SCHOOL OF MINES and METALLURGY
A Constituent of KAZI NAZRUL UNIVERSITY, Asansol

Diploma in Mining Engineering & Diploma in Metallurgical Engineering
(EFFECTIVE FROM THESESSION 2017-18)
Metallurgical Engineering

CURRICULAR STRUCTURE FOR FIRST YEAR FIRST SEMESTER

Paper Code	SUBJECT	CREDITS	PERIODS			EVALUATIONSCHEME			
			L	TU	PR	Internal Assessment	END SEMESTER EXAMINATION (ESE)		
						IA	Th	PR	TOTAL
DIPMETEN 101	Communicative English (GEN PAPER-1)	2	1	1	-	30	70		100
DIPMETPH 102	Basic Physics (CORE PAPER-1)	3	2	-	2	30	70	100	200
DIPMETCH103	Basic Chemistry (CORE PAPER-2)	3	2	-	2	30	70	100	200
DIPMETMC104	Mathematics (CORE PAPER-3)	5	4	1	-	30	70	-	100
DIPMETEM105	Engineering Mechanics (CORE PAPER-4)	4	3	1	-	30	70	-	100
DIPMETED106	Engineering Drawing (CORE PAPER-5)	4	2	-	3	15	35	50	100
DIPMETCF107	Computer Fundamentals (GEN PAPER-1)	3	1	-	3	15	35	50	100
DIPMETWS108	Workshop Practice-I (CORE WORKSHOP-1)	2	-	-	3	-	-	100	100
	Total	**26**	**15**	**3**	**13**	**180**	**420**	**400**	**1000**

Metallurgical Engineering

CURRICULAR STRUCTURE FOR FIRST YEAR SECOND SEMESTER

Sl.No.	Subject	Credits	Periods			Evaluation Scheme			
			L	TU	PR	Internal Assessment	End Semester Examination (ESE)		
						IA	TH	PR	TOTAL
1.	Business Economics & Accountancy (Syawam Based course)	3	3	-	-	30	70		100
2.	Applied Physics	3	2	-	2	15	35	100	150
3.	Applied Chemistry	3	2	-	2	15	35	100	150
4.	Engineering Mathematics	4	3	1	-	30	70	-	100
5.	Strength of Materials	3	2	1	-	30	70	-	100
6.	Electrical Technology	3	2	1	-	30	70	-	100
7.	Engineering Drawing-Part II	3	1	-	3	15	35	100	150
8.	Workshop Practice-II	2	-	-	3	-	-	100	100
9	Developmental of Life Skill	3	1	-	3	-	-	50	50
	TOTAL	27	17	3	13	135	315	450	900

STUDENT CONTACT HOURS PER WEEK: 33 hrs
L-Lecture, TU-Tutorials, PR-Practical, IA-Internal Assessment, ESE-End Semester Exam.

METALLURGICAL ENGINEERING

SECOND YEAR FIRST SEMESTER (THIRD SEMESTER)

Sl.No.	Subject	Credits	Periods			Evaluation Scheme					
			L	TU	PR	Internal Scheme			End Semester Examination (ESE)		
						TA	CT	TOTAL	ESE	PR	TOTAL
1.	FUNDAMENTALS OF ELECTRONICS	3	2	-	2	5	10	15	35	50	100
2.	FUNDAMENTALS OF METALLURGY	6	4		3	10	20	30	70	50	150
3.	METALLURGICAL THERMODYNAMICS	4	4	-	-	10	20	30	70	-	100
4.	MECHANICAL TESTING OF METALS	6	4	-	4	10	20	30	70	100	200
5.	MECHANICAL ENGINEERING	3	2	-	2	5	10	15	35	50	100
6.	WORKSHOP PRACTICE	2	-	-	3	-	-	-	-	100	100
7.	PROFESSIONAL PRACTICE - I	2	-	-	3	-	-	-	-	50	50
	TOTAL	**26**	**16**	**0**	**17**	**40**	**80**	**120**	**280**	**400**	**800**

STUDENT CONTACT HOURS PER WEEK: 33 hrs , DURATION : 15 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam..

METALLURGICAL ENGINEERING

SECOND YEAR SECOND SEMESTER (FOURTH SEMESTER)

Sl.No.	Subject	Credits	L	TU	PR	TA	CT	TOTAL	ESE	PR	TOTAL
			Periods			Internal Scheme			End Semester Examination (ESE)		
1.	IRON MAKING PROCESS	4	3	-	1	10	20	30	70	50	150
2.	PHYSICAL METALLURGY	5	3	-	3	10	20	30	70	100	200
3.	METAL WORKING	4	3	-	2	10	20	30	70	50	150
4.	FUEL, FURNACE & REFRACTORY	4	3	-	2	10	20	30	70	50	150
5.	ELECTRICAL ENGINEERING	3	2	-	2	5	10	15	35	50	100
6.	COMPUTER PROGRAMMING	2	1	-	2	-				50	50
7.	DEVELOPMENT OF LIFE SKILL – II	2	1	-	2	-				50	50
8.	PROFESSIONAL PRACTICE - II	2	1	-	2	-				50	50
	TOTAL	**26**	**17**		**16**	**45**	**90**	**135**	**315**	**450**	**900**

STUDENT CONTACT HOURS PER WEEK: 33 hrs , DURATION : 15 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam..

KAZI NAZRUL UNIVERSITY

Nazrul Road, Kalla Bypass More
P.O-Kalla(C.H), Dist.-Burdwan, Pin-713340

SCHOOL OF MINES and METALLURGY

Diploma in Mining Engineering & Diploma in Metallurgical Engineering
(EFFECTIVE FROM THESESSION 2017-18)

METALLURGICAL ENGINEERING

THIRD YEAR FIRST SEMESTER (FIFTH SEMESTER)

Sl.No.	Subject	Credits	L	TU	PR	TA	CT	TOTAL	ESE	PR	TOTAL
			Periods			**Internal Scheme**			**End Semester Examination (ESE)**		
1.	STEEL MAKING PROCESS	5	4	-	2	10	20	30	70	50	150
2.	FOUNDRY TECHNOLOGY	6	4	-	4	10	20	30	70	100	200
3.	METAL PROCESSING	5	4	-	2	10	20	30	70	50	150
4.	ELECTIVE – I : ALLOY STEEL & CAST IRON	4	4	-	-	10	20	30	70	-	100
5.	ENERGY & ENVIRONMENT CONTROL	3	3	-	-	10	20	30	70	-	100
6.	COMPUTER AIDED DRAFTING	1	-	-	2	-	-	-	-	50	50
7.	INDUSTRIAL PROJECT & ENTREPRENEURSHIP DEVELOPMENT	1	-	-	2	-	-	-	-	50	50
8.	PROFESSIONAL PRACTICE - III	1	-	-	2	-	-	-	-	50	50
	TOTAL	**26**	**19**		**14**	**50**	**100**	**150**	**350**	**350**	**850**

STUDENT CONTACT HOURS PER WEEK : 33 hrs ; DURATION : 15 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam.

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SCHOOL OF MINES and METALLURGY

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METALLURGICAL ENGINEERING

THIRD YEAR SECOND SEMESTER (SIXTH SEMESTER)

Sl.No.	Subject	Credits	L	TU	PR	TA	CT	TOTAL	ESE	PR	TOTAL
						Internal Scheme			**End Semester Examination (ESE)**		
						TA	CT	TOTAL	ESE	PR	TOTAL
1.	ADVANCE ENGINEERING MATERIALS & CORROSION METALLURGY	3	3	-	-	10	20	30	70	-	100
2.	HEAT TREATMENT TECHNOLOGY	6	4	-	4	10	20	30	70	100	200
3.	ELECTIVE – I I : FERRO ALLOYS & DRI	3	3	-	-	10	20	30	70	-	100
4.	NON - FERROUS METALLURGY	3	3	-	-	10	20	30	70	-	100
5.	INDUSTRIAL MANAGEMENT	4	4	-	-	10	20	30	70	-	100
6.	PROJECT WORK & SEMINAR	3	-	-	6	-	-	-	-	100	100
7.	PROFESSIONAL PRACTICE - IV	2	-	-	3	-	-	-	-	50	50
8.	GENERAL VIVA VOCE	3	-	-	-	-	-	-	-	100	100
	TOTAL	**27**	**17**		**13**	**50**	**100**	**150**	**350**	**350**	**850**

STUDENT CONTACT HOURS PER WEEK : 33 hrs ; DURATION : 15 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam.

NETALLURGICAL ENGINEERING
1ˢᵗ SEMESTER
SYLLABUS FOR COMMUNICATIVE ENGLISH

	Content
Unit:1 Comprehending a text	1.1 Identifying important information & keywords using SQ3R (i.e. **survey, question, read, recite, and review**) or similar technique and linking words. 1.2 Comprehension –Responding to multiple choice& short-answer questions from the text; making sentences with marked words from the text to bring out the meaning of the words, filling up gaps to complete information structure, Identifying central idea of the text.
Unit: 2 Note taking	2.1 Using mind-mapping to establish relationship among information 2.2 Using SQ3R(or similar) technique , mind mapping , symbols, abbreviations, diagrams & charts to represent important information from written text in note form

Unit: 3
Writing Technical Paragraphs
	3.1Developing notes into paragraph (that is, from given information in diagrams, pictures, charts & so on).
	 Concept of Topic Sentence and Supporting sentences.
	  The paragraph types are:
	  i. Description of process and route;
	  ii. Problem-Solution type;
	  iii. Cause & Effect type;
	Comparing & Contrasting type.

Unit:4 Writing Technical Reports	4.1 The reports should contain a Front Cover and Covering Letter i) Progress Reports ii) Industrial Accident Report iii) Feasibility Report

Text Books:	
Name of Authors	Title of the Book
Ghosh, Mukherjee &Ghosh (WBSCTE & The British Council)	English Skills for Technical Students
P.C. Wren & H. Martin	High School English Grammar & Composition
Dr. Sunita Mishra Dr. C. Muralikrishna	Communication skills for Engineers

S.P.Dhanavel	English and Communication skill for Students of Science and Engineering
E Suresh Kumar	Engineering English
Ghosh, Mukherjee and Ghosh	English Skills for Technical Students
Dr. Sunita Mishra & Dr. C. Muralikrishna	Communication Skills for Engineers

SYLLABUS ON BASIC PHYSICS

	Content
Unit – 1 UNITS, DIMENSIONS & MEASUREMENTS	**1.1 System of units** – Need of measurement in engineering and science. CGS, MKS and SI. Fundamental and derived units (SI). **1.2 Dimensions:** Dimensions of physical quantity. Principle of dimensional homogeneity (explanation with examples). Applications of dimensional analysis. Limitations of dimensional analysis. **1.3 Estimation of errors**: Concept of significant figure. Absolute error, Relative or Proportional error and percentage error (concept only). Accuracy & precision of instruments (concept only, examples only with slide calipers and screw gauge).
Unit -2 GENERAL PROPERTIES OF MATTER	**2.1 Elasticity**: Deforming force and restoring force. Elastic and plastic body. Stress and strain. Hooke's law. Stress – strain diagram. Young's modulus, Bulk modulus, Rigidity modulus and Poisson's ratio (definition and formula) and relation between them (no derivation). (Simple numerical problems). **2.2 Surface tension**: Cohesive and adhesive forces. Definition, dimension and SI unit of surface tension. Surface energy (concept only). Angle of contact (definition only). Capillarity, shape of liquid meniscus in a capillary tube, rise of liquid in a capillary tube (no derivation, simple numerical problems). Effect of impurity and temperature on surface tension. Some natural examples of surface tension. **2.3 Fluid Mechanics**: Pascal's law. Multiplication of force. Buoyancy. Conditions of equilibrium of floating body. Archimedes' principle. [Simple numerical problems]. Streamline flow and turbulent flow of a fluid (concept), critical velocity (definition only). Equation of continuity and Bernoulli's theorem (statement and equation only, simple problems). Viscosity, Newton's formula for viscous force, co-efficient of viscosity (definition, dimension and SI unit). Stokes law (dimensional derivation) and terminal velocity (concept and formula only). Effect of temperature on viscosity.
Unit – 3 HEAT AND THERMODYNAMICS	**3.1 Thermal expansion of solid**: Linear, areal and cubical expansion and their coefficients (definition and formula) and their relation (no derivation). Change of density with temperature (formula only). (Simple numerical problems). **3.2 Transmission of heat**: Conduction, convection and radiation (differences). Thermal conductivity (formula, definition, dimensions and SI unit). (Simple formula based numerical problems including composite slab). Examples & use of good and bad conductor of heat. **3.3 Thermodynamics**: Zeroth law of thermodynamics. Temperature and internal energy (concept only). First law of thermodynamics (statement and equation only). Specific heats of gas, their relation (no derivation) and their ratio. Isothermal, isobaric, isochoric and adiabatic process (definition only).

Unit – 4 LIGHT	**4.1 PHOTOMETRY:** Luminous flux, luminous intensity, illumination and their S.I. units — Principle of Photometry (statement only). **4.2 REFRACTION OF LIGHT:** Refraction of light through plane surface. Laws of refraction. Refractive index -- Relative & Absolute, its relation with the velocity of light in different media. Total internal reflection and critical angle. Optical fibre (Principle & applications – mention only). **4.3 OPTICAL LENS:** Lens and definition of related terms (Recapitulation). Cartesian sign convention. Lens maker's formula (no derivation). Relation between u, v, f (usual symbols) (no derivation). Principle of magnifying glass. Power of a lens and its unit. Equivalent focal length & power of two thin lenses in contact (formula only). (Simple numerical problems). **4.4 WAVE THEORY OF LIGHT & INTERFERENCE**: Huygen's wave theory, wave front – spherical, cylindrical and plane wave front (Idea only). Huygen's principle of propagation of wave front. Analytical expression for 1D plane light wave. Principle of superposition of waves. Coherent sources (Idea only). Interference of light waves, constructive and destructive interference. Young's double slit experiment – analytical treatment.
Unit- 5 MODERN PHYSICS	**PHOTOELECTRIC EFFECT:** Photoemission, Work function. Photoelectric current, its variation with intensity and frequency of incident radiation. Stopping potential, Threshold frequency. Concept of photon. Einstein's photoelectric equation. Principle of solar photo-voltaic cell and its uses.

Laboratory Experiments:

Sl. No.	At least six experiments to be performed
1.	Determination of volume of the material of a hollow cylinder by using slide Calipers.
2.	Determination of area of cross section of a wire/ thin solid rod by using a screw gauge. estimate the maximum proportional error in the measurement.
3.	Determination of the specific gravity of a solid, insoluble in water and heavier than water, by hydrostatic balance.
4.	Determination of the specific gravity of sand by specific gravity bottle.
5.	Verification of Boyle's law by Boyle's law apparatus.
6.	Verification of laws of refraction of light and determination of refractive index of glass.
7.	Determine of focal length of a convex lens by U-V method.
8.	Determination of the Young's modulus of steel by Searl's method.

9.	Determination of the surface tension of water by capillary rise method (Capillary tube radii to be supplied).
10.	Determination of coefficient of viscosity of given highly viscous liquid by Stoke's method (Radii & density of the balls and density of the liquid to be supplied).

Text and reference books:

Sl. No.	Name of the Authors	Title of Books
1	H.C. Verma	Concept of Physics. Vol.-I & II
2	R.K.Gaur & S.L.Gupta	Engineering Physics
3	S.K. Gupta	ABC of Physics
4	Duari, Maity & Majumder	H.S. Physics. Vol.-I&II
5	Resnik & Halliday	Physics–I&II

SYLLABUS FOR: BASIC CHEMISTRY

	CONTENT
Unit: 1 Name of the Topics: Atomic Structure and Chemical Bonding	**Atomic Structure** : Bohr model of atom [Radius and Energy of H – atom is excluded] , De Broglie modification, Quantum numbers, Orbits and Orbitals, Aufbau principal, Pauli's Exclusion principle, Hunds rule of maximum multiplicity, Electronic configuration of elements up to atomic number 36. Definition of Atomic number, Mass number, Isotopes, Isotones and Isobars with suitable examples. Concept of hybridization sp^3, sp^2 ,sp and shape of molecules (simple example H_2O, NH_3, BCl_3, $BeCl_2$) **Chemical Bonding**: Electrovalent, Covalent and coordinate bonds, H-bond in HF, water and ice. Classification of solids – crystalline and amorphous. Relationship between structure and properties of the following crystalline solids- (i) Ionic solid i,e. Sodium chloride (ii) Covalent solid i,e. diamond and graphite (iii) Molecular solids i,e. metallic bonds and related properties. Properties and uses of Carbon, Silicon and Germanium.
Unit: 2 Name of the Topics: Avogadro Concept , Acids , Bases & Salts	Avogadro number, Mole concept, Simple numerical problems involving Weight and volume. Acids, Bases and Salts (Arrhenius and Lewis concept) Basicity of acids and Acidity of bases, Neutralization reaction, Hydrolysis of Salts,. Equivalent Weight of acids, bases, & salts of Strength of Solution ---- normality, molarity, molality, formality and percentage strength, standard solution primary and secondary standards, concept of pH, and pH scale, Indicators and choice of indicator, principles of acidimetry and alkalimetry (simple numerical problems) Buffer solution (excluding numerical problems) Solubility product principle (excluding numerical problems), common ion effect with relation to group analysis.
Unit: 3	**Oxidation, Reduction, Electrochemistry** Oxidation and Reduction by electronic concept, balancing chemical equations by Ion-electron method, Redox Titration, Electrolysis, Arrhenius theory, Faraday's Laws, Electrolysis of $CuSO_4$ solution using Pt-electrode and Cu-electrode, simple numerical problems on electrolysis, Application of electrolysis such as Electroplating, Electrorefinings and Electrotyping, Electrochemical Cells, Primary Cell- Dry Cell, Secondary Cell --- Lead storage cell, Electrochemical series. **Chemical Equilibrium** Reversible and irreversible reactions, Exothermic and Endothermic reactions, concept of chemical equilibrium, Lechatelier's principle, Industrial preparation of Ammonia by Haber's Process, Nitric acid by Ostwald's process and Sulphuric acid by Contact Process (Physico chemical principles only), catalyst and calalysis.

Unit: 4 Name of the Topics: **Metallurgy**	Minerals, Ores, Gangue, Flux, Slag, General method of extraction of metals with reference to Iron, copper and Aluminium (detailed method of extraction is excluded) Definition of Alloy, purposes of making Alloy, Composition and uses of alloys (Brass, Bronze German Silver, Deuralumin, Nichrome, Bell metal, Gun metal, Monel metal, Alnico, Dutch metal, Babbit metal, stainless steel), Amalgams, properties and uses of cast iron, wrought iron, steel and sponge iron , Manufacture of steel by L-D process, composition and uses of different alloy steels.
Unit: 5 Name of the Topics: **Water**	Soft and Hard water, Action of soap on water, Types of Hardness, causes of hardness, Units of hardness, Disadvantages of using hard water, Estimation of total hardness by EDTA method, Removal of hardness --- Permulit process, Ion-exchange process, phosphate conditioning and calgon treatment. Distilled water and Deionised water.
Unit: 6 Name of the Topics: **Organic Chemistry**	Organic compounds, their differences from inorganic compounds, Classification, Homologous series, Functional groups, Isomerism, Nomenclature up to C5 , properties and preparation of Methane, Ethylene and Acetylene, Methylated spirit, Rectified spirit, Power alchohol, Proof spirit, uses of Benzene, Naphthalene and phenol, Chromatographic techniques of separation of organic compounds (Thin-Layer Chromatography).

Laboratory Experiments:	
1	To identify the following Basic Radicals by dry and wet tests – Pb^{+2} , Cu^{+2} , Al^{+3}, Fe^{+3}, Zn^{+2} , Ni^{+2}, Ca^{+2}, Mg^{+2} , Na^+ , K^+ , NH^+_4
2	To identify the following Acid Radicals by dry and wet tests – Cl- , CO3-2 , SO4-2, S-2 , NO3-
3	To identify an unknown water soluble salt containing one basic and one acid radical as mentioned above.
4	To perform titration of (N/10) approximate solution of an alkali with an unknown solution of an acid supplied.
5	To determine Iron content in Mohr's salt by standard K2Cr2O7 solution.
6	Preparation of Potash Alum.

Text Books:	
Name of Authors	**Title of the Book**
S. S. Dara	Environmental chem. & pollution control
Dr. Aloka Debi	A Text Book of Env. Engg.
Jain & Jain	Engg. Chem.
Madhusudan Chowdhury	Chem I & II
Dr. Kaberi Bhattacharya	Chem I & II

Dr. Aloka Debi	Chem I & II
Jain & Jain	Engineering. Chem.
Maity, Roy and Tiwari	Higher Secondary Chemistry Vol- I and Vol -II
Bahl and Bahl	A Text Book of Organic Chemistry
Dilip Basu	PolytechnicChemistry-1

SYLLABUS FOR MATHEMATICS

Unit 1	**ALGEBRA**
	1. Logarithm 1.1 Definition of natural and common Logarithm 1.2 Laws of Logarithm. Simple Problems.
	2. Complex Numbers 2.1 Definition of Complex numbers, Cartesian and polar. Exponential forms of complex numbers. 2.2 Modulus, amplitude & conjugate of a complex number 2.3 Algebra of Complex numbers (Equality, Addition, Subtraction, Multiplication). 2.4 Cube roots of unity & its properties. 2.5 De Moivre's theorem (statement only) and simple problems.
	3. Quadratic Equations 3.1 Definition of Quadratic Equations 3.2 Analysing the nature of roots using discriminant 3.3 Relation between roots & coefficients 3.4 Conjugate roots
	4. Binomial Theorem 4.1 Definition of factorial notation, definition of permutation and combination with formula 4.2 Binomial theorem for positive index (statement only) 4.3 General term and middle term. 4.4 Binomial theorem for negative index (statement only).
	5. Partial Fraction 5.1 Definition of polynomial fraction, proper & improper fractions and definition of partial fractions 5.2 Resolving proper fractions into partial fractions with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors.
Unit 2	**Vector Algebra**
	2.1 Definition of a vector quantity. 2.2 Concept of Position vector and Ratio formula.

	2.3 Rectangular resolution of a vector. 2.4 Algebra of vectors – equality, addition, subtraction & scalar multiplication. 2.5 Scalar (Dot) product of two vectors with properties. 2.6 Vector (cross) product of two vectors with properties. **Applications** Application of dot product in work done by a force and projection of one vector upon another. Application of cross product in finding vector area and moment of a force.
Unit 3	**TRIGONOMETRY**
	3.1 Trigonometric Ratios of associated, compound, multiple and sub-multiple angles. 3.2 Inverse trigonometric functions – Definition, formulae and simple problems. 3.3 Properties of Triangle – sine, cosine and tangent formulae - Simple Problems.
Unit 4	**COORDINATE GEOMETRY & MENSURATION**
	4.1 Co-ordinate System 4.1.1 Cartesian & Polar co-ordinate system 4.1.2 Distance formula and section formula 4.1. 3 Area of a triangle and condition for collinearity.
	4.2. Straight Line 4.2.1 Equation of straight line in slope point form, intercept form, two-point form, two-intercept form, normal form. 4.2.2. General equation of a straight line. 4.2.3 Angle between two straight lines – Condition for parallelism and perpendicularity. 4.2.4 Length of perpendicular from a point on a line. Perpendicular distance between two parallel lines.
	4.3 CIRCLE 4.3.1 Equation of circle in standard form, centre-radius form, diameter form, two-intercept form. 4.3.2 General equation of circle with a given centre and radius. Simple Problems.
	4.4 Conic Section 4.4.1 Standard equations of parabola, ellipse & hyperbola. 4.4.2 Definition of focus, vertex, directrix, axes, eccentricity. Simple problems
	4.5 MENSURATION 4.5.1 Regular Polygon of n sides – Formula for area and perimeter. 4.5.2 Prism and Pyramid – Formula for volume & Surface area. Simple Problems.
Unit 5	**FUNCTION, LIMIT & CONTINUITY**

		5.1 Function 5.1.1 Definitions of variables, constants, open & closed intervals. 5.1.2 Definition & types of functions – Simple Examples
		5.2 Limits 5.2.1 Concept & definition of Limit. 5.2.2 Standard limits of algebraic, trigonometric, exponential and logarithmic functions. 5.2.3 Evaluation of limits.
		5.3 Continuity 5.3.1 Definition and simple problems of continuity.
Unit 6		**DERIVATIVE**
		6.1 Definition of Derivatives, notations. 6.2 Derivative of standard functions. 6.3 Rules for differentiation in case of sum, difference, product and quotient of functions. 6.4 Derivative of composite functions (Chain rule). 6.5 Derivatives of inverse trigonometric functions. 6.6 Derivatives of implicit functions. 6.7 Logarithmic derivatives. 6.8 Derivatives of parametric functions. 6.9 Derivative of one function with respect to another function 6.10 Second order derivatives.
		6.11 Applications of Derivatives. 6.11.1 Geometric meaning of derivative. 6.11.2 Rate measurement 6.11.3 Maxima & Minima (one variable)

Text Books

Name of Authors	Title of the Book
B.K. Paul	Diploma Engineering Mathematics (Vol-1)
A. Sarkar	Mathematics (First Semester)
G.P. Samanta	A Text Book of Diploma Engineering Mathematics, Volume-1
Dr. S. Bose & S. Saha	A Complete Text Book of Mathematics

H.S. Hall & S.R. Knight	Higher Algebra
S.L. Loney	Trigonometry
H.K. Dass	Engineering Mathematics
T.M. Apostol	Calculus, Volume-1
B.K.Pal, K.Das	Engineering Mathematics, Volume-1
B.C. Das & B.N. Mukherjee	Differential Calculus
KAR	Engineering Mathematics
SINGH	Engineering Mathematics
B.K. Paul	Diploma Engineering Mathematics (Vol I)
G.P. Samanta	A Text Book of Diploma Engineering Mathematics, Volume-I
S.N. De	Higher Secondary Mathematics Vol I and Vol II
H.K. Dass	Engineering Mathematics
Singh	Engineering Mathematics

SYLLABUS OF ENGINEERING MECHANICS

Unit 1	Content
	Force Systems:
	1.1 Fundamentals and Force system: Definitions of Mechanics, engineering mechanics, statics, dynamics, kinetics, kinematics, rigid body, scalar and vector, force, SI unit of force, representation of force by vector and by Bow's notation method, Characteristics of a force, effect of a force, Principle of transmissibility, Classification of force system(coplanar & non coplanar), detail classification of coplanar force system (collinear, concurrent, non concurrent, parallel, like parallel & unlike parallel). **1.2 Resolution of a force:** Definition, Method of resolution, mutually perpendicular components and non – perpendicular components. **1.3 Moment of a Force:** Definition, measurement of moment of a force, SI unit of moment, physical significance of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments – Varignon's theorem and it's use. Couple- Definition, SI unit, measurement of moment of a couple, Equivalent couples- resultant of any number of coplanar couples, resolution of a given force into a force acting at a given point and a couple, properties of couple. **1.4 Composition of Force:** Definition of resultant force, method of composition of force – **Analytical method -** parallelogram law, triangles law & polygon law of force, Algebraic method for determination of resultant for concurrent, non-concurrent & parallel coplanar force system. **Graphical method -** space diagram, vector diagram and funicular polygon to determine resultant for concurrent & parallel force system only.
Unit 2	**Equilibrium:**
	2.1 Definition, condition of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non concurrent and parallel force system, free body and free body diagram. 2.2 Lami's Theorem – statement & explanation, Application of this theorem for solving various engineering problems. 2.3 Definition of equilibrant, relation between resultant and equilibrant, equilibrant of concurrent & non concurrent force system. 2.4 Beams – Definition, types of beams (cantilever, simply supported, overhanging, fixed and continuous), types of end supports (simple support, hinged, roller, fixed), classification of load, reaction of a simply supported, cantilever and overhanging beam subjected to vertical point load and uniformly distributed load by analytical and graphical method.
Unit 3	**Friction:**
	3.1 Definition: friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction & angle of repose, cone of friction & its significance, types of friction, laws of friction, advantages & disadvantages of friction. **3.2 Equilibrium of bodies on horizontal and inclined plane**: equilibrium of body on horizontal plane subjected to horizontal and inclined force, equilibrium of body on inclined plane subjected to forces parallel to inclined plane only, Ladder friction
Unit 4	**Centroid and Centre of gravity**
	4.1 Centroid: Definition of Centroid, moment of an area about an axis, Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle, quadrant of a circle. Centroid of composite figure. (No deduction for determining Centroid of basic geometrical figures) **4.2 Centre of gravity**: Definition of centre of gravity, centre of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube and rectangular block. Centre of gravity of composite solids. (No deduction for determining Centre of gravity of simple solids)

Unit 5	**Simple Machine:**
	5.1 Definition: simple machine, compound machine, load, effort, mechanical advantage, velocity ratio, input of a machine, output of a machine, efficiency of a machine, ideal machine, ideal load, ideal effort, machine friction, load lost in friction, effort lost in friction. **5.2 Analysis:** Law of machine, maximum mechanical advantage of a machine & maximum efficiency of a machine, Reversibility of a machine, condition of Reversibility of a machine, self locking machine. **5.3 Study of Simple machine:** Calculation of mechanical advantage, velocity ratio, efficiency and identification of reversible or self locking machine of following machines: Simple Axle & Wheel, Differential axle and Wheel, Weston's differential pulley block, Single Purchase crab, Double Purchase crab, Worm & Worm wheel, geared pulley block, Screw Jack, Pulleys (first, second & third system of pulleys).

Text Books

Name of Author	Title of the Book
D.S.Kumar	Engineering Mechanics
R.S.Khurmi	Engineering Mechanics
Basu	Engineering Mechanics
R.C. Hibbeler	Engineering Mechanics
S. S. Bhavikatti, K. G. Rajashekarappa	Engineering Mechanics
A.K. Tayal	Engineering Mechanics: Statics and Dynamics
R.S .Khurmi	Engineering Mechanics
TIMOSHENKO	Engineering Mechanics ,Revised
NELSON	Engineering Mechanics: Statics & Dynamics
Beer–Johnson	Engineering Mechanics

SYLLABUS FOR TECHNICAL DRAWING

Contents	
Unit: 1 Name of the Topics: Drawing Instruments and their uses.	1.1 Letters and numbers (Single stroke vertical 1.2 Convention of lines and their applications. 1.3 Scale (reduced, enlarged & full size) plain scale and diagonal scale. 1.4 Geometrical construction
Unit: 2 Name of the Topics: Engineering curves & Loci of Points.	2.1 To draw an ellipse by (a) Directrix and focus method (b) Arcs of circle method (c) Concentric circles method 2.2 To draw a parabola by (a) Directrix and focus method (b) Rectangle method 2.3 To draw a hyperbola by (a) Directrix and focus method (b) Passing through given points with reference to asymptotes 2.4 To draw involutes of circle & polygon 2.5 To draw a cycloid, epicycloid, hypocycloid 2.6 To draw Helix & spiral 2.7 Loci of points with given conditions and examples related to simple mechanism.
Unit: 3 Name of the Topics: Projection of Straight Lines and Planes	3.1 Lines inclined to one reference plane only and limited to both ends in one quadrant. 3.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal and hexagonal, inclined to one reference plane and perpendicular to the other.
Unit: 4 Name of the Topics: Orthographic projections	4.1 Introduction to Orthographic projections 4.2 Conversion of pictorial views into Orthographic views (First Angle Projection Method only) 4.3 Dimensioning technique as per SP-46
Unit: 5 Name of the Topics: Isometric projection	5.1 Isometric scale 5.2 Conversion of orthographic views into isometric views / projection (Simple objects)
Unit: 6 Name of the Topics: Introduction to CAD	6.1 To draw line, rectangle, circle, polygon with given dimensions and hatch

Contents		
List of Practical	Intellectual skills	Motor skills
1. **LETTERING , SCALE & GEO.CONST.** Single Stroke vertical Alphabets &Numerical Plain Scale and Diagonal Scale (reduced & enlarged) Construction of Regular Polygons (1 Sheet)	To develop ability to understand Scaling and problem on geometrical constructions	To develop ability to draw Scale & geometrical constructions
2. **Engineering Curves & loci of points** Draw ellipse , parabola, hyperbola, involutes, cycloid, spiral Draw locus of point on any one mechanism (1 Sheet)	To develop ability to differentiate between conic and curves. To develop ability to identify the type of locus from the nature of surface and the position of generating circle. Able to interpret the given mechanisms and locus of points.	To develop ability to draw different types of curves.
3. **Projection of line and planes** Two problems on projection of lines and Two problems of planes. (1 Sheet)	To develop ability to differentiate between true length and apparent length. To interpret the position of lines and planes with plane	Able to draw orthographic projections of line and planes.
4. **Orthographic projections** Four objects by first angle method (1 Sheet)	Develop ability to interpret first angle projection method To interpret and able to solve problem on orthographic projection of given object.	Develop ability to draw orthographic projections by first angle projection method
5. **Isometric projection** Four objects two by true scale and another two by isometric scale (1 Sheet)	Develop ability to differentiate between isometric view and isometric projections. To differentiate between isometric scale and true scale	Develop ability to draw isometric views and isometric projections from given orthographic views of an object
6. **Introduction to CAD** Draw a figure with the help of different draw and modify Command by Computer And redraw any one object of Orthographic projection.	To develop ability to handle different tools of CAD	To develop ability to draw different figure by computer.

Text Books:

Name of Authors	Titles of the Book
N.D.Bhatt	Engineering Drawing
R.K.Dhawan	Engineering Drawing
K.Venugopal	Engineering Drawing and Graphics +AutoCAD
Basant Agrawal C M Agrawal	Engineering Drawing
Pal & Bhattacharya	Engineering Drawing
N. D. Bhatt	Engineering Drawing
K. Venugopal	Engineering Drawing and Graphics + Auto CAD
Pal & Bhattacharya	Engineering Drawing 6th Edition
P.S Gill	Engineering Drawing

SYLLABUS FOR COMPUTER FUNDAMENTAL

Theory: **F.M:50**

Introduction to Computer:-Definition of Computer System; Evolution of Computer – a brief history; Classification of computer; Generation of Computers; Basic organization of computer.   [15%]

Computer software and hardware:- Definition of Software; Classification of Software; Introduction to OS: Definition of OS, Functions of OS, basic concept on different type of OS- Batch processing OS, Multitasking OS, Multi-user OS, Network OS;
Definition of Hardware; Basic units of Computer System; CPU – Control Unit, ALU; System Buses, Memory module – Primary Memory, Secondary Memory, Cache Memory, Virtual Memory – definition, classification, features and functions; measuring unit of memory – Bit, Byte, KB, MB, GB; Input Devices – Keyboard, Mouse, Scanner, Output Devices – Monitor, Printer.   [25%]

Number System and Boolean algebra:– Positional and Non Positional number system; Various Number system-Decimal, Binary, Octal Hexadecimal; Number system conversions – working with integer and fractional number; Simple binary arithmetic – addition, subtraction multiplication, division; Postulates of Boolean Algebra; Principle of Duality;
Theorems of Boolean algebra.   [30%]

Concept on computer Program and Languages: Problem Solving tools: Algorithm, Flow Charts, Decision Tables and Pseudo code; Analogy with Natural Languages, Machine Language-Advantages and Limitations, Assembly Language-Assembler, Advantages and Limitations, High Level Language-Compiler, Linker, Advantages and Limitations.   [15%]
Introduction to data communication and computer networks:
Introduction: Communication systems, Analogue data, digital data, Synchronous data, Asynchronous data; Function of Modem.
Transmission Modes: simplex, half duplex, full duplex;
Transmission media: Twin wire, Coaxial cable, Optical fibre, Radio, VHF and microwaves, satellite links,.
Introduction to Networking: Network topology: Bus, Star, Ring, Tree, Mesh; Network types: LAN, MAN, WAN;   [15%]

Practical: **F.M:50**

WINDOWS: Introduction to WINDOWS-7, Desktop, Icon, Taskbar, resizing windows, control panel, Recycle bin.

MS Word: Overview, creating, saving opening, importing, exporting, and inserting files, Home: Cut/Copy/Paste, Font menu, Paragraph style; Insert: Header, Footer, Page number, Text-box, WordArt; Page layout: Orientation, Columns, Watermark, Page Colour, Page Border, Indent, Margins; Mailings: Mail Merge; and View: Different document views, Ruler, Split, Macros.

MS Excel: inserting and deleting rows/columns, formulas and functions, sorting, filtering, advance filter, Pivot tables.

MS Access: Introduction, understanding databases, creating tables, queries, forms, reports, adding graph to your reports.

Power Point: Creating presentation, saving, closing and opening. View slides, Inserting pictures, Changing Slide layouts, applying design templates.

CURRICULAR STRUCTURE FOR FIRST YEAR SECOND SEMESTER

BUSINESS ECONOMICS & ACCOUNTANCY

Unit: 1
Name of the Topics: Economics and Its Relation with Engineering
	1.1 Allocation and effective utilisation of scarce resources ;Opportunity cost; Rationality Costs and benefits
	1.2 <u>Theory of demand and Supply</u>
	    Demand function; Law of demand ;
	    Determinants and exceptions to the law of demand; Price elasticity of demand and its importance; Determinants of elasticity;
	    Income elasticity of demand; Cross price elasticity of demand;
	    Classification of goods on the basis of elasticities Determinants of price elasticity
	    Supply function and its determinants
	    Market mechanism; equilibrium and its stability
	    Application :
	    a) Calculating elasticity from linear demand equation;
	    b) solving linear demand and supply equations
	    c) Shifts of demand and supply curves

Unit: 2
Name of the Topics: Theory of Production, Cost and Markets
	2.1 Theory of Production and Costs Production func@on A short run & long run; Short run A theory of production ; Long run A Returns to scale; Theory of costs A short run and long run cost curves Economic Concept of profit; Application:
	    (1a) Cobb-Douglas production function
	    (1b) Maximization of profit /output from linear demand function and quadratic or cubic cost functions;
	2.2 Markets
	Basic features of A
	    a) Perfectly Competitive Market
	    b) Monopolistic Competition
	    c) Oligopoly and
	    d) Monopoly,
	    Relevant examples from Indian economy

Unit: 3
Investment Planning and Problems of Indian
	3.1 Investment Planning
	    Concept of investment
	    Evaluating Capital Projects
	    (a) Payback Period Method
	    (b) Net Present Value Method
	    (c) Internal Rate of Return Method
	Application : Solving numerical problems
	3.2 Economic Concepts and issues in the Context of Indian Economy
	    Mixed Economy and relevance of planning; Globalization;
	    Gross Domestic Product and its growth; Inflation;
	    Business Cycle and real estate business in India; Foreign Direct Investment;

Unit: 4	4.1 Introduction to Accountancy

Name of the Topics: Fundamentals of Accountancy	4.1.1 Accountancy: Definition & objectives 4.1.2 Book Keeping & Accountancy 4.1.3 Accountancy &Accounting Evolution 4.1.4 Single & Double Entry System 4.2 Double Entry System 4.2.1. Transaction Concepts: Accounts & Classification of Accounts – Transaction- Two fold aspects Events – Golden Rules 4.2.2 Journal as a book of prime entry : subdivisions of Journal –Recording of Transaction Narration 4.2.3 Ledger : Rules for writing Ledger – Balancing of Ledger Accounts—Concepts of b/d and c/d

Unit: 5
Name of the Topics: Cash Book and Trial Balance
	5.1 Cash Book
	   5.1.1 Single Columns and Double Column including Contra Entry
	   5.1.2 Concept of Petty Cash Book
	5.2 Trial Balance
	   5.2.1 Preparation of Trial Balance
	   5.2.2 Rectification of Wrong Trial Balance
	   5.2.3 Errors detected in Trial Balance
	   5.2.4 Errors not detected in Trial Balance

Unit: 6
Name of the Topics:
Preparing Final Account
	6.1 Basic Concepts Regarding Final Account
	   General Concept – Assets, Liabilities, Capital Drawings, Provision, Reserve, Reserve Fund, Bad Debts, Provision for Debts, Profit Seeking and Non-profit Seeking Concerns
	6.2 Final Account
	   Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustment)

Text Books

Name of Authors	**Title of the Book**
Samuelson & Nordhaus	Economics Sixteenth Edition
Mankiw, Gregory N.	Principles of Economics Sixth Edition
A.N. Agarwal	Indian Economy: Problem of Development and Planning
Dey & Dutt Amitava Basu	Hisab Shastra Financial Accountancy A 1
Ranesh Roy	Bharat-er Arthaniti (Bengali Version)
Haridas Acharya	Adhunik Arthaniti

SYLLABUS ON APPLIED PHYSICS

Unit	Content
Unit – 1 PARTICLE DYNAMICS	**1.1** Rectilinear Motion: Kinematical equations in one dimension: $v=u+ a t$, $s=ut+(1/2)at^2$, $V^2=u^2+2as$ (only equation), Distance travelled by particle in nth second, Velocity- Time Diagrams:- uniform velocity, uniform acceleration and uniform retardation. Kinematical equations for motion under gravity. **1.2** Laws of Motion: Newton's laws of motion, definition of force from second law. Momentum and impulse of force (definition and SI unit) and their relation. Conservation of linear momentum (statement only). Applications

	to – Recoil of gun, Motion of lift, Motion of two bodies connected by light inextensible string passing over smooth pulley. (Simple problems). **1.3** Rotational Motion: Angular displacement, angular velocity and angular acceleration (definition and SI unit only). Relation between linear velocity & angular velocity and between linear acceleration & angular acceleration. Centripetal acceleration and centripetal force (definition and formula only, no derivation). Centrifugal force (formula & concept only). Moment of a force or torque (definition & SI unit). Moment of inertia (definition & SI unit). Angular momentum (definition & SI unit). Relation between torque and angular momentum (no derivation). Principle of conservation of angular momentum (Statement only).
Unit – 2 WORK, POWER AND ENERGY	Concept and explanation of work, power and energy with their SI units. Importance of force – displacement curve (concept of work). Mechanical energy: kinetic energy (derivation) and potential energy. Work – energy principle. Law of conservation of mechanical energy. (Simple numerical problems)
Unit – 3 CURRENT ELECTRICITY	**3.1 ELECTRIC CURRENT:** Ohm's law — Resistance and its unit, specific resistance — Various factors affecting the resistance. Concept of super conductivity, Equivalent resistance for Series and Parallel arrangements of resistances (No deduction), (Simple numerical problems) Concept of conversion of Galvanometer to Ammeter and Voltmeter and related simple problems. Wheatstone Bridge Principle for balanced condition, its applications in Meter Bridge and P.O. Box. **3.2 HEATING EFFECTS OF CURRENT:** Joule's law — Electrical work, energy and power with practical units (Simple numerical problems). **3.3 THERMOELECTRICITY:** Thermocouple. Seebeck effect, thermo-emf (expression only), emf- temperature curve, neutral temperature & inversion temperature, thermoelectric power(definition only) Peltier effect (statement only). Differences between Peltier effect with Joule's effect.
Unit – 4 ELECTROMAGNETISM	4.1 **MAGNETIC EFFECT OF ELECTRIC CURRENT:** Bio- Savart's law. Magnetic field: (i) for infinitely long straight current conductor, (ii) at the centre of a current carrying circular coil, (iii) for infinitely long current solenoid (no deduction, only concept and mathematical expression in S.I. units). Force on a current carrying conductor placed in a magnetic field (formula only), Fleming's left hand rule. Application of Magnetic effect of electric current – Galvanometer (concept only) 4.2 **ELECTROMAGNETIC INDUCTION:** Magnetic flux, Magnetic flux density with SI units, Faraday's laws, Lenz's law, Motional emf (qualitative discussion with formula only). Fleming's right hand rule. Self induction, mutual induction and their coefficients (definition and SI unit). Principles of generation of AC.
Unit – 5 MODERN PHYSICS	**5.1 SEMI – CONDUCTOR:** Energy band in solids (Idea only). Distinction between conductor, insulators & semi-conductors in terms of energy band diagram, Intrinsic and extrinsic (P-type; N-type) semiconductor, P – N junction diode, depletion region, potential barrier. Forward and reverse biasing; Forward and reverse bias characteristic curve. Application of P – N junction diode as – (i) half wave rectifier, (ii) full wave rectifier (Bridge circuit only) (only circuits and explanation with input and output curves). **5.2 X – rays**: Production of X- rays by Coolidge X- ray tube. X-ray spectra – continuous and characteristic X- rays (Graphical plot only), minimum wavelength (simple problems). Properties of X- rays. Application of X- rays. LASER: Light amplification by stimulated emission of radiation. Properties of laser. Spontaneous and stimulated emission, population inversion, pumping. He - Ne laser (Principle only). Hologram and its use (mention only).

Recommended that Units – 3 & 4 be taught at the beginning to provide back up to ELECTRICAL TECHNOLOGY.

Practical:

Sl. No.	Skills to be developed
1	Intellectual skills-

	✓ Proper selection of measuring instruments on the basis of range, least count, precision and accuracy required for measurement. ✓ Analyze properties of matter & their use for the selection of material. ✓ To verify the principles, laws, using given instruments under different conditions. ✓ To read and interpret the graph. ✓ To interpret the results from observations and calculations.
2	Motor skills- ✓ Proper handling of instruments. ✓ Measuring physical quantities accurately. ✓ To observe the phenomenon and to list the observations in proper tabular form. ✓ To adopt proper procedure and precautions while performing the experiment. ✓ To plot the graphs.

Laboratory Experiments :

Sl. No	At least six experiments to be performed
1	Verification of series law of resistances by P.O. Box (Values of resistances to be supplied).
2	Determination of specific resistance of the material of a wire by metre bridge (length and diameter of the wire to be supplied).
3	Verification of parallel law of resistances by ammeter – Voltmeter method.
4	Drawing of the forward bias characteristic curve (I-V curve) of a P – N junction diode.
5	Determination of the velocity of sound in air at NTP by resonance air column method.
6	Determination of the frequency of an unknown tuning fork by resonance air column method / preferably by sonometer.
7	Determination of acceleration due to gravity by simple pendulum.
8	Determination of the resistance of a table galvanometer by half deflection method.

Text and reference books:

Sl. No.	Title of the Book	Name of Authors	Publisher
1.	Physics – I &II	Resnik & Halliday	Wily Eastern Ltd.
2.	Physics. Part – I & II		NCERT
3.	Applied Physics	Arthur Beiser	Tata McGraw- Hill
4.	Physics - I	V. Rajendram	Tata McGraw- Hill Pub.
5.	Engineering Physics	Avadhanulu, Kshirsagar	S. Chand Publication
6.	Concept of Physics. Vol.- I &II	H. C. Verma	Bharati Bhavan Pub. & Distribution
7.	B. Sc. Physics. Vol.- I & II	C. L. Arora	S. Chand & Co. Ltd.
8	Engineering Physics	R. K. Gaur & S. L. Gupta	Dhanpat Rai Pub.
9	University Physics	Young	
10.	ABC of Physics	S. K. Gupta	Modern Publisher, New Delhi
11.	General Properties of matter	D. S. Mathur	S. Chand & Co. Ltd.
12.	Text Book of ISC Physics	Bhatnagar	Selina Publication
13.	A Text Book of Light	B. Ghosh & K. G. Majumder	Sreedhar Pub.
14.	Elements of H. S. Physics-I & II	Dutta & Pal	Publishing Syndicate
15.	H. S. Physics. Vol.- I & II	Duari, Maity & Majumder	Chhaya Prakashani
16.	H. S. Physics – I & II	C. R. Dasgupta	Pub.Book Syndicate
18.	Senior Practical Physics	A.S. Vasudeva	S. K. Kataria & Sons
19.	Elements of Physics-2	Dr. Subrata Kamilya	Knowledge Group Publications
20	Physics 2	Basak (WBSCTE Series)	Tata McGraw- Hill

SYLLABUS FOR: APPLIED CHEMISTRY

	Content
Unit: 1 Name of the Topics: Cement	Portland cement: Raw materials, Composition and Manufacture, Setting and Hardening of cement, function of gypsum, Cement Mortar, Cement concrete, Lime mortar, plaster of paris.
Unit: 2 Name of the Topics: lubricant	Definition, purpose and types of lubrication, names of common lubricants and uses, Flash point, Fire point, Pour point, Cloud point, selection of lubricant.
Unit: 3 (For printing Technology only)	Aliphatic compounds: Chemical test to identify & uses- Alcohol: Ethanol, 2-propanol, 1- butanol. Ketone: Acetone, butanone. Acid: Acetic acid, propanoic acid. Ester: Ethyl acetate, amylacetate. Aromatic compounds : Benzene: chlorination, Nitration, Friedel-Crafts alkylation; Aniline: Diazolisation, Coupling reaction with phenol aniline & N, N-dimethyl aniline.
Unit: 4 Name of the Topics:Fuel	Defination and classification, calorific value (Dulong formula), Determination of calorific value by Bomb calorimeter. Solid Fuels : Composition , properties and uses of wood, peat, lignite, Proximate andU A Liquid fuels : Fractional distillation of petroleum (product and uses), Cracking, Knocking, Octane number, Cetane number, antiknock compounds. Gaseous Fuels : Composition and uses of Coal gas, Water gas, Producer gas, Gobar gas, Natural gas, LPG, CNG, LNG.
Unit: 5 Name of the Topics: Corrosion	Definition, Causes of Corrosion and methods of prevention, Refractories --- properties and use of Boron Carbide and Carborandirm , Asbestors, Glass, Ceramics, Cork (preliminary idea only).
Unit: 6 Name of the Topics: Protective Coating	Paints : Composition , types (Snowchem, distemper) Varnishes : Definition , types , difference from paint, uses, characteristics. Metallic coating : Galvanisation, Electroplating, Tin plating. Lacquers.
Unit: 7 Name of the Topics: Polymers	Definition & classification of Synthetic polymers Synthetic plastic : Thermoplastic plastic and Thermosetting plastic --- their differences with examples, preparation and uses of Polythene, PVC, Polypropylene, Polystyrene, Teflon, Bakelite, Orlon, Saran. Synthetic rubber : Buna –S, Buna –N, Neoprene, Butyl, rubber, silicone, Vulcanization of rubber. Synthetic Fibres : Nylon , Terylene , Rayon.
Unit: 8 Name of the Topics: Environmental Pollution	Introduction , Definition , Causes of pollution, Types of pollution. Air pollution : Definition, sources of Air pollution, causes of Air pollution, Different types of Air pollutants and their effects, Green House Effect, Acid Rain, OZone Layer Depletion, Air pollution control methods. Water Pollution : Definition, causes of water pollution, sources of water pollution, Methods of preventing water pollution, Domestic wastes, Industrial wastes, their physical and Biologocal characteristics, BOD, COD, Effects of water pollution.

Laboratory Experiments :

Sl.No.	Content

1	Estimation of total hardness of a sample of water by standard EDTA method.	
2	Qualitative detection of Arsenic content of a given sample of water [5 ppm soln of sod. Arsenite] [2 lit Arsenic containing water to 20ml by evoporation]	
3	To determine pH value of an unknown solution by pH meter.	
4	To apply Thin Layer Chromatography for separation of mixture of compounds.	
5	Preparation of phenol formaldehyde resin.	
6	Determination of dissolve O2 in a sample of water.	
7	To determine neutralization point of weak acid and weak base by conductivity meter.	
8	To determine end point of titration between dilute H2SO4 and BaCl2 using conductivity meter.	

Text Books:

Name of Authors	Title of the Book
S. S. Dara	Environmental chem. & pollution control
Dr. Aloka Debi	A Text Book of Env. Engg.
Jain & Jain	Engg. Chem.
Madhusudan Chowdhury	Chem I & II
Dr. Kaberi Bhattacharya	Chem I & II
Dr. Aloka Debi	Chem I & II

SYLLABUS FOR ENGINEERING MATHEMATICS

Unit	Content

1.	**DETERMINANTS & MATRICES**
	1.1 Determinant
	  1.1.1 Definition & expansion of determinants of order 2 and 3.
	  1.1.2 Properties of determinants (statement only)
	  1.1.3 Minors and cofactors.
	  1.1.4 Evaluation of determinants of order 4 by Chio's method.
	1.2 Matrix Algebra
	  1.2.1 Definition of a matrix of order mxn, leading element, principal diagonal.
	  1.2.2 Types of matrices – null matrix, square matrix, diagonal matrix, identity matrix etc.
	  1.2.3 Symmetric and Skew symmetric matrices.
	  1.2.4 Matrix algebra – addition, subtraction, scalar multiplication and multiplication of matrices.
	  1.2.5 Matrix inversion by adjoint method.

2.	**NUMERICAL METHODS** 2.1 Concept of Interpolation with Newton forward interpolation formula (Statement only). Simple Problems. 2.2 Numerical solution of simultaneous linear equations by Gaussian elimination method only (without proof). 2.3 Numerical Solutions of non-linear equations by Newton- Raphson method (without proof). 2.4 Numerical integration by trapezoidal rule & Simpson's 1/3 rule (without proof).

3.	**INTEGRATION**
	3.1 Definition of Integration as inverse process of differentiation.
	3.2 Integration of standard functions.
	3.3 Rules for integration (sum, difference, scalar multiple).
	3.4 Methods for Integration
	  3.4.1 Integration by substitution.
	  3.4.2. Integration by trigonometric substitution.
	  3.4.3 Integration by parts.
	  3.4.4 Integration by partial fraction.
	3.5 Definite Integral
	  3.5.1 Definition of Definite Integral.
	  3.5.2 Properties of definite integrals with simple problems.

	3.6 Applications of Definite Integral 3.6.1 Area under plain curves. 3.6.2 Area bounded by two curves. 3.6.3 Volume of revolution. Simple examples.
	ORDINARY DIFFERENTIAL EQUATIONS

4.	4.1 Definition of ordinary differential equation, order & degree.
	4.2 Solution of differential equations of 1st order & 1st degree of
	    4.2.1 variable separable type
	    4.2.2 Homogeneous type
	    4.2.3 Reducible to homogeneous type
	    4.2.4 Exact type
	    4.2.5 Linear type
	    4.2.6 Reducible to linear type (Bernoulli's Equation).
	4.3 Solution of 2nd order linear ordinary differential equations with constant coefficients –
	    4.3.1 Evaluation of Complementary functions (C.F.)
	    4.3.2 Evaluation of Particular Integral (P.I.) for exponential function, polynomial function, sine and cosine function & functions of the form where V is any one of the above.

	PARTIAL DIFFERENTIATION
5.	5.1 Definition & meaning of partial derivative. 5.2 Evaluation of partial derivatives. 5.3 Definition & examples of homogeneous functions. 5.4 Euler's theorem (1st order) on Homogeneous functions for 2 & 3 variables (without proof). Simple problems.
	STATISTICS & PROBABILITY

6.	**6.1 Statistics**
	    6.1.1 Definition & examples of frequency distribution.
	    6.1.2 Measures of central tendency (mean, median, mode) for ungrouped and grouped frequency distribution.
	    6.1.3 Measures of dispersion – Standard deviation, Simple problems.
	6.2 Probability
	    6.2.1 Definition of random experiment, sample space, event, occurrence of events & types of events (eg. Impossible, mutually exclusive, exhaustive, equally likely)
	    6.2.2 Classical & axiomatic definition of probability
	    6.2.3 Addition & multiplication theorems of probability (statement only). Simple problems.

Text Books

Name of Authors	Title of the Book
B.K. Paul	Diploma Engineering Mathematics (Vol-2)
A. Sarkar	Engineering Mathematics
G.P. Samanta	A Text Book of Diploma Engineering Mathematics, Volume-2
Konch & Dey	Engineering Mathematics
B.S. Grewal	Higher Engineering Mathematics

Babu Ram	Engineering Mathematics
H.K. Dass	Advanced Engineering Mathematics
Erwin Kreyszig	Advanced Engineering Mathematics
Nurul Islam	Numerical Analysis
B.C. Das & B.N. Mukherjee	Integral Calculus - Differential Equations
Srimanta Pal	Engineering Mathematics

SYLLABUS OF STRENGTH OF MATERIALS

Unit	Content
Unit 1	**Mechanical Properties of Materials, Simple stresses & Strain:** Definition of Elasticity, plasticity, ductility, malleability, hardness, fatigue, creep, brittleness. Types of loads, Types of stress – normal stress (tensile stress & compressive stress) & shear stress, Strain – longitudinal & lateral strain, Poisson ratio, Hooke's law, Young's modulus, Stress- strain curves for ductile material (MS) and brittle material (CI)- discussion on salient points on the stress – strain diagram, working stress, Factor of safety.(simple problems on normal stresses and longitudinal strain, no discussion on composite section). Direct shear stress, Single shear, double shear, shear strain, modulus of rigidity. (simple Problems on direct shear in riveted joint, punching press, cotter pin, lap welded joint) Thermal stress & strain of uniform section (no discussion on composite section) simple problem. Thin cylindrical shell subjected to internal pressure - hoop stress – longitudinal stress. Simple problem.
Unit 2	**Shear Force & Bending Moment** Definition of Shear force & bending moment, sign convention, Relation between shear force & bending moment, Shear force and bending moment diagrams for simply supported beam, overhanging beam and cantilever subjected to point loads & uniformly distributed load, location of point of contraflexure. (Problems to be based on simply supported beam, overhanging beam & cantilever beam)
Unit 3	**Moment of Inertia** Definition of area and mass moment of inertia, Parallel and perpendicular axes theorem (no derivation), Moment of inertia about centroidal axis of solid sections – Square, rectangular, circular, semicircular, Triangular section, Hollow sections – square, rectangular and circular cross section only. Moment of Inertia of angle section, channel, Tee, I section about centroidal axis and any other axis parallel to centroidal axis. Polar moment of inertia of circular solid and hollow section. Problems on concerned cross sections
Unit 4	**Deflection of Beam** Concepts of deflection, Maximum deflection and slope of simple supported beam subjected to point load at mid span and / or uniformly distributed load on entire span and cantilever beam subjected to point load at free end and / or uniformly distributed load on entire length. (no deduction). Simple problem on maximum deflection and slope of beam.
Unit 5	**Columns & Struts**

	Definitions of column & strut – Buckling of column, Concept of equivalent length as per different end conditions, Critical load/ buckling load, safe load, Euler's & Rankine's formulae for critical/ buckling load for columns. Simple problem

Text Books:

Name of Authors	Title of the Book
R.S.Khurmi	Strength of Materials
S.S.Bhavikatti	Strength of Materials
S. Ramamrutham & R. Narayanan	Strength of Materials
R.K. Rajput	Strength of Materials
B.K.Sarkar	Strength of Materials
R.K.Bansal	Strength of Materials
M. Chakraborty	Strength of Materials

SYLLABUS FOR ELECTRICAL TECHNOLOGY

UNIT-I

	Content
Module 1 : **Different sources of Energy**	1.1 Conventional & Non- conventional sources of energy 1.2 Advantages of Electrical Energy 1.3 Uses of Electrical Energy
Module 2: **Basic concepts of Electrical quantities**	2.1 Basic concept of charge, current, voltage, resistance, inductance, Capacitance, power, energy and their units. 2.2 Basic concept about supply source- D.C. & A.C. (names only)
Module 3: **D.C. Circuits**	3.1 Statement & explanation of (a) Ohm's law, resistances in series and parallel (b) Kirchhoff's Current & Voltage laws 3.2 Simple problems on D.C. Circuits
Module 4: **A.C. Circuits**	4.1 Principle of generation of sinusoidal voltage and its waveform representation 4.2 Difference between a.c. & d.c. 4.3 Idea about- (i) instantaneous value(ii) Cycles (iii) Frequency (iv) Time Period (v) Amplitude (vi) Phase (vii) Phase difference (viii) average value & R.M.S. value of Sinusoidal quantity (ix) Form factor & peak factor 4.4 Representation of sinusoidal quantities in (i)Exponential form (ii) Complex form (iii) Polar form 4.5 Expressions of voltage and current for sinusoidal sources through Pure Resistance, Inductance, and Capacitance 4.6 Simple R –L, Simple R – C and Simple R– L – C circuits 4.7 Concept of impedance , impedance triangle , power factor, active, reactive and apparent power and power triangle. 4.8 Simple problems on A.C. circuit.

UNIT-II

Module 1: Electromagnetism	1.1 Introduction to electromagnetism : magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction (concept only) 1.2 Force between two parallel current carrying conductors (concept only) 1.3 Force on a conductor placed in the magnetic field (concept only) 1.4 Definitions and units of : Magnetising force, Magnetic intensity, Magnetomotive force, Magnetic flux, Permeability, Permeance, Reluctance 1.5 Concept of magnetic circuit and comparison with electric circuit 1.6 Concept of hysteresis, loop and hysteresis loss 1.7 Simple problems
Module 2: Electromagnetic induction	2.1 Faraday's Laws of electromagnetic induction 2.2 Lenz's law 2.3 Fleming's right and left hand rule 2.4 Principle of self and mutual induction 2.5 Energy stored in a magnetic field 2.6 concept of eddy current, eddy current loss
Module 3: Electrical Machines	3.1 Classification of electrical machines 3.2 Basic working principles of generator , motor and transformer (no deductions) 3.3 Field of applications 3.4 Storage cells- working principle, charging method, care and maintenance of storage cells.

UNIT-III

Module 1: Electrical power supply systems	1.1 Comparison between D.C. and A.C. system 1.2 Block diagram of a typical A.C. power supply system 1.3 Concept of single phase and three phase system 1.4 Star and delta connections- relation between phase and line voltage and current (no deductions)
Module 2: Domestic power supply	2.1 Simple idea of house wiring starting from commencement of supply 2.2 Types of electric wiring used for domestic purpose and name of materials 2.3 Role of fuses/ MCB/RCCB/ELCB 2.4 Concept and necessity of earthling
Module 3: Measuring and Testing Instruments	3.1 Name and Types of instruments used in measurement of Voltage, Current, Power and Energy (Moving iron, Moving coil & Digital Meters 3.2 Use of Meggar with connection diagram, measurement of earth resistance 3.3 Connection diagram of energy meter and basic principle of energy measurement 3.4 Digital & Analog multimeters-applications

Text Books:

Name of Authors	Title of the Book
1.B.L. Thereja	A text book of Electrical Technology Vol-I & II
2.Nagrath& Kothari	Basic Electrical Engineering
3.J.B.Gupta	Basic Electrical Engineering/
4.Surjit Singh	Electrical Estimating & Costing

5.K.Murugesh Kumar	Basic Electrical Science & Technology

SYLLABUS FOR ENGINEERING DRAWING

Content (Theory)	
Unit: 1 Name of the Topics: Projections of Solids	1.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes perpendicular /inclined to one reference plane and parallel to other.
Unit: 2 Name of the Topics: Sectional Views	2.1 Types of sections 2.2 Conversion of pictorial view into sectional orthographic views (First Angle Projection Method only)
Unit: 3 Name of the Topics: Missing Views[Not for ARCH] Perspective Projection [For ARCH]	3.1 Draw missing view from the given orthographic views- simple components (First Angle Projection Method only)[Not for ARCH] Introduction to the Principals of perspective projection (one point and two points) Ground Plane-Picture Plane-Station Point-Horizontal Plane-Central Plane-Ground Line- Horizontal Line-Axis of Vision-Centre of Vision-Visual Ray Method- Vanishing Point Method. [For ARCH]
Unit: 4 Name of the Topics: Sections of Solids	4.1 Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube resting on their base on Horizontal plane. 4.2 Prism, Cylinder : Axis parallel to both the reference plane 4.3 Section plane inclined to one reference plane and perpendicular to other
Unit: 5 Name of the Topics: Isometric Projection	5.1 Conversion of orthographic views into Isometric view / projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces)
Unit: 6 Name of the Topics: Developments of Surfaces	6.1 Developments of Lateral surfaces of cube, prism, pyramids, cylinder, cone and their applications such as tray, funnel, chimney, pipe bends etc.
Unit: 7 Name of the Topics: Free Hand Sketches[Not For ARCH] Axonometric Projections[For ARCH]	7.1 Free hand sketches of nuts, bolts, rivets, threads, split pin, foundation bolts, keys and couplings.[Not for ARCH] Introduction to Axonometric Projections [For ARCH]

Content (Practical)		
List of Practical	**Intellectual skill**	**Motor skill**
1.Projection of solids Three problems on three different solids, one by axis of solid inclined to H.P and parallel to V.P. and one problem by axis inclined to V.P. and parallel to H.P. and one problem by axis inclined to both planes. (1 sheet)	To interpret the different positions of solids with reference planes. To develop ability to differentiate between true length of axis and apparent length of axis.	To draw projections of different solids when axis is inclined or perpendicular to one of the reference plane.
2.Sectional Views & Isometric Projections Two objects by First Angle Projection Method with section Two objects one by true scale and another by Isometric scale	To interpret sectional views of given object Develop ability to differentiate between Isometric view and isometric projections	Develop ability to draw sectional views , Isometric views and Isometric projections from given objects and orthographic views of an

		object
3.Missing Views Two problems by first angle projection	To interpret the missing view from given orthographic views.[Not for	To develop ability to draw missing view from given orthographic views.
method [Not for ARCH] Two simple problems on Perspective Projection [For ARCH] (1 sheet)	ARCH] To generate the perspective views from given orthographic views [For ARCH]	To develop ability to draw perspective view from given orthographic views.
4.Section of solids Three problems on different solids, one problem, section plane inclined to H.P.and perpendicular to V.P. one problem ,section plane inclined to V.P.and perpendicular to H.P And one problem, section plane perpendicular to one reference plane and parallel to other plane. (1 sheet)	To differentiate between true shape and apparent shape of section. To Interpret the positions of section plane with reference planes.	To develop ability to draw the sectional orthographic views of given solids ,when it is cut by section plane in different position with reference planes. Ability to draw true shape of section.
5.Development of surfaces Three problems on development of surfaces of different objects (1 sheet)	Able to interpret the development of surfaces of different solids.	Ability to draw the development of surfaces of different objects in different shapes.
6.Free hand sketches [Not for ARCH] Any six figures on different topics Axonometric Projections[For ARCH] Axonometric Projection of exterior interiors (Bed Room- Kitchen- Toilet etc.) of any house. (1 sheet)	To differentiate between scale drawing and free hand drawing. To differentiate between various parts of machine.[Not for ARCH] To express exterior or interior views of any house through Axonometric views [For ARCH]	Develop ability to draw orthographic views of different machine elements.[Not for ARCH] Develop ability to draw axonometric views of exterior or interiors of any house [For ARCH]
7. Drawing with CAD One object by first angle projection method with section and one Isometric figure.	To differentiate between two dimensional figure and three dimensional figure.	Develop ability to draw orthographic and Isometric figure with computer

Text Books:

Name of Authors	Title of the Book
N.D.Bhatt	Engineering Drawing
R.K.Dhawan	Engineering Drawing
K.Venugopal	Engineering Drawing and Graphics +AutoCAD
Basant Agrawal C M Agrawal	Engineering Drawing
N D Bhatt	Machine Drawing
R K Dhawan	Machine Drawing
Pal & Bhattacharya	Engineering Drawing
D. Sen	Engineering Drawing

SYLLABUS FOR : WORKSHOP PRACTICE

	Content
Unit: 1	**Electrical Shop (Compulsory)** **1. General Shop Talk** 1.1 General safety & precautions taken in Electrical Workshop 1.2 Electric shock, methods of shock treatment 1.3 Fuse and safety measure 1.4 Earthing as safety measure — I.E. Rule – 61 — Different types of Earthing 1.5 Different types of wire-gauge & strands, applications 1.6 Different tools used Electrical wiring installations — Applications 1.7 General wiring accessories & their uses. 1.8 Types of wiring & their comparison. **2. PRACTICES** 2.1 Study of Single Phase service connection from Pole to house (Equipments required : Service Pole, Energy Meter, Service Fuse, Distribution Board, Earth Wire) & Complete connection of Consumer Installation. 2.2 To make Straight & 'T' Joint of 7/20 PVC wire. 2.3 Wiring practice in Casing / Conduit Wiring (PVC Conduit) (one light, one fan ,one plug point & One lamp controlled by Two- Way switches including connection of Single phase Energy Meter & Main Switch). 2.4 Wiring of Calling-Bell (on T.W. batten/ PVC conduit / PVC casing). 2.5 Connection of Twin-Fluorescent Tube (AC/DC) . 2.6 Practice of Soldering & De soldering Techniques). 2.7 Identification of Basic Electronics components using Multimeter. * N.B. ITEM 2.1 & 2.3 ARE COMPULSORY AND THE STUDENTS ARE TO UNDERGO ANY 3 OUT OF THE REST 5 PRACTICES.

Unit: 2	**Carpentry**
	
	1. GENERAL SHOP TALK
	1.1 Name and use of raw materials used in carpentry shop: wood & alternative materials
	1.2 Names, uses, care and maintenance of hand tools such as different types of Saws, 'G'- Clamp Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.
	1.3 Specification of tools used in carpentry shop.
	1.4 Different types of Timbers , their properties, uses & defects.
	1.5 Seasoning of wood.
	1.6 Estimation.
	
	2.0 PRACTICES
	
	2.1 PRACTICES FOR BASIC CARPENTRY WORK
	   ▪ Sawing practice using different types of saws
	   ▪ Assembling jack plane — Planning practice including sharpening of jack plane cutter
	   ▪ chisels including sharpening of chisel
	   ▪ Making of different types of wooden pin & Fixing methods.

	• Marking, measuring and inspection of jobs. 2.2 PREPARATION OF JOINTS IN A SINGLE PIECE OF JOB (ANY ONE) • Half-lap joint ("I" Cross or "L" or 'T'). • Mortise & Tenon Joint (including drilling and fixing using wooden pins) — T-joint • Dovetail joint (Lap & Bridle Dovetail) 2.3 PRACTICE ON WOOD WORKING LATHE • Safety precaution on Wood working machines. • Study of wood working lathe; • Sharpening of lathe tools; • Setting of jobs and tools; • Different type of wood turning practice 2.4 PRODUCTION OF UTILITY ARTICLES (GROUP WORK) • Making Handles of chisels / files /screw drivers etc. • Making Legs of cabinets: Straight, Tapered and Ornamental 2.5 Study on and practice of the following machines: • Surface Planer • Band Saw • Circular Saw * May be done in group work if possible

Unit 3	**SMITHY/ FORGING SHOP**
	1. GENERAL SHOP TALK
	
	1.1 Purpose of Smithy / Forging Shop
	1.2 Different types of Hearths used in Smithy / Forging shop
	1.3 Purpose specifications uses, care and maintenance of various tools and equipments used in hand forging by segregating as cutting tools, supporting tools, holding tools, measuring tools etc.
	1.4 Types of fuel used and maximum temperature obtained
	1.5 Types of raw materials used in Smithy / Forging shop
	1.6 Uses of Fire Bricks & Clays in Forging Work Shop.
	
	2. PRACTICES
	
	2.1 Practice of firing of hearth / Furnace, Cleaning of Clinkers and Temperature Control of Fire.
	2.2 Practice on different basic Smithy / Forging operations such as Cutting, Upsetting, Drawing down, Setting down, Necking, Bending, Fullering, Swaging, Punching and Drifting
	
	<u>Demonstration</u> — Making cube, hexagonal cube, hexagonal bar from round bar
	
	<u>Job Preparation (Any one)</u>
	
	    Job 1 Making a cold / hot, hexagonal / octagonal flat chisel including tempering of edges
	    Job 2 Making a chain-link or Door Ring by bending and forge-welding
	    Job 3 Production of utility goods e.g. hexagonal bolt / square shank boring tool, fan hook (long S-type) [Two jobs are to be done by the students]

Unit: 4	**WELDING SHOP**
	1. GENERAL SHOP TALK
	  1.1 Purpose of Welding, Brazing and Soldering.
	  1.2 Purpose, specifications, uses, care and maintenance of various Welding machines, Cables, tools and equipments used for welding,

	brazing and soldering (soft and hard)
	1.3 Purpose of fluxes, electrodes, filler rods
	1.4 Safety equipments used in Welding Shop
	1.5 Various method of Welding (Fusion and Resistance) and its use.
	1.6 Selection of Electrods
	
	2. PRACTICES
	2.1 Study of Welding Transformers and Generators used in Arc-Welding
	2.2 Demonstration of Gas-Cutting and Gas-Welding processes
	2.3 Practice of Edge Preparation, Simple run, Tag Welding on arc-welding.
	2.4 PRACTICE OF WELDING: (a) Lap welding, (b) Different methods of Butt Welding (c) T' Fillet & Groove Welding, (d) Edge & Corner Welding in different position like Down hand Flat, Horizontal and Vertical (e) Stress relieving method.
	
	Job Preparation (Any One)
	  JOB - 1 JOINING of M.S. plates — Two jobs on Lap-Joint and Butt-Joint (single/double plates), thickness of plates varying from 6 mm to 12 mm with proper edge preparation
	  JOB - 2 SPOT-WELDING on M.S. /G.I. Sheets
	  JOB - 3 SOLDERING: use of soft / hard solders and brazing on dissimilar materials
	  JOB - 4 Study of TIG / MIG welding sets
	
	Testing
	  Defects in welding and testing of welding joints by Dry Penetration method & by Mechanical Method.

Unit: 5	**BENCH WORK & FITTING SHOP**
	1. GENERAL SHOP TALK
	 Purpose of Bench Work and Fitting Shop:
	Study of different types of hand tools & their uses, care and maintenance of tools e.g. Files, Chisels, Hammers, Hack-saw with frames, Fitting Bench Vice, Different other Vices, Divider, Try- square, Drill-taps, Dies, V-blocks, Bevel protector, Scribers, Surface plates, Types of Callipers Types of Drill bits etc.
	Study of measuring instruments by direct and indirect methods: Micrometer – Vernier callipers – Bevel protectors – Steel Rule.
	Dismantling & Assembling of Fitting Bench Vice.
	Study of Drilling Machine.
	
	2. BASIC FITTING SHOP PRACTICES*
	
	  2.1 Chipping and chiselling practice
	  2.2 Filling practice
	  2.3 Marking and measuring practice
	  2.4 Drilling and tapping practice
	  2.5 Making Stud Bolt by Die.
	  2.6 Making Male- Female Joint.
	* N.B. AT LEAST ONE JOB COVERING THE ABOVE MENTIONED ARE TO BE PREPARED INCLUDING PROCESSES.

Unit: 6	**MACHINE SHOP**
	1. SHOP TALK ON MACHINE SHOP
	  1.1 Safety Precautions.
	  1.2 Demonstration of drilling machine, Lathe machine, Shaping, Slotting machine.
	  1.3 Demonstration of drill bits, Single Point & Multi point Cutting tools
	2. PRACTICE ON MACHINE SHOP
	  2.1 Use of Drill Machine and drilling practice

	2.2 Preparation of one job in Lathe machine involving the operation like Plane Turning, Step Turning, Grooving, Chamfering, Knurling etc.

Unit :7	**ELCTRONICS WORKSHOP**
	
	1. SHOP THEORY
	  1.1 Common Assembly tools.
	  1.2 Identification of Basic Components; both active & passive
	  1.3 Use of Multimeter (both Analog and digital).
	  1.4 Rules for soldering & de-soldering.
	  1.5 Rules of component mounting and harnessing.
	  1.6 Artwork Materials in PCB design, General artwork rules, taping guidelines.
	2. PRACTICES
	  2.1 Identification of basic components: Passive- resistors, Capacitors, Inductors/Coils, Transformers, relays, switches, connectors; Active-Batteries/cells, diode, transistors (BJT, FET) SCR, diac, Triac, LED, LCD, Photo-diode, Photo-transistors.
	  2.2 Use of Multimeters to test components and measurement of circuits, Voltage, resistance etc.
	  2.3 Soldering and de-soldering practice
	  2.4 Component mounting practice
	  2.5 Wire harnessing practice
	  2.6 General artwork practice on graph sheets and taping practice on mylar sheet.

Unit :8	**COMPUTER WORKSHOP**
	
	1. SHOP THEORY
	  1.1 Different types of Key Boards.
	  1.2 Different types of Mouse.
	  1.3 Different types of Scanners.
	  1.4 Different types of Modems.
	  1.5 Different types of Printers.
	  1.6 Different types of CD Writers, Speakers, CD Read/ Write Drive.
	  1.7 Different types of Microphones, LCD Projectors, Pen Drive, DVD Drives.
	  1.8 Different types of Monitors.
	  1.9 Different makes of Hard Disks.
	  1.10 Different types of Net Work Interface Cards.
	  1.11 Different types of Cables Such as Data Cables, Printers Cables Net Work Cables, Power Cables etc.
	  1.12 Different types of Floppy Disk.
	  1.13 Mother Board connection.
	  1.14 Graphics Card connection.
	  1.15Net Work Interface card connection.
	
	2. PRACTICES
	
	  2.1 Connection of Mouse in different ports.
	  2.2 Connection of Key Boards in different ports.
	  2.3 Connection of Monitors.
	  2.4 Connection of Printers.
	  2.5 Different Switch settings of Printers.
	  2.6 Printer's self test.

	2.7 Jumper setting of Hard Disks. 2.8 Attaching FDD, HDD and CD Drives. 2.9 Attaching Pen Drives and DVDs. 2.10Attaching Scanner.

Text Books:

Name of Authors	Title of the Book
S. K. Hazra Chaudhury	Work Shop Technology Volume I &II Latest
Raghuwanshi	Work Shop Technology Volume I &II Latest
Gupta	Production Technology
Bawa	Manufacturing Processes
Ali Hasan & R. A. Khan	Manufacturing Processes

SYLLABUS FOR DEVELOPMENTAL OF LIFE SKILL

Unit	Content
Unit 1	Importance of development Life Skill (DLS) , Introduction to subject, importance in present context, application
Unit: 2	**Information Search** Information source –Primary, secondary, tertiary Print and non – print, documentary, Electronic Information center, Library , exhibition, Government Departments. Internet Information search – Process of searching, collection of data –questionnaire , taking Interview , observation method. Information analysis and processing.
Unit: 3	**Self Analysis** Understanding self— Attitude, aptitude, assertiveness, self esteem, Confidence buildings. SWOT Analysis – concept, how to make use of SWOT Concept of motivation.
Unit: 4	**Self Development** Stress Management –Concept, causes, effects and remedies to Avoid / minimize stress. Health Management – Importance, dietary guidelines and exercises. Time management- Importance, Process of time planning, Urgent Vs importance, Factors leading to time loss and ways to handle it, Tips for effective time management. EMOTION-CONCEPT, TYPES, CONTROLLING, EMOTIONAL INTELLIGENCE. CREATIVITY-CONCEPT, FACTORS ENHANCING CREATIVITY. THINKING – ANALYTICAL & LOGICAL THINKING, HIGHER ORDER THINKING GOAL SETTING – CONCEPT, SETTING SMART GOAL.
Unit: 5	**Study habits** Ways to enhance memory and concentration. Developing reading skill. Organisation of knowledge, Model and methods of learning.

Text Books:

Name of Authors	Title of the Book
Personality Development & Soft Skills	B. K. Mitra

E.H. Mc Grath , S.J.	Basic Managerial Skills for All
Allen Pease	Body Language
Lowe and Phil	Creativity and problem solving
Adair, J	Decision making & Problem Solving
Bishop , Sue	Develop Your Assertiveness
Marion E	Make Every Minute Count