larger objective of technical education. Promotion of meaningful learning, feedback, class activity. Comparison of methods for imparting information. Assimilation of information, methods to support assimilation. Aspects and methods of application, comparison of methods. Aspects of progress in learning, methods of assessment. Problems of motivation, methods of introduction. Construction of lessons, selection and combination of methods. Steps in preparing a lesson plan, use of lesson plan form. Observation and analysis of lessons. Assessment of lessons, observable activities and results.
- ED 6841 Educational Measurements 2-0-2
- The role of tests in education. Necessity of observable objectives. Transformation of objectives in test items. Essay questions, supply type questions, true false questions, multiple choice, matching questions. Distractor problems. Difficulty and discrimination power. Conditions for validity and reliability. Derived scores and standard scores. Analysis of test data. Rating system. Test construction for testing skills. Rating of works.
- ED 6891 Teaching Practice 0-3-2
- Presentation of different types of test. Construction of observable objectives. How to assemble behavioral objectives, principles of evaluation.

Designing of objective test items, testing, evaluation, testing item analysis. Distribution of marks. Preparation of program of next semester. This course provides micro-teaching lessons from 5 minutes up to 20 minutes.

Second Semester

LA 6184 Technical English 2-0-0

Advanced training in conversation, reading and writing of special technical subjects. Training in translating some parts of English textbook into technical Thai language.

MA 6026 Applied Mathematics 2-0-0

First order differential equations, variables separable, homogeneous equations, exact equations and linear equations, second order differential equations with constant coefficients, higher order homogeneous differential equations with constant coefficients, D operator method, applications in electric circuits. Fourier series analysis and its applications. Laplace transforms of elementary function, derivatives and integrals, shifting theorem, periodic and step functions. Inverse Laplace transforms, partial fraction method, convolution property and Heaviside expansion. The applications of Laplace transforms in solving differential equations.

TE 6902 Advanced Electrical Technology 2-0-2

Circuits with permanent magnets. Maxwells equations and their interpretation, radiation of electromagnetic waves, propagation of electromagnetic conductions in gases and liquids and in semiconductors. Theory

and application of super conductivity. Effective value and mean value of several functions. Current and voltage functions at linear and nonlinear components. Harmonic distortions, measurement of harmonic distortions.

TE 6922 Electrical Machines 2-0-2

Synchronous machines: Constructions and applications, voltage generation, magnetic circuit, various kinds of armature windings, vector diagram, Current diagram over and under excitation. *Asynchronous machines*: equivalent circuits and voltage equations, locus diagram, evaluation of the locus diagram, slip, torque, power, currents, power factor, speed-torque-current characteristics, slip ring rotor, losses and efficiency.

TE 6942 Electrical Installations 2-0-2

Design and estimation of high tension power distribution system. Calculation of electrical characteristics, selection of overhead line, line voltage, natural load. thermal limits to transmission capacity, voltage drop, power losses, leakage and corona-discharge losses. Mechanical characteristics, sag calculation, spacing of conductors, wind pressure on conductors, and structures of poles and towers, safety calculation for poles and towers, foundations. Switch gear installation. Different types of high tension, open air switch gear installations, general circuit diagrams, voltage and current transformers for open air installation. Control room and auxiliary installation work. Indoor high tension switch gear installations. Metering of switch gear installations. Protection and control gear, relays, safety regulations and standards.

- TE 6962 Industrial Electronics 2-0-2
Review : four layer diode, diac, thyristor, triac, unijunction transistor, thyristor tetrode. Power losses in thyristors, thermal equivalent circuit, protection circuits for thyristors, parallel and series connections. Trigger circuits for phase control and switched circuits, controlled rectifiers for single phase and three phase calculations, applied control circuits for power regulation. Thyristors in DC circuits, switch-off circuits. Speed control for DC motors. Power converter DC/DC, DC/AC, AC/AC and their applications. Special topics about thyristors and their applications.
- TE 6992 Laboratory 0-5-2
Performance of further experiments following the special laboratory course pattern and covering the subject-matter of the lecture course.
- TE 6994 Workshop Practice 0-7-2
Advanced training in motor-control circuits, paging and telecom systems, and fault finding. Training in reaching industrial performance (speed and quality) in selected fields of electrical techniques.
- ED 6804 Conditions of Learning 2-0-2
Basic types of learning. Skinner's experiments, chaining. Speaking and thinking, verbal associations. Interference multiple discrimination piaget's experiments, concept formation. Principle of learning, hierarchies. Problem solving, learning of strategies. Gestalt theory. learning by insight. Analysis of learning sequences. Teaching for transfer. Planning of learning sequences.

ED 6862 Teaching Aids

2-0-2

Classification of teaching aids according to their features, teaching aids for dynamic development of information. Chalk-board layout and wall-charts for student participation, features of overhead transparencies and slides. Analysis of chalk-boards, wall-charts, transparencies and slides. Conditions for production of models, evaluation of samples. Application and production of models and films. Presenting information for directed study. Features of information sheets and work sheets. Evaluation of drafted sheets. Use of textbooks in classroom. Features of programmed instruction. Introduction into drafting of PI units.

ED 6892 Teaching Practice

0-7-4

The teacher students start to give full lessons of two periods for vocational students. The teacher class is divided into three or four groups so that every teacher student will teach approximately 6 or 8 periods during this semester. The other five weekly periods are assigned to 2 periods of guided preparation, 2 periods of rehearsal lesson in front of fellow teacher students and one period of discussion.

Third Semester

SS 7003 Social Science

1-0-1

The human body and its essential functions, the digestive system, food and diet, the blood as carrier of energy, defence systems, vaccination, the nervous system, effects of smoking, drinking and drugs. Ways to improve performance in athletics, preventive measures, danger signals

regimen, physiology of work, accident prevention, fundamentals of first aids, vocational diseases.

TE 7561 Workshop Technology 2-0-2

Production process and application of insulation materials, gluing, turning etc. of insulation materials. Selection and aging of transformer oils. Production of printed circuits and boards, soldering techniques for printed boards. Principle and different kinds of corrosion, corrosion protection in normal and critical environment. Oxidation and reduction. Impregnation of coils and electronic circuits. Types and maintenance of batteries. Magnetic materials, production and handling in shops: Electric heating, electric welding. Antipollution measures in shops.

TE 7971 Principles of Feedback and Control Systems 2-0-2

Introduction to linear systems, nonlinear systems, control system terminology. Linear system by means of ordinary time invariant differential equation and Laplace transform. Stability of linear feedback systems, block diagrams and transfer functions, signal flow graph. Error constants and sensitivity, Nyquist analysis, root locus analysis, bode analysis, compensation of feedback control systems. Analysis and design of feedback control systems.

TE 7973 Electrical Measurements 2-0-2

Review of systems of units. Errors in measurements and their estimation. Common construction principles of pointer instruments, Moving-coil, moving-iron, electrodynamic, cross coil and moving magnet instruments, static voltmeter, hot wire instrument, vibration reed instrument, watt-

hour meter, multi-meters and their applications, accessories for multi-meters, thermo-converter, transformers. Compensation methods and compensators. Principles of recording instruments, continuous-line, dotted-line recorders, light beam scopes, bridge circuits for DC and AC, special bridge circuits.

TE 7981 Data Processing 1-0-1

Review of switching algebra, basic digital blocks. Counters, registers, half adder and adder network. Clock pulse generation, pulse shaper, coder. Numbering systems, mathematical operations with binary number. Error detection and error correction. Organization of computers, arithmetic unit of computers, control unit and instructions, memories, the storage principle, magnetic-core memory, magnetic drum, magnetic-tape and magnetic-disc memories, semiconductor memories.

TE 7991 Laboratory 0-6-3

Performance of further experiments following the special laboratory-course pattern and covering the subject-matter of the lecture courses.

TE 7993 Special Projects 0-7-3

The students will design and construct a special project, which should either be teaching aids, laboratory equipment or other instructional materials. This special project must show that future teacher is able to develop and build necessary equipment for these kinds of work. Although there are two special project semesters, the student should finish his first assignment within this third semester of teacher-training. A descriptive report about the project (Thai/English) must be delivered.

ED 7831 Educational Psychology

2-0-2

Stages of cognitive development. Intelligence tests. Problems of measuring intelligence. Aptitude tests. Temperament and Physique. Instincts and habits. Emotional development, motivation and discipline. Conscious and unconscious mental conflicts. The inferiority complex and other complexes and neuroses. The role of playing. The influence of mass media. Role play, the peer group. Interaction analysis. Sociometric techniques. Applications of group dynamics.

TE 7871 Course Developments

2-0-2

Derivation and selection of observable objectives from second-level objectives : Task analysis, formulation of observable objectives, hierarchies of objectives, taxonomies. Derivation and selection of second-level objectives from course descriptions : Collection of pertinent information, preselection and stating of objectives in reference to target learner, hierarchies, criteria for final selection. Planning of a course when syllabus is not given or inadequate.

TE 7891 Classroom Teaching Practice

0-6-3

The six weekly periods are divided into one hours of guided preparation, two hours of rehearsal lesson, two hours of "real" lesson and one hours of discussion. In order to get a maximum amount of practical experience the teacher-student classes are divided into small groups, which teach in parallel, taking full responsibility for their classes including marking. The subjects are similar to those in the second semester.

ED 7895 Workshop and Laboratory Teaching Practice 0-4-2

Here the students learn to use techniques that are pertinent to workshop and lab instructions. As in classroom teaching practice, the student teacher class is divided into groups, If the program repeats itself e.g. the workshop program in TE 1. different methods of teaching the same course can be practiced and compared.

Fourth Semester

SS 7004 Social Science 1-0-1

Manpower and its bearing on production, population and its bearing on consumption and prosperity, problems of population density, family planning. Social security, economics of insurance. Fundamentals of civil law, fundamentals of criminal law, rights and responsibilities of teachers.

BU 7098 Shop Management and Cost Estimation 2-0-1

Organization of school shops and labs, organization scheme planning of material orders, ordering materials and equipments, store keeping, time schedules for workshops and labs., supervision and control safety precautions, maintenance problems. Organization of production shops, manual trades for Thailand. Management and marketing for small and medium workshops, repair work and its bearing on rural development, production and improvement of simple machinery, depreciation, taxes and duties.

TE 7942 Electrical Installations

2-0-2

Design and estimation of electrical installations, power consumption, lighting calculation and consumption of light installation. General power distribution, one-line diagrams. Design of main switchboard, selection of power switches, fuses, instruments etc. One-line diagrams of the different substations, selection of switches, fuses instruments etc. for substations. Calculation of the voltage drop, short circuit currents, estimation of selective tripping. Layout of the electric wiring and location of substations. Design of schematic diagram for special circuits. Design of lightning arrester installation acc. to standards. Specification of parts, gears, and instruments. Cost estimation of material and manpower.

TE 7974 Electrical Measurements

2-0-2

Principles of CRT oscilloscopes, X- and Y- amplifier, sweep generator, trigger unit, construction of CRT and storage tube, sampling-scopes, application of oscilloscopes for the measurement of frequencies and for curve tracing. Transducer for length measurements, force measurement temperature measurements, light measurements, gas analysis, humidity and radioactivity. AC/DC converters, types and principles. Errors in digital measurements, Digital frequency measurements.

TE 7982 Data Processing

2-0-2

Storage of programs and data on punched tapes and cards, input devices for punched tapes and cards, character-reading devices, teleprinter, A/D inputs, mechanical printers as output devices, displays and their operation,

special purpose output device. Signal flow diagram. Computer languages. Program examples. Principle of time sharing systems. Computers in production lines. Analog computers in comparison to digital computers. Construction and operation of analog computers. Hybrid computers.

TE 7992 Laboratory 0-7-3

Performance of further experiments following the special laboratory course pattern and covering the subject-matter of the lecture courses.

TE 7994 Special Projects 0-7-3

The gain in experience during the third semester will allow a higher standard of the special project work during the final semester. In case the students previous work has serious flaws, he can produce an improved version of his original assignment using the same material as far as possible. If the project of the previous semester meets the necessary standards and can be fully used for its intended purpose, the student gets an additional supplementary assignment. A descriptive report about the project (Thai/English) must be delivered.

ED 7802 Teaching Methods 2-0-2

Synopsis of teaching methods employed in technical education : Distinction of typical features, preparation and performance of teaching sequences in from of directed studies, demonstrative presentations by students, experimental analysis at the hand of written material of TV recordings, development of criteria for efficient use. Frame of reference for teaching situations : Investigation of typical teaching situations, discussion of consequences of different courses of action open to the teacher.

ED 7852 Vocational Education and Administration 2-0-2

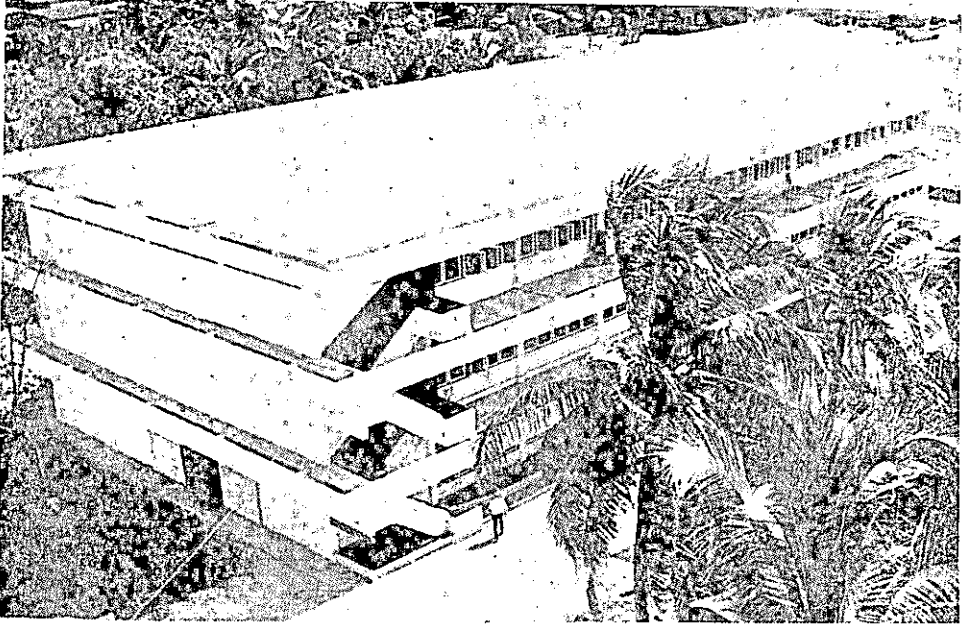
Practical concepts of training skill workers and different types of technicians, emphasis on vocational school course design. Administration techniques, pitfalls, sandwich type production work.

ED 7892 Classroom Teaching Practice 0-4-2

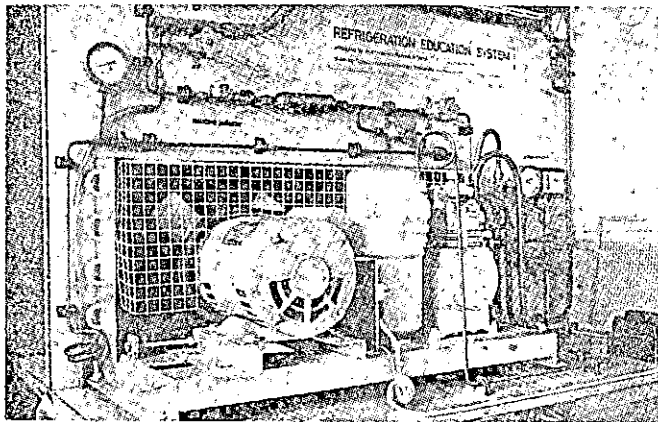
During the final semester the teacher students can specialize in certain subjects, normally one from the second year skilled-worker program, one from the third-year skilled-worker program and one e.g. Electrical Measurement, from the technician course. The time available is divided into two hours of teaching and two hours of discussion and preparation. Evaluation, done immediately after teaching, will take only a short time because the teacher students are supposed to be experienced and self-reliant by now.

ED 7896 Workshop and Laboratory Teaching Practice 0-4-2

Teacher students which did shop instruction during the third semester will now deliver lab instructions, and vice versa. In all other respects, apart from the different subject matter, this subject is similar to ED 7895 in the third semester.



Shop and Laboratory Building



Special project

DEPARTMENT OF TEACHER TRAINING
IN MECHANICAL TECHNOLOGY.
TECHNICIAN DIPLOMA COURSE

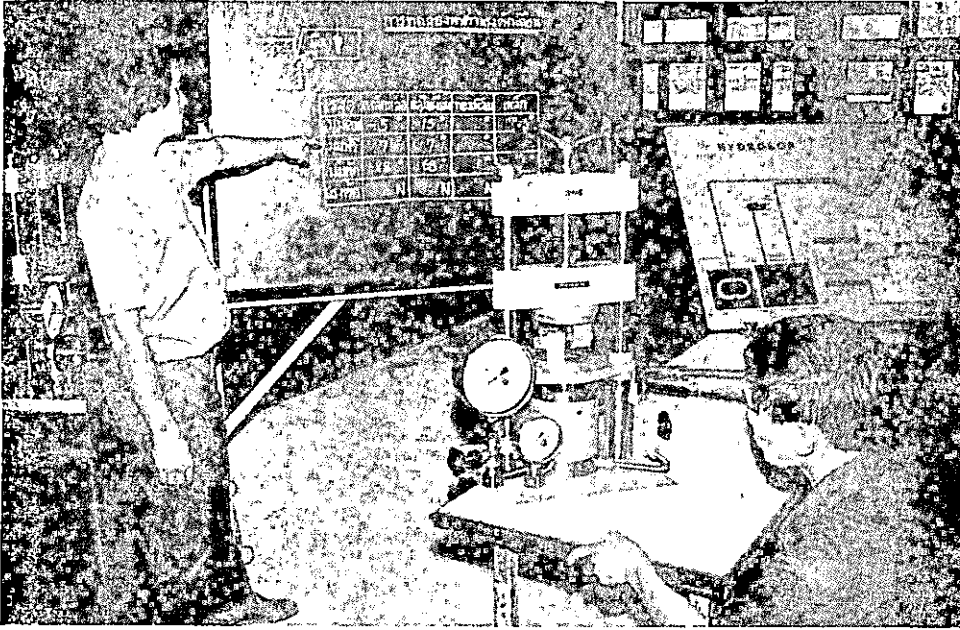
Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
1	LA 4183	Technical English	2	1	2
	MA 4027	Mathematics	2	0	2
	SC 4055	Physics	2	0	2
	SC 4075	Chemistry	2	0	2
	TM 4401	Engineering Mechanics	3	1	3
	TM 4421	Engineering Materials	2	0	2
	TM 4431	Technical Drawing	1	3	2
	TM 4561	Cutting Operations	2	0	2
	TM 4691	Laboratory	0	2	1
	TM 4693	Workshop Practice	0	12	4
			16	19	22
2	SS 4003	Social Science	1	0	1
	LA 4184	Technical English	2	1	2
	MA 4028	Mathematics	2	0	2
	SC 4056	Physics	2	0	2
	TM 4402	Engineering Mechanics	3	1	3
	TM 4422	Engineering Materials	2	0	2
	TM 4434	Machine Elements	2	0	2
	TM 4562	Cutting Operations	2	0	2
	TM 4692	Laboratory	0	3	1
	TM 4694	Workshop Practice	0	11	3
TM 4902	Electrical Technology	2	0	2	
			18	17	22

Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
3	LA 5183	Technical English	1	1	1
	MA 5027	Mathematics	2	0	2
	TM 5401	Engineering Mechanics	2	1	2
	TM 5433	Machine Elements	3	1	3
	TM 5441	Fluid Mechanics	2	0	2
	TM 5451	Applied Thermodynamics	2	0	2
	TM 5541	Noncutting Operations	2	0	2
	TM 5561	Cutting Operations	2	0	2
	TM 5691	Laboratory	0	3	1
	TM 5693	Workshop Practice	0	11	3
	TM 5901	Electrical Technology	2	0	2
			18	17	22
4	SS 4004	Social Science	1	0	1
	BU 5098	Shop Management and Cost Estimation	2	0	1
	LA 5184	Technical English	1	1	1
	MA 5028	Mathematics	2	0	2
	TM 5432	Tools, Dies, Jigs and Fixtures	3	1	3
	TM 5434	Machine Elements	3	1	3
	TM 5452	Applied Thermodynamics	2	0	2
	TM 5512	Pumps and Compressors	2	0	2
	TM 5542	Noncutting Operations	2	0	2
	TM 5692	Laboratory	0	2	1
	TM 5694	Workshop Practice	0	12	4
			18	17	22

BACHELOR DEGREE COURSE

Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
1	LA 6183	Technical English	2	0	0
	MA 6027	Mathematics	3	0	3
	TM 6401	Mechanics of Machinery	2	0	2
	TM 6431	Machine Elements	2	0	2
	TM 6433	Design of Machine Elements	1	1	1
	TM 6561	Cutting Operations	2	0	2
	TM 6691	Laboratory	0	2	1
	TM 6693	Workshop Practice	0	13	4
	ED 6801	Teaching Methods	2	0	2
	ED 6841	Educational Measurements	2	0	2
	ED 6891	Teaching Practice	0	3	2
			16	19	21
2	LA 6184	Technical English	2	0	0
	SS 6004	Social Science	2	0	1
	TM 6402	Mechanics of Solid	2	0	2
	TM 6422	Engineering Materials	2	0	2
	TM 6434	Design of Machine Elements	2	0	2
	TM 6562	Cutting Operations	2	0	2
	TM 6692	Laboratory	0	5	2
	TM 6694	Workshop Practice	0	7	2
	ED 6804	Conditions of Learning	2	0	2
	ED 6862	Teaching Aids	2	0	2
	ED 6892	Teaching Practice	0	7	4
			16	19	21

Semester	Course No.	Subjects	Periods/week		Credits
			Lecture	Practice	
3	TM 7421	Engineering Materials	2	0	2
	TM 7433	Design of Machine Elements	2	0	2
	TM 7541	Noncutting Operation	2	0	2
	TM 7691	Laboratory	0	6	3
	TM 7693	Special Project	0	7	3
	TM 7901	Electrical Technology	2	0	2
	ED 7831	Educational Psychology	2	0	2
	ED 7871	Course Developments	2	0	2
	ED 7891	Classroom Teaching Practice	0	6	3
	ED 7893	Workshop Teaching Practice	0	4	2
			12	23	23
4	BU 7098	Shop Management and Cost Estimation	2	0	1
	TM 7434	Design of Machine Elements	2	0	2
	TM 7442	Industrial Hydraulics and Pneumatics	2	0	2
	TM 7452	Applied Thermodynamics	2	0	2
	TM 7542	Noncutting Operations	2	0	2
	TM 7692	Laboratory	0	6	3
	TM 7694	Special Project	0	7	3
	ED 7802	Teaching Methods	2	0	2
	ED 7852	Vocational Education and Administration	2	0	2
	ED 7892	Classroom Teaching Practice	0	4	2
ED 7894	Workshop Teaching Practice	0	4	2	
			14	21	23

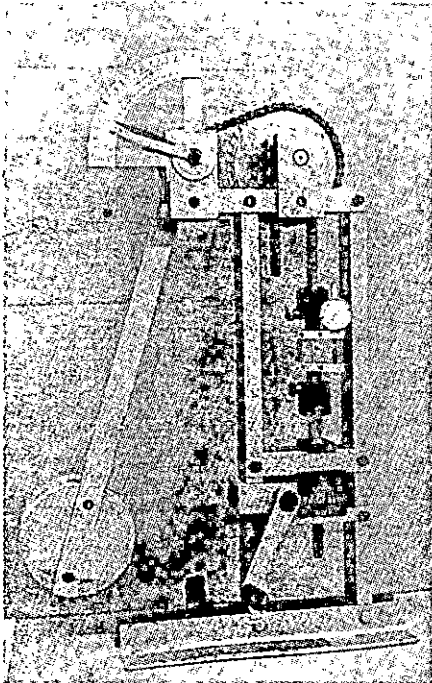
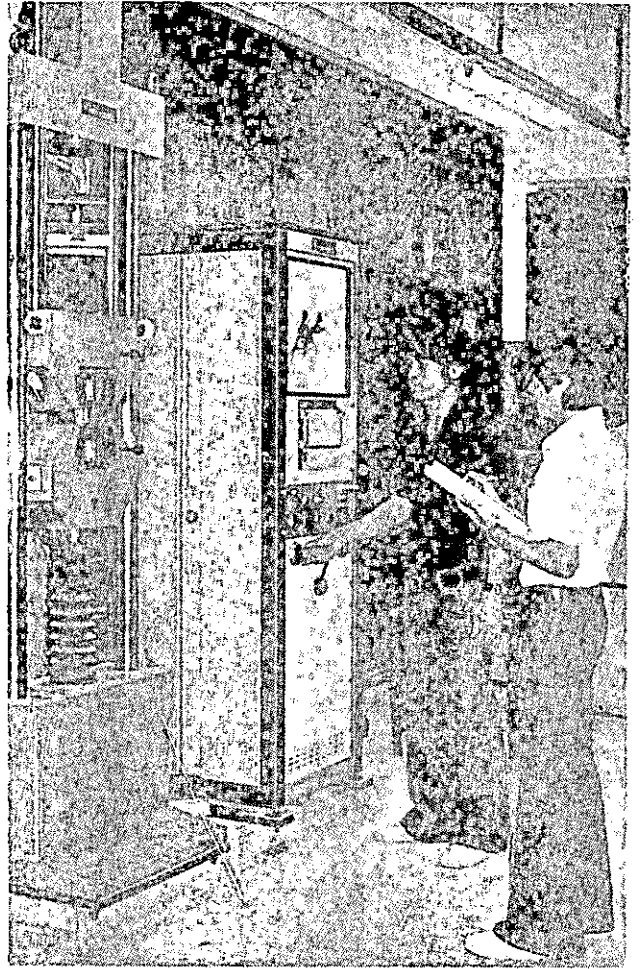


Machine Tools Laboratory



Metrology Laboratory

Material Testiny Laboratory



Tensile testing Machine

COURSE DESCRIPTION
Technician Diploma Course (TE)

First Semester

LA 4183 Technical English 2-1-2

Fundamental technical terms and their usage. Basic patterns used frequently in technical English. Explanation of difficult terms and patterns taken from books or sheets used in lectures about mechanical technology. Pertinent exercises. Pronunciation drills.

MA 4027 Mathematics 2-0-2

Revision of fundamental trigonometric functions and equations. Trigonometric theorems. Revision of algebra. Series : arithmetic progressions, harmonic and geometric progressions. Complex numbers and their fundamental relations. Binomial theorems. Determinants.

SC 4055 Physics 2-0-2

Measurements : MKS Systems and SI Units.

Hydrostatic : Fluid pressure, centre of pressure, resultant thrust of fluid on any surface, buoyancy.

Hydrodynamic : General principles, fluid flow, Bernoulli's law, applications.

Light : Nature of light. Mirrors and lenses. Optical instruments. Polarization.

Sound : Nature and propagation of sound waves. Measurement of frequency. Pitch loudness.

- SC 4075 Chemistry 2-0-2
- Physical and chemical change. Periodic table. Bohr's model of atoms. Acids, bases and salts. Synthesis, analysis and crystallization of molecules. Ionic and covalent bonds. Colour reaction of indicators. Oxyhydrogen gas. Reduction. Stoichiometrical calculations.
- TM 4401 Engineering Mechanics 3-1-3
- Forces : Introduction of vectors, resolution, resultants of coplanar force systems. Funicular polygon.
- Moments : Moment of a force, principles of moments. Couples. Lever system. Centre of Gravity. Transmission ratio. Simple machines.
- Equilibrium : Conditions of equilibrium, stability, equilibrium by funicular polygon.
- Friction : Resistance to sliding, resistance to rolling. Angle of friction.
- Wedges. Screws. Journal bearings. Disc or plate clutches.
- Work, power and efficiency.
- Energy : Law of conservation of energy.
- Resultant and equilibrium of three dimensional force systems.
- TM 4421 Engineering Materials 2-0-2
- Properties of materials. Manufacture of steel : Kinds of ores, reduction process, blast furnace process, Bessemer process, L-D Oxygen process, open hearth process. Effect of phosphorus and sulphur in steel, segregation. Rimmed steel, killed steel. Naming of ferrous metal according to carbon percentage. DIN, BS, SAE and AISI classifications of steel. Alloying elements of steel and their effects. Grey cast iron,

chilled cast iron, malleable cast iron, nodular cast iron. Tool steel, high speed steel, carbide tips. Corrosion and its prevention. Electrochemical series of metals.

TM 4431 Technical Drawing 1-3-2

Introduction into technical drawing. Geometrical constructions. Standard lettering. Orthographic first angle projection, dimensioning according to ISO standard, drawing of missing views. Machining symbols. Sections: full section, half section. Representation and dimensioning of rivets, screws, welding seams, taper, keys and threads. Sections of cylinder. Section of cone. Different ends of a round bar in three views. Intersections of surfaces. Development of different bodies such as pyramids, cones and funnels. Assembly drawings, list of parts and bill of material, working drawings. Drawing of complex parts.

All the topics for this course should be given with special emphasis on dimensioning of the workpieces, correct tolerances and surface finish symbols.

TM 4561 Cutting Operations 2-0-2

Measurement, measuring instruments : Verniers, micrometers, dial indicators and their constructions. Gauges. Angular measurement. Allowances, fits, surface quality. ISO limit system. Angles of cutting tools, tool life and other features. Chiseling, scraping, sawing, filing. Drilling tools, drilling machines, drilling operations. Reaming, honing.

TM 4691 Laboratory 0-2-1

Metrology : Linear and angular measurement. Straightness, flatness squareness and roundness measurements.

- TM 4693 Workshop Practice 0-12-4
 Bench work. Forging. Hardening and tempering. Plastic works.
 Workshop experiments. General shop works.

Second Semester

- SS 4003 Social Science 1-0-1
 Introduction to Thai culture, etiquette and manner. The civics and ethics for Thai people in a democratic society. The role of the economic and social development plans.
- LA 4184 Technical English 2-1-2
 A continuation of the first semester programme using more complex structures of technical English.
- MA 4028 Mathematics 2-0-2
 Analytic geometry of the straight line, intersecting lines, circle, systems of areas, parabola, ellipse and hyperbola.
- SC 4056 Physics 2-0-2
Property of Matters: Molecular forces, state of aggregate, adhesion, surface tension, capillary.
Heat: Temperature scales. Expansion of solids, liquids and gases. Calorimetry, fusion, vaporization. Transfer of heat.
Magnetism: Magnetic substance, magnetic force, magnetic field, magnetic properties of matter. Inductance
Electricity: Coulomb's law, electric field, intensity, capacitance.

- TM 4402 Engineering Mechanics 3-1-3
- Definition of stress and strain. Hooke's law and stress-strain relation for tensile test. Young's modulus. Simple strain energy theory. Temperature stresses. Statically indeterminate problems in tension and compression. Thin walled vessels. Torsion. Theory of beam : Shearing force and bending moment diagrams, stresses in beam, slope and deflection of beam. Theory of columns. Combined stresses.
- TM 4422 Engineering Materials 2-0-2
- Cooling curves of pure metals and alloys, aggregate states, critical points. Eutectic equilibrium diagram e.g. of lead/tin alloy, Crystalline structure of alpha and gamma iron. Iron/Iron carbide equilibrium diagram: ferrite, pearlite, austenite. Hardening process of tool steel. Heat treatment of heat treatable steel : Quenching and tempering.
- TM 4434 Machine Elements 2-1-2
- ISO limits and fits : System of basic bore and basic shaft, combination and selection of fits.
- Permanent joints : Design of riveted joints, welded joints, soldered joints, brazed joints, bonded joints, shrink-fit joints.
- Detachable joints : Design of keys, standard splines, serrate splines and involute splines.
- TM 4562 Cutting Operations 2-0-2
- Motion of machine tools, classification of systems. Cutting conditions, types of chips. Belt drives. Gear drives, power transmission diagram, speed progression, design of various gear drives, speed diagram of gear

drives. Main drive mechanism of the centre lathe. Power requirement and specific cutting force. Turning operations. Method of workpiece for lathe. Mechanically-driven shaper, determination of driving crank velocity. Hydraulically-driven shaper, feed mechanism, tool holding devices. Method of workpiece clamping for shaper.

TM 4692 Laboratory 0-3-1

Laboratory course covering the subject-matter of lecture courses in engineering science.

TM 4694 Workshop Practice 0-11-3

Shaping. Turning. Milling. Gas welding. Electrical welding. Soldering.

TM 4902 Electrical Technology 2-0-2

D.C. circuits. Magnetic circuits. Induction. A.C. circuits. Single-phase transformer. Three-phase systems. Fundamental of electrical measurements.

Third Semester

LA 5183 Technical English 1-1-1

Grammatical practice of phrases, clauses and sentence structure. Practice in using and building up vocabulary. More difficult patterns used in technical subjects. Developing the ability to understand and interpret technical texts. Review of the morphology of English.

MA 5027 Mathematics 2-0-2

Function and limits, slope of a curve, derivative of a function, velocity and rates, formulas for differentiation, higher order of derivative, the

differentials, implicit functions and parametric functions with their derivative, chain rule, approximation by differentials, related rates, maxima and minima, points of inflection. The indefinite integral with applications, differentiation and integration of trigonometric functions.

TM 5401 Engineering mechanics 2-1-2

Kinetics : motion in the straight line and under gravity, graphical representation of motion, projectiles, circular motion.

The laws of motion : D' Alembert's principle and inertia force, relation of a rigid body. Work, power and energy.

Momentum : linear and angular momentum. Centripetal and centrifugal force. Simple vibrations.

TM 5433 Machine Elements 3-1-3

Screws : characteristic of threads, types of screws, design and uses of screws. Power screws : forces, friction, efficiency, self-locking, buckling. Pins : standardization, application. Clamp connection. Cone connection. Axles and Shafts. Sliding bearing : design, proportion, bearing materials, mounting and method of lubrication.

TM 5441 Fluid Mechanics 2-0-2

Important concepts and principles I : Pressure, temperature, flow rate. Multiplication of force (Pascal's Law), multiplication of pressure, expansion and compressibility of fluid, Bulk Modulus, Bernoulli's equation, continuity equation, torricelli's theorem, viscosity of fluid, typer of flow, Reynold's equation and Reynold's number.

Flow of fluid through pipelines. Losses of energy in pipelines. Measurement of pressure, flow and temperature. Transmission of power by pipelines, Impact of jets. Flow under varying head. Important concepts and principles II : Hagen Poiseville Law for laminar flow, Darcy's formula, etc.

TM 5451 Applied Thermodynamics 2-0-2

Working substance and its properties. Laws of a perfect or ideal gas, characteristic equation. Energy equations, first law of thermodynamics. Process of expanding a perfect gas : Constant pressure, constant volume, isothermal, adiabatic and polytropic process. Ideal heat-engine Cycles : Carnot, Otto, Diesel cycles ; Air Standard efficiency. Indicator diagrams. Engine performance.

TM 5541 Noncutting Operations 2-0-2

Gas welding. Brazing, application of fluxes. Soldering, equilibrium diagram for lead-tin solder. Oxy-acetylene flame, Oxygen cylinder, acetylene cylinder pressure regulator.

Electric arc welding : application, welding machines, advantages and disadvantages of AC and DC welding machines, electrodes purpose of coating, magnetic arc blow. Melting of grey cast iron, cupola furnace, moulding of splitted patterns, moulding of splitted patterns with core, pattern making, Shrinkage, change of section, draft, foundry sands, green and dry sand moulding.

- TM 5561 Cutting Operations 2-0-2
 Types of milling machines, milling cutters, face and plain milling operation, cutting conditions, speed, feeds, power, gear drives of milling. Features of spur gears, involute construction, generating and hobbing of gears, correction of undercut. Grinding machines, grinding tools, cutting machines, cutting conditions, tool mounting, grinding operations.
- TM 5691 Laboratory 0-3-1
 Material Testing : Tensile, bending, compressive and hardness test.
 Oil properties Testing : Viscosity, flash and fire point, cloud and pour point.
 Electrical Laboratories :
- TM 5693 Workshop Practices 0-11-3
 Shaping. Turning. Milling. Welding. General shop works.
- TM 5901 Electrical Technology 2-0-2
 D.C. Machines. Single phase and three phase A.C. machines, Motor control. Electrical measurement. Electrical systems for motor cars.

Fourth Semester

- BU 5098 Shop Management and Cost Estimation 2-0-1
 Introduction and the art of book keeping organization of factory, types of organizations, job evaluation, wage payments, storing and flow of material, inventory control, store room operation, production control, purchasing department, sales department, technical and commercial side of an enterprise, public relations.

- LA 5184 Technical English 1-1-1
A continuation of the third semester programme with the emphasis on developing the ability to read and speak. Practice on writing business letters and technical reports.
- MA 5028 Mathematics 2-0-2
Area under and between curves, the inverse trigonometric functions with their derivatives, derivatives and integrals of special functions. Several methods of integration. Basic differential equations and their technical application.
- SS 4004 Social Science 1-0-1
Fundamental principle of economics and their applications to modern society, national income, employment and economic growth. Money and banking system. Demand, supply and prices. Competition and monopoly. Current economic problems.
- TM 5432 Tools, Dies, Jigs and Fixtures 3-1-3
Basic components of cutting-die and their functions. Kinds of cutting-tools : Punch guiding in cutting-tools, cutting-tools with successive operation. Mechanism of shearing process. Calculation of cutting force and positioning of clamping shanks. Utilization of materials, calculation of utilization-degree, limitation of strip feed (position of limit stop). Design of single-step cutting-tools. Components of tools for forming operation and their functions. Steps of various bending-operations and bending-tools. Steps of various rolling-operations and rolling tools. Effects of bending and rolling operations on materials.

- TM 5434 Machine Elements 3-1-3
- Ball and roller bearings : Bearing features, functions and selections ; mounting arrangements, lubrication and sealing devices. Couplings and clutches : rigid and flexible couplings, safety coupling ; single and multiple disk clutches, centrifugal and overrunning clutches ; fluid couplings. Springs : Characteristics and classification ; disk springs, helical spring and spiral springs. Belt and chain drives. Gears : Fundamental laws of gearing, theory of gearing ; involute, undercut and profile off-set ; strength on gear teeth, wear and pitting ; design of spur gears and helical gears ; gear trains, gear boxes ; worms and wormgears ; design of worms and wormgears.
- TM 5452 Applied Thermodynamics 2-0-2
- Historical development of internal combustion engines. Carnot process. Atomic and molar structure of perfect and imperfect gases. Ideal Otto engine. Entropy and enthalpy. Nonideal process of Otto engine. Fuels and combustion. Diesel engine. Important factors in practical engine operation. Supercharging. Gas turbocharger. Gas turbines and rockets.
- TM 5512 Pumps and Compressors 2-0-2
- Revision of essential fluid mechanic fundamentals. Constructions, operations and applications of reciprocating pumps, centrifugal pumps and rotary pumps. Head on pumps and pump selections. Economic pipe size selections. Pump installations, controls and testing methods. Layout of water handing pipework. Constructions, operations and applications of vacuum pumps and air-compressors. Compressed air production and

applications. Compressor installations, controls and testing methods. Constructions, operations and applications of fans and blowers. Layout of air-handling pipework.

TM 5542 Noncutting Operation 2-0-2

Comparison between noncutting and cutting operations. Hardening and annealing processes. Suitable materials for cold-working process. Rolling. Wire drawing. Drop forging, swaging. Extrusion. Deep drawing, spinning. Shearing. Powder metallurgy : Applications, production of powder, pressing and sintering. Plastic works : Welding, blowing, vacuum moulding, transfer moulding and injection moulding.

TM 5692 Laboratory 0-2-1

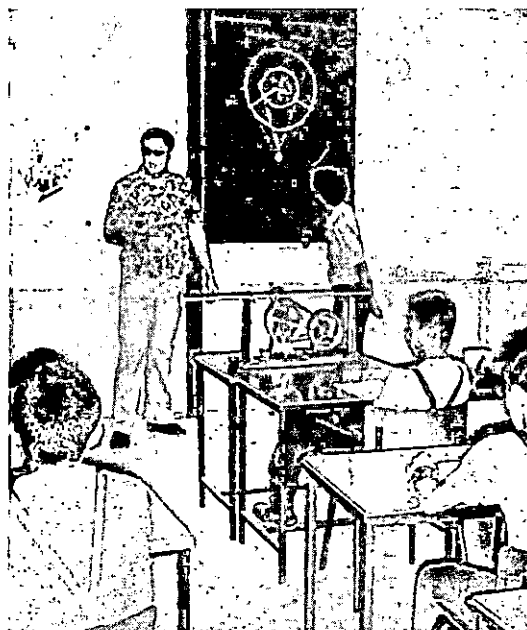
A course to illustrate the principles of machine tool technology covering the following topics : Hydraulic press : Penetration force. Chip cutting force. Bending force (Stamping) Drilling machine : Relations between cutting force and heat ; work dimensions and burr ; tool life and wear ; lubricant and cooling effect. Production time. Accuracy of motions. Reamed surface. Thread cutting force. Lathe : Accuracy of motions, accuracy of taper turning, thread cutting conditions.

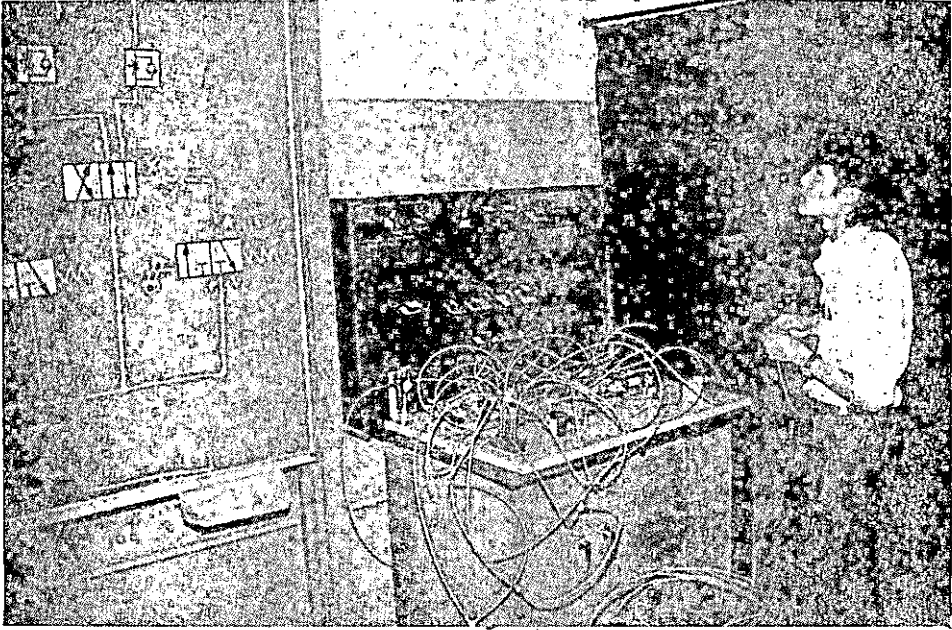
TM 5694 Workshop Practice 0-12-4

Turning : copy-turning. Milling : differential indexing, screw-thread milling, gear milling. Grinding : round grinding, flat grinding.

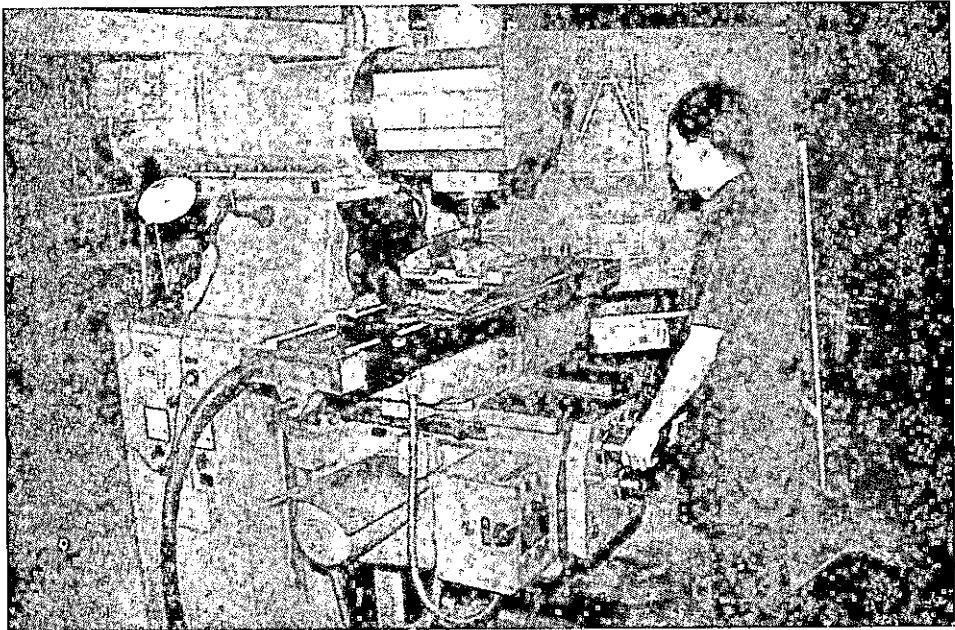


Teaching Practice





Pneumatic Laboratory



Milling Work

COURSE DESCRIPTION
Bachelor Degree Course (TTM)

First Semester

- LA 6183 Technical English 2-0-0**
Review about the structure of technical English, including the structure of grammar. Advanced technical conversation as well as advanced exercises in report writing. Part of this subjects will be taught in sound laboratory. This subject shall bring new students from different Technical Institutes to an equal level in technical English language.
- MA 6027 Mathematics 3-0-3**
Introduction into statistics, frequency distribution, measures of central tendency, standard deviation, basic forms of probability, binomial distribution, normal distribution, standard errors of measurement. Series expansion of functions, Maclaurin's and Taylor's series, computations using power series. Hyperbolic functions with graphs and their relations, differentiation and integration of hyperbolic functions. Partial derivatives, total differential and derivatives. First and second order differential equations with applications.
- TM 6401 Mechanics of Machinery 2-0-2**
General analysis of plain motion. Kinematics of machines. Velocities and accelerations in machines. Static and inertia forces in machines.

Balancing of rotating masses. Primary and secondary balancing of engines. Free and forced vibration of linear systems.

TM 6431 Machine Elements 2-0-2

ISO Fits. Welding. Calculation with eccentric load. Calculation on power screws. Deflection of shafts. Roller bearings : selection and mounting, calculation of bearing capacity. Clutches and brakes. Spur gears, helical gears, herring bone gears, and their applications, worm and wormgears.

TM 6433 Design of Machine Elements 1-1-1

Geometrical lay outs. Different conical sections. The ellipse and its construction according to Ryth. First angle projection with 3 planes. The true length of sizes and areas. Straight lines intersecting a body. Development of inclined cut solids, pyramids, cones. Construction and development of a pipe-elbow. Round and square funnels with transition piece. Development of a Y-pipe. Different bar-ends. Intersection of solids with different centerlines. Joints and intersections between differently shaped bodies. Cutting-sphere method, to obtain lines of intersection. Lines of intersection between hollow cylinder, solid cylinders and cones. Different sections on a cylinder. Graphical differentiation and integration with applications e.g. to find centroid and second moment of area. Graphical statics and influence lines with applications e.g. to construct diagrams of shear, bending moment, slope and deflection of beams.

TM 6561 Cutting Operations

2-0-2

Spindles, bearings and guideways in machine tools. Gear drives of various machine tools, special features. Crank drives. Mechanical variable drives. Hydraulic and electrical variable drives. Features and construction of planing machines. Radial boring machine, coordinate table drilling machine. Horizontal boring machine. Broaching process, broaching machines.

TM 6691 Laboratory

0-2-1

A machine tools laboratory course using hydraulic press to experiment on the following topics : cutting force for sheet metal, deep drawing and extruding, plastic forming. Experiments on lathe to find cutting force, surface finish, tool life, power requirement, speed range, production time, kind of chips and copying method.

TM 6693 Workshop Practice

0-13-4

Advanced skill training; the aim is to equalize the standard of the students coming from different institutes. Special techniques needed for teaching aid production and application. Production work, e.g. a series of teaching aids shall be produced, that can be distributed to other technical schools in the country.

ED 6801 Teaching Methods

2-0-2

The learning process and the purpose of teaching. Basic condition of communication, media combination in teaching. Conditions of understanding, sequence rules in information. Meaningful learning in view of larger objective of technical education. Promotion of meaningful learning, feed-

back, class activity. Comparison of methods for imparting information. Assimilation of information, methods to support assimilation. Aspects and methods of application, comparison of methods. Aspects of progress in learning, methods of assessment. Problems of motivation, methods of introduction. Construction of lessons, selection and combination of methods. Steps in preparing a lesson plan, use of lesson plan form. Observation and analysis of lessons. Assessment of lessons, observable activities and results.

ED 6841 Educational Measurements 2-0-2

The role of tests in education. Necessity of observable objectives. Transformation of objectives in test items. Essay questions, supply type questions, true false questions, multiple choice, matching questions. Distractor problems. Difficulty and discrimination power. Conditions for validity and reliability. Derived scores and standard scores. Analysis of test data. Rating system. Test construction for testing skills. Rating of works.

ED 6891 Teaching Practice 0-3-2

Presentation of different types of test. Construction of observable objectives. How to assemble behavioural objectives, principles of evaluation. Designing of objective test items, testing, evaluation, testing item analysis. Distribution of marks. Preparation of program of next semester. This course provides micro teaching lessons from 5 minutes up to 20 minutes.

Second Semester

- LA 6184 Technical English 2-0-0
Advanced training in conversation, reading and writing of special technical subjects. Training in translating some parts of English textbook into technical Thai language.
- SS 6004 Social Science 2-0-1
The human body and its essential functions, the digestive system, food and diet, the blood as carrier of energy, the defence functions, vaccination, the nervous system, smoking, drinking, drugs; ways to improve performance in athletics, preventive measures, danger signals regimen; psychology of work, accident prevention, first aid, vocational diseases. Manpower and its bearing on production, population and its bearing on consumption, education and prosperity, problems of population density, family planning; social security, economics of insurance. Fundamentals of civil laws, fundamentals of criminal law; rights and responsibilities of teachers.
- TM 6402 Mechanics of Solid 2-0-2
Revision of two-dimensional treatment of complex stresses, Mohr's stress circle. Theories of fatigue strength. Plain strain, Mohr's strain circle, analysis of strain gauge results. Generalized Hooke's law in three dimensions. Relationship between elastic constants. Statically indeterminate beams. Theory of curved beams. Strain energy, Castigliano's theorem. Thick walled cylinders and rotating discs.

- TM 6422 Engineering Materials 2-0-2
- Lubricants : their chemical compositions, properties of lubricants, testing of lubricants. Friction and lubrication theory. Cutting oil. Aluminium alloys. Eloxation of Aluminium alloys, age-hardening. Copper and copper alloys, equilibrium diagram of Cu-Ni as an alloy with soluble constituents. Bearing metals. Plastics, series of hydrocarbon. Polymerisation and condensation process in plastic production. Classification. Ingredients of commercial plastic materials. Properties and property testing. Factors affecting the strength of polymers. Determination of plastics.
- TM 6434 Design of Machine Elements 2-0-2
- Clamping device with spiral excenter. Rollerblock for a roller bed. Drilling jig. Progressive punch. Joint coupling. Excenter drive. Spindle bearing. Small testing calender.
- TM 6562 Cutting Operations 2-0-2
- Production time charts. Grinding machines. Honing, lapping. Ultrasound, electroerosion, electrochemical grinding. Surface quality specifications. Turret lathe, cam design. Single spindle automatic machines. Gear generating and hobbing machines. Electric control of machine tools. Numerical control of machine tools. Programming process of NC-machines.
- TM 6692 Laboratory 0-5-2
- Metrology laboratory (1 period) : uses of various kinds of gauges; angular, surface roughness, screw thread and gear measurement.

Machine tools laboratory (2 periods) : Shaper ; cutting force, velocities, production time. Milling machine; cutting force, production time, indexing, spiral cutting. Grinding machine ; types of surfaces, balancing grinding wheels. Universal joint. Ball bearing.

Material testing laboratory (2 periods) : tensile, impact, bending, hardness, shearing and Erichsen cupping tests.

TM 6694 Workshop Practice 0-7-2

Advanced training in different fields of metal work. Training to acquire industrial performance (speed and quality) in certain selected fields of mechanical engineering work.

ED 6804 Conditions of Learning 2-0-2

Basic types of learning. Skinner's experiments, chaining. Speaking and thinking, verbal associations. Interference, multiple discrimination. Piaget's experiments, concept formation. Principle of learning, hierarchies. Problem solving, learning of strategies. Gestalt theory, learning by insight. Analysis of learning sequences. Teaching for transfer. Planning of learning sequences.

ED 6862 Teaching Aids 2-0-2

Classification of teaching aids according to their features, teaching aids for dynamic development of information. Chalk-board layout and wall-charts for student participation, features of overhead transparencies and slides. Analysis of chalk-boards, wall-charts, transparencies and slides. Conditions for production of models, evaluation of samples. Application and

production of models and films. Presenting information for directed study. Features of information sheets and work sheets. Evaluation of drafted sheets. Use of textbooks in classroom. Features of programmed instruction. Introduction into drafting of SI units.

ED 6892 Teaching Practice

0-7-4

The students will prepare, hold and evaluate full lessons. Emphasis is placed on putting into practice the educational theory presented during the first semester. As the young teachers must be allowed to concentrate on, and gather experience with teaching methods and educational measurement, the subjects to be taught are chosen in such a way that

- i) the subject matter itself is relatively easy,
- ii) the subject allows the application of a wide range of teaching methods,
- iii) the students are able to complete in teams while teaching in parallel classes and
- iv) the students have sufficient opportunity to hold lessons.

In order to meet these conditions the vocational classes of this institute are chosen as practice classes. The available 7 hours/week are distributed as follows:

a. 3-4 hours : preparation in seminar

According to the given objectives the students must select, design, prepare, discuss in teams the following.

- items of information and application under consideration of pre-knowledge and transfer of knowledge
- means of assessment, tests
- methods, student activities
- teaching aids, instruction materials
- sequence, variation in construction of lesson, timing.

They will represent their lesson plans on a prescribed form which must be delivered together with instruction materials before the student is allowed to teach.

The seminar serves also to revise lesson plans and instruction materials according to the experience and evaluation of previously performed lessons.

b. 2-3 hours : teaching

Up to 4 students perform the planned lesson in parallel classes at the same time. They are supervised by a tutor, and by their fellow students who are ordered to observe and note key points of the lesson at the a special investigation form. Each student will teach 12 periods of 50 minutes per semester.

c. 1 hour : evaluation of lessons

Immediately after performance the students evaluate their lessons in teams. The performing student has to analyse himself, the observing students have to criticise what they have seen, in order to make the students self-reliant in their teaching.

Third Semester

- TM 7421 Engineering Materials 2-0-2
- Iron carbide diagram with grey cast iron part. Grey cast iron with pearlitic and ferritic matrix. Flame hardening of grey cast iron. Cooling examples through the sequence of different crystalline structures. Time-thermal-transformation diagram. Application of TTT-diagram in heat treatment. Application in hardening of high speed steel. Hardening and carburizing in salt bath, heat treatment sequences in case hardening (carburizing). Nitriding. Annealing processes, grain growth in recrystallisation, degree of deformation. Corrosion. Intergranular corrosion, relationship between microstructure and corrosion resistance. The influence of stress in corrosion, passivity. Assessment of metallic coatings for corrosion protection. Non-metallic coatings e.g. chromating and phosphating. Cathodic protection.
- TM 7433 Design of Machine Elements 2-0-2
- Reel and reel bearing. Pull and guide roller. Stretch roller drive. Spur flange gearing. Transmission case. Friction gearing. Bevel gear drive. Worm gear mechanics.
- TM 7541 Non-cutting Operations 2-0-2
- Safety regulations in oxy-acetylene gas welding. Injector principle in welding torch. Gas consumption according to torch type. Application and installation of gas cylinder batteries. Problems of flame cutting, armor plating. Shrinkage effect of welding, flame straightening technique. Material effects of welding, annulling of heat effects by an-

nealing. Arc welding. Assessment of electrode coating. Anodic and cathodic effects in arc welding. Volt-Ampere-Characteristic of welding machines. Inert gas welding (TIG, MIG, MAG). Different methods of plastic welding.

TM 7691 Laboratory 0-6-3

Metallurgy laboratory : microstructure, macrostructure, distribution of sulphur and phosphorus in steel. Physic laboratory : experiments to demonstrate the principle of engineering science so that students can use it to build teaching aids and educational materials.

TM 7693 Special Project 0-7-3

The student will design and construct a special project, which should be teaching aids, lab equipment or other instructional materials. This special project must show that the prospective teacher is able to develop and build necessary equipment or create instruction materials for his work. A descriptive report about the project (Thai/English) must be delivered.

TM 7901 Electrical Technology 2-0-2

Induction. Alternator. Transformers and welding transformers. Three phase power supply systems. A.C. single and three phase induction motors. Control systems for machine tools. Electrical safety. Semiconductors, diodes and transistor. Advanced electrical systems in motor cars. Electrical system for appliances such as air conditioners.

ED 7831 Educational Psychology 2-0-2

Stages of cognitive development. Intelligence tests. Problems of measuring intelligence. Aptitude tests. Temperament and Physique. Instincts and habits. Emotional development ; motivation and discipline. Conscious and unconscious mental conflicts. The inferiority complex and other complexes and neuroses. The role of playing. The influence of mass media. Role play ; the peer group. Interaction analysis. Sociometric techniques. Applications of group dynamics.

ED 7871 Course Developments 2-0-2

Derivation and selection of observable objectives from second-level objectives : task analysis, formulation of observable objectives, hierarchies of objectives, taxonomies. Derivation and selection of second-level objectives from course descriptions : collection of pertinent information, preselection and stating of objectives in reference to target learner, hierarchies, criteria for final selection. Planning of a course when syllabus is not given or inadequate.

ED 7891 Classroom Teaching Practice 0-6-3

Practice teaching in classroom is done along the same lines as mentioned in the second semester, the six hours are divided into

2 hours preparation,

3 hours classroom teaching,

1 hour for evaluation and analysis.

The subjects are similar to those in the second semester. Good students are selected to teach in 2nd year vocational classes. For each student the frequency of teaching is increased by reducing the size of the teacher student groups.

ED 7893 Workshop Teaching Practice 0-4-2

Topics of the shop-/lab- program of the technician classes are selected. The students are given: the practice jobs, or the objectives, or the skills to be tested, in a later stage the topics only. The lessons are prepared, held and evaluated according to the principles described for practice teaching in the second semester. In addition to this, the students have to test their lesson plans, instruction materials, practice jobs and tests in shop before teaching. Each student will teach periodically every fourth week :

1st week (seminar) - draft of lesson plan, design of jobs etc.

2nd week (shop) - testing of draft

3rd week (seminar) - finalization of lesson plan, materials

4th week (shop) - teaching and evaluation

Each student will teach 12 periods of 50minutes per semester.

Fourth Semester

BU 7098 Shop Management and Cost Estimation 2-0-1

Organization of school shops and labs, organization scheme planning of material orders, ordering materials and equipments, store keeping, time schedules for workshops and labs, supervision and control safety precautions, maintenance problems. Organization of production shops,

manual trades for Thailand. Management and marketing for small and medium workshops, repair work and its bearing on rural development, production and improvement of simple machinery, depreciation, taxes and duties.

TM 7434 Design of Machine Elements 2-0-2

Tailstock. Hose pump. Air Compressor. Dosing pump. Coil winder. Punch with and without guidance plate and/or columns. Simple follow on punch. Progressive punch with different sequences. Bending device. Welded or casted pipe vice.

TM 7442 Industrial Hydraulics and Pneumatics 2-0-2

Introduction to pneumatics, physical fundamentals of compressed air. Types of compressors, controlling of compressed air. Air cylinders and air consumption. Pneumatic valves and their application. Pneumatic-hydraulic feed units. Basic circuit. design of compressed air systems. Sequence control, time-way-diagram. Exercises with pneumatic circuits. Low pressure control. Introduction to hydraulics, compressed liquids, hydraulic power. Hydraulic oil, properties, conditioning. Hydraulic pumps, characteristic and application. Hydraulic motors, characteristic and application. Hydraulic gears, application in machine tools, vehicles etc. Hydraulic circuits.

TM 7452 Applied Thermodynamics 2-0-2

Carnot's process for refrigeration. Pressure-enthalpy and temperature-entropy diagram of refrigerant. Refrigeration cycle, condensing load,

evaporating load, compression power and flow rate. Problems of sub-cooling, superheating and pressure drop. Heat transfer. Condenser and evaporator design. Cooling load calculation for air conditioning room and cold storage. Mollier diagram for air, air cooling and heating. Air conditioning systems and their applications e.g. air conditioning system in theatres, conference rooms, hospitals and hotels. Electrical circuit and controls in air conditioning systems.

TM 7542 Noncutting Operations 2-0-2

Dislocation theory and grain distortion of materials by plastic deformation. Strain-hardening, stress relief annealing. Press operations. Design principles of cutting dies. Modern casting processes e.g. injection casting, mold casting, system croning, lost wax precision casting.

TM 7692 Laboratory 0-6-3

Electrical laboratory : a course to demonstrate the principle of electrical technology. Welding laboratory : a course to cover the subject-matter in a lecture course on welding technology. Pneumatic laboratory : study of the operations of air-compressor and associated equipments (i.e. cut-in and cut-out control, filter, pressure regulator, oiler, etc.), various control valves and special valves. Study of automatic control circuits and typical industrially-used circuits. Industrial Hydraulic laboratory : study of the operations of hydraulic pumps and associated equipments, various control valves and special valves. Study of automatic control circuits and typical industrially-used circuits.

TM 7694 Special Project 0-7-3

The gain in experience during the third semester will allow a higher standard of the special project work during the final semester. In case the students previous work has serious flaws, he can produce an improved version of his original assignment using the same material as far as possible. If the project of the previous semester meets the necessary standards and can be fully used for its intended purpose, the student gets an additional supplementary assignment. A descriptive report about the project (Thai/English) must be delivered.

ED 7802 Teaching Methods 2-0-2

Synopsis of teaching methods employed in technical education : distinction of typical features, preparation and performance of teaching sequences in form of directed studies, demonstrative presentations by students, experimental analysis at the hand of written material of TV recordings, development of criteria for efficient use. Frame of refernce for teaching situations : Investigation of typical teaching situations, discussion of consequences of different courses of action open to the teacher.

ED 7852 Vocational Education and Administration 2-0-2

Practical concepts of training skill workers and different types of technicians ,with emphasis on vocational school course design. Administration techniques, pitfalls, sandwich type production work.

ED 7892 Classroom Teaching Practice 0-4-2

For classroom teaching there are only 2 hrs. per week for preparation and 2 periods weekly in front of a class for each group. Evaluation is

done immediately after the teaching in a very short time, as the teacher student teams are supposed to be experienced and selfreliant by now. The new aspect for the training in this final semester is the wide variety and higher difficulty level of the subjects. Following the principles of the previous semesters, the students must teach various subjects in the second year vocational classes as well as technician classes.

ED 7894 Workshop Teaching Practice

0-4-2

Shop instruction training are continued during this semester in the same way as administered in the third semeter.

Academic and Administrative Staff

ACADEMIC AND ADMINISTRATIVE STAFF

<i>Rector</i>	Prof. Bhongsakdi	Vorasuntarosoth	B.Eng.,M.S.M.E. (Purdue)
<i>Vice Rector</i>	Prof. Boonyasak	Jaijongkit	B.S.Ch.E.,M.S.Ch.E. (Purdue)
<i>Dean</i>	Mr. Chana	Kasipar	B.Sc. (Hons.), M.Sc. (Eng.), D.I.C. (London)

Faculty Secretary Office

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<i>Asst. Head</i>	Mr. Vichien	Thammasudjarit	B.Eng. (K.M.I.T.)

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Miss Usa	Todtansuk	Cert. in Secretary
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Department of Teacher Training in Mechanical Technology

<i>Acting Head</i>	Mr. Chana	Kasipar	B.Sc. (Hons.), M.Sc. (Eng.), D.I.C. (London)
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Asst. for Theoretical Subjects

Mr. Banleng	Sornil	Ing. Grad. (Cologne)
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Asst. for Workshop & Laboratories

Mr. Jamnong	Pumkum	Kfz-Meister, B.S.I.Ed. (K.M.I.T.)
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	Mr. Chairroj	Patimapornthep	Dip. in Piping & Welding
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	Mr. Surat	Thaitrong	B.S.I.Ed. (K.M.I.T.)
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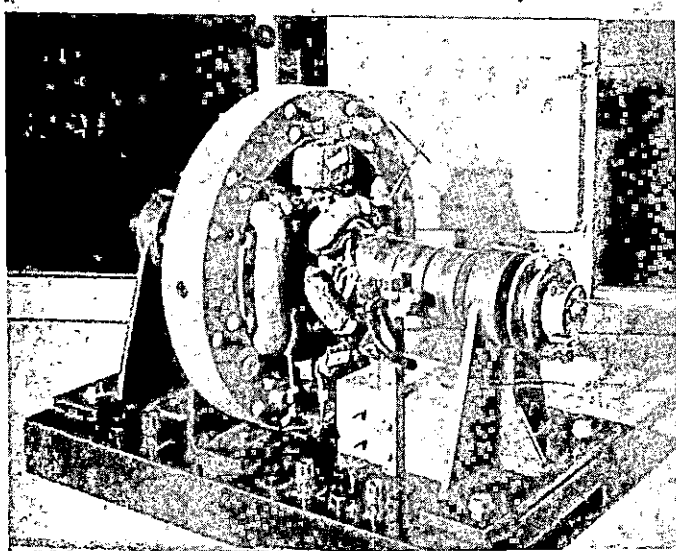
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