

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
(Formerly West Bengal University of Technology)  
**Syllabus for B. Tech in Civil & Environmental Engineering**  
(Applicable from the academic session 2018-2019)

**SEMESTER - III**

**VALUES & ETHICS IN PROFESSION**

**CODE: HU 301**

**CONTRACTS: 1L**

**CREDITS: 1**

Science, Technology and Engineering as knowledge and as Social and Professional Activities

***Effects of Technological Growth:***

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology Movement of Schumacher; later developments Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

***Ethics of Profession:***

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

***Profession and Human Values:***

Values Crisis in contemporary society

Nature of values: Value Spectrum Of good life

Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity

Moral and Ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

***Books:***

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.
4. Premvir Kapoor, Professional Ethics & Human Values, Khanna Publishing House.

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**CHEMISTRY-2**  
**CODE: CH (CHE) 302**  
**CONTRACTS: 3L+2T**  
**CREDITS: 3**

**Module I: 10L**

Colloids: Introduction; Classification of colloids; Size and shape; preparation of sols; Origin of charge in Colloidal particles; Stability of Colloids; Kinetic, Optical & electrical properties; Electrokinetic phenomena; Electrical Double Layer; Ultracentrifuge and Molecular weight determination of Macromolecules. Viscosity: Definition of viscosity of a liquid; Determination of Viscosity; Shear Viscosity; Intrinsic Viscosity; Molecular weight from Viscosity measurement; Surface Tension: Introduction; Origin of Surface Tension; Surface energy; Laplace & Young-Laplace Equation, Capillarity; Contact Angle; Measurement of Surface Tension by Capillary rise method; Variation of Surface Tension of a liquid with Temperature and Concentration.

**Module II: 10L**

Kinetic theory of gases, Van der Waals Equation of state, Maxwell distribution law, vapour- liquid equilibrium, Colligative property. Adsorption: Introduction; Gibb's adsorption equation; Surface Excess; Adsorption isotherms: Freundlich, Langmuir, BET adsorption equations; Surface Films; Langmuir Balance; two-dimensional equation of state.

**Module III: 10L**

Introduction to quantum mechanics: Spectral shape of Blackbody radiation, Planck's equation and a concept of quanta, breakdown of the classical equipartition principle, basic postulates of quantum mechanics, Hamiltonian function & Hamiltonian operator, important properties of a Hamiltonian operator, Heisenberg's uncertainty principle, Schrodinger equation and its solution for an electron in a one dimensional box where potential energy is zero inside & infinity outside the box. Normalization and orthogonality of the wavefunction. General Organic Chemistry: Common organic reactions i.e. Friedel-Crafts, Claisen Condensation, Cannizzaro, Aldol condensation, Fischer-Tropsch; Preparation and synthetic application of Acetoacetic ester, Malonic ester and Grignard's reagent;

**Module IV: 10L**

Aminoacids: Classification; General methods of preparation and properties of amino acids, polypeptide synthesis, General properties of proteins, colour tests, enzymes. Lipids, fats and steroids; nucleic acid, DNA & RNA - generation and structure; cell nutrients- macronutrients, micronutrients. Carbohydrate: Classification, Glucose and fructose, Disaccharides: Sucrose, maltose, cellobiose (introductory concept).

**Revision: 10L**

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**Text Books:**

1. Physical Chemistry: G.W.Castellan, Narosa.
2. Organic Chemistry: Finar; I.L. – Vol – I & II, Pearson Education.
3. Organic Chemistry: Morrison & Boyd; PHI/Pearson Education.

**References:**

4. Physical Chemistry: P. W. Atkins: Oxford.
5. A Text book of Physical Chemistry: K. L. Kapoor: Macmillan
6. A guide Book to Mechanism in Organic Chemistry: Peter Sykes
4. Organic Chemistry: Loudon: Oxford

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**BASIC ENVIRONMENTAL ENGINEERING & ELEMENTARY BIOLOGY**

**CODE: CH (FT) 301**

**CONTACTS: 3 L**

**CREDITS: 3**

**Introduction:**

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship. 1L

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. 2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. 1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. 2L

**Ecology**

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. 1L

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web. 2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 2L

**Air pollution and control**

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. 1L

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems. 1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget. 1L

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). 2L

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. 2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. 2L

Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozonemodification. 1L

Standards and control measures: Industrial, commercial and residential air quality standard,

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control measure (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

**Water Pollution and Control**

Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. 2L

River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. 2L

Lake: Eutrophication [Definition, source and effect]. 1L

Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) 1L

Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. 2L

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic. 1L

**Land Pollution**

Lithosphere; Internal structure of earth, rock and soil 1L Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste). 2L

**Noise Pollution**

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] 1L

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level,  $L_{10}$  (18hr Index) ,  $L_{dn}$ . Noise pollution control. 1L

**Environmental Management:**

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. 2L

**References/Books**

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.
3. M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House (AICTE Recommended – 2018).
4. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi (AICTE Recommended – 2018).
5. O.P. Gupta, Elements of Land/ Soil, Khanna Publishing House, New Delhi.
6. O.P. Gupta, Elements of Water Pollution Control Engineering, Khanna Publishing House, New Delhi.

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**THERMODYNAMICS AND KINETICS**

**CODE: FT 301**

**CONTACTS: 2L**

**CREDITS: 2**

**Module I: 10L**

Basic Concepts of Thermodynamics: The Ideal Gas, Review of first and second laws of thermodynamics, PVT behaviour of Pure Substances, Virial Equation of State, , Application of the Virial Equations, Cubic Equations of State, Generalized Correlations for Gases and Liquids. The Nature of Equilibrium, the Phase Rule, Duhem's Theorem

**Module II: 10L**

Simple model's for vapour/liquid Equilibrium, Rault's Law, Henry's law, Modified Raoult's Law, Vapour Liquid Equilibrium, K-value correlations; VLE from Cubic Equations of State; Equilibrium and Stability; Liquid/liquid equilibrium; Solid/liquid equilibrium, Solid/vapour equilibrium.

**Module III: 10L**

Thermodynamics and its Applications: The Chemical Potential and Phase Equilibria Fugacity and Fugacity, Coefficient: for pure species and solution; Generalised correlations for Fugacity, the Ideal Solution, Property Changes and Heat Effects of Mixing Processes. The Vapour-Compression Cycle, the Choice of Refrigerant, Absorption, Refrigeration and liquefaction: Low temperature cycle: Linde and Claude.

**Module IV: 10L**

Kinetics: Rate of chemical reaction; Effect of Temperature on Rate Constant, Arrhenius equation, Collision Theory, Transition State Theory, Order and Molecularity of a Chemical reaction, Elementary Reactions, First, Second and Third order reactions, Non Elementary Reactions, Pseudo-first order reaction, Determination of rate constant and order of reaction, Half life method, Fractional order reactions.

**Revision: 5L**

**Textbook:**

1. Smith & Vanness, Thermodynamics for Chemical Engineers, MGH

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**Reference books:**

1. Richardson, J.F., Peacock, D.G. Coulson & Richardson's Chemical Engineering- Volume 3 ed., First Indian ed. Asian Books Pvt. Ltd. 1998
2. Levenspiel.O., Chemical Reaction Engineering, Wiley Eastern Ltd.
3. Bailey & Olis, Biochemical Engg. Fundamentals, MGH, 1990
4. Physical Chemistry: Castellan, Narosa Publishing.

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**SURVEYING**  
**CODE: CE302**  
**CONTACT: 2L + 1T**  
**CREDITS: 2**

**Module I: 12L**

**Introduction:**

Definition, classification of surveying, objectives, principles of surveying

**Chain surveying:**

Chain and its types, Optical square, Cross staff, Reconnaissance and site Location, locating ground features by offsets – Field book. Chaining for obtaining the outline of structures, Methods for overcoming obstacles, Conventional symbols, Plotting chain survey and Computation of areas, Errors in chain surveying and their elimination: Problems

**Compass Surveying:**

Details of prismatic compass, Use and adjustments, Bearings, Local attraction and its adjustments. Chain and compass surveying of an area, Booking and plotting, Adjustments of traverse, Errors in compass surveying and precautions: Problems.

**Module II: 11L**

**Plane Table Surveying:**

Equipment, Orientation, Methods of Plane Tabling, Three Point Problems.

**Leveling:**

Introduction, Basic definitions, Detail of dumpy Level, Temporary adjustment of Levels, Sensitiveness of bubble tube; Methods of leveling – Differential, Profile & fly Leveling, Effect of curvature and refraction, Automatic levels, Plotting longitudinal sections and Cross sections; Measurement of area and volume.

**Contouring:**

Topographic Map, Characteristics of Contour, Contour Interval. Methods of Locating Contours, Interpolation of Contours.

**Module III: 11L**

**Theodolite Surveying:**

Components of a Transit Theodolite, Measurement of horizontal and vertical Angles, Co-

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ordinates and traverse Table

Tacheometry: Definition, Details of stadia System, Determination of horizontal and vertical distance with Tacheometer- Staff held vertically and normal to the line of sight.

**Module IV: 8L**

**Simple & Transition Curves:**

Definition, Degree of Curve, Elements of Simple Curve, Setting out by Linear method and Rankine's tangential method, Transition Curves.

Introduction to Total Station with Field applications.

**References**

- 1 Surveying:- Vol - I & II B.C. Punmia
- 2 Surveying & Leveling R. Subramanian (OXFORD)
- 3 Surveying& Leveling Vol - I [Part I & II ] T.P.Kanetkar & Kulkarni
- 4 Surveying:- Vol - I & II S.K. Duggal
- 5 Fundamental of Engineering Survey J.K. Ghosh (Studium Press, Roorkee)
- 6 Higher Surveying Dr. A. M. Chandra
- 7 Surveying R.B. Gupta & B.K. Gupta
- 9 Plane and Geodetic Surveying ( Vol - I & II ) David Clark
- 10 Fundamental of Surveying S. K. Roy
- 11 Surveying Saikia & Das (PHI)

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**BUILDING MATERIAL AND CONSTRUCTION**

**CODE: CE 303**

**CONTACT: 3L + 2T**

**CREDITS: 3**

**Module I: 13L**

**Bricks:** Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick Earth, Different forms of bricks, Testing of bricks as per BIS. Defects of bricks. Aggregates: Classification, Characteristics, Deleterious substances, Soundness, Alkali – aggregates reaction, Fine aggregates, Coarse aggregates, Testing of aggregates

**Lime:** Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling

**Cement & Concrete:**

**Cement:** OPC: Composition, PPC, Slag cement, Hydration, setting time

**Concrete:** Types, ingredients, W/C ratio, Workability, Different grades in cement concrete, Tests on cement concrete

**Module II: 10L**

**Mortars:** Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars

**Wood and Wood Products:** Classification of Timber, Structure, Characteristics of good timber, Seasoning of timber, Defects in Timber, Diseases of timber, Decay of Timber, Preservation of

Timber Testing of Timber, Veneers , Plywood, Fibre Boards, Particle Boards, Chip Boards , Black Boards, Button Board and Laminated Boards, Applications of wood and wood products

**Paints, Enamels and Varnishes:** Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish , French Polish, Wax Polish

**Miscellaneous Materials:** Gypsum: Classification, Plaster of Paris, Gypsum wall Plasters, Gypsum Plaster Boards, Adhesives, Heat and sound insulating materials, Geo-synthetics

**Module III: 10L**

**Foundations:** Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations.

**Brick masonry:** Definitions, Rules for bonding, Type of bonds – stretcher bond, Header bond, English bond, Flemish Bond, Comparison of English Bond and Flemish Bond (one and one and half brick thick wall)

**Wall, Doors and Windows:** Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal

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**Module IV: 10L**

**Stairs: Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case**

**Flooring:** Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing

**Plastering and Pointing:** Plastering with cement mortar, Defects in plastering, pointing, white washing, colour washing, Distempering,

**Roofs:** Types, Pitched roofs and their sketches, Lean – to roof, King Post – Truss, Queen post truss and Simple steel Truss , Roof Covering materials: AC sheets GI sheet

**References**

1. Building Materials S.K. Duggal
2. Building Materials P.C. Varghese PHI
3. Engineering Materials S.C. Rangwala
4. Concrete Technology M. S. Shetty
5. Concrete Technology A.M. Neville & J.J. Brooks Pearson Education
6. Building Construction B.C. Punmia
7. Building Construction and Foundation Engineering Jha and Sinha

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**Practical**

**CHEMISTRY-2 LAB**

**CODE: CH (FT) 392**

**CONTACTS: 3P**

**CREDITS: 2**

1. Amino Acid Analysis: pH measurements and Buffer Preparation
2. Amino Acid Analysis: Isoelectric Point Determination
3. Estimation of proteins by Lowry's method / Biuret method
4. Estimation of proteins by Bradford Assay
5. Determination of N, P, K, organic C from soil samples
6. Lipid/sugar: TLC/Paper Chromatography
7. Study on kinetics of iodine / ester hydrolysis
8. Detection of aldehyde / aliphatic or aromatic alcohol / carboxylic / ester / amino group(s)

**ENVIRONMENTAL ENGINEERING LAB**

**CODE: CH 391**

**CONTACTS: 3P**

**CREDITS: 2**

1. Physical examination of Sewage/Water:
  - a. Total Solid
  - b. Total dissolve solid
  - c. Total suspended solid
  - d. pH, color and odor
2. Chemical estimation of Sewage/Water and soil
  - a. Determination of Chlorides
  - b. Estimation of Chemical oxygen Demand
3. Microbial examination of Sewage/Water
  - a. Confirmation of coliforms
  - b. Biological oxygen demand
4. Determination of soil microbial biomass carbon.
5. Examination of different bacteria, algae, fungi, plants and animals by microscopic or morphological examination

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**SURVEYING PRACTICE- I**

**CODE: CE392**

**CONTACT: 3P**

**CREDITS :2**

Chain surveying

Preparing index plans, Location sketches, Ranging, Preparation of map, Heights of objects using chain and ranging rods, Getting outline of the structures by enclosing them in triangles/quadrilaterals, Distance between inaccessible points, Obstacles in chain survey.

Compass surveying

Measurement of bearings, Preparation of map, Distance between two inaccessible points by chain and compass, Chain and compass traverse

Plane Table survey

Temporary adjustments of plane table and Radiation method, Intersection, Traversing and Resection methods of plane tabling, Three-point problem

Leveling

Temporary adjustment of Dumpy level, Differential leveling, Profile leveling and plotting the profile, Longitudinal and cross sectioning, Gradient of line and setting out grades, Sensitiveness of Bubble tube

Contouring

Direct contouring, Indirect contouring – Block leveling, Indirect contouring – Radial contouring, Demonstration of minor instruments

**BUILDING DESIGN AND DRAWING**

**CODE: CE 393**

**CONTACT: 3P**

**CREDITS: 2**

Foundations

Spread foundation for walls and columns; Footing for a RCC column, raft and pile foundations;

Doors and Windows

Glazed and paneled doors of standard sizes; Glazed and paneled windows of standard sizes; special windows and ventilators

Stairs

Proportioning and design of a dog-legged, open well RCC stair case for an office / Residential building; Details of reinforcements for RCC stair cases; Plan and elevation of straight run, quarter turn, dog-legged and open well stair cases.

Roofs and Trusses

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Types of sloping roof, lean-to roofs, RCC roof with details of reinforcements, King post and Queen post trusses.

**Functional Design of Buildings**

To draw the line diagram, plan, elevation and section of the following:

Residential Buildings (flat, pitched and combined roofs), Office Buildings (flat roof), School  
The designs must show positions of various components including lift well and their sizes.

Introduction to drawing by using software package

**References**

- 1 Principles of Building Drawing, Shah & Kale
- 2 Text Book of Building Construction, Sharma & Kaul
- 3 Building Construction , B C Punmia