TECHNO INDIA UNIVERSITY

W E S T B E N G A L

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

3-Year Diploma Engineering Curriculum and
Syllabus for Electrical Engineering (EE)

FIRST SEMESTER

Course Code	Course Title	Contact Hrs. / Week			Credit
		L	T	P	
Theory					
TIUSD-101	Career Advancement Skill Development-I	2	1	0	3
TIUBSM-102	Mathematics-I	3	1	0	4
TIUBSP-103	Physics	2	1	0	3
TIUBSC-104	Chemistry-I	2	1	0	3
TIUBPM-105	Engineering Mechanics	3	1	0	4
TIUBPH-106	English Language & Communication Skills	1	1	0	2
Practical					
TIUBSP-191	Physics Lab	0	0	3	2
TIUBSC-192	Chemistry Lab	0	0	3	2
TIUBPH-193	Technical Drawing	0	0	3	2
TIUBPH-194	Workshop Practice	0	0	3	2
Sessional					
TIUCSL-114	Entrepreneurship Skill Development-I	0	0	3	2
Total Credits					**29**

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Mathematics-I
TIUBSM-102

L-T-P: 3-1-0   **Credit: 4**

ALGEBRA

1.1 Logarithm
1.1.1 Definition of natural and common Logarithm
1.1.2 Laws of Logarithm. Simple Problems.

1.2 Complex Numbers
1.2.1 Definition of Complex numbers, Cartesian and polar. Exponential forms of complex numbers.
1.2.2 Modulus, amplitude & conjugate of a complex number
1.2.3 Algebra of Complex numbers (Equality, Addition, Subtraction, Multiplication).
1.2.4 Cube roots of unity & its properties.
1.2.5 De Moivre's theorem (statement only) and simple problems.

1.3 Quadratic Equations
1.3.1 Definition of Quadratic Equations
1.3.2 Analysing the nature of roots using discriminant
1.3.3 Relation between roots & coefficients
1.3.4 Conjugate roots

1.4 Binomial Theorem
1.4.1 Definition of factorial notation, definition of permutation
and combination with formula
1.4.2 Binomial theorem for positive index (statement only)
1.4.3 General term and middle term.
1.4.4 Binomial theorem for negative index (statement only).

1.5 Partial Fraction
1.5.1 Definition of polynomial fraction, proper & improper
fractions and definition of partial fractions
1.5.2 Resolving proper fractions into partial fractions with
denominator containing non repeated linear factors, repeated
linear factors and irreducible non repeated quadratic factors.

Vector Algebra
2.1 Definition of a vector quantity.
2.2 Concept of Position vector and Ratio formula.

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2.3 Rectangular resolution of a vector.

2.4 Algebra of vectors – equality, addition, subtraction & scalar multiplication.

2.5 Scalar (Dot) product of two vectors with properties.

2.6 Vector (cross) product of two vectors with properties.

2.7 Applications

2.7.1 Application of dot product in work done by a force and projection of one vector upon another.

2.7.2 Application of cross product in finding vector area and moment of a force.

TRIGONOMETRY

3.1 Trigonometric Ratios of associated, compound, multiple and sub-multiple angles.

3.2 Inverse trigonometric functions – Definition, formulae and simple problems.

3.3 Properties of Triangle – sine, cosine and tangent formulae - Simple Problems.

COORDINATE GEOMETRY & MENSURATION

4.1 Co-ordinate System

4.1.1 Cartesian & Polar co-ordinate system

4.1.2 Distance formula and section formula

4.1.3 Area of a triangle and condition for collinearity.

4.2 Straight Line

4.2.1 Equation of straight line in slope point form, intercept form, two-point form, two-intercept form, normal form.

4.2.2 General equation of a straight line.

4.2.3 Angle between two straight lines – Condition for parallelism and perpendicularity.

4.2.4 Length of perpendicular from a point on a line. Perpendicular distance between two parallel lines.

4.3 CIRCLE

4.3.1 Equation of circle in standard form, centre-radius form, diameter form, two-intercept form.

4.3.2 General equation of circle with a given centre and radius. Simple Problems.

4.4 Conic Section

4.4.1 Standard equations of parabola, ellipse & hyperbola.

4.4.2 Definition of focus, vertex, directrix, axes, eccentricity. Simple problems.

4.5 MENSURATION

4.5.1 Regular Polygon of n sides – Formula for area and perimeter.

4.5.2 Prism and Pyramid – Formula for volume & Surface area. Simple Problems.

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FUNCTION, LIMIT & CONTINUITY

5.1 Function
5.1.1 Definitions of variables, constants, open & closed intervals.
5.1.2 Definition & types of functions – Simple Examples

5.2 Limits
5.2.1 Concept & definition of Limit.
5.2.2 Standard limits of algebraic, trigonometric, exponential and logarithmic functions.
5.2.3 Evaluation of limits.

5.3 Continuity
5.3.1 Definition and simple problems of continuity.

DERIVATIVE

6.1 Definition of Derivatives, notations.
6.2 Derivative of standard functions.
6.3 Rules for differentiation in case of sum, difference, product and quotient of functions.
6.4 Derivative of composite functions (Chain rule).
6.5 Derivatives of inverse trigonometric functions.
6.6 Derivatives of implicit functions.
6.7 Logarithmic derivatives.
6.8 Derivatives of parametric functions.
6.9 Derivative of one function with respect to another function
6.10 Second order derivatives.

6.11 Applications of Derivatives.
6.11.1 Geometric meaning of derivative.
6.11.2 Rate measurement
6.11.3 Maxima & Minima (one variable)

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Physics
TIUBSP-103

L-T-P: 2-1-0   **Credit: 3**

Unit – 1: UNITS, DIMENSIONS & MEASUREMENTS

1.1 System of units – Need of measurement in engineering and science. CGS, MKS and SI. Fundamental and derived units (SI).

1.2 Dimensions: Dimensions of physical quantity. Principle of dimensional homogeneity (explanation with examples). Applications of dimensional analysis. Limitations of dimensional analysis.

1.3 Estimation of errors: Concept of significant figure. Absolute error, Relative or Proportional error and percentage error (concept only). Accuracy & precision of instruments (concept only, examples only with slide calipers and screw gauge).

Unit – 2: GENERAL PROPERTIES OF MATTER

2.1 Elasticity: Deforming force and restoring force. Elastic and plastic body. Stress and strain. Hooke's law. Stress – strain diagram. Young's modulus, Bulk modulus, Rigidity modulus and Poisson's ratio (definition and formula) and relation between them (no derivation). (Simple numerical problems).

2.2 Surface tension: Cohesive and adhesive forces. Definition, dimension and SI unit of surface tension. Surface energy (concept only). Angle of contact (definition only). Capillarity, shape of liquid meniscus in a capillary tube, rise of liquid in a capillary tube (no derivation, simple numerical problems). Effect of impurity and temperature on surface tension. Some natural examples of surface tension.

2.3 Fluid Mechanics: Pascal's law. Multiplication of force. Buoyancy. Conditions of equilibrium of floating body. Archimedes' principle. [Simple numerical problems]. Streamline flow and turbulent flow of a fluid (concept), critical velocity (definition only). Equation of continuity and Bernoulli's theorem (statement and equation only, simple problems). Viscosity, Newton's formula for viscous force, co-efficient of viscosity (definition, dimension and SI unit). Stokes law (dimensional derivation) and terminal velocity (concept and formula only).Effect of temperature on viscosity.

Unit – 3: HEAT AND THERMODYNAMICS

3.1 Thermal expansion of solid: Linear, areal and cubical expansion and their coefficients (definition and formula) and their relation (no derivation). Change of density with temperature (formula only). (Simple numerical problems).

3.2 Transmission of heat: Conduction, convection and radiation (differences). Thermal conductivity (formula, definition, dimensions and SI unit). (Simple formula based numerical problems including composite slab). Examples & use of good and bad conductor of heat.

3.3 Thermodynamics: Zeroth law of thermodynamics. Temperature and internal energy (concept only). First law of thermodynamics (statement and equation only). Specific heats of gas, their relation (no derivation) and their ratio. Isothermal, isobaric, isochoric and adiabatic process (definition only).

Unit – 4: LIGHT

4.1 PHOTOMETRY: Luminous flux, luminous intensity, illumination and their S.I. units — Principle of Photometry (statement only).

4.2 REFRACTION OF LIGHT: Refraction of light through plane surface. Laws of refraction. Refractive index -- Relative & Absolute, its relation with the velocity of light in different media. Total internal reflection and critical angle. Optical fibre (Principle & applications – mention only).

4.3 OPTICAL LENS: Lens and definition of related terms (Recapitulation). Cartesian sign convention. Lens maker's formula (no derivation). Relation between u, v, f (usual symbols) (no derivation). Principle of magnifying glass. Power of a lens and its unit. Equivalent focal length & power of two thin lenses in contact (formula only). (Simple numerical problems).

4.4 WAVE THEORY OF LIGHT & INTERFERENCE: Huygen's wave theory, wave front – spherical, cylindrical and plane wave front (Idea only). Huygen's principle of propagation of wave front. Analytical expression for 1D plane light wave. Principle of superposition of waves. Coherent sources (Idea only). Interference of light waves, constructive and destructive interference. Young's double slit experiment – analytical treatment.

Unit – 5: MODERN PHYSICS

PHOTOELECTRIC EFFECT: Photoemission, Work function. Photoelectric current, its variation with intensity and frequency of incident radiation. Stopping potential, Threshold frequency. Concept of photon. Einstein's photoelectric equation. Principle of solar photo-voltaic cell and its uses.

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Chemistry-I
TIUBSC-104

L-T-P: 2-1-0   **Credit: 3**

Unit: 1 Name of the Topics: Atomic Structure and Chemical Bonding
Atomic Structure : Bohr model of atom [Radius and Energy of H – atom is excluded] , De Broglie modification, Quantum numbers, Orbits and Orbitals, Aufbau principal, Pauli's Exclusion principle, Hunds rule of maximum multiplicity, Electronic configuration of elements upto atomic number 36. Definition of Atomic number, Mass number, Isotopes, Isotones and Isobars with suitable examples. Concept of hybridization sp^3, sp^2,sp and shape of molecules (simple example H_2O, NH_3, BCl_3, $BeCl_2$)

Chemical Bonding: Electrovalent, Covalent and coordinate bonds, H-bond in HF, water and ice. Classification of solids – crystalline and amorphous. Relationship between structure and properties of the following crystalline solids- (i) Ionic solid i,e. Sodium chloride (ii) Covalent solid i,e. diamond and graphite (iii) Molecular solids i,e. metallic bonds and related properties. Properties and uses of Carbon, Silicon and Germanium.

Unit: 2 Name of the Topics: Avogadro Concept , Acids , Bases & Salts
Avogadro number, Mole concept, Simple numerical problems involving Weight and volume. Acids, Bases and Salts (Arrhenius and Lewis concept) Basicity of acids and Acidity of bases, Neutralization reaction, Hydrolysis of Salts,. Equivalent Weight of acids, bases, & salts of Strength of Solution ---- normality, molarity, molality, formality and percentage strength, standard solution primary and secondary standards, concept of pH, and pH scale, Indicators and choice of indicator, principles of acidimetry and alkalimetry (simple numerical problems) Buffer solution (excluding numerical problems) Solubility product principle (excluding numerical problems), common ion effect with relation to group analysis.

Unit: 3
3.1 Oxidation, Reduction, Electrochemistry
Oxidation and Reduction by electronic concept, balancing chemical equations by Ion-electron method, Redox Titration, Electrolysis, Arrhenius theory, Faraday's Laws, Electrolysis of CuSO4 solution using Pt-electrode and Cu-electrode, simple numerical problems on electrolysis, Application of electrolysis such as Electroplating, Electrorefinings and Electrotyping, Electrochemical Cells, Primary Cell- Dry Cell, Secondary Cell --- Lead storage cell, Electrochemical series.

3.2 Chemical Equilibrium
Reversible and irreversible reactions, Exothermic and Endothermic reactions, concept of chemical equilibrium, Lechatelier's principle, Industrial preparation of Ammonia by Haber's Process, Nitric acid by Ostwald's process and Sulphuric acid by Contact Process (Physico chemical principles only), catalyst and calalysis.

Unit: 4

Name of the Topics: Metallurgy

Minerals, Ores, Gangue, Flux, Slag, General method of extraction of metals with reference to Iron, copper and Aluminium (detailed method of extraction is excluded) Definition of Alloy, purposes of making Alloy, Composition and uses of alloys (Brass, Bronze German Silver, Deuralumin, Nichrome, Bell metal, Gun metal, Monel metal, Alnico, Dutch metal, Babbit metal, stainless steel), Amalgams, properties and uses of cast iron, wrought iron, steel and sponge iron , Manufacture of steel by L-D process, composition and uses of different alloy steels.

Unit: 5

Name of the Topics: Water

Soft and Hard water, Action of soap on water, Types of Hardness, causes of hardness, Units of hardness, Disadvantages of using hard water, Estimation of total hardness by EDTA method, Removal of hardness --- Permulit process, Ion-exchange process, phosphate conditioning and calgon treatment. Distilled water and Deionised water.

Unit: 6

Name of the Topics: Organic Chemistry

Organic compounds, their differences from inorganic compounds, Classification, Homologous series, Functional groups, Isomerism, Nomenclature up to C5 , properties and preparation of Methane, Ethylene and Acetylene, Methylated spirit, Rectified spirit, Power alchohol, Proof spirit, uses of Benzene, Naphthalene and phenol, Chromatographic techniques of separation of organic compounds (Thin-Layer Chromatography).

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Engineering Mechanics
TIUBPM-105

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L-T-P: 3-1-0   **Credit: 4**

1. COMPOSITION AND RESOLUTION OF FORCES
1.1 Definition, Effect, characteristics of force.
1.2 System of Forces.
1.3 Principle of Transmissibility of Forces.
1.4 Concept of Resultant Force.
1.5 Law of-
• Parallelogram of Forces
• Triangle of Forces
• Polygon of Forces
1.6 Determination of Resultant of two or more concurrent forces (analytically and graphically).

2. PARALLEL FORCES AND COUPLES
2.1 Classification of Parallel Forces.
2.2 Methods of finding resultant Force of parallel forces- analytically & graphically.

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2.3 Position of resultant force of parallel forces.
2.4 Definition, Classification and characteristics of a force Couple, moment of couple.

3. MOMENTS AND THEIR APPLICATIONS

3.1 Definition, Types and law of moment.
3.2 Varignon's Principle of moment and its applications.
3.3 Lever and its Applications.
3.4 Types of supports and determination of support reactions of a simply supported beam subjected to point load and uniformly distributed load (UDL).

4. EQUILIBRIUM OF FORCES

4.1 Equilibrium of a system of concurrent forces.
4.2 Conditions and types of Equilibrium.
4.3 Lami's Theorem and its applications.

5. CENTRE OF GRAVITY

5.1 Difference between Centroid and Center of Gravity (CG).
5.2 Centroid of standard plane figures and CG of simple solid bodies.
5.3 Method of finding out Centroid of composite plane laminas and cut sections.
5.4 Method of finding out CG of Composite solid bodies.

6. FRICTION

6.1 Concept and types of friction.
6.2 Limiting Friction, coefficient of friction, angle of friction, angle of repose.
6.3 Laws of friction (Static and Kinetic).
6.4 .Analysis of equilibrium of Bodies resting on Horizontal and inclined Plane.
6.5 Utility / Nuisance value of friction.

7 SIMPLE LIFTING MECHINES

7.1 Concept of lifting Machines.
7.2 Definition of Mechanical Advantage, Velocity Ratio and Efficiency of Machines and their relation.
7.3 Reversibility of Machines and condition for self locking machine.
7.4 Law of Machines, Maximum mechanical advantage and maximum efficiency of machine.
7.5 Friction in machine (In terms of Load and effort).
7.6 Calculation of M. A, V.R. and efficiency of following machines
• Simple wheel and axle
• Differential wheel and axle
• Single purchase crab
• Double purchase crab
• Simple screw jack
• Different System of simple pulley blocks

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English Language & Communication Skills
TIUBPH-106

L-T-P: 1-1-0   **Credit: 2**

Unit:1 Comprehending a text

1.1 Identifying important information & keywords using SQ3R (i.e. **survey, question, read, recite, and review**) or similar technique and linking words.
1.2 Comprehension –Responding to multiple choice& short-answer questions from the text; making sentences with marked words from the text to bring out the meaning of the words, filling up gaps to complete information structure, Identifying central idea of the text.

Unit: 2 Note taking

2.1Communication using symbols & abbreviations.
2.2Communication using diagrams & charts.
2.3Using mind-mapping to establish relationship among information
2.4 Using SQ3R(or similar) technique , mind mapping , symbols, abbreviations, diagrams & charts
to represent important information from written text in note form

Unit: 3 Writing Technical Paragraphs

3.1 Developing notes into paragraph (that is, from given information in diagrams, pictures, charts & so on). Concept of Topic Sentence and Supporting sentences.
The paragraph types are:
i) Description of process and route;
ii) Problem-Solution type;
iii) Cause & Effect type;
iv) Comparing & Contrasting type.

Unit:4 Writing Technical Reports

The reports should contain a Front Cover and Covering Letter
i) Progress Reports
ii)Industrial Accident Report
iii) Feasibility Report

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Physics Lab
TIUBSP-191

L-T-P: 0-0-3   **Credit: 2**

LIST OF EXPERIMENTS:
1. Refractive index of prism (I-d) curve.
2. Refractive index of prism (spectrometer).
3. Focal length of a convex lens by u-v method.
4. Focal length of a convex lens by displacement method.
5. Verification of Ohm's law.
6. To find out unknown resistance by meter bridge.
7. To find out internal radius of hollow tube by vernier calipers.
8. To find out volume of given cylinder by screw gauge.
9. Surface tension by Capillary rise method.
10. Coefficient of viscosity.
11. Coefficient of Thermal conductivity by searl's method.
12. Verification of Newton's cooling law.

Chemistry Lab
TIUBSC-192

L-T-P: 0-0-3   **Credit: 2**

LIST OF EXPERIMENTS:
1. To identify one Anion and Cation in a given sample.
2. Determination of flesh point and fire point of a given sample of oil by Abel's apparatus.
3. Determination of viscosity by Red Wood Viscometer no. 1 and no. 2.
4. Redoximetry Titration :
a. Percentage of Iron in given sample of alloy.
b. Determination of strength of ferrous ammonium sulphate.
c. Determination of strength of anhydrous ferrous sulphate and ferrous sulphate.
5. Determination of hardness of water by :
a. EDTA Method and Soap Solution Method
6. Determination of solid content in the given sample of water.
7. Determination of percentage of moisture in the given sample of coal by proximate analysis.

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Technical Drawing
TIUBPH-193

L-T-P: 0-0-3   **Credit: 2**

Unit: 1 Name of the Topics: Drawing Instruments and their uses.

1.1 Letters and numbers (Single stroke vertical
1.2 Convention of lines and their applications.
1.3 Scale (reduced, enlarged & full size) plain scale and diagonal scale.
1.4 Geometrical construction

Unit: 2 Name of the Topics: Engineering curves & Loci of Points.

2.1 To draw an ellipse by (a) Directrix and focus method (b) Arcs of circle method (c) Concentric circles method
2.2 To draw a parabola by (a) Directrix and focus method (b) Rectangle method
2.3 To draw a hyperbola by (a) Directrix and focus method (b) Passing through given points with reference to asymptotes
2.4 To draw involutes of circle & polygon
2.5 To draw a cycloid, epicycloid, hypocycloid
2.6 To draw Helix & spiral
2.7 Loci of points with given conditions and examples related to simple mechanism.

Unit: 3 Name of the Topics: Projection of Straight Lines and Planes

3.1 Lines inclined to one reference plane only and limited to both ends in one quadrant.
3.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal and hexagonal, inclined to one reference plane and perpendicular to the other.

Unit: 4 Name of the Topics: Orthographic projections

4.1 Introduction to Orthographic projections
4.2 Conversion of pictorial views into Orthographic views (First Angle Projection Method only)
4.3 Dimensioning technique as per SP-46

Unit: 5 Name of the Topics: Isometric projection

5.1 Isometric scale
5.2 Conversion of orthographic views into isometric views / projection (Simple objects)

Unit: 6 Name of the Topics: Introduction to CAD

To draw line, rectangle, circle, polygon with given dimensions and hatch

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Workshop Practice
TIUBPH-194

L-T-P: 0-0-3   **Credit: 2**

1. Carpentry (Wood Working): Timber, Seasoning and Preservation, Plywood and Plyboards, Carpentry Tools, Engineering applications. Different Joints

2. Metal Joining: Definitions of welding, brazing and soldering processes, and their applications. Oxy-acetylene gas welding process, equipment and techniques. Types of flames and their applications. Manual metal arc welding technique and equipment. AC and DC welding, electrodes, constituents and functions of electrodes. Welding positions. Types of weld joint. Common welding defects such as cracks, slag inclusion and porosity.

3. Bench work and Fitting: Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses.