



**BANGLADESH**  
**TECHNICAL EDUCATION BOARD**  
**DIPLOMA IN TECHNICAL EDUCATION**  
**CURRICULUM**

**(SESSION: 2021-2022)**

**TECHNICAL TEACHERS' TRAINING COLLEGE**  
Tejgaon Industrial Area, Dhaka-1208.

# DIPLOMA IN TECHNICAL EDUCATION

**The Diploma in Technical Education has the following objectives:**

1. To upgrade and update the subject knowledge of technical teachers.
2. To enhance the quality of workshop and laboratory practice by practical training.
3. To improve the standard of instruction by intensive pedagogical training.
4. To develop appropriate professional attitudes commensurate with teaching in technical education.
5. To identify needs of future individual professional development.

## ADMISSION REQUIREMENTS

**a. In-service:** To be eligible for enrolment on the diploma in Technical Education, the candidate must:

- Be an in-service teacher in the Directorate of Technical Education
- Possess a Diploma in Engineering in the field of Architecture, Civil, Chemical, Electrical, Electronics, Computer, Mechanical, Power Ceramics and Survey Technology of the Bangladesh Technical Education Board (or its equivalent)

Candidates will be selected by the Directorate of Technical Education on the basis of the Admission rules for the session and placed at the Technical Teachers Training College on Deputation or on transfer to teacher trainee posts.

**b. Pre-service:**

- Possess a Diploma in Engineering in the field of Architecture, Civil, Chemical, Electrical, Electronics, Computer, Mechanical, Power, Ceramics and Survey Technology of the Bangladesh Technical Education Board (or its equivalent)

Candidates will be selected by Technical Teachers Training College on the basis of the admission rules for the session.

## MODES FOR COMPLETING THE ACADEMIC REQUIREMENTS:

The academic requirements for Diploma in Technical Education may be completed by Following any one of the modes below:

**A. Full-time (TTTC based)**

This is full-time course of two semesters held at the Technical Teachers Training College

**B. Part-time**

This is a part-time programmed consisting of short courses/workshops to be held at TTTC or at some other institutions.

The time-frame for completion through this mode will vary from individual to individual. The study plan for each individual will have to be approved by the TTTC.

For the award of the Diploma in Technical Education participants will have to appear in

the final examination(s) conducted by the BTEB.

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# (SESSION: 2021-2022)

## Diploma-in-Technical Education (1 Year) under BTEB Course Structure

1 <sup>st</sup> Semester								Marks Distribution			
Sl. NO	Area Subject	Course No.	Course Title	T	P	C	Marks	Theory		Practical	
								C.A	S.F	C.A	S.F
1	Pedagogy, Education & Science	SC 1112	Applied Mathematics-1	2	-	2	100	40	60	-	-
2		SC 1123	Applied Science	2	3	3	150	40	60	30	20
3		ED 1114	Instructional Planning & Methodology	3	3	4	200	60	90	30	20
4		ED 1123	Educational Psychology	2	3	3	150	40	60	30	20
5		ED 1132	Educational Technology	1	3	2	100	20	30	30	20
6		GS 1112	Communicative English-1	1	2	2	100	20	30	50	-

### Technology -1

7	Civil Eng.	CE 1113	Geotechnical Engineering I	2	3	3	150	40	60	30	20
	EE. Eng.	EEE 1113	Measurements and Networks								
	Mech Eng. (only one)	ME 1113	Thermodynamics-1								
		ME 1123	Production Process (Power Group)								

### Technology -11

8	Civil Eng.	CE 1123	Engineering Materials	2	3	3	150	40	60	30	20
	EE. Eng	EEE 1123	Basic Electronics								
	Mech Eng.	ME- 1133	Fluid Mechanics								
Total=				15	20	22	1100	300	450	230	120

2nd Semester								Marks Distribution			
Sl. NO	Area Subject	Course No.	Course Title	T	P	C	Marks	Theory		Practical	
								C.A	S.F	C.A	S.F
1	Pedagogy Education & Science	ED 1243	Testing and Evaluation in Education	2	3	3	150	40	60	30	20
2		ED 1254	Technical Education in Bangladesh	3	3	4	200	60	90	30	20
3		ED 1262	Communication in Teaching & Learning	2	0	2	100	40	60	-	-
4		SC 1232	Applied Mathematics-II	2	0	2	100	40	60	-	-
5		SC-1243	Applied Mechanics	2	3	3	150	40	60	30	20
6		SC 1251	Computer Application	0	3	1	50	-	-	30	20
		GS 1222	Communicative English-II	1	2	2	100	20	30	50	-

### Technology -111

7	Civil Eng.	CE 1233	Geotechnical Engineering II	2	3	3	150	40	60	30	20
	EE. Eng.	EEE 1233	Machines, Instrumentation and Control								
	Mech Eng.	ME- 1243	Metallurgy and Heat Treatment								
		ME 1253	Themodynamics-II								
		ME 1263	Quality Control & Material Handling								
	Technology- 1V										
8	Civil Eng. (only one)	CE 1243	Fluid Mechanics	2	3	3	150	40	60	30	20
		CE 1253	Architechtrual Professional Practices								
	Mech Eng. (only one)	ME 1273	Machine Tools & Tool Engineering								
		ME 1283	Refrigeration and Air Conditioning								
		ME 1293	Automobile Engineering (for PowerGroup)								
9.	EE Eng.	EEE 1243	Microporcessor and Microcomputer Technology								
10	Pedagogy	ED- 1202	Practice Teaching (4 weeks)	0	0	2	100	-	-	100	
			Total=	16	20	25	1250	300	450	380	120

# COURSE CONTENTS

## Common Courses in Pedagogy, Education & Science :

### SC- 1112 Applied Mathematics-I

**Algebra :** Binomial Expansion for negative integral index. Exponential Theorem and Logarithmic series. Remainder's theorem and its applications. Determinant and its applications.

**Trigonometry :** Remainder's Theorem and its applications. Inverse circular functions.

**Calculus :** Differential- functions, area, change of function, differential, co-efficient, differentiation-function of function, implicit function, explicit function, differential co-efficient, geometrical meaning of differential co-efficient, successive differentiation.

**Integration :** Fundamental integrals, method of substitution, integration by parts, rational integrals

**Set Theory :** Fundamental idea of set theory.

**Statistics :** Measures of central tendency & variability.

### SC- 1123 Applied Science

Stress, Strain, Hooke's law, different types of strain, modulus of elasticity, Poisson's ratio interrelation between elastic constants, limiting value of Poisson's ratio, elasticity of gases, deformation of beam by bending, bending moment, cantilever, friction, Co-efficient of friction, laws of friction, applications-Kinetic energy of rotating bodies, moment of inertia, radius of gyration calculation in different cases.

Kinetic theory of gases, ideal & real gas-gas-liquid transition Properties and behavior of longitudinal and transverse wave. Simple harmonic motion, resonance in sound.

Refraction of light through prism & lenses; combination of lenses, dispersion of light. Visible spectrum and color, Optical instruments. Direct current circuit: Kirchhoff's law & their application, principle of Wheatstone bridge & its applications, magnetic effect of current, Ampere's law & its applications, magnetic field due to long straight wire & solenoid, electromagnetic induction, Lenz's law, inductance, principle of electric generator.

Chemical reactions, acids, bases & salts-application to engineering problems, atomic structure and bonding (covalent and ionic) electrochemical reactions.

**Practical experiments:** Investigating properties of different materials and verifying Hooke's law. Investigation the nature of elongation of a wire with stress and determination of Young's modulus of a wire. Investigating dynamic and static friction. Investigating rotational motion of different bodies & finding the moment of inertia of a fly wheel. Investigating properties of gases & verifying Boyle's law & Charles' law. Determination of the refractive index of a material/glass. Determination of the focal length and hence to find the power of a lens. Investigating the properties of acid, base & salts. Investigating different circuits. Verification of Ohm's law. To obtain operating characteristics of a filament bulb and to predict its operating filament.

## **ED-1114 Instructional Planning & Methodology**

**Education and Educational process:** Teaching methods and teaching techniques; Evolution of teaching methods; Teaching-learning process, student centered and activity oriented education

**Instructional planning and Instructional process :** Systems approach, instructional planning process of instructional planning, relation between techniques of teaching and success in learning; content materials arranged in logical sequence, the topic precedent diagram, the scheme of works.

**Teaching-learning strategies :** Lecturer, Demonstration, Question-answer, Discussion, Project, Heuristic Case studies, Seminar, Role playing, Simulation, Programmed Instruction, Conference, Workshop practice, Problem solving, Inductive, Deductive, Analytic and Synthetic.

Criterion for selecting methods of instruction.

Efficiency in teaching (qualities of teaching), Psychological basis of teaching, different skill in teaching, technique of developing skills in teaching, team teaching; Micro-teaching concept, process and use.

Lesson classification, lesson planning-introduction, development, consolidation, evaluation of lesson plan and evaluation of teaching, knowledge and skill lesson plan; product and process objectives-taxonomy of educational objectives; selection and use of appropriate learning resources ( lab. sheet, work sheet, exercise sheet, assignment sheets etc.) to enrich teaching-learning processes.

## **ED- 1123 Educational Psychology**

Introduction to Educational Psychology. Students' growth development and learning. Physical basis of sensation and perception. Motivation and emotion.

Modern theories of Learning. Transfer of Learning. Retention and forgetting. Attitudes. Attention and interest. Intelligence and its measurement-different scales. Individual differences and Learning. Personality evaluation.

**Practical Experiments/Sessional:** Experiments on memory drum, colour perception, illusion, projective test.

## **ED- 1132 Educational Technology**

Educational Technology-definitions & sop. Communication: types of communication-basic principles of communication & teaching learning process, Communication & media, Communications & Interaction.

**Learning resources :** types of resources (teaching aids). Soft ware & Hard ware, Projected, Non projected, Print, Non print. Audio Visual aids- chalk board, OHP, film projects-radio, audio records & players, video-recorders player, T.V. duplicators. Psycho-philosophical factors of use of a.v. aids in teaching learning process ( theory of a.v. instruction) functions of a.v. aids.

Planning for Learning Resources-in teaching-learning process. System approach-definition, components of instructional system, designing a system. Criterion for selecting different learning resources- Instructional kits, Developing a.v. aids- Instructional material development (programmed learning), module, leaflet.

Computer aided learning. Resource center. Maintaining a.v. equipments & learning Resource Centre.

**Practical Experiments :** Preparation and production of a tutor's learning resource package for chalk board. Preparation and production of a learning package : (a) for Flannel board/Jute board (multipurpose use), (b) for magnetic board by magnetic bound materials. Preparation of over head projector transparencies- (a) simple-text/figure (b) overlapping (c) revelation (d) animation Lay out for and preparation of Teachers' activity sheet & students activity sheet e.g. Lecture note/ Handout/ Job sheet/ Operation sheet/ Experiment sheet/ Laboratory sheet /Assignments sheet. Preparing charts-using different techniques/bulletin board. Basic operational and maintenance skills of audio-visual equipments- (a) OHP (b) Episcopes (c) film projector (d) Slide projector (e) Still camera (f) Video-recorder (g) sound Slide projector (h) Electronic stencil cutter (i) Photo copier (j) Transparency maker (k) Duplicating machine.

## **GS- 1112 Communicative English-1**

### **Theory :**

- A. Listening Skill : Follow-short talk social exchange, question answer, instruction and scat accordingly Take notes from short talk, story and explanation and answer questions that follow in written form.**
- B. Speaking Skill:** Control of Demonstrating-ask and answer questions, request and officers, accept and refuse, Participate real life conversations in classroom. Workplace and various social situations.
- C. Writing Skill : Writing skill :** Reinforce grammatical skill, device paragraph from hints, write shone paragraph on given topic, write formal and informal tatters, write cover letter and resume.

**Practical : Based on theory.**

## **CE- 1113 Geotechnical Engineering I ( Technology I)**

Identification and classification of soils; soil grain and aggregate properties; Weight-volume and moisture-density relationships; Soil structure and consistency; Stress-strain characteristics of soils; Permeability; Seepage; Capillarity and flow nets; Hydraulic and Consolidation properties; Compaction; Principles of total and effective stress; Methods of exploration and sampling; Direct measurement of consistency and relative density; correlation of strength parameters with N values; Field exploration and exploratory programmers.

**Practical Experiments:** Water contents; Specific gravity; Grain size distribution (dry and wet); Achtenberg's limits; Inset density; Void ration and density index; Compaction; Site investigation; Sub-surface investigation.

## **EEE - 1113 Measurements and Networks (Technology I )**

Basic principles of analogue & digital instruments. Basic design, construction and operation of cathode ray oscilloscopes. Comparison of analogue and digital instruments. Loading effect of instruments. Shunt and multiplier design. Measurement of Power and wattmeter's. Measurement of energy and energy meters. Power factor and frequency measurements. Electric circuits and network theorems - Kerchief's laws, solving equations with two and three unknowns, superposition theorem, Thevenin's theorem and its equivalent circuit, Norton's theorem and its equivalents circuit, delta/star and star/delta transformations, Network solution using a computer. Maximum power transfer theorem. Mathematical and trigonometrically representation of phases. Significance of operator  $j$  and its application in ac circuit analysis, R-L-C resonant ckt-series and parallel. Types of transients. Electrical differential equations and their solutions. Time constant. Steady state and transient response of R-L and R-C series circuit. Fundamentals of filters. Introduction to Fourier analysis.

**Practical Experiments :** Design and test shunts and multipliers. Measurements of amplitude, frequency and phase using the CRO. Investigate loading effects of digital and analogue instruments. Measurement of Power,energy,Power factor and frequency. Investigate Kerchief's superposition,Thevenin's and Norton's theorem. Investigate Star-Delta networks. Simulation and solution of networks, using a computer. Investigate steady state and transient response of R-L and R-C series circuits. Investigate the characteristics of single pole filters. Harmonic detection of Fourier components.

## **ME- 1113 Thermodynamics-I**

Introduction to thermodynamics. Identities of fundamental parameters and their importance. Classification of thermodynamic systems and their application (non-flow and steady-flow), Properties of a system, Laws of thermodynamics and their explanations. Laws of perfect gases and their properties. Thermodynamic processes of perfect gases. Entropy of perfect gases. Analysis of thermo-dynamic cycles. Steam turbines. Pure substance and its properties. Analysis of the mixture of perfect gases. Fuels and combustion of fuels. Calorific values of fuels. Fundamentals of Internal combustion engine. The fundamental concept of refrigeration cycle. Analysis of absorption refrigeration system.

**Practical Experiments :** Determinations of mechanical equivalent of heat. Determination of specific heat of a number of liquids. Understand the different thermodynamic processes using a computer program. Determination of calorific value of solid and liquid fuels using Bomb calorimeter. Determination of flash point and fire point of different fuels. Analysis of exhaust gases using orsat gas analysis apparatus. Verification of the first Law of thermodynamics. Determination of dryness fraction of the steam produced and used on the plant steam generation apparatus. Performance characteristics of a steam engine. Verification of the relationship between pressure and temperature for saturated steam. Identification of the type of refrigerant within a refrigeration system or refrigerant cylinder. Identification of leak with 'electronic leak detector ' and ' sievert gas leak detector torch'.

## **ME- 1123 Production Process ( power group )**

Study of Engineering materials, iron & Steel, Non-ferrous alloys, Plastics and Ceramic materials, Hot and Cold working processes, Press works, Casting, Welding, Surface finishing and Electroplating, Corrosion of materials, Metal cutting, Metal spraying.

**Practical Experiments :** Preparation and observation of crystal structure of different metals using microscope. Corrosion studies. Casting. Tensile Testing (Monsanto tensometer). Brinell and Rockwell hardness testing. Bench type torsion testing. Soft metal rolling. Electroplating. Industrial visit (Press work, Welding, Electroplating). Welding. Send testing. Shell molding. Metal cutting.

## **CE- 1123 Engineering Materials**

Building stones; Bricks and other clay products; Lime; Cement; Chemistry of cement; Aggregates; Concrete; Chemical attack of concrete; Design of concrete Mix; Concrete for special purposes; Cement and lime mortars; Timber and wood based materials; corrosion and its prevention; Paint; Varnishes and metallic coating; Atomic structure and bonding of metals; crystal structures; mechanical properties; Yielding; Fracture; Elasticity; Plasticity; Properties and uses of Rubber; Glass and plastics; Insulating materials; Asphalt, Tar and Bitumen; Ferro-cement.

**Practical Experiments :** Laboratory tests of specific gravity, Unit weight, Moisture content of coarse and fine aggregates. Standard tests of Brick, Cement and concrete. Determination of crushing strength of a brick Determination of absorption of a brick, Determination of initial and final setting time of cement, Tensile and compressive strength of cement mortar; Sounding of cement; Fineness by sieve method of a given sample of cement. Gradation of coarse and fine aggregates. Resistance to abrasion of coarse aggregate. Determination of compressive strength of concrete. Effect of water cement ratio on compressive strength and consistency of concrete.

## **EEE 1123 Basic Electronics**

Introduction to semiconductor materials- charge carriers in semiconductors- holes and electrons, P-type and n-type impurities. Semiconductor Diodes- N junction, V-I characteristics, special purpose diodes. Power Supplies - full wave & Half wave rectifiers, Filters & voltage regulation ; Bipolar Transistors & Field Effect Transistors - types, biasing, characteristics and circuit applications. Amplifiers: Graphical analysis, load lines, dc and small signal model for both BJT



& FET-Practical amplifier circuits including push-pull amplifiers. Operational amplifiers-basic principles and applications. Feedback and oscillation-types, principles, Phase-shift oscillator & Multivibrators. Digital Logic fundamentals- basic gates, Boolean algebra and minimization techniques.

**Practical Experiments:** Junction diode, Zener diode and transistor characteristics. Investigation into the behavior of power supply circuits and voltage regulators. Measurement of transistor gain and investigate the transistor as a switch. Investigate the behavior of discrete Bipolar and FET transistor amplifiers. Investigate the behavior of operational amplifiers. Investigate the behavior of discrete. Bipolar transistor, FET and operational amplifier oscillators. Design and verification of practical logic circuits.

#### **CE- 1243 Fluid Mechanics (Technology IV)**

Fluid and its fundamental properties, fluid pressure, and its measurement, Hydrostatic pressure on surface, Buoyancy and Floatation, fundamentals of fluid flow-types, Energy equation, Equation of continuity, Venturi meter, Orifice, Weir, notches, Friction and pipes flow, Water hammer, flow through open channel-classification, critical flow-its computation, Hydraulic jump, Pumps and Turbine.

**Practical Experiment :** Manometer, Venturimeter, Pitot tube, orifice mouth piece and notches, flow through pipes, Bernoulli's experiment, fluid friction, orifice meter, current meter, sharp and broad crested weir, sluice gate, Determination of Manning's roughness coefficient.

## **2nd Semester**

#### **ED- 1243 Testing and Evaluation in Education**

Role of measurement in human life. Historical background of measurement in Education. Test, Measurement, Assessment and Evaluation-definitions-differences, functions of measurement & Evaluations to teachers, Students, Administrators, Parents.

**Classifications of tests :** classroom test, standardized test, placement, formative, diagnostic and summative. Characteristics of a good test. Basic principles of test construction (planning the test). Essay type test-advantages & disadvantages-methods of improving the test . Objective type test-different types of objectives type of tests, principles of construction. Performance testing, skill testing, for practical works of laboratory work, Intelligence test, Aptitude test, Attitude test, Personality test, Inventory, anecdotal record.

Rating Scale, observation schedule, (skill assessment ) Course work assessment, Item analysis, Scoring, Grading, Reporting, Interpreting, Test Scores. Basic quantitative concepts-central tendency, variability, percentiles-ranks, kurtosis, regression, correlation, normal probability curve & its application.

#### **ED- 1254 Technical Education in Bangladesh**

History of the development of Technical Education in Bangladesh. Education system-General Education vis-à-vis technical & vocational education. Problems and prospects of technical education-in Bangladesh with special references to polytechnic and vocational institutes. Future changes of technical education in Bangladesh. Comparison of technical education system with other countries.

Curriculum design and development, stages of curriculum development, approaches to the design of curriculum-different curriculum models. Development of curriculum in technical education in Bangladesh/ guide lines. Technical Education curriculum in Bangladesh-retrospect and prospect.

## **ED- 1262 Communication in Teaching & Learning**

Unit I: Communication, definition, nature, concept and scope. Theory of communication. Types of Communication. Communication cycle. Communication and language: Communication through speech, handwriting, printing, telecommunication

Unit II: Person to person, small group, large group and classroom oral communication. Goal directed communication. Communication and learning. The teachers as a communicator. Language sense, style, meaning, feedback. Lecture and Lecher demonstration as communication Interaction. Role of teacher as resourceful communicator.

Unit III: Lecture types. Debate. Discussion. Speech evaluation. The novice speaker/ teacher how to develop his skills and competence. Microteaching as a method of developing skill and competence: Teaching skills, Link practice Role of supervisors in Micro-teaching.

**Practical experiments :** Criticize fellow speaker and Microteaching practice. Prepare a 5 minute informative speech. Write a review on Debate or discussion not exceeding 100 words. Description of an incident or event or phenomenon. Story writing.

## **ED- 1202 Practice teaching**

Preparation of Scheme of Work, Lesson Plan & other teaching materials for designated classes on departmental subjects. Practice Teaching is it be conducted at Polytechnics under guided supervision. At least 24 lesson plans for 24 classes including practical classes (duration at least 4 weeks).

## **SC- 1232 Applied Mathematics-II**

**Algebra:** Partial Fractions, Matrices and its solutions, Summation of series, Convergence and Divergence.

**Calculus :** Maximum and Minimum, Indeterminate forms, Definite integrations, Beta and Gamma functions, First order differential equations.

**Geometry :** Straight lines, Pair of straight lines Parabola and Hy-perbola.

**Vectors :** Definitions, Laws of vectors, Simple applications, Dot and Cross products of vectors and its applications.

## **SC - 1243 Applied Mechanics**

Introduction and Basic concepts. Resultant and Components of forces; Free body diagrams, Equilibrium of Co-planar and Non Co-planar forces, Centurions, Moment of inertia of area and mass, Kinematics of absolute and relative motions, Friction, Maximum and Minimum forces, Basic mechanics, kinetics of rectilinear and curvilinear motion of particles, Principles of work and energy.

## **SC- 1251 Computer Applications**

General description of microcomputer systems. Commonly used commands of PC/MS DOS and Windows. Principles of data storage-floppy diskettes, floppy disk drives and hard disks. Rules for naming and managing files. Detailed study of selected software packages. Application of software packages in the production of teaching-learning materials.

**Practical :** Practicing DOS and Windows commands. Completing exercises designed by the class teacher which will cover the key commands and facilities of a selected software package. Exercises to produce instructional materials using a selected software package.

## **GS- 1222 Communicative English-II**

- A. Speaking Skill :** Control of Demonstration- obtaining information on events objects process.
- B. Reading Skill :** Spelling, meaning and uses. Reading texts related to everyday life, the environment as well as matters related to technology e.g. tools, machines, production process, engineering materials, science passages and identify related ideas of life and nature, science and technology .
- C. Writing Skill :** Essays and reports on given topic related to Civil/ Electrical and Electronics Mechanical Technology e.g. construction process, generation, telecommunication, production process, industrial hazard, natural resources, modern science and technology.

**Practical :** Based on theory.

## **CE- 1233 Geotechnical Engineering II**

Lateral Earth pressure, stability of slopes; Bearing capacity and Settlement; Various types of foundations; Factors determining the type of foundation; Design of piles; Retaining walls; Dams and well foundations.

**Practical Experiment :** Permeability test (static and falling head Method) Triaxial compression test; Consolidation test-Oedometer and Rowe cell; Unconfined compression test; Direct shear Test and vane shear test; Standard penetration test; Plate load test; California Bearing Ratio.

## **EEE 1233 Machines, Instrumentation and Control**

Principle of transformer- EMF equation, equivalent circuit, open circuit and short circuit tests, losses and efficiency and voltage regulation. Three phase transformer connections- current and voltage relations. CT and PT principles and their applications. Operating Principles, characteristics and applications of dc and ac rotating machines - including torque/speed characteristics and their specific applications ( pumps, compressors, fans and machine tools). Operating principles, characteristics and application of thermocouples, thermostats, potentiometers, light dependent resistors, optical switches, linear variable differential transformers and strain gauges. Bridge Op - Amp measurements & bridge amplifiers. Basic relay circuit sequential control. Open and closed loop control systems -on-off and continuous control. introduction to control system characteristics and stability - including steady state error and practical proportional control ( eg speed, temperature, position etc.) Power control using power bipolar transistors, field effect transistors, thyristors, triacs and diacs.

**Practical Experiments:** Transformer open circuit , short circuit and regulation tests. Ac and dc machine characteristics. Air cooler and fan investigations. Thermostat characteristics. Potentiometer linearity. LDR characteristics. Optical switch characteristics strain gauge characteristics. Strain measurements. Bridge amplifiers. LVDT investigation. Speed and temperature control system tests and evaluation. Basic relay circuit control. Power transistor switching and control characteristics. Thyristor and triac controllers.

## **ME- 1243 Metallurgy and Heat Treatment**

Metal melting, common metal melting units and variables to be controlled in melting and casting. Casting, structure of metals, crystallinity and grain structure of metals. Production of grain structure of a pure metal during solidification. The structure and properties of non-ferrous alloys and their applications. The structure and properties of irons and steels, their applications and uses, characteristics of alloys and steels. Cast irons, Plain carbon steels. Phase diagrams, Binary equilibrium diagrams. Metallography; microscopic and macroscopic examinations of specimen. Heat treatment furnaces, control of variations in heat treatment. Powder metallurgy, metal powders and their uses. Mechanical properties. Non-destructive testing (NDT ).

**Practical Experiments:** Preparation of atomic structure model (BCC,FCC & CPH).Preparation of samples with Epoxy -Resin. Preparation of samples with thermosetting powder by mounting press. Preparation of samples by grinding, polishing and etching for micro and macro examination. Microscopically examine the prepared samples. Investigation the hardenability of steels of unknown composition. Heat treatment of different steel samples. Hardness testing of different metals (Brinell & Rockwell). Production at a sulphur print of a selection of steel samples. Torsion testing using cussons Torsion Testing machine. Tensile testing of standard specimen using Monsanto Tensometer. Tensile testing of metals using Tequipment SM100 machine. Impact testing. jominy hardenability testing.

## **ME- 1253 Thermodynamics-II**

Identities of fundamental parameters and their importance. Classification of thermodynamic systems and their application (non-flow and steady-flow) Properties of a system, Laws of thermodynamics and their corollaries. Laws of perfect gases and their properties. Thermodynamic processes of perfect gases. Entropy of perfect gases. Analysis of thermodynamic cycles. Pure substance and its properties. Properties of mixture of perfect gases, Dalton's and Gibbs-Dalton's law, Volumetric analysis of gas mixtures, Fuels and combustion of fuels, Experimental product analysis. The fundamental concept of modes of heat transfer. Fourier's law of conduction . One-dimensional steady conduction through a plane, a circular, and a composite wall. The Newton- Rikhman law of convection and its application. Overall heat transfer coefficient. The concept of a black body. The Kirchhoff's law of radiation and its application.

**Practical Experiments:** Mechanical equivalent of heat. Specific heat of liquids. Thermodynamic processes using a computer programme. Calorific value of solid and liquid fuels using Bomb calorimeter. Flash point and fire point of different fuels. Analysis of the exhaust gases using orsat gas analysis apparatus. Energy balance of a steam plant and varify the first Law of Thermodynamics. Dryness fraction of the steam produced and used on the plint steam generation apparatus, Rankine cycle analysis. Performance characteristics of a steam engine. Verification of pressure, Temperature relationship for saturated steam. Conductivity of different material using rod apparatus. Comparison of heat radiation from different surfaces. Absorption of heat radiation by different surfaces using the 'Griffin' radiation kit.

## **ME- 1263 Quality Control & Material Handling**

Errors in measurement (individual and cumulative), Linear and Angular measurement. Length standard and light waves as standard length. Gear measurement. Thread measurement. Comparators. Machine Tool Metrology. Surface flatness and surface roughness. Strain measurement. Simple probability theory. Normal distribution curve and its application in quality control. Sampling inspection ( Single and Double sampling plan). Material handling idea, importance and scope of material handling. Classification of conveying machine. General theory of conveying machines. Resistance to motion factor. Resistance power in conveying machine with a flexible pulling member. Determination of the effective pull and motor power and dynamic phenomenon in chain conveyors. Belt conveyors. Description of different other conveyors and their principles.

**Practical Experiments:** Squareness testing and measurement of taper using steel ball of roller. Dismantling and assembly of different models of micrometer. Setting up toolmakers Buttons (Precision boring). Alignment tests of lathe,pillar drill and milling m/cs. Drawing a surface profile using precision level. Balancing of motor wheel using wheel balancing M/c. Determination of wave length of light using laser beam and interferometer. Check surface flatness using optical flar. Comparative study of surface roughness using comparative plates, Mecrin instrument and Mitutoyo electronic surfest instrument. Angular measurement using angle gauge blocks, Sine bar, Vernier Protractor and precision rollers. Screw thread measurement. Use of comparator-electrical,meachanical. Gear measurement-tooth & pitch. Calibration testing of vernier height gauge using Height micrometer.

## **ME- 1133 Fluid Mechanics**

Introductory concepts and definitions of important terms related to the fluid mechanics. Classification of fluids and their properties.

**Fluid Static's :** The basic hydrostatic equation, Pressure variation in static incompressible and compressible fluid, Total pressure and centre of pressure on submerged planes and curved surfaces, Manometers, Pressure of sluice gates.

**Fluid Dynamics :** Continuity equation for a control volume, relation between system approach and control volume approach, Energy and momentum equations and their applications, Similitude and Dimensional analysis, Compressible flow, Speed of sound and wave propagation, Energy equation for Isentropic and Isothermal flow, Stagnation state for the flow of an ideal gas. laminar and turbulent flow, Boundary Layer theory.

**Fluid Kinematics :** Fluid motion. Lines of flow. Displacement of fluid particles. Type of fluid flow and their explanation. Continuity equation. Rotation and velocity. circulation and velocity Stream function. Flow net. etc.

**Practical Experiments:** Forces analysis of an inclined flat plate which is totally immersed in a liquid. Determination of forces and moments produced by a vessel floating in stationary water. Impact of Jet. Verification of energy equation of pipe flow analysis through a circular orifice. Determination of frictional energy loss in pipes of different size and roughness. Study of the different pipe flow management devices. Study of the channel flow over a sharp crested weir. Energy losses associated with flow through pipe bends and fittings. Velocity profiles across a pipeline conveying oil, under laminar and turbulent conditions. Performance characteristics for a centrifugal pump. Performance characteristics for a Francis turbing. Performance characteristics for a pelton wheel. Analysis uniform flow conditions in a rectangular perspex channel and determine values of 'C' and 'n' . Conform the theory relating to flow under a sluice gate with the formation of a hydraulic jump in a rectangular channel.

## **CE- 1253 Architectural Professional Practice**

Profession of Architectural ; Professional life; Services rendered by architect; Architect and his client; Contractor, Employees; Relation with other professionals; Professional Societies; Professional ethics; Working organization and their activities; securing works; General Conditions of contracts; Tender, Bidding procedure, receiving tenders, Opening tenders, Analysis and comparison, Award, Laws of contract. Types of contract; Administration of Contract; Housing standard; labour laws and housing codes.

**Practical :** Based on theory

## **ME- 1273 Machine Tools and Tool Engineering**

Fundamentals of machine tools, Drive systems, Power transmission system, Tool engineering, locating and clamping methods, jig and fixture, Various types of dies (piercing, blanking, compound, progressive, bending, extruding and drawing dies), Various types of bearing (ball, journal, roller, Radial and needle bearing), Machine tool control, Detailed case study of machine tools; engine lathe, turret lathe, automatic lathe, Milling, Grinding, Drilling, Broaching, Hobbling and Honing machine.

**Practical Experiments:** Setting gear box for thread cutting by a lathe m/c. Studying the Kinematic system of a lathe machine. Setting indexing head for gear cutting by a milling machine. Taper turning and checking by a sine bar. Investigation of the quick return motion mechanism for a shaper machine. Setting up of the surface grinder for various feed of a work piece. Investigation of the various mechanism of lathe, drill, shaping, grinding and milling machine, power saw. Various operations of a lathe (turning, taper turning, drilling, knurling, facing), drill (drilling, boring) grinder (surface grinding), power saw, milling (gear cutting, slot cutting), shaper and planer. Observation of Locating system in work piece holding devices.

## **ME- 1283 Refrigeration and Air Conditioning**

Fundamentals of refrigeration: Simple vapour compression refrigeration system: multi-pressure systems of refrigeration. Vapour absorption refrigeration system; Air refrigeration system. Refrigerants. Refrigeration components and controls. Low temperature refrigeration (Cryogenics). Psychrometry: Dry bulb temperature, Weight bulb temperature, psychometric charts, Room sensible heat factor, Gross sensible heat factor. Air Conditioning Systems: comfort, summer and winter, industrial air-conditioning. Automobile air-conditioning. Cooling load calculations of various application.

**Practical Experiments:** Identification of refrigerant within a refrigeration system refrigerant cylinder and study of gauge manifold assembly. Study of the 'Thermostatic Expansion Valve' and the measurement and adjustment of superheat. Make a project using different pipe works (swaging, flaring, brazing). study of the low pressure and high pressure switch units and their adjustments. 'Pump Down' of the refrigeration system for maintenance purposes. Charging of refrigerants in a Refrigeration system. Detection of leak with a 'electronic leak detector' and 'sievert gas leak detector torch'. Plotting a typical practical pressure enthalpy diagram with the help of a refrigeration unit. Comparative study of: (a) Capillary expansion valve, (b) Hand expansion valve, (c) Thermostatic expansion valve. Faults fluiding with the help Cussons Refrigeration plant fault simulator. Testing of valves in a compressor (suction & delivery). Effects of heat load and heat leakage in a refrigeration cycle using the Focus 803/I Trainer unit. Cooling load calculation. Designing of a space to be air-conditioned with the help of a psychometric chart

## **ME- 1293 Automobile Engineering**

Components of an automobile. Automobile's systems. Engine types and its classification. Engine construction. Cooling, Lubricating, and Ignition system. Fuel system of S.I. and C.I. engines, Carburation and Carburetor circuit. Calculation of air/fuel ration. Combustion of S.I. and C.I. engine's fuels and their phenomena. Combustion chamber design of S.I. and C.I. engines. Testing of I.C. engines, Performance and rating of engines, Emission control.

**Practical Experiments:** I.C. engine testing- Setting up the test equipment and their safety. Determine the break mean effective pressure. Determine the break power and torque. Determine the fuel and air consumption in a I. C. engine. Determine indicated power by Morse test. Determine the effects of ignition timing on power. Determine the mechanical, volumetric and thermal efficiency. Operation of the Crypton.

Basic fault diagnosis- Voltmeter test. Operation of coil ignition systems. Oscilloscope and meter tests (primary circuit). Oscilloscope and meter tests ( secondary circuit ). Measurement of motor and lead kV.

## **EEE 1243 Microprocessor and Microcomputer Technology ( Technology IV )**

Number system and Binary arithmetic. Introduction to microprocessors and microcomputers. Architecture of a typical 8-bit microprocessor system ( MPU, RAM, ROM, Bus system and I/O ). Machine code programming. Assembly Language programming. Microprocessor support chips and interfacing.

**Practical :** Verify the behavior of key instructions using practical data manipulation. Implement key instructions using the main addressing modes ( immediate, direct, indirect, indexing etc.) Develop machine code and assembly language programmed to solve basic data manipulation problems. Develop I/O control programmers to perform simple interfacing tasks.

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