



**WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION
AND SKILL DEVELOPMENT**

(A Statutory Body under Government of West Bengal Act XXVI of 2013)
(Technical Education Division)

WBSCTVESD Curriculum Structure for Diploma Courses in 3D Animation and Graphics

Semester - I

Sl. No	Category of Courses	Course Title	L	T	P	Contact Hours	Credit	Marks
1.	Basic Science	Mathematics-I	2	1	0	3	3	100
2.	Basic Science	Applied Physics -I	2	1	0	3	3	100
3.	Basic Science	Applied Chemistry	2	1	0	3	3	100
4.	Humanities & Social Science	Communication Skill in English	2	0	0	2	2	100
5.	Engg. Science	Engineering Graphics	0	0	3	3	1.5	100
6.	Engg. Science	Basics Sketching	0	0	3	3	1.5	100
7.	Basic Science	Applied Physics -I Lab	0	0	2	2	1	100
8.	Basic Science	Applied Chemistry Lab	0	0	2	2	1	100
9.	Humanities & Social Science	Sports & Yoga	0	0	2	2	1	100
10.	Humanities & Social Science	Communication Skill in English Lab	0	0	2	2	1	100
Total Credit and Marks							18	1000

Syllabus for Engineering Mathematics-I

Course Title:	Engineering Mathematics-I
Course Code:	BS101/M-I
Number of Credits :	3(L: 2+1: T) P: 0
Pre Requisites :	1) Basic Formulae of Algebra, Trigonometry should be known 2) Preliminary knowledge of the vector
Total Contact Hours :	45 hrs.

Aim: Engineering Mathematics is the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with the need of engineering branches. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on the application of various contents like algebra, complex numbers, vectors, trigonometry and derivative. This course will develop analytical abilities to make exact calculations and provide a continuing educational base for the students.

Course Objectives: After the completion of the course the students will be able to

- apply the basic concepts of logarithm, complex number, quadratic equation and binomial theorem for solving the engineering and practical problems.
- find the solutions of vector oriented problems like work done, moment etc by applying vector algebra.
- simplify trigonometric expressions and solve trigonometric equations which will be useful in solving the scientific problems.
- analyze limit, continuity, derivatives of different functions and physical interpretation of derivatives which will be applicable in real situation.

Course Content

Unit-1

Algebra

1.1 Logarithm:

3 Hours

1.1.1 Definition of natural and common logarithm.

1.1.2 General Properties of logarithm and simple problems

Syllabus for Engineering Mathematics-I

1.2 Complex Numbers:

5 Hours

- 1.2.1 Definition of Complex numbers, Real and Imaginary parts of a complex number, Equality of two complex numbers, Conjugate of a complex number
- 1.2.2 Modulus and Argument of a complex number and simple problems
- 1.2.3 Polar and Cartesian forms of a complex number and their relation.
- 1.2.4 Algebraic operations (Addition, Subtraction, multiplication, Division) of complex numbers
- 1.2.5 De Moivre's Theorem (without proof) and simple problems.
- 1.2.6 Cube roots of unity and their properties with problems.

1.3 Quadratic Equations:

4 Hours

- 1.3.1 Definition of Quadratic Equations.
- 1.3.2 Finding the roots of a quadratic equation, conjugate roots & simple problems
- 1.3.3 Nature of the roots using discriminant & problems
- 1.3.4 Relation between roots and co-efficients & problems
- 1.3.5 Formation of quadratic equations if roots are given.

1.4 Binomial Theorem:

4 Hours

- 1.4.1 Definition of factorial of a number, permutation (nPr) & combination (nCr) with formula only
- 1.4.2 Binomial Theorem (without proof) for any index, simple problems on positive index only
- 1.4.3 General Term and Middle Term and problems
- 1.4.4 Expansion of $(1+x)^{-1}$, $(1-x)^{-1}$, where $|x| < 1$, exponential & logarithmic series only (no problem)

Unit-2

Vector Algebra

7 Hours

- 2.1 Definition of vector and types of vectors
- 2.2 Concept of a position vector and Ratio formula & simple problems
- 2.3 Rectangular resolution of a vector
- 2.4 Equality, addition, subtraction of vectors and multiplication of a vector by a scalar
- 2.5 Scalar (dot) and Vector (cross) product of two vectors with properties & simple problems
- 2.6 Application of dot product -- work done by a force, projection of a vector upon another
- 2.7 Application of cross product -- finding area of a triangle and parallelogram, moment of a force

Syllabus for Engineering Mathematics-I

Unit-3

Trigonometry

10 Hours

- 3.1 Concept of trigonometrical angles, measurement of angles in degree, radian and grade & their relation only.
- 3.2 Trigonometrical ratios of angles, associated angles, Trigonometric ratios of some standard angles, problems
- 3.3 Compound angles formula (without proof), multiple, sub-multiple angles & simple problems
- 3.4 Solutions of Trigonometrical Equations, simple problems (angle lies between 0 and 2π)
- 3.5 Inverse Circular Function & simple problems
- 3.6 Properties of triangle, basic formulae only

Unit-4

Function, Limit & Continuity, Derivative

4.1 Function

2 Hours

- 4.1.1 Definition of variables & constants
- 4.1.2 Definition of function with examples, domain and range of a function
- 4.1.3 Types of functions (even-odd, increasing-decreasing, inverse, periodic) with simple examples
- 4.1.4 Graph of trigonometric functions, $\sin x$, $\cos x$, $\tan x$ only

4.2 Limit & Continuity

2 Hours

- 4.2.1 Definition of limit (with left hand limit & right hand limit), Fundamental Theorem on limit (only statement), standard limits and simple problems
- 4.2.2 Continuity of functions, elementary test for continuity of functions (finite limit)

4.3 Derivative

8 Hours

- 4.3.1 Definition of derivatives
- 4.3.2 Derivatives of standard functions
- 4.3.3 Rules of differentiation of sum, difference, product and quotient of functions.
- 4.3.4 Derivatives of composite functions (Chain Rule)
- 4.3.5 Derivatives of inverse circular functions, implicit functions and logarithmic differentiation
- 4.3.6 Derivative of parametric functions, derivative of a function with respect to another function

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4.3.7 Second order derivatives with simple problems

4.3.8 Application of derivatives –Physical & Geometrical interpretation of derivative, checking increasing-decreasing functions, finding velocity & acceleration, Maxima-Minima of function of single variable with simple problems.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective questions- 20 marks (1 mark each question), (At least 5 question from each **group**)
2. Subjective questions- 40 marks (at least 2 questions of 10 marks from each **group**)
 - **Group- A** contains Unit-1 & Unit-2 (At least 40 marks); **Group-B** contains Unit-3 (At least 20 marks); **Group-C** contains Unit-4(At least 20 marks)

N.B.- Student will answer objective type questions of 20 marks and for subjective question of 40 marks, taking at least one question from each **group** of the above three **groups**.

B. For the internal Assessment 40 marks:

1. Class Test Examination/Internal Examination; 20 marks; choose best two out of three Class Test Examinations/ Internal Examinations
2. Class Attendance; 10 marks
3. Viva/ Quiz/Presentation/Assignment/Project/Report etc.; 10 marks

Syllabus for Engineering Mathematics-I

Text Books & Reference -

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Konch & Dey, Bhagabati Publication
3. Engineering Mathematics, Babu Ram, Pearson
4. Trigonometry, S.L.Loney, S.Chand & Co.
5. Higher Algebra, H. S. Hall & Knight, Book Palace, New Delhi
6. Advanced Engineering Mathematics, E. Kreyszig, Wiley
7. Engineering Mathematics, A. Sarkar, Naba Publication
8. Diploma Engineering Mathematics, B. K. Paul, U.N.Dhar & Sons
9. Analytic Geometry Two & Three Dimensional and **Vector Analysis**, R. M. Khan, New Central Book Agency
10. Higher Algebra: Classical, S.K. Mapa, Sarat Book House
11. Introduction to Real Analysis, S.K. Mapa, Sarat Book House
12. Engineering Mathematics, Reena Garg, Khanna Publishing House, New Delhi
13. Calculus and Analytic Geometry, G. B. Thomas, R. L. Finney, Addison Wesley
14. Engineering Mathematics, V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Vikas Publishing House.
15. Advanced Engineering Mathematics, Reena Garg & Chandrika Prasad, Khanna Publishing House, New Delhi
16. Web portal: <https://www.ndl.gov.in/homestudy/science>
<https://ncertbooks.ncert.gov.in/login>
<https://epathshala.nic.in/>
<https://webscte.co.in/>
<https://en.wikipedia.org/wiki/>
<https://openlibrary.org/>
<https://www.youtube.com/>
<http://content.inflibnet.ac.in/>
<https://doabooks.org/>
<https://www.oapen.org/home>
<http://www.gutenberg.org/>
17. Apps in Google Play Store: National Digital Library
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Applied Physics for Sem-I (Theory)

Reviewed and prepared by Syllabus-Sub-committee, on the basis of recommendation of AICTE

Sem –I (Theory)

Course Code	:	BS103
Course Title	:	Applied Physics-I
Number of credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	High School Level Physics
Course Category	:	BS

Course Content:

Unit 1: Physical world, Units and Measurements

Physical quantities; fundamental and derived, Units and systems of units (CGS and SI units),

Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis.

Measurements: Need, measuring instruments, least count, types of Measurement (direct, indirect), Errors in Measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

Unit 2: Force and Motion

Force, Momentum, Conservation of linear momentum, its applications such as recoil of gun, numerical problems rockets (concept only), Impulse and impulsive force.

Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), concept of Centripetal and centrifugal forces with examples (No derivation, only formula) banking of roads and bending of cyclist, concept and formula and numerical problems.

Unit 3: Work, Power and Energy

Work: Concept and units, examples of zero work, positive and negative work

Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on rough inclined plane.

Energy and its units, kinetic energy and potential energy, Conservation of mechanical energy for freely falling bodies(simple numerical problems), transformation of energy (examples only).

Power and its units, power and work relationship, calculation of power (numerical problems).

Unit 4: Rotational Motion

Translational and rotational motion with examples, Definition of torque and angular momentum and their relation, Conservation of angular momentum (quantitative) and its applications.

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only). Simple numerical problems.

Unit 5: properties of Matter

Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve.

Surface tension: Concept, units, cohesive **and adhesive forces**, angle of contact, Capillary rise (formula only), applications of surface tension, effect of temperature and impurity on surface tension.

Viscosity and coefficient of viscosity: terminal velocity, Stoke's law and effect of temperature on viscosity.

Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numericals) and its applications (mention name only).

Unit 6: Heat and Thermometry

Concept of heat and temperature, basic concepts of measurements of heat and temperature, modes of heats transfer (conduction, convection and radiation with examples), Co-efficient of thermal conductivity simple numerical problems.

Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions of solids and relation amongst them, specific heats C_p & C_v of a gas and their relationship (Mention only).

References:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. Engineering Physics by DK Bhattacharya & Poonam Tandan; Oxford University Press, New Delhi
6. Comprehensive Practical Physics, Vol,I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
7. Practical Physics by C.L. Arora, S. Chand Publication.
8. Comprehensive Physics Vol,I & II.

Applied Physics for Sem-I (Lab)

Course Code	:	BS107
Course Title	:	Applied Physics-I Labs
Numbers of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives:

Study of Applied Physics aims to give an understanding of physical world by observations and predictions. Concrete use of physical principles and analysis in various fields of engineering and technology is very prominent. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

List of Practical's/Activities(To perform minimum 8 practical's).

1. To measure the volume of the material of a given hollow cylinder, using a Vernier calipers.
2. To determine the area of cross section of a thin wire using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/ surface using a spherometer.
4. To find the co-efficient of friction between wood and glass using a horizontal board.
5. To determine force constant of a spring using Hook's law.
6. To find the moment of inertia of a flywheel.
7. To find the viscosity of a given liquid (Glycerin) by Stoke's law
8. To find the co-efficient of linear expansion of the material of a rod.
9. To **verify** Boyle's law.
10. To determine the relative density of sand by using a sp. gr. Bottle.

Reference books:

1. Text books of Physics for Class-XI & XII (Part-I & II); N.C.E.R.T., Delhi.
2. Comprehensive Practical Physics, Vol-I & II, JN Laxmi Publications (P) Ltd.,
3. Practical Physics by C.L. Arora, S. Chand Publication.

Applied Chemistry

Course Code	:	BS105
Course Title	:	Applied Chemistry
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	High School Level Chemistry
Course Category	:	BS

Course Objectives:

There are numerous number materials used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyse and properties of natural raw materials require for producing economical and eco-friendly finished products.

- Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.
- Use relevant water treatment method to solve domestic and industrial problems.
- Solve the engineering problems using knowledge of engineering materials and properties.
- Use relevant fuel and lubricants for domestic and industrial applications
- Solve the engineering problems using concept of Electrochemistry and corrosion.

Instruction on question setting:

- Question paper contains three groups A, B and C. Unit 1 and unit 2 are included in group A, unit 3 and unit 4 in group B, unit 5 in group C.
- 20 (twenty) number of questions are of objective types consisting of all groups, each carrying 1 (one) mark.
- 5 (five) questions are to be answered taking at least one from each group (each question carries 8 marks).

Course Content:

• Unit 1: Atomic Structure, Chemical Bonding and Solutions

Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers - orbital concept. Shapes of s, p and d orbitals Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.

Type of chemical bonding: ionic, covalent, metallic and hydrogen bonds. Example of each type. Hybridization, sp^3 , sp^2 , sp , example: $BeCl_2$, BF_3 , CH_4 , NH_3 , H_2O ; structure of diamond, graphite.

Solution - idea of solute, solvent and solution, methods to express the concentration of solution - molarity (M = mole per liter), ppm, mass percentage, volume percentage and mole fraction.

• Unit 2: Water

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by EDTA method, total dissolved solids (TDS) alkalinity estimation.

- 1) Water softening techniques - soda lime process, zeolite process and ion exchange process.
- 2) Municipal water treatment (in brief only) - sedimentation, coagulation, filtration, sterilization.

Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

• Unit 3: Engineering Materials

Natural occurrence of metals - minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy - brief account of general principles of metallurgy. Extraction of iron from haematite ore using blast furnace, aluminium from bauxite along with reactions, reactions during copper extraction. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.

General chemical composition, composition based applications (elementary idea only details omitted):

Port land cement and hardening, Glasses Refractory and Composite materials.

Polymers - monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon - 6, nylon - 66, Bakelite only), rubber and vulcanization of rubber.

• Unit 4: Chemistry of Fuels and Lubricants

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

Proximate analysis and ultimate analysis of coal solid fuel

petrol and diesel - fuel rating (octane and cetane numbers),

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication - function and characteristic properties of good lubricant, classification with examples, lubrication mechanism - hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point, cloud and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.

• Unit 5: Electro Chemistry

Electronic concept of oxidation, reduction and redox reactions.

Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems.

Elementary concept of pH and buffer.

Industrial Application of Electrolysis –

- Electrometallurgy
- Electroplating
- Electrolytic refining.

Application of redox reactions in electrochemical cells –

- Primary cells - dry cell,
- Secondary cell - commercially used lead storage battery, fuel and Solar cells.

Introduction to Corrosion of metals –

- definition, types of corrosion (chemical and electrochemical), H₂ liberation and O₂ absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.

Internal corrosion preventive measures –

- Purification, alloying and heat treatment and

External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.

Suggested Sessional work:

- **Unit 1: Atomic Structure, Chemical Bonding and Solutions**

Assignments: Writing electronic configuration of elements up to atomic number 30 ($Z = 30$). Numerical on molarity, ppm, mass percentage, volume percentage and mole fraction of given solution.

Seminar: 1. Quantum numbers,
2. Discuss the metallic properties such as malleability, ductility, hardness, high melting point, conductance of heat and electricity, magnetic properties of metals.

Projects: Model of molecules BeCl_2 , BF_3 , CH_4 , NH_3 , H_2O

- **Unit 2: Water**

Assignments: Simple problems on hardness calculation.

Seminar: 1. Quality and quantity requirement of water in house and industry.
2. Quality of control measures of effluents (BOD & COD).

Projects: Collect water samples from different water sources and measure of hardness of water.

- **Unit 3: Engineering Materials**

Assignments: Preparation of table showing different ores of iron, copper and aluminium metals along with their chemical compositions and classify in to oxide sulphide halide ores.

Seminar: Discuss the chemical reactions taking place in Blast Furnace in extraction of iron; Reactions occurring during extraction of copper and aluminium metals.

Projects: Make table showing place of availability of different ores in India and show places on India map.

- **Unit 4: Chemistry of Fuels and Lubricants**

Assignments: Calculation of HCV and LCV of fuel using fuel composition in Dulong's formula.

Seminar: Chemical structure of fuel components influence on fuel rating.

Projects: Mapping of energy resources in India. Collection of data of various lubricants available in the market.

- **Unit 5: Electro Chemistry**

Assignments: Simple problems on Faradays laws of electrolysis.

Seminar: 1. Corrosion rate and units.
2. Corrosion preventions.

Projects: Mapping of area in India prone to corrosion. Collection of data of various electrochemical cells batteries used in equipment and devices and available in market. Visit to sites such as Railway station to watch corrosion area in railways and research establishment in and around the institution.

Applied Chemistry

References/Suggested Learning Resources:

(a) Books:

- 1) Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
- 2) Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
- 3) C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
- 4) S. S. Dara & S.S.Umare, Engineering Chemistry, S. Chand. Publication, New Delhi, New Delhi, 2015.
- 5) Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
- 6) S. Vairam, Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
- 7) G. H. Hugar & A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
- 8) Rajesh Agnihotri, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

(b) Open source software and website address:

- 1) www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
- 2) www.visionlearning.com (Atomic structure and chemical bonding)
- 3) wwwcheml.com (Atomic structure and chemical bonding)
- 4) <https://www.wastewaterelearning.com/elearning/> (Water Treatment)
- 5) www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
- 6) www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
- 7) www.chemcollective.org (Metals, Alloys)
- 8) www.wqa.org (Water Treatment)

Applied Chemistry Lab

Course Code	:	BS109
Course Title	:	Applied Chemistry Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives:

There are numerous number of materials used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. The course aims to supplement the factual knowledge gained in the lectures by first hand manipulation of processes and apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering problems.

LIST OF PRACTICALS:

Perform any 12 (twelve) Laboratory Practicals:

Volumetric and Gravimetric analysis.

1. Preparation of standard oxalic acid and standard potassium dichromate solution.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution and phenolphthalein as indicator.
3. Standardization of potassium permanganate solution using standard oxalic acid and determination of percentage of iron present in given Hematite ore by KMnO_4 solution
4. a) Standardization of sodium thiosulphate using standard potassium dichromate solution by IODOMETRY.

Applied Chemistry

- b) Iodometric estimation of copper in copper pyrite ore.
5. Volumetric estimation of total acid number (TAN) of given oil.
6. Volumetric estimation of
 - a. Total hardness of given water sample using standard EDTA solution.
 - b. Alkalinity of given water sample using 0.01N sulphuric acid.
7. Proximate analysis of coal
 - a. Gravimetric estimation moisture in given coal sample.
 - b. Gravimetric estimation ash in given coal sample

Instrumental analysis

8. Determine the conductivity of given water sample.
9. Determination of the Iron content in given cement sample using colorimeter.
10. Determination of viscosity of lubricating oil using Redwood viscometer.
11. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
12. To verify the first law of electrolysis of copper sulfate using copper electrode.
13. Construction and measurement of emf of electrochemical cell (Daniel cell).
14. To study the effect of dissimilar metal combination on cell emf.
15. To apply thin layer chromatography for separation of mixture of inorganic/organic compounds.
16. Qualitative detection of ARSENIC in a given sample of water (~5 ppm solution of sodium arsenite)
17. Determination of dissolved oxygen in a sample of water.
18. Determination of pH value of unknown solution.

Reference book

VOGELS INORGANIC QUANTITATIVE ANALYSIS.

Members present in Syllabus Committee:

1. **Dr. Ujjval Kumar Bhattacharyya** (convener, lecturer, North Calcutta Polytechnic).
2. **Dr. Gandhi Kumar Kar** (Professor and head of the Dept. of Chemistry, Presidency University, Kolkata)
3. **Dr. Shyamal Kumar Chattopadhyay** (Professor IEST, Shibpur).
4. **Dr. Mrinal Kanti Bain**, lecturer, Calcutta Technical School.
5. **Dr. Dipankar Maity**, lecturer, Birla Institute of Technology.
6. **Dr. Ranjal Paul**, Sr. Manager, Sun Pharmaceuticals Baroda.
7. **Prolay Roy**, lecturer, Memari Government Polytechnic.

Syllabus for Engineering Graphics

Name of the Course : Engineering Graphics	
Course Code : ES 101	Semester : First
Duration : 17 Weeks	Maximum Marks : : 100
Lecture : Nil	Assignment : 20
	Class Performance : 20
Tutorial : Nil	Viva Voce : 10
	Attendance : 10
Practical : 3 hrs./week	External (Viva, Sketch Book & Drawing Sheet) : 40
Credit : 1.5	

Aim :

1. The Course is aimed to develop the basic graphic skills so that the students can prepare Engineering Drawing in their practical field.
2. Understand the fundamentals of Engineering Graphics.
3. Read and interpret object drawing.
4. To develop the skills of Computer Aided Drafting and can easily cope up the skill of drafting for modern drawing offices/industries.

Objectives :

1. To develop sense of Scale and drawing technique of different curves and their application.
2. To develop drafting and sketching skills, to know the applications of drawing equipment and get familiarize with Indian Standards related to engineering drawing.
3. To develop concept of Orthographic Projection and to draw Orthographic Views for different objects.
4. To visualize three dimensional objects from Orthographic Views and to draw isometric views/projections.
5. To be familiar with AutoCAD and to develop the skill of drafting in AutoCAD by using different commands.

Pre-requisites :

1. Unambiguous and clear visualization.
2. Sound Pictorial Intelligence.

Unit No.	Contents
Unit 1	1.1 Letters and numerals (Single Stroke Vertical) 1.2 Conventions of lines and their applications 1.3 Concept of Representative Fraction (R.F), Reduced scale, Enlarged scale & Full Scale, Engineering Scale such as Plain Scale & Diagonal Scale. 1.4 Dimensional Techniques - Unidirectional System and Aligned System.
Unit 2	2.1 Geometrical Construction : a) Draw Regular Polygons, Ellipse, Parabola, hyperbola b) Draw Curve passing through given no. of points, cycloid, involute of a circle and polygon
Unit 3	3.1 Introduction to Orthographic Projection : Concept of First Angle & Third Angle of projection. Projections of lines(limited to both ends in 1st quadrant) : parallel to the reference planes, inclined to the reference planes (1 st Angle Method) 3.2 Projections of solid body: Regular Polygonal Pyramid, Cylinder, Cone - inclined to only one reference plane (1 st Angle Method)

Unit 4	4.1 Conversion of Pictorial Views into orthographic views (Simple Objects & First Angle Projection Method Only)
Unit 5	5.1 Introduction to Isometric Projections, Concept of Isometric Scale and Isometric Views 5.2 Conversion of Orthographic views into Isometric Views/Projections : Simple Objects e.g. regular prism, pyramid, cone, cylinder.
Unit 6	6.1 Free hand sketches of engineering elements such as thread profile, nuts, bolts, studs, set screws, washers, locking arrangements etc. and their conventional representation (For branches other than Mechanical Engineering, the teachers should select branch specific elements for free hand sketching)
Unit 7	7.1 Introduction to different commands and toolbars of AutoCAD a) Draw command : Lines, Circle, Polygon, Arc, Ellipse, Polyline, Fillet, Chamfer, Hatch, Array (Rectangular & Polar) etc. b) Modify Command : Offset, Trim, Extend, Erase, Fillet, Chamfer, Break, Lengthen, Copy, Move, Mirror, Stretch, Match Properties, Pedit etc. c) View : Zoom All, Zoom Window, Zoom Extent etc. d) Dimensioning : Dimension Setting, Linear, Aligned, Radial, Diameter, Leader, Angular etc. e) Text : Text Style, Dtext, Mtext, DDedit etc. f) Format : Limits, Layers, Pan etc. 7.2 Making a few simple 2D drawings in AutoCAD.

Sl. No.	Practical Exercise	Unit No.	Hrs.
1	Draw horizontal, vertical, 30°, 45°, 60°, 75°, different types of lines, dimensioning styles using Tee and Set Squares / Drafters. (Do this exercise in Sketch Book)	1	02
2	Write single stroke vertical alphabets and numerical (7:4 ratio) (Do this exercise in Sketch Book)	1	02
3	Draw regular geometric constructions and redraw/copy the given figure (Do this exercise in Sketch Book)	1	02
4	Draw at least two problems on plain scale and two problems on diagonal scales (Do this exercise in Sketch Book)	1	03
5	Draw problems on ellipse, parabola, involute and cycloid (Do this exercise in Sketch Book)	2	06
6	Draw at least two problems on lines and two problems on solid (First Angle Projection method) (Do this exercise in A2 size drawing sheet)	3	09
7	Plan, Elevation and Side View of at least two pictorial views to be drawn on one A2 size Drawing Sheet along with dimensions	4	06
8	At least Two Isometric Views and two Isometric Projections to be drawn on one A2 size Drawing Sheet	5	06

9	Draw free hand sketches / conventional representation of machine elements such as thread profile, nuts, bolts, studs, set screws, washers, locking arrangements etc.	6	03
10	Simple geometrical figures such as triangle, rectangle, polygon, circle, ellipse, and simple orthographic views of brackets, gaskets etc. to be drawn in AutoCAD and Printout to be taken on A4 size Sheet. At least two sheets to be prepared.	7	12
Total Period			51

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
N.D.Bhatt	Engineering Drawing	53 rd Edition	Charotkar Publishing House
R.K.Dhawan	Engineering Drawing	Revised Edition 2015	S.Chand & Co.
K. Venugopal & V. Prabhuraja Raja	Engineering Drawing and Graphics + AutoCAD		New Age Publication

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
S.N. Lal	Engineering Drawing		CENGAGE
Basant Agrawal & C M Agrwal	Engineering Drawing		Tata McGrew Hill
Dhananjay A Jolhe	Engineering Drawing with an Introduction to AutoCAD		Tata McGrew Hill
S.P.Dey	AutoCAD 2014		Vikas Publisher
P.S. Gill	Engineering Drawing		S.K.Kataria & Sons.

References :

- 1.Engineering Graphics Syllabus of AICTE Model Curriculum 2019.
2. Syllabus of Technical Drawing (Old) of W.B.S.C.T.E

Syllabus for Basics of Sketching (1st Semester)

Name of the Course: 3D Animation and Graphics Name of the Subject: Basics of Sketching.	
Course Code:	Semester: First
Duration: 15 weeks	Maximum Marks:
Teaching Scheme	Examination Scheme
Theory & Tutorial: NIL	Attendance & Teacher Assessment: 50% of
Pre-requisite Knowledge: NIL	Maximum marks
Practical: 3hrs./week	End semester examination: 50% of Maximum marks
Practical: 3hrs./week	Credit: 1.5
Course Objectives	
This course enables the students to:	
1.	Covering basic sketching concepts and techniques.
2.	Understanding fundamental principles of color theory.
3.	Exploring the importance of lines, shapes, forms, and proportions in art and design.
4.	Developing a grasp of form and proportion principles in art.
5.	Comprehending the principles of perspective in visual art.
6.	Progressing from portrait drawing proficiency to mastering figure drawing.
Course Outcomes	
After the completion of this course, students will be able to:	
1.	Develop basic sketching skills for effective representation of objects, scenes, and ideas.
2.	Gain knowledge and skills for effective color application in diverse art and design contexts.
3.	Understand how lines and shapes convey meaning and visual interest in artistic and design projects.
4.	Accurately perceive, analyze, and manipulate forms and proportions in artistic and design contexts.
5.	Apply perspective techniques to create accurate spatial depth in artworks and designs.
6.	Depict human facial features, proportions, expressions, and overall body anatomy with accuracy and skill.
Pre- Requisite: NA	

Content Details		Hours/Units
Module1	Introduction to Sketching	2
	1. What is Sketching? 2. Why Learn Sketching? 3. Basic Sketching Tools and Materials 4. Types of Pencils 5. Pencil Grips and Techniques 6. Shading Basics	
	Colour Basics	

Module2	<ol style="list-style-type: none"> 1. Primary Colours 2. Secondary Colours 3. Tertiary Colours 4. Colour Wheel 5. Complementary Colours 6. Warm and Cool Colours 7. Hue, Saturation, and Brightness 8. Colour Schemes 9. Colour Psychology 	6
Module3	Lines and Shapes	3
	<ol style="list-style-type: none"> 1. Definition of Lines 2. Types of Lines 3. Uses of Lines 4. Line Quality 5. Implied Lines 6. Definition of Shapes 7. Types of Shapes 8. Composition and Balance 9. Shape Relationships 10. Symbolism of Shapes 11. Shapes in Design 	
Module4	Understanding Forms and Proportion	4
	<ol style="list-style-type: none"> 1. Definition of Forms 2. Types of Forms 3. Creation of Forms 4. Function of Forms 5. Texture and Surface of Forms 6. Definition of Proportion 7. Golden Ratio 8. Human Proportions 9. Architectural Proportions 10. Visual Harmony 	
Module5	Understanding Perspectives	6
	<ol style="list-style-type: none"> 1 One-Point Perspective 2 Two-Point Perspective 3 Three-Point Perspective 	
Module6	Still life drawing	8
	<ol style="list-style-type: none"> 1. Introduction to Still Life Drawing 2. Understanding Composition 3. Exploring Line and Contour 4. Value and Shading Techniques 5. Texture and Surface Details 	

Module7	Portrait Drawing	8
	<ol style="list-style-type: none"> 1. Proportion and Guidelines 2. Block In the Features 3. Shape of the Head 4. Eyes and Eyebrows 7.5. Nose and Mouth 6. Ears and Hair 7. Shading and Texture 	
Module8	Figure Drawing	8
	<ol style="list-style-type: none"> 1. Select a Model 2. Gesture Drawing 3. Proportion and Structure 4. Anatomy Study 	

Suggested Books:

Perspective Made Easy

By Ernest Norling (Author)

Fun With A Pencil: How Everybody Can Easily Learn to Draw

By Andrew Loomis

Figure Drawing for all it's worth

By Andrew Loomis

Drawing the Head and Hands

By Andrew Loomis

COMMUNICATION SKILLS IN ENGLISH

Course Code	HS101
Course Title	Communication Skills in English
Number of Credits and L-T-P	2 [L - 2, T - 0, P - 0]
Course Category	Humanities & Social Sciences

Course Objectives:

The course intends to:

- Impart the basic theory and practice of communication.
- Make students aware about the importance of soft skills as essential Life skills for both personal development and professional excellence.
- Train students for improving their reading, writing, listening and speaking skills.
- Clear the learners' misconceptions and misunderstandings of English grammar.
- Give students the skills and the confidence required to speak English fluently.

Course Contents

Unit1: Communication: Theory and Practice:

(Marks division: 04)

- Basic of Communication: Introduction, meaning and definition, process of communication etc.
- Types of communication: formal and informal, verbal, non-verbal and written. Barriers to effective communication.
- 7 Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous).
- Technical Communication.

Unit-2 Soft Skills for Professional Excellence:

(Marks division: 08)

- Introduction: Soft Skills and Hard Skills.
- Time Management.
- Motivation
- Stress Management.
- Emotional Intelligence.
- Self-awareness.
- Problem solving skills
- Decision Making
- Interpersonal Skills

Unit-3: Reading Comprehension:

(Marks division: 10)

- Comprehension of a written text

- Note Taking.

Unit-4: Professional Writing:

- Writing Reports - (Marks division: 20)
- Writing Emails – (Marks division: 10)
- Writing Memo – (Marks division: 10)
- Job Application Letters – (Marks division: with CV - 15)
- CV/Resume – (Marks division: 10)

Unit-5: Vocabulary and Grammar: (Marks division: 08)

- Remedial Grammar and Exercises
- Parts of speech, active and passive voice, tenses etc.

Course Outcomes:

After the completion of the Course, the learners will be able to:

- Understand, remember and effectively apply the Theory of Communication.
- Inculcate the essential soft skills in their life.
- Substantially improve their reading, writing, listening and speaking skills.
- Clarify and/ or remedy their misunderstanding and misconceptions about grammar which they have learnt till date.
- Overcome their hesitations, inhibitions and fear and gain confidence in communicating in simple, easily understandable English.

#Note: No Subjective questions are to be set for the Theoretical examinations from Units 1, 2 and 5 of the syllabus.

COMMUNICATION SKILLS IN ENGLISH - LAB

Course Code	HS105
Course Title	Communication Skills in English Lab
Number of Credits and L-T-P	2 [L - 0, T - 0, P - 2]
Course Category	Humanities & Social Sciences

Course Objectives:

The course intends to:

- Impart the basic theory and practice of communication.
- Make students aware about the importance of soft skills as essential Life skills for both personal development and professional excellence.
- Train students for improving their reading, writing, listening and speaking skills.

- Clear the learners' misconceptions and misunderstandings of English grammar.
- Give students the skills and the confidence required to speak English fluently.

Sessional 100 Marks (Internal: 60 Marks + External: 40 Marks)

Course Contents:

- Introducing yourself and others:
 - Talking about yourself
 - Describing people
- Speaking about your free time:
 - Talking about your free time
 - Giving reasons for things you like
 - Discussing daily routines
- Giving instructions and advice:
 - Giving and following instructions
 - Giving route directions
 - Advising about places/ tourist spots etc.
- Out and about:

Talking about

 - Going shopping
 - Eating in a restaurant
 - Films and Television
 - Holidays
 - Social Events
- Speaking and listening:
 - College Life
 - Talking about the World, Weather, Environment, etc.
- Enhancing employability and professional skills:
 - Job Interviews
 - Group discussions
 - Professional Presentations

Course Outcomes:

After the completion of the Course, the learners will be able to:

- Understand, remember and effectively apply the Theory of Communication.
- Inculcate the essential soft skills in their life.
- Substantially improve their reading, writing, listening and speaking skills.

- Clarify and/ or remedy their misunderstanding and misconceptions about grammar which they have learnt till date.
- Overcome their hesitations, inhibitions and fear and gain confidence in communicating in simple, easily understandable English.

Sessional Activities

The students should prepare and write down the following activities in their sessional file and submit it to the Internal Examiner. The signed sessional file should be brought during the External Sessional viva examination.

1. A brief introduction about themselves.
2. A brief write-up about how they spend their leisure time.
3. Write down at least five conversations in dialogue from topics listed in the sessional syllabus (students should practice all types of conversation given in the list).
4. (i) List the Dos and Don'ts of a job interview.
(ii) Write down anticipated questions (HR Round) asked during a job interview and write down appropriate answers to them.
5. List the Dos and Don'ts of an effective Group Discussion.
6. Prepare a professional Powerpoint Presentation (individually/ in groups) on a topic. The printouts of the slides should be attached in the sessional file.

Reference Books

- 01 English Skills for Technical Students (West Bengal State Council of Technical Education in collaboration with the British Council), Orient Black Swan
- 02 Communication Skills by Shri Sanjay Kumar & Ms. Pushp Lata, Oxford University Press
- 03 Improve Your Writing by Shri U.N. Arora & Ms. Lakshmi Chandra, Oxford University Press
- 04 Listening Skills by Shri Ian Mackay, Universities Press
- 05 Improving Teaching & Learning of English & Communication Skills in West Bengal Polytechnics Student Book, British Council
- 06 Development of Life Skills – II by Dr. Shalini Verma, Vikas Publishing House Pvt. Ltd.
- 07 Business Correspondence and Report Writing: A Practical Approach to Business and Technical Communication by R. C. Sharma, Krishna Mohan, Virendra Singh Nirban
- 08 Effective Technical Communication by Ashraf Rijvi
- 09 Personality Development and Soft Skills by Barun K. Mitra, Oxford University Press

Sports and Yoga

Course Code	HS103
Course Title	Sports and Yoga
Number of Credits and L-T-P	1 [L – 0, T – 0, P - 1]
Course Category	Humanities & Social Sciences
Prerequisites	Nil

Course Objectives:

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
- To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
- To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Content:

Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education
- Changing trends in Physical Education

Olympic Movement

- Ancient & Modern Olympics (Summer & Winter)
- Olympic Symbols, Ideals, Objectives & Values
- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhyanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness & Wellness
- Components of Physical fitness
- Components of Health related fitness
- Components of wellness
- Preventing Health Threats through Lifestyle Change

- Concept of Positive Lifestyle

Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

Kinesiology, Biomechanics & Sports

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
- Newton's Law of Motion & its application in sports.
- Friction and its effects in Sports.

Postures

- Meaning and Concept of Postures.
- Causes of Bad Posture.
- Advantages & disadvantages of weight training.
- Concept & advantages of Correct Posture.
- Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, BowLegs and Scoliosis.
- Corrective Measures for Postural Deformities

Yoga

- Meaning & Importance of Yoga
- Elements of Yoga
- Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
- Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Sha-shankasana)
- Relaxation Techniques for improving concentration - Yog-nidra

Yoga & Lifestyle

- Asanas as preventive measures.
- Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.
- Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
- Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.

- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pawan Muktasana, Ardh Matsyendrasana.
- Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

Training and Planning in Sports

- Meaning of Training
- Warming up and limbering down
- Skill, Technique & Style
- Meaning and Objectives of Planning.
- Tournament – Knock-Out, League/Round Robin & Combination.

Psychology & Sports

- Definition & Importance of Psychology in Physical Edu. & Sports
- Define & Differentiate Between Growth & Development
- Adolescent Problems & Their Management
- Emotion: Concept, Type & Controlling of emotions
- Meaning, Concept & Types of Aggressions in Sports.
- Psychological benefits of exercise.
- Anxiety & Fear and its effects on Sports Performance.
- Motivation, its type & techniques.
- Understanding Stress & Coping Strategies.

Doping

- Meaning and Concept of Doping
- Prohibited Substances & Methods
- Side Effects of Prohibited Substances

Sports Medicine

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention.
- Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

Sports/ Games

Following sub topics related to any one Game/Sport of choice of student out of:
Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming,
Table Tennis, Volleyball, Yoga etc.

- History of the Game/Sport.
- Latest General Rules of the Game/Sport.
- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.
- Sports Personalities.
- Proper Sports Gear and its Importance.

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

Course Outcomes:

On successful completion of the course the students will be able to:

- (i) Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
- (ii) Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- (iii) Learn breathing exercises and healthy fitness activities
- (iv) Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- (v) Perform yoga movements in various combination and forms.
- (vi) Assess current personal fitness levels.
- (vii) Identify opportunities for participation in yoga and sports activities.
- (viii) Develop understanding of health-related fitness components: cardio respiratory endurance, flexibility and body composition etc.
- (ix) Improve personal fitness through participation in sports and yogic activities.
- (x) Develop understanding of psychological problems associated with the age and lifestyle.
- (xi) Demonstrate an understanding of sound nutritional practices as related to health and physical performance.
- (xii) Assess yoga activities in terms of fitness value.
- (xiii) Identify and apply injury prevention principles related to yoga and physical fitness activities.
- (xiv) Understand and correctly apply biomechanical and physiological principles related to exercise and training.