

BANGLADESH TECHNICAL EDUCATION BOARD

**DIPLOMA IN TECHNICAL EDUCATION
SYLLABUS**

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

COURSE CONTENTS

Common Courses in Pedagogy, Education & Science :

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, Programme 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 & scope. Communication: types of communication-basic principles of communication & teaching learning process, Communication & media, Communication & 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.

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-a-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 Lecture 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 to be conducted at Polytechnics under guided supervision. At least 24 lesson plans for 24 classes including practical classes (duration at least 4 weeks).

SC- 1112 Applied Mathematics-I

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

Trigonometry : De Moivre'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 behaviour 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 colour, 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.

SC- 1232 Applied Mathematics-II

Algebra: Partial Fractions, Matrices and its solutions, Summation of series, Convergency and Divergency.

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, Centroids, 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- 1112 Cominucative English-1

Theory :

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

Practical : Based on theory.

GS- 1222 Cominucative 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 idas 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.

Technology courses in Mechanical Engineering :

ME- 1113 Thermodynamics-I (Technology 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 (Technology I for 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. Sand casting. Shell moulding. Metal cutting.

ME- 1133 Fluid Mechanics (Technology II)

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

Fluid Statics : 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 vorticity. circulation and vorticity. 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.

ME- 1243 Metallurgy and Heat Treatment (Technology III)

Metal melting, common metal melting units and variables to be controlled in melting and casting. Casting, structure of metals, crystalinity and grain structure of metals. Productions 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 (Technology III)

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 verify the first Law of Thermodynamics. Dryness fraction of the steam produced and used on the plant 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. Absorbtion of heat radiation by different surfaces using the 'Griffin' radiation kit.

ME- 1263 Quality Control & Material Handling (Technology III)

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 surfstest 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- 1273 Machine Tools and Tool Engineering (Technology IV)

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, cextruding 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, Hobbing 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 (Technology IV for power group)

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 airconditioned with the help of a psychometric chart

ME- 1293 Automobile Engineering (Technology IV for power group)

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.

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