

## **University is going to introduce Four-year B.Tech. Course in various subjects from session 2015-16**

- **4-year B.Tech. course**

- **Introduction**

The existing B.Tech. course in all the Engineering & Technology departments (except Jute & Fiber Technology) is a 3-year B.Tech. course, where students get admitted after passing B.Sc. Honours courses. The University of Calcutta is going to introduce the 4-year B.Tech. (10+2+4) course from session 2015-16 for all the Engineering courses. This is the first ever Opportunity for XII (Science) qualifying WBJEE to study B.Tech. directly in this 158 year old University in various subjects.

- **Subjects/Departments**

- Electrical Engineering (EE) / [Applied Physics](#)
- Electronics & Communication Engineering (ECE)/ [Radio Physics & Electronics](#)
- Instrumentation Engineering (IE) / [Applied Physics](#)
- Computer Science & Engineering (CSE) / [Computer Science and Engineering](#)
- Information Technology (IT)/ [AKC School of Information Technology](#)
- Optics and Optoelectronics (OOE) / [Applied Optics & Photonics](#)
- Chemical Engineering(CHE) / [Chemical Engineering](#)
- Chemical Technology (CHT) / [Chemical Technology](#)
- Polymer Science & Technology (PST)/ [Polymer Science & Technology](#)
- Jute & Fiber Technology(JFT) [already existing as 4-year B.Tech. course]/ [Jute & Fiber Technology](#)

○ Syllabus

▪ Course Structure

**1<sup>st</sup> SEMESTER**

Serial No.	Name	Code	Credit	Weekly Load			Total Load
				L	T	P	
1	Communicative English	HU101	03	2	1	0	03
2	Physics-I	PH102	03	2	1	0	03
3	Chemistry-I	CH103	03	2	1	0	03
4	Engineering Mathematics-I	MA104	03	2	1	0	03
5	Electrical Technology	EE105	03	2	1	0	03
6	Computer Programming and Data Structure	CS106	03	2	1	0	03
7	Language Lab	HU107	02	0	0	3	03
8	Physics-I Lab	PH108	02	0	0	3	03
9	Chemistry-I Lab	CH109	02	0	0	3	03
10	Electrical Technology Lab	EE110	02	0	0	3	03
11	Computer Lab	CS111	02	0	0	3	03
	TOTAL		28	12	6	15	33

**2<sup>nd</sup> SEMESTER**

Serial No.	Name	Code	Credit	Weekly Load			Total Load
				L	T	P	
1	Sociology	HU201	03	2	1	0	03
2	Physics-II	PH202	03	2	1	0	03
3	Chemistry-II	CH203	03	2	1	0	03
4	Engineering Mathematics-II	MA204	03	2	1	0	03
5	Basic Electronics	ET205	03	2	1	0	03
6	Engineering Mechanics	ME206	03	2	1	0	03
7	Physics-II Lab	PH207	02	0	1	3	03
8	Chemistry-II Lab	CH208	02	0	0	3	03
9	Electronics Lab	ET209	02	0	0	3	03
10	Workshop Practice	ME210	02	0	0	3	03
11	Engineering Drawing	ME211	02	0	0	3	03
	TOTAL		28	14	4	15	33

**3<sup>rd</sup> SEMESTER – 8<sup>th</sup> SEMESTER** (See Departmental Website/ Link)

- **Detailed Syllabus**

## **1<sup>st</sup> SEMESTER**

### **THEORETICAL PAPERS**

#### **HU101- Communicative English**

Developing Listening Comprehension through Language Lab Device; Conversational Practice , Classroom presentation; Group Discussion , Comprehension from selected stories; Correction of errors, Vocabulary, Grammar: Sentence Structures and Transformation; Active & Passive Voice; Direct & Indirect Narration.

#### **PH102- Physics-I**

Viscosity, electricity, surface tension; Vectors in particle mechanics: Unit vectors in spherical and cylindrical polar coordinates, Conservative vector fields and their potential functions - gravitational and electrostatic examples, Gradient of a scalar field, Equipotentials, States of equilibrium, Work and Energy, Conservation of energy, Motion in a central field and conservation of angular momentum. Simple harmonic motion: Composition of simple harmonic motion, Forced vibration and resonance, Wave equation in one dimension and travelling wave solution, Standing waves, Wave velocity and group velocity. Wave Optics: Diffraction- Fresnel and Fraunhofer class, theory of plane transmission grating, missing orders, resolving power. Polarization – Double refraction, ordinary and extra ordinary rays, polaroids, linearly, circularly and elliptically polarized light, half wave and quarter wave plates. Fiber Optics: Core and cladding, step index and graded index fibers, acceptance angle, numerical aperture, losses, applications. Acoustics: Propagation of sound waves, acoustics of buildings.

#### **CH103- Chemistry-I**

Chemical Bonding :Valence bond theory, Molecular orbital theory, characteristics of different bonds; Structure and Reactivity of Organic Molecules : Electronic influencing effects, aromaticity, elementary idea of stereochemistry, mechanisms of some selected organic reactions. Coordination Chemistry : Coordination numbers, Chelate effect, Coordination complexes and application, Bio-inorganic chemistry : Metal ions in Biological systems., environmental aspects of Metals, NO<sub>x</sub>, CO, CO<sub>2</sub>. Organic Reaction Mechanism : Mechanisms of selected organic, bio-organic, polymerization and catalytic reactions. Stereochemistry of Carbon Compounds : Selected Organic Compounds : Natural products and Biomolecules (Amino acids/nucleic acids/proteins).

#### **MA104- Engineering Mathematics-I**

Differential calculus: Differential, Successive differentiation, Leibnitz Rule. Rolles Theorem. L'Hospital's Rule. Taylor's theorem with Lagrange's and Cauchy's forms of remainders, Taylor's and Maclaurin's series, expansion of functions, curvature, asymptotes. Maxima and minima of functions of a single variable Curvature, concavity. Convexity, Points of inflexion. Partial derivatives, differentials and total derivatives of composite functions. Euler's theorem on homogeneous functions. Taylor's theorem for a function of two variables. Maxima and minima of a function of several variables. Lagrange's method of undetermined multipliers. Infinite Series : Geometric series, Comparison test, p-series, D'Alembert's Ratio Test, Cauchy's Root Test, Rabbe's test, Gauss' test, Power series, radius of convergence. Int. Calculus: Properties of definite integrals. Quadrature, Rectification, Numerical integration by Trapezoidal Rule and Simpson's Rule. Double integral, change of order of integration, change of variables, determination of area, volume, moment of inertia, centroid.

Vector calculus: Brief review of vector algebra, scalar and vector triple products, Directional derivatives, gradient, divergence, curl, statements of Gauss's theorem, Green's theorem, Stokes' theorem, examples.

### **EE105- Electrical Technology**

D.C. Circuits: Kirchhoff's laws, Maxwell's loop current method, star-delta transformation. Network theorems – Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem. Magnetic Circuit: MMF, Flux, Reluctance. B-H Loop. Hysteresis and Eddy current loss. Magnetic circuit analysis with air gap. A.C. Fundamentals : Sinusoidal quantities, phase & phase difference, average & RMS values, form factor & peak factor, concept of Sinusoids, impedance & admittance, power & power factor, A.C. Circuits: Series and parallel R-L-C Circuits, Form Factor, Peak. Factor. Phasor concept of Sinusoids. Impedance and Admittance. Power, Power Factor, V A, V AR. Balanced 3-phase: 3-phase AC balanced circuits. Phase-sequence, Star and Delta connections. Power Measurement: Wattmeter circuit connection. Power Measurement by two wattmeter methods in 3phase system. DC Machines: Construction and general principle of operation. Generator EMF Equation. Field connection, shunt series and compound. Generator characteristics. Motor-equation and general operation. starting and speed control, torque -speed curve. 1-Phase Transformer: Construction. EMF equation. Phasor diagram. Equivalent circuits. Losses and Efficiency. Open circuit and Short circuit test. 3-Phase Induction Machine: Types of induction machines. Rotating magnetic field, slip, torque equation, torque-speed curve. DOL starting and reduced voltage starting.

### **CS106- Computer Programming and Data Structure**

Introduction to digital computers; introduction to programming – variables, assignments; expressions; input/output; conditionals and branching; iteration; functions; recursion; arrays; introduction to pointers; structures; introduction to data-procedure encapsulation; dynamic allocation; linked structures; introduction to data structures – stacks and queues; time and space requirements.

## **PRACTICAL PAPERS**

### **HU107 - Language Lab**

Honing 'Listening Skill' and its sub skills through Language Lab Audio device; Honing 'Speaking Skill' and its sub skills; Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/Stress/ Intonation/ Pitch & Accent) of connected speech; Introducing 'Group Discussion' through audio – Visual input and acquainting them with key strategies for success; Honing 'Conversation Skill' using Language Lab Audio – Visual input; Conversational Practice Sessions; 'Group Discussion' through audio – Visual input and acquainting them with key; strategies for success; G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD; Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension

### **PH108 - Physics-I Lab**

Determination of: Modulus of elasticity, Coefficient of viscosity by Stoke's law, Refractive index of transparent liquid by travelling microscope, Moment of inertia, Surface tension of a liquid, Coefficient of friction.

**PH109- Chemistry-I Lab**

1. Titrations: acid-base, redox, complexometric, conductometric
2. To determine calcium and magnesium hardness of a given water sample separately.
3. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
4. Determination of partition coefficient of acetic acid between n-butanol and water
5. Determination of dissolved oxygen present in a given water sample.
6. To determine chloride ion in a given water sample by Argentometric method

**EE110 - Electrical Engineering Lab**

Familiarization experiments(Variac,Potential divider, MCV,MIV,MCA,MIA &Wattmeter); Study of AC series R-L-C series circuit; Characteristics of Tungsten and Carbon filament lamps; No load test on Single phase Transformer ; Experiments on DC circuits and DC machines; Calibration of voltmeter, ammeter and energy meter; Experiments on magnetic circuit principles

**CS111 - Computer Lab**

Introduction to: LAN, Server-Client, Microsoft Windows and Linux Platforms, Common OS Commands, Editor, Compiler. Expression evaluation; Conditionals and branching; Iteration; Functions; Recursion; Arrays; Structures; Linked lists; Data structures

## 2<sup>nd</sup> SEMESTER

### **THEORETICAL PAPERS**

#### **HU201-Sociology**

Sociology: Nature and scope of Sociology - Sociology and other Social Sciences - Sociological Perspectives and explanation of Social issues. Society and Technology: Impact of Technology on the Society - A case study. Social Stratification: Systems of Social Stratification - determinants of Social Stratification - Functionalist, Conflict and Elitist perspectives on Social Stratification. Work: Meaning and experience of work: Post industrial society- Post-Fordism and the Flexible Firm. Development - Conceptions of and approaches to development - The Roles of State and the Market in the Development. Globalization: The concept of globalization - globalization and the nation state - Development and globalization in post colonial times. Industrial Policy and Technological change in India - The nature and Role of the State in India. Technology Transfer: The Concept and Types of Technology Transfer-Dynamics of Technology Transfer. Technology Assessment: The Concept - Steps involved in Technology Assessment. Environment: Sociological Perspectives on Environment - Environmental Tradition and values in ancient India. The Development of Management: Scientific Management - Organic Organization - Net Work organization - Post modern Organization - Debureaucratization - Transformation of Management. Technological Problems and the Modern Society: Selected Case Studies - Electric Power Crisis, Industrial and/or Environmental Disaster, or Nuclear Accident.

#### **PH202- Physics-II**

Nuclear Physics : Q-value, exoergic and endoergic reaction, threshold energy for endoergic reaction, packing fraction and binding energy, semi empirical mass formula, principle of reactors(qualitative). Kinetic theory of gases: Expression for pressure, Significance of temperature, Deduction of gas laws. Qualitative idea of -- Maxwell's velocity distribution, degrees of freedom and equipartition of energy, Specific heat of gases at constant volume and constant pressure. Thermodynamics: Carnot cycle, principle of steam engine and refrigeration, entropy, enthalpy, free energy, conduction of heat. Quantum Mechanics: Planck's radiation law, Compton effect, wavelength shift and recoil of electrons; de Broglie hypothesis, Schrodinger time dependent and time independent equation, application to free particle and particle in a box.

#### **CH203- Chemistry-II**

Polymeric Materials: Elementary ideas of Polymer chemistry, thermosetting and thermoplastics, Nylon 6, Nylon 66, polyester, SBR, biopolymers, proteins. Analytical chemistry: Principles of spectroscopic techniques in Chemistry, Experimental methods of structure determination using UV-VIS, IR and <sup>1</sup>H-NMR spectroscopy, Chromatographic methods of separation and analysis, potentiometric and amperometric methods of analysis. Electrochemical Systems : Electrochemical cells and EMF, Applications of EMF measurements: Thermodynamic data, activity coefficients, solubility product and pH, corrosion. Kinetics of Chemical Reactions : Reversible, consecutive and parallel reactions, steady state approximation, chain reactions, photochemical kinetics.

#### **MA204- Mathematics-II**

Linear dependence of vectors, basis, linear transformations, rank and inverse of a matrix, solution of algebraic equations. Eigenvalues and eigenvectors, Hermitian and skew Hermitian matrices. Convergence of improper integrals, tests of convergence, Beta and Gamma functions elementary properties, differentiation under integral sign, differentiation of integrals with variable limits. Rectification, double and triple integrals, computations of surfaces and volumes, Jacobians of transformations, integrals dependent on parameters applications. Scalar and vector fields, level surfaces, directional derivative,

Gradient, Curl, Divergence, Laplacian, line and surface integrals, theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates. Finite differences, Newton's forward and backward interpolation formulae, Central difference interpolation. Trapezoidal rule and Simpson's 1/3rd rule of integration. Solution of polynomial and transcendental equations, bisection method, Newton Raphson method and Regula falsi method.

### **CS205- Basic Electronics**

Introduction to electronics and electronic systems, Sem PN junction, V- I characteristics, break down mechanism, Zener diode and their application, half and full wave rectifiers, clipper, clampers. Semiconductor and devices like diodes, BJT, FET, MOSFET, Rectifier and Filters, Transistor biasing. Bipolar junction transistors, characteristics, Early effect, biasing, different mode of operation, use of BJT as amplifier, single stage amplifier, feedback amplifier. Small signal transistor amplifiers, Operational amplifier and its application, Feedback and Oscillators, Digital circuit and combinational logic, Sequential logic and flip-flops, ADC & DAC, Data acquisition systems,

### **ME206- Engineering Mechanics**

Statics: Basic concepts, Scalars and vectors, parallelogram law, Lami's theorem, Application of Vectors in Mechanics, Force Systems in two Dimensions; Moments and Couples; Resultants and Components in concurrent coplanar forces, parallel forces in a plane, Free Body Diagram Concept, Fundamentals of Friction, Limiting angle of Friction, Centroid, Moment of Inertia, Plane Trusses; Frames and Machines. Applications to wedges.

Dynamics: Introduction to vector calculus, Definition of vectors in Dynamics, Two dimensional article Kinematics in Rectangular Co-ordinates, Cylindrical Co-ordinates and in terms of Normal and Tangential Components; Rectilinear Motion, Curvilinear motion of particle and description of different coordinate systems, Kinetics, Newton's Law and D' Alembert's principle, and application to rectilinear and curvilinear motion, constrained motion, Energy and Momentum methods. Linear Impulse ; Angular Impulse and Momentum – Central Force Motion.

## **PRACTICAL PAPERS**

### **PH207 - Physics-II Lab**

Determination of : Wavelength of light by grating; Focal length of concave mirror; Optical activity of polarimeter; Resistances in series and parallel combinations; Mutual inductance; Voltage gain of amplifier

### **CH208 - Chemistry-II Lab**

Estimation of Copper in brass by iodometry; Estimation of iron in cement by dichromatometry; Determination of different organic groups known and unknown; Preparation of emulsion and study of its stability; Determination of hardness of water; Determination of fats and oils.

### **ET209 - Electronics Lab**

Study the Multi-meter; Study of Cathode Ray oscilloscope; V-I Characteristics of P-N junction Diode; Rectifier Circuit( H.W./F.W./B.R) with different filter arrangement; Digital logic trainer; Tenor characteristics .

**ME210 - Workshop Pracice**

Fitting Shop : Introduction to different hand tools , equipment and measuring devices , sawing, filing & drilling. Practice Jobs on MS Plate, making of nuts and bolts.

Carpentry Shop : Specification of wood and wood products, Introduction to Tools and equipment, different wood joints. Practice jobs on Dove Tail Notch or Dovetail Bridle Joint or Cross Joint

Forging Shop : Arc welding practice, Demonstration of forging a Octagonal Chisel, Sheet metal funnel making

**ME211 - Engineering Drawing**

Lettering, Numbering, Dimensioning. Plane Scales, Diagonal Scales & Venier Scales. Curves – Parabola, Ellipse, Involutes. Projection of Points, Lines, Surfaces, Solids and Section of solids. Orthographic and Isometric projection. Introduction to CAD tools – basics; Introduction of Development and Intersection of surfaces.

**3<sup>rd</sup> SEMESTER – 8<sup>th</sup> SEMESTER**

(See Departmental Website/ Link)