KING MONGKUT'S INSTITUTE OF TECHNOLOGY

NORTH BANGKOK CAMPUS

FACULTY OF TECHNICAL EDUCATION AND SCIENCE

SYLLABUS

ACADEMIC YEAR 1980/81

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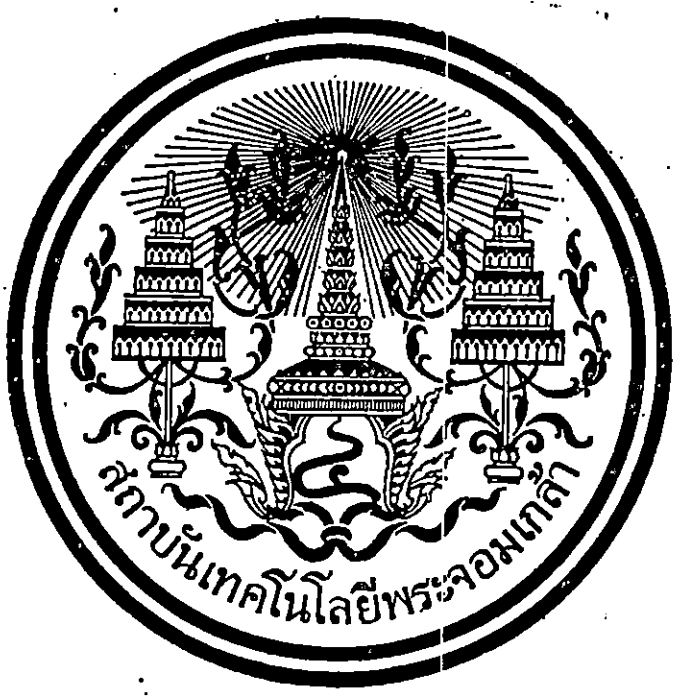

FACULTY OF TECHNICAL EDUCATION AND SCIENCE

SYLLABUS

ACADEMIC YEAR 1980/81

Faculty of

Technical Education and Science

Tel: 5858541 -9

Pracharaj I Rd.
Bangkok 8
Thailand

CONTENT

Syllabus of Courses

Bachelor's Degree Course

Programme of Study
Department of Teacher Training
in Electrical Technology

Semester	Course No	Subjects	Credits	Periods/week	
				Theory	Practice
1	SS 4003	Social Science	1	1	0
	LA 4183	Technical English	2	2	1
	MA 4025	Mathematics	3	3	1
	SC 4053	Engineering Science	2	2	0
	SC 4075	Chemistry	2	2	0
	TE 4431	Technical Drawing	1	0	2
	TE 4091	Electrical Fundamentals	2	2	1
	TE 4903	Network Analysis	2	2	0
	TE 4971	Signal and Control Circuits	2	2	0
	TE 4991	Laboratory	3	0	7
	TE 4993	Workshop Practice	2	0	7
			22	16	19
2	SS 4004	Social Science	1	1	0
	LA 4184	Technical English	2	2	1
	MA 4026	Mathematics	2	2	0
	SC 4054	Engineering Science	2	2	0
	TE 4902	Fundamental Electrical Technology	3	3	1
	TE 4904	Network Analysis	2	2	1
	TE 4962	Industrial Electronics	2	2	0
	TE 4972	Signal and Control Circuits	2	2	0
	TE 4974	Electrical Measurements	2	2	0
	TE 4994	Electrical Workshop Practice	2	0	7
	TE 4692	Mechanical Workshop Practice	2	0	7
			22	18	17

Semester	Course No	Subjects	Credits	Periods/week	
				Theory	Practice
3	LA 5183	Technical English	2	2	1
	MA 5025	Mathematics	2	2	0
	SC 5053	Engineering Science	2	2	0
	BU 5098	Shop Management and Cost Estimation	1	2	0
	TE 5903	Network Analysis	2	2	0
	TE 5921	Electrical Machines	3	3	1
	TE 5941	Electrical Installations	2	2	1
	TE 5961	Industrial Electronics	2	2	0
	TE 5973	Electrical Measurements	2	2	0
	TE 5991	Laboratory	2	0	6
	TE 5993	Workshop Practice	2	0	7
			23	19	16
4	LA 5184	Technical English	1	1	1
	MA 5026	Mathematics	2	2	0
	SC 5054	Engineering Science	2	2	0
	TE 5922	Electrical Machines	3	3	1
	TE 5942	Electrical Installations	2	2	1
	TE 5962	Industrial Electronics	2	2	0
	TE 5971	Signal and Control Circuits	2	2	0
	TE 5972	Contactless Control	2	2	0
	TE 5992	Electronic Laboratory	3	0	7
	TE 5996	Electrical Machine Laboratory	3	0	7
			22	16	17

emester	Course No	Subjects	Credits	Periods/week	
				Theory	Practice
5	*	Non-Technical Elective (LA 6183 or HU 6201)	1	2	0
	MA 6025	Applied Mathematics	3	3	0
	TE 6901	Advanced Electrical Technology	3	3	1
	TE 6921	Electrical Machines	2	2	0
	TE 6941	Electrical Installations	2	2	0
	TE 6961	Industrial Electronics	2	2	0
	TE 6991	Laboratory	3	0	7
	TE 6993	Workshop Practice	2	0	6
	ED 6801	Teaching Methods	2	2	0
	ED 6862	Teaching Aids	2	2	0
	ED 6891	Teaching Practice	2	0	3
			24	18	17
6	*	Non-Technical Elective (LA 6184 or HU 6202)	1	2	0
	MA 6026	Applied Mathematics	2	2	1
	TE 6902	Advanced Electrical Technology	2	2	0
	TE 6922	Electrical Machines	2	2	0
	TE 6942	Electrical Installations	2	2	0
	TE 6962	Industrial Electronics	2	2	0
	TE 6992	Laboratory	2	0	5
	TE 6994	Workshop Practice	2	0	7
	ED 6804	Conditions of Learning	2	2	0
	ED 6841	Educational Measurements	2	2	0
	ED 6892	Teaching Practice	4	0	7
			23	17	19

mester	Course No	Subjects	Credits	Periods/week	
				Theory	Practice
7	SS 7003	Social Science	1	1	0
	TE 7561	Workshop Technology	2	2	0
	TE 7971	Principles of Feedback and Control Systems	2	2	0
	TE 7973	Electrical Measurements	2	2	0
	TE 7981	Data Processing	2	2	0
	TE 7991	Laboratory	3	0	6
	TE 7993	Special Projects	3	0	7
	ED 7831	Educational Psychology	2	2	0
	ED 7871	Course Developments	2	2	0
	ED 7891	Classroom Teaching Practice	3	0	6
	ED 7895	Workshop and Lab. Teaching Practice	2	0	4
			24	13	23
8	SS 7004	Social Science	1	1	0
	BU 7098	Shop Management and Cost Estimation	1	2	0
	TE 7942	Electrical Installations	2	2	0
	TE 7974	Electrical Measurements	2	2	0
	TE 7982	Data Processing	3	3	0
	TE 7992	Laboratory	3	0	7
	TE 7994	Special Projects	3	0	7
	ED 7802	Teaching Methods	2	2	0
	ED 7852	Vocational Education and Administration	2	2	0
	ED 7892	Classroom Teaching Practice	2	0	4
	ED 7896	Workshop and Lab. Teaching Practice	2	0	4
			23	14	22

Programme of Stury
Department of Teacher Training
in Mechanical Technology

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

mester	Course No	Subjects	Credits	Periods/week	
				Theory	Practic
3	LA 5183	Technical English	2	2	1
	MA 5027	Mathematics	2	2	0
	TM 5401	Engineering Mechanics	2	2	1
	TM 5433	Machine Elements	3	3	0
	TM 5441	Fluid Mechanics	2	2	0
	TM 5451	Applied Thermodynamics	2	2	0
	TM 5541	Noncutting Operations	2	2	0
	TM 5561	Cutting Operations	2	2	0
	TM 5691	Laboratory	1	0	3
	TM 5693	Workshop Practice	3	0	11
	TM 5901	Electrical Technology	2	2	0
			23	19	16
4	SS 4004	Social Science	1	1	0
	BU 5098	Shop Management and Cost Estimation	1	2	0
	LA 5184	Technical English	1	1	1
	MA 5028	Mathematics	2	2	0
	TM 5432	Tools Dies Jigs and Fixtures	3	3	1
	TM 5434	Machine Elements	3	3	1
	TM 5452	Applied Thermodynamics	2	2	0
	TM 5512	Pumps and Compressors	2	2	0
	TM 5542	Noncutting Operations	2	2	0
	TM 5692	Laboratory	1	0	2
	TM 5694	Workshop Practice	4	0	12
			22	18	17

Semester	Course No	Subjects	Credits	Periods/week	
				Theory	Practice
5	MA 6027	Mathematics	3	3	0
	TM 6402	Mechanics of Solid	2	2	0
	TM 6431	Machine Elements	2	2	0
	TM 6433	Design of Machine Elements 1	1	1	1
	TM 6561	Cutting Operations	2		0
	TM 6691	Laboratory (Machine Tools Lab)	1	0	2
	TM 6693	Workshop Practice	4	0	13
	ED 6801	Teaching Methods	2	2	0
	ED 6841	Educational Measurements	2	2	0
	ED 6891	Teaching Practice	2	0	3
	*	Non-Technical Elective (HU 6201 or LA 6183)	1	2	0
			22	16	19
6	SS 6004	Social Science	1	2	0
	TM 6401	Mechanics of Machinery	2	2	0
	TM 6422	Engineering Materials	2	2	0
	TM 6434	Design of Machine Elements II	2	2	0
	TM 6562	Cutting Operations	2	2	0
	TM 6696	Laboratory(Metrology & Material Testing Lab.)	1	0	3
	TM 6694	Workshop Practice	2	0	7
	ED 6804	Conditions of Learning	2	2	0
	ED 6862	Teaching Aids	2	2	0
	ED 6892	Teaching Practice	4	0	7
	ED 7831	Educational Psychology	2	2	0
	*	Non-Technical Elective (HU 6202 or LA 6184)	1	2	0
			23	18	17

emester	Course No	Subjects	Credits	Periods/week	
				Theory	Practice
7	TM 7421	Engineering Materials	2	2	0
	TM 7433	Design of Machine Elements 3	2	2	0
	TM 7441	Fluid Power Technology 1	3	2	2
	TM 7695	Matallurgy Laboratory	1	0	3
	TM 7693	Special Projects	3	0	7
	TM 7901	Electrical Technology	2	2	0
	ED 7871	Course Developments	2	2	0
	ED 7891	Classroom Teaching Practice	3	0	6
	ED 7893	Workshop Teaching Practice	2	0	4
	*	Technical Elective (TM 7453, TM 7541 or TM 7543)	2	2	0
			22	12	22
8	BU 7098	Shop Management and Cost Estimation	1	2	0
	TM 7434	Design of Machine Elements 4	2	2	0
	TM 7444	Fluid Power Technology 2	3	2	2
	TM 7452	Applied Thermodynamics	2	2	0
	TM 7694	Special Projects	3	0	7
	TM 7992	Electrical Laboratory	1	0	2
	ED 7802	Teaching Methods	2	2	0
	ED 7852	Vocational Education & Administration	2	2	0
	ED 7892	Classroom Teaching Practice	2	0	4
	ED 7894	Workshop Teaching Practice	2	0	4
	*	Technical Elective (TM 7454, TM 7542 or TM 7544)	2	2	0
	*	Technical Elective Lab. (TM 7696, TM 7697 or TM 7698)	1	0	2
			23	14	21

COURSE DESCRIPTION

1. General Education

BU 5098 **Shop Management and Cost Estimation** 1(2-0)

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.

BU 7098 **Shop Management and Cost Estimation** 1(2-0)

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.

HU 6201 **Human Relations** 1(2-0)

Study of human interaction in different forms and analysis of human behaviour in various groups such as family, peer group, working group, crowd etc. Also study psychological concept that deals with personal interaction and the way to create human relations.

HU 6202 **Vocational Guidance** 1(2-0)

Principles and practices in the guidance services. Career development, vocational objectives, advice on methods of approach to employers, interviewing techniques. Placement service. An appreciation of the interaction between school, home and community.

LA 4183 **Technical English** 2(2-1)

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 and mechanical technology. Pertinent excercises. Pronunciation drills.

LA 4184 Technical English 2(2-1)

Continuation of the first semester programme using more complex structures of technical English.

LA 5183 Technical English 2(2-1)

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.

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.

LA 6183 Technical English (elective) 1(2-0)

Review of the structure of technical English including the structure of grammar, advanced technical conversations as well as advanced exercises in report writing. This course shall bring new students from different technical institutes to an equal level in technical English and parts of this course will be taught in the sound laboratory.

LA 6184 Technical English (elective) 1(2-0)

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

MA 4025 Mathematics 3(3-1)

Review algebra and trigonometry. Complex numbers and their fundamental relations. Cramer's rule. Matrices and determinants. Rectangular and polar coordinates. Analytic geometry of the straight line, intersecting lines, circle, parabola, ellipse and hyperbola.

MA 4026 Mathematics 2(2-1)

Functions and graphs. Limits and continuity, slope of a curve, derivative of a function, velocity and rates, formula for differentiation, higher order of derivatives, implicit functions and parametric equations with their derivatives, the chain rule for derivatives. The differentials, approximation by differentials. Tangent and normal lines, angle of intersection of curves. Related rates. Maxima and minima with applications, point of inflection. The indefinite integral with applications. Differentiation and integration of trigonometric functions. Area under a curve, area between two curves.

MA 4027 Mathematics 3(3-1)

Review algebra and trigonometry. Complex numbers and their fundamental relations. Cramer's rule. Matrices and determinants. Rectangular and polar corrdinates. Analytic geometry of the straight line, intersecting lines, circle, parabola, ellipse and hyperbola.

MA 4028 Mathematics 2(2-1)

Functions and graphs. Limits and continuity, slope of a curve, derivative of function, velocity and rates, formula for differentiation, higher order of derivatives, implicit functions and parametric equations with their derivatives, the chain rule for derivatives. The differentials, approximation by differentials. Tangent and normal lines, angle of intersection of curves. Related rates. Maxima and minima with applications, point of inflection. The indefinite integral with applications. Differentiation and integration of trigonometric functions. Area under a curve, area between two curves.

MA 5025 Mathematics 2(2-1)

The inverse trigonometric functions with their derivatives. The natural logarithms with their properties and graph, the derivative of ln, the exponential function and function a^u with their derivatives. Methods of integration. Basic differential equations and their applications. Applications of integration.

MA 5026 Mathematics 2(2-1)

Hyperbolic functions with graphs and their relations. Sequence and series Maclaurin's and Taylor s expansions. Fourier series analysis and its applications. Partial differentiation. Linear equations, matrices and determinants with applications in linear equations, eigen values and eigen vectors.

MA 5027 Mathematics 2(2-)

The inverse trigonometric functions wich their derivatives. The natural logarithms with their properties and graph, the derivative of ln, the exponential function and function a^u with their derivatives. Methods of integration. Basic differential equations and their applications. Applications of integration.

MA 5028 Mathematics 2(2-1)

Hyperbolic functions with graphs and their relations. Sequence and series, Maclaurin's and Taylor's expansions. Fourier series analysis and its applications. Partial differentiation. Linear equations, matrices and determinants with applications in linear equations, eigen values and eigen vectors.

MA 6025 Applied Mathematics 3(3-0)

Double and triple integrations with applications in physics. Vectors and scalars, laws of vector algebra, unit vectors, components of vectors. Dot, cross and triple products. Ordinary derivatives of vectors, space curves, gradient, divergence and curl. Ordinary integrals of vectors, line and surface integrals. Introduction to statistics, frequency distributions, measures of central tendency, standard deviation, basic forms of probability, binomial and normal distributions, standard errors of measurement.

MA 6026 Applied Mathematics 2(2-1)

First order differential equations, variables separable, homogeneous equations, exact equations and linear equations. Second order differential equations with constant coefficients, D - operator method, applications in electrical circuits. 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. Linear equations, vector spaces, determinants, linear transformation, eigenvalues and eigenvector, inner product spaces, application to differential equations.

MA 6027 Mathematics 3(3-0)

Introduction to statistics, frequency distribution, measures of central tendency, standard deviation, basic forms of probability, binomial and normal distributions, standard errors of measurement. Double and triple integrations with applications in physics. First order differential equations, variables separable, homogeneous equations, exact equations and linear equations. Second order differential equations with constant coefficients, D - operator method, applications in mechanics.

MA 6028 Introduction to Numerical Analysis (elective) 3(3-0)

Errors, non - linear equations, graphical and bisection methods, iterative, Nowton's and Raphson's method. Finite difference operators. Newton's interpolation and inverse interpolation. Numerical differentiation and integration, numerical solution of differential equations by the methods of Picard, Euler, Runge and Kutta.

SC 4053 Engineering Science 2(2-0)

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 4054 Engineering Science 2(2-0)

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.

SC 4055 Physics 2(2-0)

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. Polarlization.

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

SC 4056 Physics 2(2-0)

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.

SC 4075 Chemistry 2(2-0)

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.

SC 5053 Engineering Science 2(2-0)

Review: Temperature and heat, latent heat of fusion and vaporization, heat transfer, thermal resistance, Boyle's law, and Charle's 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.

SC 5054 Engineering Science 2(2-0)

Sound: Free oscillations, forced oscillations, propagation of waves, superposition, wavelength and frequency, interference. Porperties of sound, acoustic in buildings, resonance, musical instruments.

Light: Images in mirrors and in lens systems, telescope, microscopes and electron microscope, resolving power, still and cine cameras. Colour photography, photoflash. Stroboscope. Spectrum lines, spectrum analysis. Polarization.

SS 4003 Social Science 1(1-0)

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.

SS 4004 Social Science 1(1-0)

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.

SS 6004 Social Science 1(2-0)

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.

/SS 7003 Social Science 1(1-0)

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.

/SS 7004 Social Science 1(1-0)

Manpower and its bearing on production, population and it 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.

2. Professional Education

2.1 Educational Subjects

ED 6801 Teaching Methods 2(2-0)

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 6804 Conditions of Learning 2(2-0)

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 6841 Educational Measurements 2(2-0)

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 6862 Teaching Aids 2(2-0)

Classification of teaching aids according to their features, teaching aids for dynamic development of information. Chalkboard 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 6891 Teaching Practice 2(0-3)

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.

ED 6892 Teaching Practice 4(0-7)

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.

ED 7802 Teaching Methods 2(2-0)

Synopsis of teaching methods employed in technical eduction : 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, developemnt of criteria for efficient use. Frame of reference for teaching situations : Investigation of typical teaching situations, discussion of consequence of different course of action open to the teacher.

ED 7831 Educational Psychology 2(2-0)

Stages of cognitive development. Intelligence tests. Problems of measuring intelligence. Aptitude test. 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 7852 Vocational Education and Administration 2(2-0)

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 7871 Course Developments 2(2-0)

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 3(0-6)

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 partical 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 7892 Classroom Teaching Practice 2(0-4)

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 selfreliant by now

ED 7893 Workshop Teaching Practice 2(0-4)

Topics of the shop/lab-program of the technician classes are selected. The students are given:the practice jobs, or the objectives, or the skilled 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 test 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 50 minutes per semester.

ED 7894 Workshop Teaching Practice 2(0-4)

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

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

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

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

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.

2.2 Technical Subjects

2.2.1 Electrical Technology Programme

TE 4431 Technical Drawing 1(0-2)

Geometrical constructions, introduction to technical drawing. Standard lettering. Drawing in 3-views, first 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 4692 Mechanical Workshop Practice 2(0-7)

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

TE 4901 Fundamental Electrical Technology 2(2-1)

Electron flow, conduction in gases, neon glow lamp
Electrical field, capacitors. Magnetic field.
Electromagnetism, permeability and hystersis.
Motor principle, induced e.m.f. Alternator. Tranformer.
Single-and three phase system. Inductors at D.C. and A.C.
Eddy current and skin effect.

TE 4902 Fundamental Electrical Technology 3(3-1)

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 4903 Network Analysis 2(2-0)

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 4904 Network Analysis 2(2-1)

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(2-0)

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 4971 Signal and Control Circuits 2(2-0)

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 4972 Signal and Control Circuits 2(2-0)

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(2-0)

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 transfermers, Recording instruments. Oscilloscopes and their application. D.C. bridges, testing of cables and wires.

TE 4991 Laboratory 3(0-7)

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

TE 4993 Workshop Practice 2(0-7)

Refining of bench work techniques, installation of different electrical circuits, transformer winding.

TE 4994 Electrical Workshop Practice 2(0-7)

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

TE 5903 Network Analysis 2(2-0)

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(3-1)

Transformer principle, transformer cores, autotransformer, variable-ratio transformenrs, 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 5922 Electrical Machines 3(3-1)

D,C, generators : operation, components, characteristics; types and applications, D,C, Motors : operation origin of torque, characteristics, armature reaction and commutation. Universal motor. Induction motors : operation, rotating field, components. Squirrel cage motors. Wound rotor motors : equivalent circuits and circle diagram. Three phase induction motor. Synchronous motor.

TE 5941 Electrical Installations 2(2-1)

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 5942 Electrical Installations 2(2-1)

Safety. Accident prevention. Protection against excessive contact voltage : insulation, low voltage. earthing, protection circuits. Lighting protection. Short circuit calculation. Selection of switch gears and instruments.

TE 5961 Industrial Electronics 2(2-0)

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

TE 5962 Industrial Electronics 2(2-0)

Vacuum tubes, cathode ray tubes, tube amplifier, gas tubes with and without heater. Four layor diode and diac, thyristor and triac, Unijunction transistor. Control and applications of SCR. Field effect transistors. Photoelectric devices. Special nonlinears devices. Intergrated circuit amplifier. operational amplifiers.

TE 5971 Signal and Control Circuits 2(2-0)

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 5972 Contactless Control 2(2-0)

Fundamentals of logic algebra, AND, OR, NOT-functions : Nand-, Norfunction, logic rules, analyzing and synthesising, 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 5973 Electrical Measurements 2(2-0)

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 2(0-6)

Laboratory course covering the subject-matter of the lecture course in power measurement.

TE 5992 Electronic Laboratory 3(0-7)

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

TE 5993 Workshop Practice 2(0-7)

Fabrication of related projects such as teaching-aids etc.

TE 5996 Electrical Machine Laboratory 3(0-7)

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

TE 6901 Advanced Electrical Technology 3(3-1)

Appearance of electric fields, electric field strength, electric flux density and related properties, Ganss' 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.

TE 6902 Advanced Electrical Technology 2(2-0)

Circuits with permanent magnets. Maxwells equations and their interpretation, radiation of electromagnetic waves, propagation of electromagnetic waves, propagation of electromagnetic conductions in gases and liquids and in semicaonductors 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, measurment of harmonic distortions.

TE 6921 Electrical Machines 2(2-0)

DC-machines : 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.
Transformers : 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.

TE 6922 Electrical Machines 2(2-0)

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, speedtorque-current characteristics, slip ring rotor, losses and effiency.

TE 6941 Electrical Installations 2(2-0)

Review of components and appliances of electrical installations. Characteristics and application of fuses. Automatic circuit breakers lighting switches, eavy curren swi ches and switchgear, high tension switches and switchgear. Relays, contactors, their characteristic and applications, l ctrothermally n electromagnetically operated tripping devices. Overload release, undervoltage release. Protective devices for electrical Machines. Buchholz protective relay for transformers, Lightning protection. Protection against short circuits, thermal overload internal faults. Protection of high-tension distribution networks.

TE 6942 Electrical Installations 2(2-0)

Design and estimation of high tension power distribution system. Calcul tion of elec ical characterist cs, selection of overhead line, line voltage, natural load. thermal limits to transmission capacity, voltage drop, powe 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 swith gear installations. Metering of switch gear installations. Protection and control gear, relays, safety regulations and standards.

TE 6961 Industrial Electronics 2(2-0)

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 6962 Industrial Electronics 2(2-0)

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 circuit, 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 6991 Laboratory 3(0-7)

This laboratory course covers various experiments, mainly of the different fields fo 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 6992 Laboratory 2(0-5)

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

TE 6993 Workshop Practice 2(0-6)

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.

TE 6994 Workshop Practice 2(0-7)

Advanced training in moter-control circuits, paging and telecom syst systems, and fault finding. Training in reaching industrial performance (speed and quality) in selected fields of electrical techniques.

TE 7561 Workshop Technology 2(2-0)

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 7942 Electrical Installations 2(2-0)

Design and estimation of electrical installations, power consumtion, lighting calculation and consumtion 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 7971 Principles of Feedback and Control Systems 2(2-0)

Introduction to linear systems, nonlinear systems. control system terminology. Linear system by means of ordinary time invariant differntial 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(2-0)

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, watthour meter, multi-meters and their applications, accessories for multimeters, thermo-converter, transformers. Compensation methods and compensators. Principles of recording instuments continous-line, dottedline recorders, light beam scopes, bridge circuits for DC and AC, special bridge circuits.

TE 7974 Electrical Measurements 2(2-0)

Principles of CRT oscilloscopes, X-and Y-amplifier, sweep generator, trigger uni . 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 7981 Data Proceesing 2(2-0)

Review ofswitching algebra, basic digital blocks. Counters, reisters, 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, magnetictape and magnetic-disc memories, semiconductior memories.

TE 7982 Data Processing 3(3-0)

Storage of programs and data on punched tapes and cards, input devices for punched tapes and cards, character reading devices, teleprinter, A/D inputs, machanical 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 comparision to digital computers. Construction and operation of analog computers. Hybrid computer.

TE 7991 Laboratory 3(0-6)

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

TE 7992 Laboratory 3(0-7)

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

TE 7993 Special Porjects 3(0-7)

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.

TE 7994 Special Projects 3(0-7)

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 mate as far as possible. If the project of the previous semester meets the necessary tandards and can fully used for it intended purpose, the student gets an additional supplementary assignement. A descriptive report about the project (Thai/English) must be delivered.

2.2 2 Mechanical Technology Programme

TM 4401 Engineering Mechanics 3(3-1)

Forces : Introduction of vectors, resolution, resultants of coplanar force systems. Funcular polygon.

Moments Moment of a force principles of moments. Couples. Lever system. Centre of Gravity. Transmission ratio. Simple machines. Equili rium Condit ons of equilibrium, stability, equilibrium by funicular polygon.

Friction : Resistance sli ing, 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 4402 Engineering Mechanics 3(3-1)

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 stress in beam. slope and deflection of beam. Theory of columns. Combined stresses.

TM 4421 Engineering Materials 2(2-0)

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, seggregation. Rimmed steel, killed steel. Naming of ferrous metal according to carbon percentage. DIN, BS,SAE and AISI classifications of steel. Alloving elements of steel and their effects. Grey cast iron, chilled cast iron, nodular cast iron. Tool steel, high speed steel, carbide tips. Corrosion and its prevention. Electrochemica seri of metals

TM 4422 Engineering Materials 2(2-0)

Cooling curves of pure metals and alloys, aggregate states, critical points. Eutectic equilibrium diagram e.g. of lead/tin alloy. Crystaline structure of alpa and gamma iron. Iron/Iron Carbide equilibrium diagram : ferritec, pearlite, austenite. Hardening process of tool steel. Heat treatment of heat treatable steel : Quenching and tempering.

TM 4431 Technical Drawing 2(1-3)

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, hal section. Representation and dimensioning of rivets screws, welding seams, taper, keys and threads Section of cylinder. Section of cone. Different ends of 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 th topics for this course should be given with special emphasis on dimensioning of the workpieces, correct to tolerances and surface finish symbols.

TM 4434 Machine Elements 2(2-1)

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, bazed joints, bonded joints, shrink-fit joints.
Detachable joints : Design of keys, standard splines, serrate splines and involute splines.

TM 4561 Cutting Operations 2(2-0)

Measurement, measing 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 4562 Cutting Operations 2(2-0)

Motion of machine tools, classifcation of systems. Cutting conditions, types of chips. Belt drives. Gear drives, 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-drived shaper, determination of driving crank velocity. Hydraulically-drived shaper, feed mechanism, tool holding devices. Method of workpriece clamping for shaper.

TM 4691 Laboratory 1(0-2)

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

TM 4692 Laboratory 1(0-3)

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

TM 4693 Workshop Practice 4(0-12)

Bunch work. Forging. Hardening and tempering. Plastic works. Workshop experiments. General shop works.

TM 4694 Workshop Practice 3(0-11)

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

TM 4902 Electrical Technology 2(2-0)

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

TM 5401 Engineering Mechanics 2(2-1)

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 5432 Tools, Dies, Jigs and Fixtures 3(3-1)

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. Utilzation 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 5433 Machine Elements 3(3-0)

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 5434 Machine Elements 3(3-1)

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 couplingd. Springs : Charateristics and classification; disk springs, belical spring and spiral springs. Delt 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 gear and helical gears; gear trains, gear boxes ; worms and wormgears ; design of worms and wormgears.

TM 5441 Fluid Mechanics 2(2-0)

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, low 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(2-0)

Working substance and its properties. Laws of a perfect or idealgas, 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, Disel cycles; Air Standard efficiency. Idicator diagrams. Engine performance.

TM 5452 Applied Thermodynamics 2(2-0)

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(2-0)

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 handling 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 5541 Noncutting Operations 2(2-0)

Gas welding. Brazing, application of fluxs. 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 5542 Noncutting Operation 2(2-0)

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 5561 Cutting Operations 2(2-0)

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 1(0-3)

Material Testing: Tensile, bending, compressive and hardness test.

Oil properties testing: Viscosity, flash and fire point, cloud and pour point.

Electrical Laboratories.

TM 5692 Laboratory 1(0-2)

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 5693 Workshop Practices 3(0-11)

Shaping. Turning, Milling. Welding. General shop works.

TM 5694 Workshop Practices 4(0-12)

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

TM 5901 Electrical Technology 2(2-0)

D.C. Machines. Single phase and three phase A.C. Machines, Motor control. Electrical measurement. Electrical systems for motor cars.

TM 6401 Mechanics of Machinery 2(2-0)

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 6402 Mechanics of Solid 2(2-0)

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(2-0)

Lubricants: their chemical compositions, properties of lubricants, testing of lubricants. Friction and lubrication theory. Cutting oil. Alunminium 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 6431 Machine Elements 2(2-0)

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 trainsition 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 6434 Design of Machine Elements 2(2-0)

Clamping device with spiral excenter. Rollerblock for a roller bed. Drilling jig. Progressive punch. Joint coupling. Excenter drive. Spindle bearing. Small testing calender.

TM 6561 Cutting Operations 2(2-0)

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 6562 Cutting Operations 2(2-0)

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 6691 Laboratory 1(0-2)

A machine tools laboratory course using hydraulic press to experiment on the following topic: 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 4(0-13)

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.

TM 6694 Workshop Practice 2(0-7)

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

TM 6696 Laboratory 1(0-3)

Metrology laboratory (1 period): uses of various kinds of gauges; angular, surface roughness, screw thread and gear measurement.

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

TM 7421 Engineering Materials 2(2-0)

Iron carbide diagram with grey cast iron part. Grey cast iron with pearlitic and feritic matrix. Flame hardening of grey cast iron. Cooling examples through the sequence of different crystalline structures. Timethermal-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 derformation. Corrosion. Intergranular corrosion, relationsho: 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(2-0)

Reel and reel bearing. Pull and guide roller. Stretch roller drive. Spur flang gearing. Transmission case. Friction gearing. Bevel gear drive. Worm gear mechanics.

TM 7434 Design of Machine Elements 2(2-0)

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 7441 Fluid Power Technology I 3(2-2)

Introduction to pneumatic system and historical background. Machine structure and operation. Motion and mechanism of machinery. Circuit comprehension, expression and practice. Circuit design and introduction of special components. Design projects for practical applications. Study trips.

TM 7444 Fluid Power Technology II 3(2-2)

Introduction to oil hydraulic system and historical background. Circuit comprehension, expression and practice. Circuit design and introduction of special components Design projects for practice application. Study trips.

TM 7452 Applied Thermodynamics 2(2-0)

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 subcooling, 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 7453 Automotive Technology I 2(2-0)

Internal combustion engine : Combustion chambers Ignition and combustion systems. Fuel systems. Carburettors. Benzine injection systems. Injection pumps and nozzles. Governors. Rotary engines Lubricating and cooling systems.

TM 7454 Automotive Technology II 2(2-0)

Transmission systems : clutch. Fluid fly wheels and torque convertors. Construction detials and working of planetary gears. Automatic transmission. Brake systems. Suspension systems . Steering systems.

TM 7541 Non cutting Operation 2(2-0)

Introduction to Theory of Plastic : Production processes of polymers. Identification of plastics. Plastic jointings Hot gas welding. Heat plate welding. Friction welding. Glueing. Forming of thermosettings. Forming Techniques. Forming machines. Formmaking techniques. Forming of thermoplastics. Injection moulding. Blow moulding. Vaccuum moulding. Casting of plastics. Reinforcement of plastic. Fibreglass working.

TM 7542 Noncutting Operations 2(2-0)

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

TM 7543 Welding Technology I 2(2-0)

Gas welding principles. Soldering principles. Resistance welding. Electric arc welding principles. Constructional details of welding machines. Safety code. How to set up welding station with necessary voltages and currents. Duty cycle. Electrodes shrinkage effects of welding. Material effects of welding. Testing of welding seams.

TM 7544 Welding Technology II 2(2-0)

Special welding processes Inert gas welding. Tungsten inert gas welding (TIG). Metal inert gas welding (MIG/MAG). Submerged. Plasma. Costestimation for welding jobs.

TM 7693 Special Project 3(0-7)

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 7694 Special Project 3(0-7)

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.

TM 7695 Metallurgy Laboratory 1(0-3)

Metallurgy laboratory : microstructure, macrostructure, distribution of sulphur and phosporus in steel

TM 7696 Machine-Tool Laboratory 1(0-2)

Laboratory course covering testing and maintenance of various machine tools,turning, milling,shaping,grinding,drilling and pressing machines.

TM 7697 Automotive Laboratory 1(0-2)

Engine performance testing : Dwell angle. Vacuum advance. Centifugal advance. Carburettor. Injection pump. Nozzle. Power. Torque. Fuel consumption Exhaust gas analysis.

TM 7698 Welding Laboratory 1(0-2)

Welding laboratory : a course to cover the subject-matter in a lecture course on welding technology.

TM 7901 Electrical Technology 2(2-0)

Induction. Alternator. Transformers and welding transformers. There 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 of appliances such a air conditioners.

TM 7992 Electrical Laboratory 1(0-2)

Electrical laboratory : a course to demonstrate the principle of electrical technology.

Master's Degree Course

Degree Master of Science in Technical Education
M.S.Tech.Ed.

Requirements for Admission

Candidates must have honours bachelor degree either in Technical Education, Industrial Educati n, Engineering or equivalent 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.

Degree Requirements

1. A total of 50 credits must be obtained, made up of:
   - 1.1 Compulsory modules 24 credits
   - 1.2 Elective modules 14 credits
   - 1.3 Master thesis 12 credits

2. Compulsory modules:
   - 2.1 Educational subjects (common to all programmes)
     Ed 801, Ed 802, Ed 803 or Ed 816 , Ed 804
   - 2.2 Technical subjects
     - 2.2.1 Electrical Technology Programme
       Select 12 credits from the following modules:-
       TE 801, TE 802, TE 804, TE 809,TE 811 and TE 815
     - 2.2.2 Mechanical Technology Programme
       TM 801, TM 802, TM 803, TM 804

3. Elective modules:
   6 - 8 credits in Educational subjects
   6 - 8 credits in Technical subjects

COURSE DESCRIPTION

1. Thesis

Ed 800 Thesis — 12 credits

Research in the fields of vocational-technical education in Thailand.

2. Educational Subjects

Courses common to all programmes

credits (Theory-Practice)

Ed 801 Educational Technology — 3(3-0)

Syllabus analysis, achievement tests and the instructional design of a complete course, including sessions of; teaching methods, types of teaching aids (including self instructional programs), pre and post tests, evaluation and redesign of instructional materials.

Ed 802 Supervision of Students Teaching — 3(1-4)

Nature and purpose of supervision of instruction; dynamics of supervisory behaviour; basic concepts and patterns in supervised student-teaching; aspects of evaluation; grading and marking of student-teachers.

The selection and use of appropriate methods of teaching and instruction.

Ed 803 Educational Measurement — 3(3-0)

Fundamental concepts underlying educational measurement including; reliability; validity, normative techniques, score interpretations, scaling techniques, principles of test construction and a survey of standardized tests.

Ed 804 Vocational-Technical School Administration — 3(2-2)

Concepts, theories and processes of vocational-technical school administration. Educational leadership. Budgeting, book-keeping and financial reports, requisition and purchasing of supplies, stock control. Educational Institute laws and regulations, planning and maintenance of vocational-teachnical school, plant and facilities.

Ed 805 Educational Psychology and Coordination 3(3-0)

Basic principles of conditioning and learning, functional relationships between important variables related to rate of acquisition and degree of retention, transfer effects and related phenomena. Conditions affecting the acquisitions of concepts, language, thinking, problem solving, creativity, attitudes and values.

Ed 806 Educational Research 3(2-2)

Adaption of research techniques to problems in education. Integration of concepts in research methodology, statistics and measurement; rudiments of educational research design including techniques and problems.

Ed 807 Curriculum Development 3(3-0)

An analysis of curriculum theories and principles of curriculum construction. Survey of curriculum trends, present practices and sociological factors affecting the curriculum. Methods of analysing an occupation for the purposes of determining instructional units. Development of instructional units.

Ed 808 Education by Mass Media 2(1-3)

General influence of public mass media on human development, advertising industry, intentional education by mass media, conditions for learning effectiveness, instructional design for learning from printed media, cartoons. Design for a TV-adult education program, combination of TV educational programs with printed instructional material for individual learning.

Ed 809 Educational Statistics 3(3-0)

The role of statistic in research. Introduction to methods of analysing data from experiments and surveys. Statistical concepts and models; central tendency, variability, correlation, inference and selected nonparametric techniques, sampling theory, various tests of statistical significance, the analysis of variance and related topics.

Ed 810 Economics of Education 3(3-0)

Economic aspects of education. Introduction to economic development; manpower development and untilization. Strategies for the development of human resources in developing economics; the relationship of economic development to education, training and manpower untilization Educational planning.

Ed 811 Computer Applications in Educational Problems 3(2-2)

Computer oriented problems in school organization and educational research, computer assisted instruction (CAI).

Ed 812 Philosophy of Vocational-Technical Education 2(2-0)

Historical and philosophical development of vocational-technical education in Thailand. Trends and implications. Overview of vocational education in foreign countries with emphasis on curriculum and programme, qualifications and training of instructors, administration, relationship between general and vocational-technical education.

Ed 813 Seminar of Problems in Vocational-Technical Education in Thailand 2(0-4)

Review of literature and research papers that have been published on problems in vocational-teachnical education in Thailand. Meeting and discussion about technical education with national experts and officials.

Ed 814 Supervised Professional Experience 3(0-6)

Production of course materials. The design, production, administration and evaluation of an examination paper. Personal filing systems. Human relations. Contribution and participating in educational seminars or conferences.

Ed 815 Industrial Sociology 3(3-0)

The factory as a social system, formal and informal lines of communication and authority. Development and place of occupations in modern life; personnel recruitment, education and careers; personality and work roles.

Ed 816 Vocational Guidance 3(3-0)

Principles and practices in the guidance services, administrative principles and practices in organizing and implementing the guidance services. Testing and advice on study methods, personal financial management, scholarship opportunities, medical services, vacation employment. Education regulation, discipline. Career development, vocational objectives, advice on methods of approach to employers, interviewing techniques.
Labour regulations in Thailand.
The development and organization of the trade union movement in Thailand.
Factory acts and regulations. An appreciation of the interaction between school, home and community.

3. Technical Subjects

3.1 Electrical Technology Programme

TE 801 Computational Methods 3(2-3)

Introduction to numerical method:
Error analysis, power series calculation of Functions.
Solution of equations by Newton's and Raphson's method.
Bairstow's method, iterative methods, etc.
Numerical solution of systems of linear equations by Gaussian elimination, Cramer's rule, iterative methods, etc.
Interpolation, difference.
Numerical integration and numerical solution of differential equations by the methods of Picard, Euler, Runge and Kutta.
Applications of numerical methods to the related subjects.

TE 802 Rotating Electrical Machines 3(3-0)

Review of steady-state phenomena of El.AC- and DC-Machines.
Generalized theory of electrical machines.
Transient operation of electrical machines.
Dynamic operation of electrical machines.
El. Machine problems, i.e. SC-circuit, appearance of harmonics, oscillations etc.
Operation of special designed rotating El. machines.
The designed techniques of the rotating electrical machines.

TE 803 Power System Analysis 3(3-0)

Short-circuit calculation.
Purpose of SC-calculation.
Three-phase, two-phase and single phase faults at generators.
Demagnetisation due to armature-reaction.
Subtransient, transient and steady-state short-circuit conditions.
Symmetrical- and unsymmetrical short-circuits.
Method of symmetrical components under consideration of various kinds of neutral-point earthing.
Comparision of various methods of short-circuit calculation in large interconnection networks.

TE 804 Power Electronic Design 3(3-0)

Electronic circuit design for starting and speed control of DC,AC and synchronous motors.
Excitation, rectifier and inverter.
High voltage generation with thyristor C discharging. Switching regulator. Temperature integral regulator. Zero crossing network.
Techniques of designing the circuits will be discussed.

TE 805 Non-rotating Electrical Machines (transformers) 3(3-0)

Symmetrical and unsymmetrical components in polyphase transformers.
Calculation of magn. leakage reactances for different types of windings.
Harmonics in polyphase transformers.
Transient phenomenas in transformers.
Transformer structure and its materials, insulation, heating and load stresses.
Theories of special types of transformers.
Numerical problems of designing different types of 3-phase transformers.

TE 806 Specialized Electrical Energy Sources 3(3-0)

Study of specialized sources which convert various sources of energy into electric energy. The direct energy schemes to be discussed are photovoltaic generators, thermiomic converters, magnetohydrodynamic generators etc.

TE 807 High Voltage Engineering 3(3-0)

Dielectric stress and strength of gaseous-fluid-and solid insulations.
Generation and measurement of high AC-,DC-and surge-voltages.
Calculation of electric field of various shapes of electrodes.
Coordination of insulation in electric installations.
Various causes of transient overvoltages in electric power systems.
Travelling waves. Future possibilities: High-voltage DC-power transmission compared to three-phase AC-power transmission.

TE 808 Computer Analysis of Power Systems 3(3-0)

Power system network representation.
Formulation of model admittance matrix for digital computer solution.
Methods of solution using elimination, matrix inversion and iterative techniques.
Acceleration and convergence.
Transient stability analysis using step-by-step and numerical integration methods.
Comparison of digital computer and network analyser solutions for power system problems.

TE 809 Computer Technology 3(3-0)

Digital computer organization.
Principles of operation of central processing unit and peripheral equipments.
Time-sharing and on-line real-time computer systems.
Programming languages.
System programming.

TE 810 State Variables Approach to Control Systems 3(3-0)

State variable approach applied to the analysis and synthesis of both continous and discrete linear systems:

- Simulation diagrams,
- transfer function matrices,
- matrix representations of linear state equations,
- the state transition matrix,
- controllability, observability and stability,
- contro sys.em de ign.

Introduction to optimization.

TE 811 Semiconductor Device Theory and Technology 3(3-0)

Semiconductor physics; Theory and basic technology of p-n junction diode devices, bipolar transistor and ot.e multi-junction devices. Introduction to surfaec state phenomenon Theory of selected su face effect, opto electronic, and bulk effect devices. The concept and basic technology of integrated devices.

TE 812 Advanced Electromagnetic Theory 3(3-0)

Physical interpretation of gradient divergence and curl as applied to electromagnetic fields.
Maxwell' equations and the r applications.
Plane electromagnetic waves: equations and propagation.
Poynting vector. Transmission theory.
Transmission line and wave guides.

TE 813 Global Communication 3(3-0)

Switching techniques.
Transmission technology, frequency-division multiplex and time-division multiplex.
Radio communication system in IF.,MF, F, VHF and UHF bands.
Microwave techniques.
Satellite communication systems.
Optical transmission systems.

TE 814 Design of Instructional Hardware 3(2-2)

Planning, design and implement of efficient and effective learning systems.
Evaluation of existing educational hardware.
Design of instructional and laboratory equipment and special consideration of low costs and mass production aspects.
Calculation of production period and price-using the network analysis.
Design of teaching aids in accordance with the syllabus.

TE 815 Electronics Instruments 3(3-0)

Design principles and circuit analysis of mordern oscilloscopes, recorders, bridges, digital multimeters, converters, counters, fluxmeters with hall-pick-up, sin and square wave generators.
Interference, shielding, grounding and noise sources.
Bandwidth, drift, noise and gain problem in various electronic instruments and their solutions.
Testing and calibrating methods for electronic equipment.

TE 816 Switching Theory 3(3-0)

Seqential circuits, Mealy and Moore Model, synchronous and asynchronous behavior, complete and incomplete machines, state minimization and state assignment procedures.

TE 817 Operational Methematics 3(3-0)

Operation rules and applications of Laplace transforms to solution of initial and boundary value problems in differential equations; and evaluation of Cauchy integrals.
Fourier transform.
Singularity functions as distributions.
Transforms of singularity functions.
One-sided and two-sided Laplace transforms.
Relation of Fourier and Laplace transform.

3.2 Mechanical Technology Programme

TM 801 Mathematics in Engineering 3(3-0)

Vectors and scalars, laws of vector algebra, unit vectors, components of vectors, scalar product and the equation of a plane, vector product and triple product, ordinary derivatives of vectors, space curves, gradient, divergence and curl, ordinary integrals of vectors, line and surface intergrals, volume intergrals, intergral theorems, Fourier series, matrices, differentiation under an intergral sign, gamma and beta functions and applications.

Laplace transforms with applications in solving differential equations.

Legendre's equations, Bessel equation, simple partial differential equations and boundary value problems, system of ordinary differential equations and applications.

TM 802 Thermodynamics 3(3-0)

Thermodynamic systems and control volumes.

First law of Thermodynamics for steady state and unsteady state.

Second law of Thermodynamics. Reversibility, irreversibility and availability. Absolute temperature scale, entropy, principle of entropy increase.

Second law of Thermodynamics for control volumes.

Vapour power cycles: Rankine, reheat, regenerative supercritical and binary cycles.

Ideal gas mixtures, air-vapour mixtures and their Thermodynamics properties.

Application of laws of Thermodynamics to gaseous mixtures.

Phychrometry.

Chemical reactions of combustion process, analysis of products of combustion. Basic flow equation.

Equations of states.

Thermodynamic relationships.

Basic heat transfer.

Heat exchangers.

TM 803 Fluid Mechanics 3(3-0)

Dimensional analysis and physical similarity; Concept of laminar and turbulent flow, qualitative description, nature of the mathematical problem, methods of analysis; Two-dimensional flow; principal features of ideal fluid theory including equations of motion and continuity in three dimensions; Analysis of local fluid motion, translation, rotation, distortion, vorticity, stream function, potential function; The Navier-Stokes equations; Boundary layer theory; Analysis of boundary layer flows, similar solutions, approximate solutions.

Analysis of steady one-dimensional and multi-dimensional compressible flow.

TM 804 Mechanics of Materials 3(3-0)

Review of two dimensional stress system.

Analysis of stress and strain in three dimensions.

Mohr's diagram for triaxial stress and strain.

Elastic strain and strain energies in three dimensions.

Theories of elastic failure, creep and brittle fracture.

Elasticity theory and applications.

TM 805 Experimental Stress Analysis 3(3-0)

Electrical strain gauges, mechanical, pneumatic and optical measuring devices, stress probing, stress freezing.

Principles of photo-elasticity, moire methods, oblique incidence and scattered light method.

Brittle lacquer technique.

TM 806 Mechanical Metallurgy 3(3-0)

Crystal plasticity, slip lattice rotation, deformation of poly-crystalline aggregates, dislocations.

Deformation modes in hot rolling, forces in strip and section rolling, extrusion characteristics, shape correction, steel hardenability.

TM 807 Polymer Engineering 3(3-0)

Molecular structure, crystallization and orientation, plasticizers and fillers, test methods for mechanical properties, time-dependent phenomena, theory of visco-elasticity, effect of temperature creep and relaxation, properties of fibres modes of combinations of fibres and resins.

TM 808 Lubrication 3(3-0)

Viscosity, temperature and pressure effecting viscosity during pumping, converging wedge, thermal and elastic distortion of grooved bearings, computation of Length/ Diameter and optimum clearance, porous bearings, hydrostatic squeeze, bearing materials, film effects, choice of additives.

TM 809 Turbo-machinery 3(3-0)

Types of gas turbine cycles, effect on performance of pressure ratio and inlet temperature, economizers, heat exchanger, reheating.
Steam cycles and cycle analysis.
Two phase flow and boiling heat transfer.
Steam turbines, condenser and cooling arrangements, design procedures, hydro-electric power.

TM 810 Power Plant Performance 3(3-0)

Deviations from ideal processes.
Prediction of engine output by computation.
Complex cycles.
Critical factors in the application of different types of engines for power generation.
Case studies of applications for which such factors as space-requirements, load factor, noise, freedom from pollution, speed governing, etc., are of special importance.

TM 811 Fluid-Power Control and Fluid Logic 3(3-0)

Advanced hydraulic and pneumatic control system, design and application of components with fluid control systems Circuit equations with fluid logic elements, synthesis of fluid logic systems.

TM 812 Design of Instructional Hardware 3(2-2)

Planning, design and implement of efficient and effective learning systems. Evaluation of existing educational hardware. Design of instructional and laboratory equipment and special consideration of low costs and mass production aspects. Calculation of production period and price-using the network analysis. Design of teaching aids in accordance with the syllabus.

TM 813 Design for Production 3(3-0)

Product requirements, quality, reliability, simplification. Case studies in which comparative production methods will be considered in the field of cutting and non-cutting processes, application of new manufacturing methods, solution of realistic low-cost design problems.

TM 814 Production Processes 3(3-0)

Production planning, equipment balancing, batch scheduling, methods-time measurement, networking, multi-machine supervision interference problems, assembly line balancing, influence of automatic machines, components of Numerical Control machining centres.

TM 815 Machine Tool Design 3(3-0)

Spindle design for lathe, drilling machine and milling machine tables and guides, chucking devices, gear drive design, analysis of present machine tool drives.
Design of frames and bodies for high rigidity and of machine units and machine tools for school workshops.

TM 816 Metrology-Quality Control 3(3-0)

Principles of assembling and fitting, shape deformations, fit quality selection, electric and pneumatic devices for line, flatness, squareness, roundness, alignment, roughness; thread and gear measurement in mass production.

Samp ing techniques for quality control, statistical concepts of probability, accuracy of various production processes, impact of wear expectations.

Academic and Administrative Staff

ACADEMIC AND ADMINISTRATIVE STAFF

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	Mr.Wisuit	Wiwatwisawakorn	B.S.I.Ed. Hons.(K.M.I.T.)

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	Mr.Chawalit	U-Pukdee	B.Eng.,M S.Tech.Ed.(K.M.I.T.)
	Mr.Kantipol	Vacharanat	B.S.I.Ed.(K.M.I.T.)

Department of Language and Social Sciences.

Heting Head	Mrs.Rampaisri	Suvanasang.	B.Ed.(Sri Nakhariwirot), M.A.in Ed.(NEMSC)
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	Asst.Prof.Rossukon	Srivarakan	B.A.(Chula),M.A.(Northern Colorado),Cert.in language Development and Planning (SEAMEO)
	Mrs.Achara Sungsuwan		B.A.in Adm.(ITVE)

	Mrs.Suraphi	Tonseingsom	B.A. in Ed. (Chiengmai)
	Asst.Prof. Ittisak	Tongkam	B.Ed.(Sri Nakharinwirot)
			M.A. in Ed.(Adamson)
	Miss Jantawan	Vanichakorn	B.A.(Thammasat)
			M.B.A (NIDA)
	Miss Wichanee	yamsual	B.A. (Chiengmai)
	Mrs.Pattaya	Yingwatana	B.A. in Adm. (ITVE)
	Mr.Sujit	Yuktavetya	B.Ed.(Sri Nakharinwirot)
	Mrs.Rawiwan	Yuktavetya	B.Ed.(Sri Nakharinwirot)
Department of Mathematics			
Head	Mrs. Utomporn	Phalavonk	B.Sc.Hons.,M.S.(Chula)
Staffs	Mr. Chanasak	Baitiang	B.Ed.Hons.(Sri Nakharinwirot),
			M.S.(Chula)
	Miss Preeya	Khumsup	B.Sc.,M.S.(Chula)
	Miss Roongsiri	Masarat	B.Sc.Hons.(Chiengmai),
			M.S.(Chula)
	Mrs. Viraj	Phanichwongs	B.A.(Chula)
	Mr. Sirachart	Pumpuang	B.Sc.(Chula)
	Miss Suporn	Ratanapan	B.Sc.(Ramkamhaeng),
			M.S.(Mahidol)
	Miss Jintana	Sermpongpan	B.Sc.(Chula)
	Mrs.Sivilai	Thanomsuay	B.Sc.,M.S.(Chula)
Department of Science			
Head	Assc.Prof.Tanakan	Phatrakarn	B.Sc.Hons.(Chula),M.A.(Texas)
Staffs	Miss Sarawanee	Chitrakorn	B.S.(Kasetsart),M.S.(Chula)
	Mr. Sompote	Im - erb	B.Sc, M.S.(Chula)
	Asst.Prof.Kannika	Ketusink	B.Sc.,B.Ed.(Chula)
	Mrs. Sililuck	Nivitchanyong	B.Sc. M.S. (Chula)
	Mrs. Pairoth	Pongsevee	B.Sc.(Chula)
	Mrs. Watana	Pinsem	B.Sc.,Dip.E.S.T.(Delft)
			M.Eng.(Chula)
	Mr.Boonyong	Poonantapong	Dip. in Industrial Electricity
			(K.M.I.T.)
	Mrs.Chongkol	Ratasuk	B.Sc.,M.Eng.(Chula)
	Mrs.Soawanee	Ruckvichai	BSc.,M.S.(Chula)
	Asst.Prof.Pramarn	Sermsathanaswadt	B.Sc.Hons.,M.Ed. in Adm. (chula)
	Mr.Ranachaya	Sirichoti	B.Sc.(Chula),M.S.En.E.(U.P.)

Lecturers for Master's Degree Course

1. Lecturers from KMIT

Asst.Prof.Dr.Suthi	Aksornkitti	B.Eng.(Chula),MS.EE.,Ph.D.
Mr.Teravuti	Boonyasopon	B.S.Tech,B.S.O.E.,M.Tech.Ed.(Texas)
Asst.Prof.Dr.Somchob	Chaiyavej	BSME,MSME, Ph.D.(Purdue)
Asst.Prof.Dr.Suvalai	Glankwamdee	B.Eng.Hons.(Chula),M.Sc.,D.I.C.(Imperial) Ph.D. (U.of Illinois)
Asst.Prof.Bhaisal	Hoonkeo	B.Eng (Chula),MS.EE.(IOWA)
Assc.Prof.Chana	Kasipar	B.Sc.(Hons),M.Sc.(Eng)., D.I.C. (London)
Mr.Pramuan	Kongsakorn	B.Eng.(K.M.I.T.),MS.EE.(U.P.)
Mr.Kesha	Lawanyawatana	B.Eng.Hons.(Chula),MS.ME(U.of Minn)
Mr.Tirachoon	Muangnapoh	B.Eng.(Chula),MSME (Syracuse U.)
Mrs.Utomporn	Phalavonk	B.Sc.(Hons.),M.S.(Chula)
Assc.Prof.Prasert	Songtis	BS.EE.(U. of Ill.),MS.EE. (U. of Wyoming)

2. Lecturers from other Institutes

Dr.Par	Aksornsua	B.Ed.,MA., Ph.D.
Dr.Suwanna	Kanchanaplin	B.Ed.(Hons),M.Ed., Ph.D.
Dr.Preang	Kitratnee	BS.,MA., Ph.D.
Mr.Pensit	Pothijinda	B.Sc., M.Ed.
Dr.Aree	Rangsinan	B.Ed.,M.Ed.,Ed.D.
Dr.Sowwanee	Sikkhabandit	B.Ed.,MS. in Ed., Ed.D.
Dr.Surachai	Sikkhabandit	B.Ed.,M.Ed,MS. in Ed.,Ed.D.
Dr.Rattana	Siripanit	B.Ed., M.Ed.,Ph.D.
Dr.Sripan	Sittipong	B.Ed.,M.Ed.,Ph.D.
Mr.Parpoj	Sophon	B.Ed.,Cert. in Adm. and Supervision
Dr.Padungchart	Suwanwong	B.Ed.,M.Ed.,Ph.D.
Dr.Sunanta	Tindam	B.Ed., MA.,Ph.D.