SYLLABUS FOR THE JOINT ENTRANCE EXAMINATION FOR LATERAL ENTRY TO 2ND YEAR OF THE FOUR YEAR COURSE OF BACHELOR DEGREE IN ENGINEERING AND TECHNOLOGY.

SYLLABUS

(A) For Diploma holders in Engineering / Technology : The questions will be set based on the prescribed diploma syllabus of The West Bengal State Council of Technical Education on the following six subjects

(1) Engineering Mathematics
(2) Electrical Technology
(3) Computer Applications
(4) Environmental Engineering
(5) Engineering Mechanics / Basic Engineering (for Printing )
(6) Strength of Materials / 'Printers' Materials Science (for printing).

(B) For B.Sc, candidates : A separate question paper on Mathematics will be set, based on B.Sc Mathematics pass course syllabus of the University of Calcutta.

(C) For Diploma holders in Pharmacy : A separate question paper will be set based on the Diploma Level syllabus in Pharmacy as prescribed by the Pharmacy Council of India.

As per the W.B. Joint Entrance Examinations Board Information Brochure - 2012
SYLLABUS

FOR ENGINEERING TECHNOLOGY BRANCHES ONLY

ENGINEERING MATHEMATICS
(FOR ALL BRANCHES)

MATRIX & VECTOR

NUMERICAL METHODS
Meaning of interpolation - Difference table - Newton's forward Interpolation formula (no deduction) – Problems.
Introduction to numerical integration - Formulae for composite trapezoidal and Simpson's 1/3 rule (no deduction) – Related problems
Numerical solution of non-linear equations - Formula for Newton-Raphson method (no deduction) - Problems.
Numerical solution of system of linear equation - Gauss-Elimination Method (no deduction) - Problems.

DIFFERENTIAL EQUATIONS
Definition - Order and degree of a differential equation - Differential equations of 1st order and 1st degree - Separation of variables - Problems.
Homogeneous differential equations - Equations reducible to the homogeneous form - Problems.
Exact differential equations - equations reducible to the exact form - problems Linear equations - Bernoulli's equations
Differential equations of 2nd order with constant co-efficients - Complementary function and particular integral - Problems.

PARTIAL DIFFERENTIATION
Function of two or more variables - Definition and meaning of partial derivatives (1st order). Homogeneous functions - Euler's theorem on homogeneous functions (no deduction) - Problems

PROBABILITY AND STATISTICS
Measure of central tendency - Mean - Median - Mode - Standard deviation - Simple problems
ELECTRICAL TECHNOLOGY
(FOR ALL BRANCHES)

Kirchoff’s law
Kirchoff’s voltage and current laws, Star-delta transformations - Simple problems on all topics.

A. C. FUNDAMENTALS
Concept & significance of R.M.S. value, peak value, average value, crest factor and form factor of sinusoidal voltage/current - Equation of instantaneous value of sinusoidal voltage/current - Simple problems on all.

A, C. SERIES CIRCUIT
R-L & R-C A.C. series circuit (no deduction, only the expressions of voltage, current & power for sinusoidal sources), power factor, power triangle simple problems

STORAGE CELL, TRANSFORMER, MOTORS ETC.
Basic Principle of: Storage cell, DC. motors, Transformer, A.C. generators & motors (No deduction & problems).

MAGNETIC CIRCUIT
Concept on magnetic circuit, Definitions and units of magnetic flux, m.m.t. and reluctance, analogy with electrical circuit, simple problems.

MOTOR STARTER
Need of motor starter mentioning some names useful for D.C. motors & A.C. motors.

MOTORS FOR INDUSTRIAL USES
Simple Electrical Circuit for motor installation, using block diagram of different components.

POWER GENERATION, TRANSMISSION & DISTRIBUTION
Brief idea about the power generation, transmission and distribution using block diagram of different stages.

VOLTAGE STABILISER & UPS SYSTEM
Brief idea about the operational principle of voltage stabilizer and UPS system (no description of internal circuit)

HOUSE WIRING
Simple idea house wiring starting from commencement of supply, using necessary diagram, role of fuses / MCB, fault finding & earthing concept.

LIGHTING SCHEMES
Types of lighting scheme and factors considered for designing lighting schemes i.e. illumination level, uniformity of illumination, colour of light, glare, mounting height, spacing between luminaries, colour of surrounding walls etc.

WATTMETER & MEGGER
Uses & connection diagram of Wattmeter - Use of Meggar with circuit diagram.

ELECTRICAL ENERGY MEASUREMENT
Electrical energy measurement (no mathematical deduction & description of apparatus) - circuit diagram for single-phase energy-meter connection.
COMPUTER APPLICATIONS & PROGRAMMING
(For All Disciplines)
Detail Course Content

Group - A — Fundamentals of Computer
Module 1 — Introduction to Computer
1.1 Brief history of evolution of computers
1.2 Various components of computer (brief knowledge)
1.3 Hardware-CPU inputs output system, primary memory, secondary memory.
1.4 Peripherals devices - Printers, plotter, scanners, digitals cameras, web cam sound card & speaker systems, dicta phone
1.5 Software Operating system, system software like compilers and device drivers, and various application software (definitions only).

Module 2 — Information Representation
2.1 Number System : Binary, Octal & Hexadecimal
2.2 Conversion of number systems, signed and unsigned representation
2.3 Binary arithmetic & compliments,
2.4 Character codes : ASCII, BCD & Gray codes

Group - B — Software Concepts
Module 3 — Basic of Software
3.1 Classification of Software systems-system software and application software.
3.2 Basic concepts of compilers, interpreters, assemblers and device drives
3.3 Operating system - Single user, multi user, graphical user interfaces and characters user interfaces.
3.4 Case studies : MS-DOS, Windows

Group - C — Introduction to Programming
Module 4 — Introduction to Programming
4.1 Algorithm and flowchart
4.2 Different types of programming languages - machine level, assembly level and high-level languages (basic concepts only)
4.3 Brief introduction to different high-level languages including C
4.4 Basics of C-Language
4.5 Branching and loping statements
4.6 Arrays and user-defined functions

Group - D — Computer Networking and Internet
Module 5 — Computer Networking and Internet
5.1 Basics of Computer Networking - LAN, MAN, WAN (definitions only)
5.2 Client - Server architecture (elementary level)
5.3 Internetworking concepts of World Wide Web, domain name system emails
5.4 Web browsing, use of search engines, web site hosting (elementary level)
ENVIRONMENTAL ENGINEERING
(FOFI ALL. BRANCHES)

AIR & ENVIRONMENT INTRODUCTION

AIR POLLUTION
Causes of air pollution - types & sources of air pollutants - Climatic & Meteorological effect on -air pollution concentration -formation of smog & fumigation

ANALYSIS OF AIR POLLUTANTS

AIR POLLUTION CONTROL MEASURES & EQUIPMENT

METHODS & APPROACH OF AIR POLLUTION CONTROL
Controlling smoke nuisance — Develop air quality criteria and practical emission standards — creating zones suitable for industry based on micrometeorology of air area — Introducing artificial methods of removal of particulate and matters of waste before discharging to open atmosphere

WATER & ENVIRONMENT WATER SOURCES
Origin of waste water — Type of water pollutants and their effects

DIFFERENT SOURCES OF WATER POLLUTION

WATER POLLUTION & ITS CONTROL
Adverse effects on : Human Health & Environment, Aquatic life, Animal life, Plant life — Water Pollution Measurement Techniques - Water Pollution Control Equipment & Instruments - Indian Standards for Water Pollution Control

SOIL & ENVIRONMENT
SOIL POLLUTING AGENCIES & EFFECT OF SOLUTION

SOLID WASTE DISPOSAL

NOISE & ENVIRONMENTAL MANAGEMENT SYSTEM NOISE POLLUTION & CONTROL
Noise Pollution: Intensity, Duration - Types of Industrial Noise - ill effects of Noise -Noise Measuring & Control - Permissible Noise Limits

ENVIRONMENTAL LEGISLATIONS, AUTHORITIES & SYSTEMS
Air & Water Pollution Control Acts & Rules (Salient Features only) – Functions of State / Central Pollution Control Boards - Environmental Management System ISO 14000 (Salient Features only).
ENGINEERING MECHANICS
(FOR ALL BRANCHES EXCEPT PRINTING)

GROUP-A
Module 1 INTRODUCTION

Module 2 SYSTEM OF FORCES
Definition of a force with explanation - Linear representation of force - System of co-planar forces - Parallelogram Law of Forces - Composition and Resolution - Transmissibility of forces - Action and Reaction - Triangle Law & Polygon Law of forces - Determination of Resultant by Analytical and graphical method with equilateral space diagram - Vector diagram.

Module 3 MOMENTS & COUPLES
Definition of moment of a force about a point - Physical significance of moment - Moment of a system of parallel and inclined forces - Varignon's Theorem - Definition of moment of a couple - Physical significance of Couples Equivalent couples - Resultant of any number of coplanar couples - Replacement of a force about a point by an equal like parallel force together with a couple - Properties of couples.

Module 4 CONDITION OF EQUILIBRIUM
Lami's Theorem - Triangle Law & Polygon Law of equilibrium - Conditions of equilibrium of co-planar system of concurrent forces - Conditions of equilibrium of co-planar system of non-concurrent parallel forces (like & unlike) - Conditions of equilibrium of co-planar system of non-concurrent non-parallel forces (simple problems excluding statically indeterminant).

GROUP-B
Module 5 FRICTION
Definition - Useful and harmful effects of friction - Laws of Static friction - Coefficient of friction - Angle of friction - Angle of repose - Equilibrium of a body on a rough inclined surface with and without external force

Module 6 CENTRE OF GRAVITY
6.1 Concept & definition - Centre of mass - Centroid
6.2 Methods of finding out centroids of simple area by:
   (i) Geometrical consideration and (ii) Method of Moments.
   [** Method of integration should be learnt in Strength of materials on 2nd Semester]
   Finding the centroid of the following areas by any method:
   (i) uniform triangular lamina, (ii) uniform rectangular lamina, (iii) uniform circular lamina,
6.3 Finding the centroid of the following sections using the method of moment:
   (i) T-section, (ii) equal and unequal angle-sections, (iii) equal and unequal l-sections, (iv) different cut-out sections as shown in the following figures.

Module 7 MOMENT OF INERTIA
7.1 Introduction - definition and unit
7.2 M I of a lamina
7.3 Theorems of finding out M I by:
   (i) Parallel axis theorem, and, (ii) Perpendicular axis theorem.
7.4 Radius of Gyration
7.5 Finding out M I of the following sections using formula only.
   (i) rectangular section, (ii) Square section, (iii) circular section, (iv) triangular section
7.6 M I of irregular areas such as l-sections, T-sections, - Related simple problems.
Module 8 SIMPLE MACHINES
Definition of Machine - Difference between Machine & Lever - Mechanical Advantage, Velocity Ratio and Efficiency with their relationship - Frictional Effort Load -Condition of reversibility / irreversibility - Law of Lifting Machines - Maximum mechanical advantage - Maximum efficiency - Effort vs. load curve - Efficiency vs. load curve - (Different types of lifting machine with their mechanical advantage, velocity ratio & efficiency such as wheel and axle (simple & differential), Crab winch (single & double purchase), Weston pulley block, worm & worm wheel, simple screw jack.

GROUP-C
Module 9 RECTILINEAR MOTION
Motion equations (with deduction \( S = V \times t; \ V = u \pm f \ t; \ S = u \cdot t \pm 1/2 \ f \ t^2; \ V^2 = U^2 \pm 2 \ f \ S \))
Newton's Second Law of linear motion \( P = m \ f \) (deduction) - Conservation of momentum of a body - No Numerical problems

Module 10 CURVILINEAR MOTION
Angular displacement - Angular speed - Angular velocity - Relation between angular speed & angular velocity - Angular acceleration - Relation between linear & angular velocity - Relation between linear & angular acceleration - Centripetal and centrifugal force (numerical problems)

Module-11 WORK POWER ENERGY
STRENGTH OF MATERIALS
(ALL BRANCHES EXCEPT PRINTING)

GROUP — A
Module 1 : SIMPLE STRESSES & STRAINS
1.1 Scope of subjects Use of structure, importance of knowledge of stress, strain and deformation in structure, safety and economy.
   Engineering materials: Definitions and examples
   Mechanical properties of engineering materials: Elasticity, Plasticity, Ductility;
   Hardness. Fatigue. Creep Britleness (definition, examples and applications).
1.2 Stress and strain Tensile, Compressive, Shear
1.3 Stress-strain diagram: Principles of tensile testing m universal testing machine’s showing salient points such as elastic limit, proportional limit, yield points, breaking points etc., ultimate stress, working stress and factor of safety.
1.4 Stress - Strain relations: Hooke's law, Young's Modulus, Modulus of rigidity, Poission's ratio.

GROUP — 8
Module 2 : SHEAR FORCE & BENDING MOMENT
2.1 Definition and Types of beams, supports and loads.
2.2 Shear force and bending moment in beams: Definitions, sign conventions and inter-relationships
2.3 Shear force and bending moment diagrams (with simple problems):
   (i) Cantilever beams with point loads and Uniformly Distributed Loads (UDL);
   (ii) Simply supported beams with point loads and UDL.
   (iii) Simply supported overhanging beam with point load

Module 3 : BENDING STRESSES IN BEAMS
3.1 Pure bending of beam: Assumptions, deduction of bending equation with usual notations, moment of resistance, section modulus
3.2 Problems on bending stress about axis parallel to the plane of bending For rectangular circular & I – section.

GROUP — C
Module 4 : DEFLECTION OF BEAMS
4.1 Differential equation of elastic curve — Relation among deflection, slope, shear force, bending moment and rate of loading — Sign convention of slope and deflection
4.2 Standard formula (no proof, only simple problems) for maximum slope of deflection of
   (a) cantilever beam subjected to point load at free end, uniformly distributed load on entire span;
   (b) simply supported beam carrying a point load at mid span, uniformly distributed load on entire span.

Module 5 : COLUMNS & STRUTS
5.1 Definitions of Columns & Struts — Long, Medium & Short columns — Effective Length — Slenderness Ratio
   — Critical load — Safe load — Different kinds of end conditions — Euler’s formula for critical load (no deduction and no problem).
BASIC ENGINEERING FOR PRINTING
(FOR PRINTING TECHNOLOGY ONLY)

SIMPLE STRESSES & STRAIN
Introduction — Elasticity — Stress and Strain.
Types of Stresses: Tensile Stress and Compressive Stress.
Elastic Limit — Hook's' Law — Modulus of Elasticity (Young's Modulus)
Deformation of a body due to Force acting on it — Simple problems.
Principle of Superposition — Simple problems on uniform cross-section.

MECHANICAL DRIVE
Different types of Mechanical drive and their uses only.
Belt & pulley drive Different types belt and pulley drive — Open belt drive and cross belt drive.
Types of belt and types of pulley — Velocity ratio.
Simple problems.

GEAR DRIVE
Types of gear and their uses. Definition of different parts of Spur gear. Velocity ratio of spur gear. Simple problems.

MEASURING INSTRUMENTS
Types of measuring instruments and their uses.
Description, working principle, care & maintenance of Vernier Callipers and outside micrometer.
Reading of Vernier callipers and outside micrometer.

FASTENING METHOD
Different types of fastening method with examples Types of nuts, bolts and their uses Welding, Soldering & Brazing and their uses Different types of rivet and riveted joints.
PRINTERS’ MATERIAL SCIENCE
(FOR PRINTING TECHNOLOGY ONLY)

Colloids - Definition of colloid, properties of lyophilic and lyophobic colloids, stability of colloids, protective action of lyophilic colloids, gold number, definition of gel and emulsion, application of colloids, gels and emulsions in printing.

Polymers - Uses of natural polymers (casein, cellulose, dextrin, egg albumen gelatine, fish glue, gum Arabic and starch) and synthetic polymers (polyethylene, polypropylene, Teflon, polyvinyl acetate, polyvinyl alcohol, polyvinyl chloride, phenolic resin, amino resin and polyester resin) in printing.

Chemistry of photography - Constituents of a photographic emulsion, uses of gelatine, preparation of the emulsion, lattice structure of silver chloride and silver bromide, lattice defects, latent image formation by Gurney-Mott Theory, chemistry of photographic development fixing photographic reduction and chemistry intensification, chemical reversal, elementary idea of silverless films.

Chemicals required for Image carriers - a) letterpress and flexography - photopolymeric stereo making, b) lithography - (graining, coating, developing, etching, lacquering, stencil removing, gumming, desensitising) (i) negative working plates - albumen plate, PS, diazo and photo-polymer plates, driographic (waterless) plate (ii) positive working plates - gum deep etch plate, PS, plate, diffusion transfer plate c) gravure - cylinder making (sensitising, developing, etching, finishing) d) silk screen - (coating, developing, hardening, stencil removing) direct, indirect, direct-indirect and capillary method

Surface tension - Definition, contact angle, choice of metals for image earners on the basis of contact angle, role of surface tension in wetting of the non-image areas of a lithographic plate by water and the image areas by ink.

Fountain solution - Constituents, use of each constituent, PH and conductivity,

Printing ink - Differences between liquid ink and paste ink, Raw materials of ink colourant (pigment and dyestuff), solvent, plasticiser, resin, oil, drier and additives (wax antioxidant, surfactant), ink strength, ink drying - penetration, oxidation quickset, evaporation, radiation polymerisation (UN and electron beam), IR radiation; rheology of paste inks in terms of viscosity, thixotropy, visco-elasticity, tack, length and flow. Different types of inks - quick set, heat set, moisture set inks, sheet red web fed inks, water-based inks. Characteristics of letterpress, offset, gravure, flexographic and screen inks.

Paper - Paper manufacture - sulphate process of chemical pulp preparation, bleaching, beating, internal and external sizing, coating. Paper characteristics paper grain, dimensional strength, paper acidity, runnability & printability. Requirements of letterpress, lithographic, gravure, flexographic and screen-printing papers

Adhesives - Characteristics of class-1, 2 & 3 adhesives, adhesives used in lamination & book binding, requirement of an adhesive pH of ink, paper and adhesives.