SCHOOL OF MINES AND METALLURGY
A Constituent of KAZI NAZRUL UNIVERSITY, Asansol
Diploma in Metallurgical Engineering
(EFFECTIVE FROM THE SESSION 2017-18)
Department of 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
DIPEMETG101	Communicative English (GEN PAPER-1)	2	1	1	-	30	70		100
DIPEMETC101	Basic Physics (CORE PAPER-1)	3	2	-	2	30	70	100	200
DIPEMETC102	Basic Chemistry (CORE PAPER-2)	3	2	-	2	30	70	100	200
DIPEMETC103	Mathematics (CORE PAPER-3)	5	4	1	-	30	70	-	100
DIPEMETC104	Engineering Mechanics (CORE PAPER-4)	4	3	1	-	30	70	-	100
DIPEMETC105	Engineering Drawing (CORE PAPER-5)	4	2	-	4	15	35	50	100
DIPEMETC106	Computer Fundamentals (GEN PAPER-1)	2	1	-	2	15	35	50	100
DIPEMETCP101	Workshop Practice-I (CORE WORKSHOP-1)	2	-	-	4	-	-	100	100
Total		**25**	**15**	**3**	**14**	**180**	**420**	**400**	**1000**

Department of Metallurgical Engineering
Kazi Nazrul University, Asansol

CURRICULAR STRUCTURE FOR FIRST YEAR SECOND SEMESTER

Paper Code	Subject	Credits	Periods			Evaluation Scheme			
			L	TU	PR	Internal Assessment	End Semester Examination (ESE)		
						IA	TH	PR	TOTAL
DIPEMETG-201	Business Economics & Accountancy (GEN PAPER-1)	3	3	-	-	30	70		100
DIPEMETC-201	Applied Physics (CORE PAPER -1)	3	2	-	2	15	35	100	150
DIPEMETC-202	Applied Chemistry (CORE PAPER -2)	3	2	-	2	15	35	100	150
DIPEMETC-203	Engineering Mathematics (CORE PAPER -3)	4	3	1	-	30	70	-	100
DIPEMETC-204	Strength of Materials (CORE PAPER -4)	3	2	1	-	30	70	-	100
DIPEMETG-202	Electrical Technology (GEN PAPER-2)	3	2	1	-	30	70	-	100
DIPEMETC-205	Engineering Drawing-Part II (CORE PAPER -5)	3	1	-	4	15	35	100	150
DIPEMETCP-201	Workshop Practice-II (CORE WORKSHOP-1)	2	-	-	4	-	-	100	100
DIPEMETCP-202	Developmental of Life Skill(CORE PAPER (CORE OWRKSHOP-2)	2	1	-	2	-	-	50	50
	TOTAL	26	16	3	14	165	385	450	1000

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

Department of Metallurgical Engineering
Kazi Nazrul University, Asansol
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
DIPEMETG-301	FUNDAMENTALS OF ELECTRONICS (GEN PAPER-1)	3	2	-	2	5	10	15	35	50	100
DIPEMETC-301	FUNDAMENTALS OF METALLURGY (CORE PAPER-1)	3	2		2	10	20	30	70	50	150
DIPEMETC-302	METALLURGICAL THERMODYNAMICS (CORE PAPER – 2)	4	4	-	-	10	20	30	70	-	100
DIPEMETC-303	MECHANICAL TESTING OF METALS (CORE PAPER – 3)	6	4	-	4	10	20	30	70	100	200
DIPEMETG-302	MECHANICAL ENGINEERING (GEN PAPER-2)	4	2	-	4	5	10	15	35	50	100
DIPEMETCP-301	WORKSHOP PRACTICE (CORE WORK SHOP-1	2	-	-	4	-	-	-	-	100	100
DIPEMETCP-302	PROFESSIONAL PRACTICE – I (CORE WORKSHOP-2)	1	-	-	1	-	-	-	-	50	50
	TOTAL	**23**	**14**	**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..

Department of Metallurgical Engineering
Kazi Nazrul University, Asansol
SECOND YEAR SECOND SEMESTER (FOURTH SEMESTER)

Sl.No.	Subject	Credits	Periods			Evaluation Scheme					
			L	TU	PR	Internal Scheme			End Semester Examination (ESE)		
						TA	CT	TOTAL	ESE	PR	TOTAL
DIPEMETC-401	IRON MAKING PROCESS (CORE PAPER-1)	4	3	-	2	10	20	30	70	50	150
DIPEMETC-402	PHYSICAL METALLURGY (CORE PAPER-2)	5	3	-	4	10	20	30	70	100	200
DIPEMETC-403	METAL WORKING (CORE PAPER -3)	4	3	-	2	10	20	30	70	50	150
DIPEMETG-401	FUEL, FURNACE & REFRACTORY (GEN PAPER-1)	4	3	-	2	10	20	30	70	50	150
DIPEMETG-402	ELECTRICAL ENGINEERING (GEN PAPER-2)	3	2	-	2	5	10	15	35	50	100
DIPEMETG-403	COMPUTER PROGRAMMING (GEN PAPER-3)	2	1	-	2	-				50	50
DIPEMETCP-401	DEVELOPMENT OF LIFE SKILL – II (CORE WORKSHOP-1)	2	1	-	2	-				50	50
DIPEMETCP-402	PROFESSIONAL PRACTICE – II (CORE WORKSHP-2)	2	1	-	2	-				50	50
	TOTAL	**26**	**17**		**18**	**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..

Department of Metallurgical Engineering
Kazi Nazrul University, Asansol
THIRD YEAR FIRST SEMESTER (FIFTH SEMESTER)

Sl.No.	Subject	Credits	Periods			Evaluation Scheme					
			L	TU	PR	Internal Scheme			End Semester Examination (ESE)		
						TA	CT	TOTAL	ESE	PR	TOTAL
DIPEMETC-501	STEEL MAKING PROCESS (CORE PAPER-1)	4	3	-	2	10	20	30	70	50	150
DIPEMETC-502	FOUNDRY TECHNOLOGY (CORE PAPER-2)	5	3	-	4	10	20	30	70	100	200
DIPEMETC-503	METAL PROCESSING (CORE PAPER-3)	5	4	-	2	10	20	30	70	50	150
DIPEMETC-504	ELECTIVE – I : ALLOY STEEL & CAST IRON (CORE PAPER-4)	4	4	-	-	10	20	30	70	-	100
DIPEMETG-501	ENERGY & ENVIRONMENT CONTROL GEN PAPER-1)	4	4	-	-	10	20	30	70	-	100
DIPEMETCP-501	COMPUTER AIDED DRAFTING (CORE WORKSHOP-1)	1	-	-	2	-	-	-	-	50	50
DIPEMETCP-502	INDUSTRIAL PROJECT & ENTREPRENEURSHIP DEVELOPMENT (CORE WORKSHOP-2)	1	-	-	2	-	-	-	-	50	50
DIPEMETCP-503	PROFESSIONAL PRACTICE – III (CORE WORKSHOP-3)	1	-	-	2	-	-	-	-	50	50
	TOTAL	25	18		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.

Department of Metallurgical Engineering
Kazi Nazrul University, Asansol
THIRD YEAR SECOND SEMESTER (SIXTH SEMESTER)

Sl.No.	Subject	Credits	Periods			Evaluation Scheme					
			L	TU	PR	Internal Scheme			End Semester Examination (ESE)		
						TA	CT	TOTAL	ESE	PR	TOTAL
DIPEMETC-601	ENGINEERING MATERIALS & CORROSION METALLURGY (CORE PAPER-1)	3	3	-	-	10	20	30	70	-	100
DIPEMETC-602	HEAT TREATMENT TECHNOLOGY (CORE PAPER-2)	5	3	-	4	10	20	30	70	100	200
DIPEMETC-603	FERRO ALLOYS & Solid State REDUCTIN of IRON (CORE PAPER-3)	3	3	-	-	10	20	30	70	-	100
DIPEMETC-604	PHYSICAL METALLURGY OF NON - FERROUS METALS & ALLOYS (CORE PAPER-4)	3	3	-	-	10	20	30	70	-	100
DIPEMETG-601	I N D U S T R I A L M A N A G E M E N T (GEN PAPER-1)	3	3	-	-	10	20	30	70	-	100
DIPEMETCP-601	PROJECT WORK & SEMINAR (CORE WORKSHOP-1)	3	-	-	6	-	-	-	-	100	100
DIPEMETCP-602	PROFESSIONAL PRACTICE – IV (CORE WORKSHOP-2)	3	-	-	6	-	-	-	-	50	50
DIPEMETCP-603	GENERAL VIVA VOCE (CORE WORKSHOP-3)	1	-	-	2	-	-	-	-	100	100
	TOTAL	**24**	**15**		**18**	**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.

SYLLABUS FOR COMMUNICATIVE ENGLISH

(DIPEMING101) (GC-1)

	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

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: $v=u+at$, $s=ut+(1/2)at^2$, $V^2=u^2+2as$ (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.
4.	**ORDINARY DIFFERENTIAL EQUATIONS**
	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.
5.	**PARTIAL DIFFERENTIATION**
	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.
6.	**STATISTICS & PROBABILITY**
	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

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

(1 sheet)		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
	
	Demonstration — Making cube, hexagonal cube, hexagonal bar from round bar
	
	Job Preparation (Any one)
	
	     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	<center>**BENCH WORK & FITTING SHOP**</center> **1. GENERAL SHOP TALK** <center>**Purpose of Bench Work and Fitting Shop:**</center> 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	<center>**MACHINE SHOP**</center> **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.
2.10 Attaching 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

Proposed Syllabus for 2ⁿᵈ & 3ʳᵈ year METALLURGICAL ENGINEERING

SECOND YEAR 3ᴿᴰ SEMESTER

Code : DIPMETEC 301, General Course-1,FUNDAMENTALS OF ELECTRONICS

Theory:

1.0 PASSIVE & ACTIVE CIRCUIT ELEMENTS

1.1 Familiarity with the following components: — RESISTORS : Fixed and variable , Carbon & wire wound .(colour coding, power rating, accuracy and effect on temperatures, uses of resistors .

1.2 Fuses: Ordinary fuses (specifications) , Capacitors , Fixed & Variable capacitors – Colour coding – Rating and uses of capacitors

1.3 INDUCTOR: Ferrite core – Pot core – Air core – Fixed, tapped and variable inductors – Factors affecting inductance and uses of Inductors .

2.0 TRANSFORMER

2.1 Elementary idea of transformer, Features and specifications of wideband transformer — RF and AF transformer .

3.0 RELAYS, SWITCHES, CABLES AND CONNECTORS

3.1 Familiarity with following components: — RELAY: Reed relay & solid state relays – Their characteristics, specifications and Applications.

3.2 CABLES : RF cables – High temperature cables – Low impedance cables – TV and telephone line cables – Their characteristics and specifications .

3.3 MANUALLY OPERATED SWITCHES: Toggle switch – Keyboard switch – Push-button switch – Rotary switch – Thumb-wheel switch –

Cross-bar multi switch – Their features and applications .

3.4 CONNECTORS: Plugs and sockets – RF connectors – Edge connectors for PCB – Rating and specifications of connectors – Factors affecting choice of connectors – Choice of connectors for different applications

4.0 SEMICONDUCTOR , JUNCTION DIODE , ZENER DIODE

4.1 Idea of semiconductor , P – type semiconductor , N - type semiconductor , Construction and operation of P.N.Junction Diode . Forward and reverse bias characteristics of P-N junction diode .

4.2 Construction and operation of Zener diode , Zener breakdown and avalanche breakdown .

4.3 Use of P-N junction diode as rectifier and zener diode as voltage regulator.

5.0 BIPOLAR TRANSISTOR

5.1 Construction and operation of NPN and PNP transistors-V-I characteristics, transistor in active, saturation and cut-off-CE, CB, CC configuration and their differences, definitions of current gains and their relationship .

5.2 Transistor as simple amplifier & oscillator and their simple application

6.0 FIELD EFFECT TRANSISTOR

6.1 Construction, operation and VI characteristics of JFET, pinch-off voltage, drain résistance, transconductance, amplification factor and their relationship .

7.0 UNIJUNCTION TRANSISTOR

7.1 Construction, operation and characteristics of UJT – Equivalent circuit – UJT as relaxation oscillator – Field of applications.

8.0 THYRISTOR

8.1 Construction, operation and characteristics of SCR , DIAC, TRIAC and their uses.

9.0 OPTOELECTRONICS

9.1 Elementary ideas of LED, LCD, photodiode and solar cell and their applications

10.0 INTEGRATED CIRCUITS

10.1 Basic idea of Ics – Classifications: linear and digital Ics, SSI, MSI, LSI and VLSI – field of applications

PRACTICAL : LABORATORY EXPERIMENTS

Sl.No.	NAME OF EXPERIMENT
1.	To be familiar with the common assembly tools
2.	To be able to identify the following passive and active circuit elements: — Resistor, capacitor, inductor, transformer, relay, switches, batteries/cells, diode, transistors, SCR, DIAC, TRIAC, LED, LCD, photodiode, phototransistors, Ics etc.
3.	To be familiar with the following basic instruments : — Multimeter, oscilloscope, power supply and function generator
4.	To practice soldering and de-soldering
5.	To construct & test a battery eliminator and simple amplifier circuit on a Bread Board and Vero Board

Code:- DIPMETFM 302, CC-1,FUNDAMENTALS OF METALLURGY

Theory

1.0 INTRODUCTION

1.1 Outline of metallurgy, its importance, past history, present scenario and future.

1.2 Description about course contents, books, future studies, metallurgy as carrier.

2.0 Properties of Metallic Materials

2.1 Metallic bonding in metals; typical tensile & hardness properties of important metals .

2.2 Common ferrous materials – cast irons; plain carbon and alloy steels – brief description

2.3 Common non-ferrous metals and alloys

3.0 CRYSTAL STRUCTURE OF METALS

3.1 Crystal structure of metals, miller indices , atomic arrangement, lattice parameter, packing factor, co-ordination number.

3.2 Allotropy & Anisotropy.

3.3 Diagram of different crystal structures of metals - Miller indices; planes and directions .

4.0 IRON CARBON DIAGRAM & ITS DESCRIPTION

4.1 Idea of equilibrium, phase, components, degrees of freedom.

4.2 Phase rule, mono-variant, di-variant, non-variant system.

4.3 Description of Iron Carbon diagram, eutectic, eutectoid, peritectic reaction.

4.4 Calculation of different phases, lever rule.

4.5 Brief idea about microstructure.

5.0 MICROSCOPY & METALLOGRAPHY

5.1 Metallurgical Microscope.

5.2 Magnification & Resolving power.

5.3 Numerical Aperture.

5.4 Dark field, Bright field illumination,

5.5 Depth of focus.

5.6 Polishing techniques – manual & electro polishing ..

5.7 Abrasive powders.

5.8 Etching.

5.9 Mounting.

6.0 PYROMETRY

6.1 Definiton.

6.2 Different types , uses .

6.3 Thermoelectric Pyrometers.

6.4 Calibration of thermocouples.

6.5 Basic theory of optical, radiation & resistance pyrometers.

PRACTICAL : LABORATORY EXPERIMENTS

Sl.No.	NAME OF EXPERIMENT
1.0	**CRYSTAL STRUCTURE OF METALS**
1.1	Drawing of BCC , FCC , HCP crystal structure
1.2	Model Making of BCC , FCC , HCP crystal structure
2.0	**Study of Microscope & its accessories**
2.1	Different parts of Metallurgical microscope
2.2	Sketch of Metallurgical microscope & labelling of its different parts
2.3	Handling & focusing of microscope
2.4	Photographic attachment
3.0	**Polishing & etching of metals**
3.1	Practicing of grinding
3.2	Polishing by papers & final polisihing by cloths

3.3	Etching technique & practice

Code:DIPMETTH-303.CC-3,METALLURGICAL THERMODYNAMICS

Theory:

1.0 Introduction

1.1 Definition of thermodynamics , Applications of thermodynamics in metallurgy , usefulness , limitations , meaning of metallurgical thermodynamics.

1.2 Laws of thermodynamics – 1st. law , 2nd. Law , 3rd. law , Zeroth Law .

1.3 Basic terms used in thermodynamics - Entropy , Reactor, Reaction mixture , system & surrounding , Concept of system (isolated , closed , open) , Homogeneous and heterogeneous systems, State of system , Equation of state , properties of a system (extensive , intensive) .

1.4 Reversible & Irreversible Changes , Equilibrium , types of Equilibrium , meaning of thermodynamic equilibrium .

1.5 Isothermal & Adiabatic changes .

2.0 Energy & First law of thermodynamics .

2.1 Definition of energy , different form of energy , Internal energy, energy as a state property .

2.2 Mathematical deduction & statement of First law of thermodynamics , its significance , measurement of energy change . energy change in terms of partial derivations .

2.3 Heat capacity, differential statement of Heat capacity at constant volume and pressure , relation between them , dependence of heat capacity on temperature , importance of Cp and Cv , Enthalpy, 1st. law in terms of enthalpy , enthalpy change at constant pressure , enthalpy change with temperature, enthalpy change due to chemical reaction - heat of reaction, heat of formation, heat of combustion, latent heat , Heat of solution .

2.4 Simple numerical problems on enthalpy change , heat of reaction , heat of formation .

3.0 Second law of thermodynamics.

3.1 Entropy , Statement of Second law of thermodynamics in terms of entropy , entropy change for a reversible and irreversible process,

3.2 Combined statements of 1st and 2nd laws .

3.3 Simple numerical problems .

4.0 Free Energy & Third law of thermodynamics .

4.1 Helmholtz free energy , Gibbs free energy , free energy of a state , free energy of a substance , free energy as criteria of equilibrium.

4.2 Statement of third law of thermodynamics .

4.3 Simple numerical problems on calculation of change in free energy , feasibility of a reaction to occure .

4.4 Concept of fugacity , activity , standard state , equilibrium constant & its importance , Lechatelier Principle .

4.5 Simple numerical problems on calculation of equilibrium constant , feasibility of a reaction , Gibbs free energy .

5.0 Ellingham Diagram .

5.1 Ellingham Diagram for oxides , important features , characteristics of different curves and explanations.

5.2 Simple numerical problems on Ellingham Diagram .

Code:DIPMETMT 304,CC-4,MECHANICAL TESTING OF METALS

Theory:

1.0 INTRODUCTION

1.1 Importance of mechanical testing of metallic materials

1.2 Various testing such as Tension, Compression, Impact, Fatigue, hardness testing etc.

2.0 TENSILE PROPERTY & TESTING PROCEDURE

2.1 Stress - strain diagram, proof - stress, yield - stress, ductility, & True stress, True strain

2.2 Brief description of Tensile testing machine, actual testing, measurements

3.0 IMPACT : VALUE & TESTING PROCEDURE

3.1 Definition

3.2 Izod test

3.3 Charpy test

3.4 Effect of variables on Impact test, Transition temp, Blue – Brittleness, Temper- embrittlement

4.0 HARDNESS : VALUE & TESTING PROCEDURE

4.1 Definition

4.2 Brinell hardness test, its description

4.3 Rockwell hardness test, its description

4.4 Vickers hardness test, its description

4.5 Comparison of Brinell & Vickers hardness values

4.6 Rockwell Superficial hardness test, brief idea

4.7 Rebound hardness test, brief idea

4.8 Hot hardness test, brief idea

5.0 FATIGUE & FATIGUE PROPERTY

5.1 Definition, unit

5.2 Specimen size & shape

5.3 Test procedure, Endurance Limit, application

5.4 Fatigue failure fracture

5.5 Effect of different variables on Fatigue- properties

6.0 NON-DESTRUCTIVE TESTING

6.1 Definition

6.2 Visual examination

6.3 Leakage testing

6.4 Penetrant method

6.5 Magnetic method

6.6 Acoustic method (ultrasonic testing)

6.7 Radiography

7.0 CREEP : PHENOMENON & MEASURING PARAMETERS

7.1 Importance of Creep, application area

7.2 Stages of Creep, minimum creep rate

7.3 Homologous Temperature

7.4 Stress- rupture test, application area

7.5 Comparison of creep Vs Stress – rupture

7.6 Statistical Creep data

PRACTICAL : LABORATORY EXPERIMENTS :

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SL. NO.	NAME OF EXPERIMENT
1.	Rockwell Hardness Testing
2.	Brinell Hardness Testing
3.	Izod Impact Testing
4.	Charpy Impact Testing
5.	To study the UTM and Perform The Tensile Testing .
6.	Non - Destructive Testing -- Dye Penetrate / Liquid Penetrate Method.
7.	Non - Destructive Testing -- Magnetic Particle Crack Detection
8.	Non - Destructive Testing -- Ultrasonic Testing

Code: DIPMETME 305,GC-2,MECHANICAL ENGINEERING

Theory:

1.0 MECHANICAL POWER TRANSMISSION

1.1 Types of pulleys , types of gear – spur , helical , bevel gears .

1.2 Joint – couplings – universal joint , types of bearings – applications , chain drive – types of application.

2.0 BOILER

2.2 Functions of boilers and their classification, brief description and working principles only of the following boilers – Babcock Wilcox & Fluidized Bed Combustion Boiler .

2.3 Locations & functions only of the following boiler mountings and accessories – water level indicator, fusible plug, pressure gauge , stop valve, safety valve, economiser, superheater, air preheater and feed pump.

3.0 FLUID – MECHANICS

3.1 Properties of fluid, types of flow – laminar & turbulent flow , pressure of fluid, pressure head of liquid, absolute & vacuum pressure gauge, equation of continuity of flow, Bernoulli' s theorem (proof not required), venturimeter - Simple numerical problems.

3.2 Itroduction with sketch & working principle of fluid power control . Different types of pumps – gear , spiral vane & piston pump .

3.3 Flow of liquid through notches – definition of notch, types of notch, types of notch types of notch - rectangular notch, triangular notch. Formula of discharge through notches (proof not required). Simple numerical problems on discharge.

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO.	NAME OF EXPERIMENT
1.	Study & sketch of Lancashire, Cochran, Babcock & Wilcox boiler .
2.	Study & sketch of boiler mountings & accessories
3.	Measurement of flow through orifices, notches, pipes .
4.	Verification of Bernoulli's theorem .

Code: DIPMETWS 306,CCP-3,WORKSHOP PRACTICE

PRACTICAL : LABORATORY EXPERIMENTS

SL. NO.	NAME OF EXPERIMENT
1.0	**PATTERN MAKING**
1.1	Study of pattern materials , types of patterns & pattern allowances .
1.2	Contraction and shrinkage allowance for various metals, their influence on pattern making .
1.3	Core box and core print .
1.4	Laying-out of pattern according to drawing and selecting timber for pattern.
1.5	Preparing patterns and making required core boxes for them.
1.6	Making simple patterns from drawing , such as shaft, coupling, bushing and piston etc.
2.0	**MOULDING & CASTING**
2.1	Identify sand, binders and additives used as foundry materials.Composition of Green , Dry sand .
2.2	Describe the mold making processes (ramming, venting, gating, coating, drying, etc.)

2.3	Methods used to prepare simple green mould using single piece and split patterns.
2.4	Preparation of foundry sand .
2.5	Preparation of different types of moulds using single piece, spit or any available pattern - at least 2 moulds should be prepared by each student .

Code: DIPMETPP 307, CCP-4, PROFESSIONAL PRACTICE – I

Objective : The Student will be able to :

1. Acquire information from different sources.

2. Prepare notes for given topic.

3. Present given topic in a seminar.

4. Interact with peers to share thoughts.

5. Prepare a report on industrial visit, expert lecture

1. Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work.

Visits to any two of the following :

i) Nearby Petrol Pump (fuel, oil, product specifications) .

ii) Automobile Service Station (Observation of Components / aggregates)

iii) Engineering Workshop (Layout, Machines)

iv) Dairy Plant / Water Treatment Plant

2. Lectures by Professional / Industrial Expert / Student Seminars based on information .

Search to be organized from any THREE of the following areas :

i) Pollution control.

ii) Non destructive testing.

iii) Acoustics.

iv) Illumination / Lighting system.

v) Fire Fighting / Safety Precautions and First aids.

vi) Computer Networking and Security.

vii) Topics related to Social Awareness such as – Traffic Control System, Career opportunities, Communication in Industry, Yoga Meditation, Aids awareness and health awareness.

3. Group Discussion : The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work.

Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are –

i) Sports

ii) Current news items

iii) Discipline and House Keeping

iv) Current topics related to metallurgical engineering field.

4. Student Activities :

The students in a group of 3 to 4 will perform any one of the following activities (others similar activities may be considered) .

i) Collect and study IS code for Engineering Drawing..

ii) Collecting information from Market: Nomenclatures and specifications of engineering materials.

Iii) Specifications of Lubricants.

iv) Draw orthographic projections of a given simple machine element using CAD software .

METALLURGICAL ENGINEERING

SECOND YEAR 4TH SEMESTER

Code-DIPMETIM 401, CC-1, Principles of IRON MAKING

Theory:

1.0 Introduction, Raw Materials for Iron Making .

1.1 Introduction to iron and steel making; role of iron making in integrated steel plant .

1.2 Brief geometrical idea and their location.

1.3 Indian iron ores ,quality of iron ores of different zones .

1.4 Beneficiation of iron ores .

1.5 Raw materials for iron making and their preparation.

1.6 Metallurgical coke – important properties required.

2.0 Agglomeration of iron ore .

2.1 Justification of agglomeration, comparison of quality between ore and agglomerate

2.2 Various techniques – Sintering, Pelletization, briquetting etc

2.3 Brief description of Sintering process; role of variables

2.4 Brief description of pelletization process; important properties of agglomerates .

3.0 Iron Blast furnace & its operation .

3.1 Description of blast furnace and its accessories , refractory lining and cooling . stoves; gas cleaning system. hot blast.

3.2 Burden distribution and their effects. bell-less top charging methods

3.3 Physical chemistry of the reactions at various zones, slag formation, sulphur and silicon reactions

3.4 Calculation of blast furnace charges.

3.5 Factors affecting blast furnace productivity; alumina problem in India

3.6 Some common operating troubles in blast furnace and their causes and remedies.

3.7 External treatments of hot metal – desulphurization, desiliconization

3.8 Utilization of BF products – gas and slag

4.0 Modern developments in BF iron making

4.1 Importance of reducing coke rate

4.2 Injection of solid and liquid through tuyeres – injection of coal, oil , plastic granules etc

4.3 Oxygen-enriched blast & its limitations, increase of blast temperature

4.4 High top pressure operation of blast furnace

4.5 Factors affecting blast furnace productivity; environmental aspects of iron making

5.0 Alternative route of Iron production .

5.1 Limitations of blast furnace route, other options for iron production

5.2 Mini blast furnace –characteristics; difference with conventional iron blast furnace

5.3 Electro – Thermal Smelting Process -- basic principle , operation & effectiveness .

5.4 Direct Reduced Iron (Sponge Iron) Technology - outline of important gas-based and coal- based processes, physical chemistry of the reactions; uses of sponge Iron ; Indian scenario .

5.5 Smelting Reduction (SR) technology – ITMK3 , FINEX / COREX - basic principle , operation & effectiveness .

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO	NAME OF EXPERIMENT
1.0	Chart on Iron ore deposit : Chart in a table form of iron deposit, and their utilization mentioning user, annual requirement, quality, yearly import & export .
2.0	Chart on metallurgical coal deposit
2.1	Chart in a table form the Metallurgical coal deposit in India with quality, type and amount of reserve
2.2	Draw the chart of Indin Standard Specification for Blast furnace coke and their properties
3.0	Flow chart on sinter plant
3.1	Draw the schematic arrangement & flow chart of a sinter plant .
4.0	Flow chart & diagram of blast furnace operation .
4.1	Draw the schematic diagram of Iron Blast furnace.
4.2	Draw the flow diagram of blast furnace operation .
4.3	Make a chart of typical pig iron composition for different grade.

Code: DIPMETPM-402,CC-2,PHYSICAL METALLURGY

Theory:

1.0 Alloy System & Phase transformation in Iron - Carbon equilibrium diagram.

1.1 Alloy System , Classification of alloys, Interstitial, substitutional, Intermetallic compounds.

1.2 Hume -Rothery rules of alloying;

1.3 Types of Solid Solution with example .

1.3 Different phases & their transformation mechanism in Iron - Carbon equilibrium diagram – Brief outline .

2.0 Solidification of Metals & Alloys.

2.1 Liquid Phase & Phase rule.

2.2 Nucleation.

2.3 Crystal growth from liquid phase.

2.4 Dendritic growth.

2.5 Freezing of lngots.

2.6 Cast structure.

2.7 Segregating.

2.8 Homogenization.

2.9 Inverse segregaftion.

3.0 Porosity problems.

3.0 T-T-T & CCT Diagram .

3.1 T-T-T curve & its description.

3.2 Effect of temperature on pearlite formation.

3.3 C-C-T diagram.

3.4 Difference between T-T-T & C-C-T diagram .

3.5 Critical cooling rate to produce martensite

3.6 Formation of bainite

4.0 Heat treatment of Steel.

4.1 Definition & objectives of heat treatment.

4.2 Annealing

4.3 Normalising

4.4 Hardening.

4.5 Tempering.

4.6 Sub-Zero treatment.

4.7 Defects due to heat treatment.

5.0 Hardenability

5.1 Definition & concept .

5.2 Determination of hardenability by Grossman method , merits & demerits.

5.3 Determination of hardenability by Jominy method , merits & demerits.

5.4 Effect of grain size, carbon content, & alloying elements on hardenability.

5.5 Severity of quench, Ideal quench.

PRACTICAL : LABORATORY EXPERIMENTS

SL. NO	NAME OF EXPERIMENT
1.0	**Microstructural study.**
1.1	Study of different plain carbon steel under annealed, normalized, hardened & Tempered conditions.
1.2	Study of cast- Iron.
1.3	Study of copper & its alloys
1.4	Study of Aluminium & its alloys
2.0	**Heat treatment.**
2.2	Annealing of hypo eutectoid , hyper eutectoid steel , studying microstructures & hardness value.

2.3	Normalising of above samples , studying microstructures & hardness value.
2.4	Analysis of above results & explanation
2.5	Grain size measurement in above samples .
3.0	**Determination of Hardenability by Jominy method .**
3.1	Sample preparation for hardenability test (Jominy method) .
3.2	Austenitising of hadenability sample.
3.3	Quenching of hadenability sample.
3.4	Plotting graph .
3.5	Explanation of readings.
4.0	**Calibration of Thermocouple**
4.1	Calibration of thermocouples by primary method .

Code: DIPMETMW 403,CC-3,METAL WORKING

Theory:

1.0 Introduction to different metal working processes.

1.1 Importance of hot – metal working.

1.2 Temperature in Metal working.

1.3 Classfication of metal – working.

1.4 Thermo -mechanical treatment.

2.0 Rolling of metals & Alloys.

2.1 Classification of Rolling-Mills.

2.2 Hot- rolling.

2.3 Cold-rolling.

2.4 Variables in rolling.

2.5 Forces in rolling.

2.6 Dcfects in rolling.

3.0 Forging Process .

3.1 Forgability – Forging .

3.2 Open-die Forging.

3.3 Closed die Forging.

3.4 Press & Hammer forging.

3.5 Hot- stamping.

3.6 Defects in forging.

4.0 Extrusion Process

4.1 Types of Extrusion.

4.2 Application & Limitation of extrusion.

4.3 Variables in extrusion.

4.4 Seamless tube production.

4.5 Defects in extrusion.

5.0 Wire - drawing.

5.1 Wire-drawing techniques.

5.2 Wire-drawing die.

5.3 Half-die angle, Patenting .

5.4 Defects in wire drawing.

6.0 Deep – drawing .

6.1 Re-drawing.

6.2 Deep-drawn products.

6.3 Drawability

6.4 Defects in deep Drawing.

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO	NAME OF EXPERIMENT
1.0	Flow chart & design on Rolling mill .
1.1	Flow chart of a rolling mill .
1.2	Diagram of various types of rolling mill .
1.3	Roll – pass design .
2.0	Drawings & design on Forging
2.1	Diagram of forging hammers .
2.2	Diagram of forging press .
2.3	Forging Die – design
3.0	Drawing on Extrusion .
3.1	Diagram of extrusion machine .

3.2	Diagram for extrusion of tubes .
3.3	Die – setting in extrusion
4.0	Sketching on Draw bench & Die design
4.1	Sketch of draw bench
4.2	Drawing – die design
4.3	Sketch of multiple – pass drawing head .

Code-DIPMETFR 404,GC-1, F U E L, F U R N A C E & R E F R A C T O R Y

Theory:

1.0 INTRODUCTION

1.1 Importance of fuel, furnace & refractory in metallurgy.

2.0 SOLID FUELS

2.1 Classification of coal and special characteristics of metallurgical coal.

2.2 Coke making and bye-product.

2.3 Testing of coal and coke for metallurgical purpose.

3.0 LIQUID FUELS

3.1 Important liquid fuels for metallurgical industry.

3.2 Requisite characteristics of liquid fuels.

4.0 GASEOUS FUELS

4.1 Producer gas and water gas.

4.2 Blast furnace gas and coke oven gas.

4.3 Coal gas from coal & gasification process.

5.0 FURNACES

5.1 Introduction to metallurgical furnaces.

5.2 Types & purpose, characteristics of different furnaces.

5.3 Outline of fuel-fired furnace, Resistance furnace, Arc furnace, Induction Furnace.

6.0 REFRACTORY

6.1 Introduction to refractory.

6.2 Classification and characteristics of metallurgical refractory.

6.3 Refractory testing.

6.4 Refractory used in various metallurgical furnaces.

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO	NAME OF EXPERIMENT
1	To determine moisture content in coal
2	To determine volatile matter in coal
3	To determine ash content in coal
4	To determine fixed carbon content in coal
5	To determine total Carbon & Hydrogen in coal
6	DRAWING & LABELLING OF DIFFERENT TYPES OF FURNACES WITH SMALL DESCRIPTIONS
	A. CUPOLA FURNACE
	B. ELECTRIC ARC FURNACE (E.A.F)
	C. CRUCIBLE FURNACE
	D. L.D . Converter
7	Refractory Testing
	A. Pyrometric Cone Equivalent Test (P.C.E.)
	B. Refractoriness under load (R.U.L)
	C. Cold crushing strength (CCS) :
8	Drawing and Labelling of Blast Furnace & its Refractories along with chart

Code-DIPMETEE 405,GC-2,ELECTRICAL ENGINEERING

Theory:

1.0 D.C. generators

1.1 Construction – Main parts, materials they are made of, functions of the parts.

1.2 Field & armature connection , diagrams and classification of the Generators on the basis of these connections.

1.3 Deduction of emf equation and simple problems.

1.4 Application of D.C generators.

2.0 D.C . Motor

2.1 Principle of operation & classification.

2.2 Back emf ; deduction of expression for torque, simple problems .

2.3 D.C. Motor starter - classification & necessity .

2.4 Speed equations and speed control of shunt & series motor- Armature resistance control & field control only.

2.5 Application of D.C. motors

3.0 A.C Generators / Alternators

3.1 Construction – Main parts – Rotor, stator, slip ring and brushes, exciters and their functions.

3.2 Principle of operation, classification and uses .

4.0 A.C - 3 – phase systems

4.1 Connections – a) Star connection -3 phase, 3 wire and 4 wire systems. b) Delta connection – 3 phase 3 wire systems

4.2 Relation between line & phase values of voltage & current – in each case and expression for power.

4.3 Advantages of 3 phase system over single phase system.

5.0 Transformers

5.1 Construction & principle of operation of single phase transformers.

5.2 E.M.F. equation and deduction of the relations --- $N_1 / N_2 = E_1 / E_2 = I_2 / I_1$

5.3 Connections of 3 phase transformers a) Star / Star b) Delta / Delta c) Star / Delta d) Delta / Star (Connections only)

5.4 Applications of transformers

6.0 Three phase Induction motors

6.1 Construction, principle of operation and classification (Squiorrel cage, slipring motors)

6.2 Defination and relationship of syn. speed , actual speed slip and frequency of rotor current.

6.3 Solve simple problems .

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO	NAME OF EXPERIMENT
1	Study of meggar & its application
2	Study of energy meter (induction type) & its application.
3	Study of constructional features of 3 phase induction motor.
4	Study of star / delta starter for 3 phase induction motor.
5	Study auto transformer starter for 3 phase induction motor.
6	Study of direct on line starter for 3 phase squirrel cage induction motor.
7	Measurement of armature resistance of a d.c. machine.
8	Study of the constructional features of a d.c. machine.
9	Study of the constructional features of single phase & 3 phase transformers

Code: DIPMETCP 406,GC-3,COMPUTER PROGRAMMING

Theory:

1.0 Introduction

1.1 Problem, definition and analysis, algorithm, flow charts, tracing and dry running of algorithms.

1.2 Introduction to 'C' programming, simple program using Turbo ' C ' compiler and execution of 'C' program .

2.0 C Fundamentals

2.1 Character set , constants & variables , data types, identifiers, key words, variable declarations .

2.2 Types of Operators – unary, binary, arithmetic, relational, logical, assignment.

2.3 Hierarchy of operators, expressions, library functions, Use of input / output functions viz. Printf ( ), Scanf ( ), getch ( ), putch ( ) .

3.0 Use of Control Statements

3.1 if-else, while loop, do – while loop, for loop, switch, break and continue.

3.2 Writing, Compiling, Executing and debugging programs .

3.3 Introduction to Subscripted variables, arrays, defining and declaring one and two dimensional arrays, reading and writing

4.0 Concept of String

4.1 String input / output functions .

4.2 Defining and accessing a user defined functions, Passing of arguments, declaration of function prototypes .

4.3 Storage classes: automatic, external, static variables . register .

5.0 Concept of Function

5.1 Function declaration .

5.2 Simple program using function .

5.3 Function prototype declaration .

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO	NAME OF EXPERIMENT
1.0	To write simple program having engineering application involving following statements :
1.1	Use of Sequential structure
1.2	Use of if-else statements , Use of multiple branching Switch statement .
1.3	Use of for statement
1.4	Use of Do-While Statement.
1.5	Use of While statement
1.6	Use of break and Continue statement .

1.7	Use of different format specifiers using Scanf( ) and Printf( ) .
1.8	Use of one dimensional array e.g. String, finding standard deviation of a group data.
1.9	Use of two dimensional array of integers/ reals .

Code:DIPMETLS 407,CCP-1,DEVELOPMENT OF LIFE SKILL – II

Objective :

1. Developing working in teams

2. Apply problem solving skills for a given situation

3. Use effective presentation techniques

4. Apply techniques of effective time management

5. Apply task management techniques for given projects

6. Enhance leadership traits

7. Resolve conflict by appropriate method

8. Survive self in today's competitive world

9. Face interview without fear

10. Follow moral and ethics

11. Convince people to avoid frustration

SL. NO	NAME OF EXPERIMENT
1.0	SOCIAL SKILLS : SOCIETY, SOCIAL STRUCTURE, DEVELOP SYMPATHY AND EMPATHY
2.0	Swot Analysis – Concept , How to make use of SWOT
3.0	Inter personal Relation : Sources of conflict, Resolution of conflict , Ways to enhance interpersonal relations.
4.0	Problem Solving : A . STEPS IN PROBLEM SOLVING . 1) IDENTIFY AND CLARIFY THE PROBLEM . 2) INFORMATION GATHERING RELATED TO PROBLEM . 3) EVALUATE THE EVIDENCE, 4) CONSIDER ALTERNATIVE SOLUTIONS AND THEIR IMPLICATIONS, 5) CHOOSE AND IMPLEMENT THE BEST ALTERNATIVE, 6) REVIEW B . Problem solving technique. (any one technique may be considered) 1) Trial and error, 2) Brain storming, 3) Lateral thinking
5.0	Presentation Skills : Body language -- Dress like the audience , Posture, Gestures, Eye contact and facial expression.

	PRESENTATION SKILL – STAGE FRIGHT, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. Use of aids –OHP,LCD projector, white board.
6.0	Group discussion and Interview technique – Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making . INTERVIEW TECHNIQUE , NECESSITY, TIPS FOR HANDLING COMMON QUESTIONS .
7.0	Working in Teams : UNDERSTAND AND WORK WITHIN THE DYNAMICS OF A GROUPS , TIPS TO WORK EFFECTIVELY IN TEAMS, ESTABLISH GOOD RAPPORT, INTEREST WITH OTHERS AND WORK EFFECTIVELY WITH THEM TO MEET COMMON OBJECTIVES, TIPS TO PROVIDE AND ACCEPT FEEDBACK IN A CONSTRUCTIVE AND CONSIDERATE WAY , LEADERSHIP IN TEAMS, HANDLING FRUSTRATIONS IN GROUP.
8.0	Task Management : INTRODUCTION , TASK IDENTIFICATION , TASK PLANNING , ORGANIZING AND EXECUTION, CLOSING THE TASK .

PRACTICAL : List of Assignment: Any Eight Assignment

SL. NO	NAME OF EXPERIMENT
1.	SWOT analysis:- Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT. a) Your past experiences, b) Achievements, c) Failures, d) Feedback from others etc.
2.	Undergo a test on reading skill/memory skill administered by your teacher.
3.	Solve the puzzles.
4.	Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slump area, social activities like giving cloths to poor etc.(One activity per group) .
5.	Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher.
6.	Watch / listen an informative session on social activities. Make a report on topic of your interest using audio / visual aids. Make a report on the programme. .
7.	Conduct an interview of a personality and write a report on it.
8.	Discuss a topic in a group and prepare minutes of discussion. Write thorough description of the topic discussed.
9.	Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher.

Code: DIPMETPP 408, CCP-2,PROFESSIONAL PRACTICE – II

Objective : The Student will be able to :

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture

1. Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work.

Two industrial visits may be arranged in the following areas / industries :

i) Manufacturing organizations for observing various manufacturing processes including heat treatment.
ii) Material testing laboratories in industries or reputed organizations
iii) Auto workshop / Garage
iv) Plastic material processing unit
v) ST workshop / City transport workshop

2. Lectures by Professional / Industrial Expert / Student Seminars based on information . Search to be organized from any three of the following areas :

i) Use of a plastics in automobiles.
ii) Nonferrous Metals and alloys for engineering applications
iii) Surface Treatment Processes like electroplating, powder coating etc.
iv) Selection of electric motors.
v) Computer aided drafting.
vi) Industrial hygiene.
vii) Composite Materials.
Ix) Heat treatment processes.
x) Ceramics
xi) Safety Engineering and Waste elimination

3. Individual Assignments : Any two from the list suggested .

i) Process sequence of any two machine components.
ii) Write material specifications for any two composite jobs.
iii) Collection of samples of different plastic material or cutting tools with properties , specifications and applications.
iv) Preparing models using development of surfaces.
v) Assignments on bending moment , sheer forces , deflection of beams and torsion chapters of strength of material.
vi) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.

vii) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes.

viii) List the various properties and applications of following materials – a) Ceramics b) Fiber reinforcement plastics ; c) Thermo plastic plastics ; d) Thermo setting plastics ; e) Rubbers.

OR

Conduct ANY ONE of the following activities through active participation of students and write report.

i) Rally for energy conservation / tree plantation.

ii) Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc.

iii) Conduct aptitude , general knowledge test , IQ test

iv) Arrange **any one** training in the following areas : a) Yoga. B) Use of fire fighting equipment C) First aid ; D) Maintenance of Domestic appliances.

4. Modular courses (Optional) : A course module should be designed in the following areas for max. 12 hrs. Batch size – min. 15 students.

Course may be organized internally or with the help of external organizations.

a) Forging Technology.

b) CAD-CAM related software.

c) Welding techniques.

d) Personality development.

e) Entrepreneurship development.

5. 3-D Design using software : Computer screen, coordinate system and planes, definition of HP,VP, reference planes How to create them in 2nd / 3rd environment. Selection of drawing site & scale. Commands of creation of Line, coordinate points, Axis, Poly lines, square, rectangle, polygon, sp line, circles, ellipse, text, move, copy, offset, Mirror, Rotate, Trison, Extend, Break, Chamfer, Fillet, Curves, Constraints fit tangency, perpendicularity, dimensioning Line convention, material conventions and lettering. The Student should draw – Different orthographic Views (including sections), Auxiliary views according to first / Third angle method of projection.(Minimum two sheets, Each containing two problems) after learning the contents as above.

METALLURGICAL ENGINEERING

THIRD YEAR 5^(TH) SEMESTER

Code: DIPMETSM 501,CC-1, Principles of STEEL MAKING

Theory:

O B J E C T I V E :

1. Gather concept about basic principle of steel making .

2. Understand about different processes of steel making .

3. Gather knowledge about process of Secondary steel making .

4. State about process of Ingot preparation , defects ,remedies etc.

D E T A I L C O U R S E C O N T E N T

1.0 Principle of Steel Making .

1.1 Basic theory & Principle.

1.2 Chemistry of different refining reaction.

1.3 Carbon reaction.

1.4 Sulphur reaction.

1.5 Manganese reaction.

1.6 Silicon reaction.

1.7 Phosphorous reaction.

1.8 Nitrogen & Hydrogen reaction .

1.9 Slag formation & nature of slag; role of basicity and other factors on solute removal

2.0 Review of older steel making process .

2.1 Acid & basic Bessemer processes – their limitations; reason for their obsolescence

2.2 Basic principle of Open Hearth Process - Acid and Basic process .

2.3 Reasons for decline of Open Hearth Process .

3.0 Basic oxygen converter Process

3.1 LD converter process , Refractory lining.

3.2 Reactions in LD converter .

3.3 Bath Agitation Process (BAP) – combined blowing – Brief outline .

3.4 LDAC / OLP Process - Brief outline.

3.5 KALDO Process - Brief outline .

3.6 ROTOR Process - Brief outline .

3.7 Q- BOP PROCESS -, basic features , advantages , disadvantages.

3.8 Brief outline of refining process in Q - BOP PROCESS .

4.0 Electric Arc Furnace Steel Making.

4.1 Basic principle .

4.2 Electric arc furnace constructional features & its accessories.

4.3 Charge materials, refining . double slag practice .

4.4 Development in EAF Technology – Name of different processes .

4.4.1 Ultrahigh power (UHP) transformer – brief outline .

4.4.2 Furnace shell design - brief outline .

4.4.3 Design of cooling system for side wall and roof – brief outline.

4.4.4 New design of electrode - brief outline.

4.4.5 DC electric arc furnace - brief outline.

4.4.6 Oxyfuel Burners and Oxygen Lancing - brief outline.

4.4.7 Foamy slag practice - brief outline.

4.4.8 Preheating of slag and waste heat recovery - brief outline.

4.4.9 Use of sponge iron as charge material - brief outline.

4.4.10 Use of hot metal and iron carbide as charge material - brief outline.

5.0 Secondary Steel Making.

5.1 Objectives of secondary steel making.

5.2 Various processes .

5.3 Vacuum ladle degassing

5.3.1 Recirculation Degassing (RH) – brief outline .

5.3.2 Recirculation Degassing with oxygen top lance (RH-OB) - brief outline .

5.3.3 Ladle Degassing (VD, Tank Degassing) - brief outline .

5.3.4 Vacuum Oxygen Decarburization (VOD) - brief outline .

5.4 Ladle Furnace (LF) - brief outline .

5.5 Ladle desulfurization by injection of active agents , Powder injection , Cored wire injection - brief outline .

5.6 Ladle-to-mold degassing - brief outline .

5.7 Deoxidation of steel - - brief outline .

5.7.1 Deoxidation by metallic deoxidizers - Killed steels , Semi-killed steels , Rimmed steels -

5.7.2 Deoxidation by vacuum .

5.7.3 Diffusion deoxidation

5.8 Desulfurization of steel

5.9 Electroslag Remelting (ESR) - . - brief outline

5.10 Argon - oxygen decarburization (AOD) – basic principle and application .

6.0 Ingot Casting Practice .

6.1 Tapping & teeming of killed, semi-killed & rimming steels .

6.2 Types of Ingots & Ingot models .

6.3 Ingot defects — their causes & remedies.

6.4 Continuous casting of steel . Definition ,

6.5 Types of continuous casting machine & diagram ,

6.6 Tundish – brief outline.

6.7 Common defects in concast products and remedies.

PRACTICAL : LABORATORY EXPERIMENTS :

1.0 Charts on raw materials , different routes & plants in steel making.

1.1 To draw chart showing basic raw material for steel making .

1.2 To draw flow chart on different routes of steel making .

1.3 To draw chart showing name of different Indian Steel Plants, furnaces , capacity.

2.0 Lay out of different steel making shop .

2.1 To draw lay out of BOF shop .

2.2 To draw lay out of Open Hearth shop .

2.3 To draw lay out of Electric Arc furnace shop .

3.0 Flow charts on steel making process .

3.1 To draw the L.D.Converter , showing blowing , sequence of elimination of impurities curve , refractory

lining , oxygen consumption , oxygen flow rate, etc .

3.2 To draw the LDAC / OLP Process

3.3 To draw KALDO Process .

3.4 To draw ROTOR Process

4.0 Diagram on different defects in steel ingots .

4.1 To draw different types of defects in Killed steel ingots .

4.2 To draw different types of defects in Semi – skilled steel ingots .

4.3 To draw different types of defects in Rimming & Capped steel ingots .

5.0 Diagram of Continuous casting machines with labeling of different parts. .

Code:DIPMETFT 502,CC-2,FOUNDRY TECHNOLOGY

1. Gather concept about Foundry technology .

2. Understand about pattern making , material & application .

3. Gather knowledge about use of different mould & core in foundry.

4. State the process & metallurgy of solidification process .

5. Gather knowledge about gating & risering system .

6. Know about different defects & remedial measures in casting process .

7. Know about cupola operation & production process of S.G.Iron, malleable iron , Nodular cast iron & metallurgy of all varieties

Theory:.

1.0 Introduction

1.1 Brief History ,

1.2 Advantages and Limitations . Applications

1.3 Different sections of a foundry; raw materials required

2.0 Pattern making

2.1 Pattern materials , advantages and limitations.

2.2 Pattern allowances,

2.3 Types of pattern,

2.4 Color code scheme.

3.0 Green and dry sand casting process

3.1 Types of sand and their properties, advantages and limitations.

3.2 Molding sand and its properties .

3.3 Molding sand composition.

3.4 Cores : Use , core material, types of cores, advantages and limitations .

3.5 Core prints, chaplets.

4.0 Gating & Risering

4.1 Gating System : Element of gating systems, types of gates.

4.2 Riser System : use, placement, riser design considerations.

4.3 Caine's method & Kvoronov's rule.

5.0 Special Molding Processes

5.1 Carbon dioxide molding process , brief outline , advantages and limitations.

5.2 Investment casting process , - , brief outline , advantages and limitations.

5.3 Die casting process - , brief outline , advantages and limitations.

5.4 Shell molding process , brief outline , advantages and limitations.

5.5 Full molding process . , brief outline , advantages and limitations.

5.6 Vacuum-Sealed casting process , brief outline , advantages and limitations.

5.7 Centrifugal casting processes – true & semi-centrifugal casting ; centrifuging

6.0 Fettling & Salvaging of Castings .

6.1 Fettling steps; salvaging of castings by welding

6.2 Types of different defects found in castings.

6.3 Causes and remedies of defects such as blowholes, pinholes, blisters, hot tears, cold shut, metal penetration.

7.0 Melting Practices : Cupola operation .

7.1 Description about Cupola operation.

7.2 Chemical reactions in cupola furnace.

7.3 Charge calculations,

PRACTICAL : LABORATORY EXPERIMENTS :

1.0 SIEVE ANALAYSIS OF MOULDING SAND

1.1 Analysis technique of Sand by sieve analysis.

1.2 Plotting graph on sieve analysis .

1.3 Inference on results .

2.0 MAKING SAND SAMPLES USING SAND RAMMER

2.1 Handling & operation of muller & Mixer .

2.2 Mixing of sand and other additives .

2.3 Specimen preparation by ramming .

3.0 DETERMINATION CLAY CONTENT IN MOULDING SAND

3.1 Basic principle of measuring clay-content in sand.

3.2 Handling and drawing of the apparatus.

3.3 Inference on results .

4.0 DETERMINATION OF MOISTURE CONTENT IN MOULDING SAND

4.1 Description & drawing of moisture content machine .

4.2 Basic principle

4.3 Inference on results .

5.0 DETERMINATION OF GREEN & DRY STRENGTH OF DIFFERENT MOULDING SAND MIXTURES.

5.1 Description & drawing of Sand strength Testing machine .

5.2 Determination of Green sand strength (compression & shear).

5.3 Determination of Dry sand strength (compression & shear).

6.0 DETERMINATION OF PERMEABILITY IN MOULDING SAND

6.1 Definition & Basic principle .

6.2 Drawing of the apparatus .

6.3 Process description and results .

6.4 Inference on results .

7.0 DETERMINATION OF HARDNESS OF MOULDING SAND

7.1 Definition & Basic principle .

7.2 Apparatus description .

7.3 Results & inferences.

Code: DIPMETMP 503,CC-3,METAL PROCESSING

O B J E C T I V E

1. Gather concept about Controlled rolling processes .

2. Understand about Metal Joining process & application .

3. Gather knowledge about Powder Metallurgy .

4. Gather knowledge about Surface Coating process .

Theory :

1.0 Controlled Rolling Processes

1.1 Thermo-mechanical controlled process .

1.2 Graphical time-temperature presentation ;

1.3 Rolling of TMT bars and automobile sheets .

1.4 Metallurgical features of controlled rolling;

1.5 Rolling of thin sheets and aluminum foils

2.0 Metal Joining process

2.1 Different joining process - welding , soldering , & Brazing , their applications .

2.2 Classification of different welding processes .

2.3 Gas welding , Oxy-acetylene gas welding – brief outline .

2.3 Arc Welding - brief outline , its application.

2.4 Submerged-arc welding , brief idea , its application.

2.5 TIG process , brief idea, its application.

2.6 MIG process , brief idea , its application.

2.7 Resistance welding , brief idea , its application .

2.8 Ultrasonic welding , brief idea , its application .

2.9 Explosives welding , brief idea , its application .

2.10 Thermit welding, , brief idea , its application .

2.11 Thermal effects of welding on parent metal.

2.12 Different zones , Definition of HAZ.

2.13 Metallurgical aspects of soldering & Brazing.

2.14 Defects in welds & its Remedies

3.0 Powder Metallurgy

3.1 Powder metallurgy: scope and importance

3.2 Production of metal powders.

3.3 Compaction and sintering processes.

3.4 Secondary and finishing operations ,

3.5 Economics, advantages, and applications of powder metallurgy.

4.0 Surface Coating

4.1 Surface coating of metals : objectives and importance

4.2 Classification of surface coatings / modification techniques.

4.3 Electro- and electroless- plating : mechanisms .

4.4 Bath characteristics and electrochemical parameters.

4.5 Anodizing, chromating, phosphating etc.

4.6 Spray coating processes, hot dipping and weld coating methods.

4.7 Testing and quality control of coatings. Selection of coating materials and methods.

PRACTICAL : LABORATORY EXPERIMENTS :

1.0 Sketch on Controlled Rolling Processes

1.1 Sketch the different types of Controlled Rolling Processes .

1.2 Sketch & Practice on Arc welding .

2.0 Sketch chart of essential Arc welding equipments .

2.1 Practicing arc welding , studying problems encountered & avoidable remedies .

2.2 Studying about straight polarity / Reverse polarity .

2.3 Draw the TIG welding set up and Sketch the penetration pattern for various shielding gases.

3.0 Study of strength & microstructure in HAZ .

3.1 Studying tensile strength & hardness in HAZ .

3.2 Studying microstructure in HAZ .

4.0 Charts on Failure & remedies of weld structure .

4.1 Charts on different defects in welds, such as cracks, distortion, inclusion, blow holes, poor fusion, under cutting,

overlapping etc. & remedies .

Code:DIPMETAC 504,CC-4,ALLOY STEEL & CAST IRON

O B J E C T I V E

1. Gather concept about structural back ground & defination of alloy steel .

2. Understand about different alloy steels , their compositions & applications like -- Nickel chromium steel . High speed steel , stainless steel , Maraging steel .

3. Gather knowledge about H.S.L.A steel & its applications .

4. State about process Thermo mechanical treatment .

5. Gather knowledge about Alloy Cast irons .

Theory:

1.0 Structural background

1.1 Plain carbon steel, its definition.

1.2 Limitation of plain carbon steel.

1.3 Definition of alloy steel .

1.4 Cast irons – types, a brief review

2.0 Role of alloying elements

2.1 Different group of alloying elements .

2.2 Role of Mn, Ni, W, Mo, V, Boron, Si on Iron carbon diagram.

2.3 Role of alloying elements on structure and properties.

2.4 Hot-shortness, cold shortness.

2.5 Effect of composition on hardenability of steels

2.6 Role of alloying elements on eutectic carbon, eutectic temperature, critical cooling rate .

3.0 Low alloy steels

3.1 Merits & demerits of adding Ni in alloy steel.

3.2 Merits & demerits of Cr in alloy steel.

3.3 Air-hardening steel.

3.4 Ball-bearing steels – properties, heat treatment; quality control .

3.5 Silicon steels for electrical applications

3.6 HSLA and microalloyed steels –characteristic features and applications

4.0 Stainless steel.

4.1 Introduction, classification of stainless steels .

4.2 Ferrite stainless steel, composition, characteristic, application.

4.3 Martensitic stainless steel, composition, characteristic, application.

4.4 Austentic stainless steel, composition, characteristic, application.

4.5 Duplex stainless steels – wrought and cast, properties and heat treatment

4.6 Subsftitution of Ni in Stainless steel.

4.7 Sensitization, stabilization.

5.0 Special Alloy Steels

5.1 Spring steels.

5.2 Non deforming – non shrinking tool steel – grades, composition, heat treatment and application.

5.3 High Mn-alloy steel (Hadfield steel) - production, composition , heat treatment , properties, application

5.4 Maraging steel- composition, properties and heat treatment , application

5.5 Perm alloy , composition, heat treatment and application.

5.6 Invar alloy , composition, heat treatment and application

5.7 High speed steel , Composition, Heat treatment.

5.8 Explanation of hardening temperature .

5.9 Explanation of tempering temperature.

5.10 Sub-zero treatment.

6.0 Thermo-mechanical treatment of steels

6.1 Controlled rolling.

6.2 Hot working , Cold working.

6.3 Aus forming. Isoforming ,

6.4 HSLA steels, Ultra-high strength steels , Composition , Characteristic.Heat treatment – applications .

7.0 Alloy Cast irons

7.1 Introduction, effect of alloying elements on structure & graphite formation

7.2 Effect of alloying on grey and white cast irons – improvement of properties; heat treatment and applications

7.3 Corrosion –resistant cast irons – 'Ni-resist' and similar grades

7.4 Wear-resistant cast irons – alloyed graphitic and ductile irons; 'Ni-hard' grades

7.5 Alloyed ductile iron, high strength ductile irons; austempering

Code:DIPMETEE 505,GC-1,ENERGY & ENVIRONMENT CONTROL

O B J E C T I V E

1. Gather concept about Energy control & its importance .

2. Understand about different Energy considerations in metallurgical industries .

3. Gather knowledge about Energy audit .

4. State about different processes of energy conservation & recovery .

Theory:

1.0 Introduction

1.1 Concept of Energy control & auditing .

1.2 Its importance in industries under present scenario , cost control .

1.3 Concept of energy management .

2.0 Enegry consideration in metallurgical industries .

2.1 Energy consumption in Metallurgical Industries.

2.2 Application of thermodynamic principles and energy balance.

2.3 Different types of Fuels and their utility .

2.4 Energy consumption in electrometallurgical extraction processes , Rolling mill , Forging shop , Blast furnace , Arc furnace , L-D furnace , Induction furnace , Cupola , Heat treatment furnace , Sponge iron plant , Ferro- alloys plants etc.

3.0 Energy conservation & recovery .

3.1 Concept of Energy conservation .

3.2 Different types & utility .

3.3 Recovery processes .

4.0 Energy audit

4.1 Theory & concept of Energy audit & its management.

4.2 Conventional and non-conventional energy sources , their utility .

Code:DIPMETCD 506,CCP-1,C O M P U T E R A I D E D D R A F T I N G

O B J E C T I V E

On satisfactory completion of the course, the students should be in a position

1. To solve two dimensional design & drafting problems by AutoCAD .

2. Being able to use AutoCAD commands to make a drawing, create text, dimension a drawing, hatch patterns and make & insert symbols & blocks.

3. They will also be able to plot drawings.

PRACTICAL : LABORATORY EXPERIMENTS :

1.0 GETTING STARTED – I .

1.1 Starting AutoCAD – AutoCAD screen components – Starting a drawing: Open drawings, Create drawings (Start from scratch, Use a template & Use a wizard) – Invoking commands in AutoCAD .

1.2 Drawing lines in AutoCAD – Co-ordinate systems: Absolute co-ordinate system, Relative co-ordinate system –Direct distance method – Saving a drawing: Save & Save As – Closing a drawing – Quitting AutoCAD.

2.0 GETTING STARTED – II

2.1 Opening an existing file – Concept of Object – Object selection methods : Pick by box, Window selection, Crossing Selection, All, Fence, Last, Previous, Add, Remove – Erasing objects: OOPS command, UNDO / REDO commands – ZOOM command – PAN command, Panning in real time – Setting units – Object snap, running object snap mode – Drawing circles .

3.0 DRAW COMMANDS

3.1 ARC command – RECTANG command – ELLIPSE command, elliptical arc – POLYGON command (regular polygon) – PLINE command – DONUT command – POINT command – Construction Line: XLINE command, RAY command , MULTILINE command .

4.0 EDITING COMMANDS

4.1 MOVE command – COPY command – OFFSET command – ROTATE command – SCALE command – STRETCH command – LENGTHEN command – TRIM command – EXTEND command – BREAK command – CHAMFER command – FILLET command – ARRAY command – MIRROR command – MEASURE command – DIVIDE command – EXPLODE command – MATCHPROP command – Editing with grips: PEDIT .

5.0 DRAWING AIDS

5.1 Layers – Layer Properties Manager dialog box – Object Properties: Object property toolbar, Properties Window – LTSCALE Factor – Auto Tracking – REDRAW command, REGEN command .

6.0 CREATING TEXT .

6.1 Creating single line text – Drawing special characters – Creating multiline text – Editing text – Text style .

7.0 BASIC DIMENSIONING .

7.1 Fundamental dimensioning terms: Dimension lines, dimension text, arrowheads, extension lines, leaders, centre marks and centre lines, alternate units – Associative dimensions – Dimensioning methods – Drawing leader.

Code: DIPMETIP 507,CCP-2,INDUSTRIAL PROJECT AND ENTREPRENEURSHIP DEVELOPMENT

Objective : -

1. To identify and train potential entrepreneurs.

2. To motivate the entrepreneurial instinct

3. To develop necessary knowledge and skills among the participants.

4. To help in analyzing the various options to select the most appropriate product suiting to the entrepreneur and the market.

5. To give a clear picture about the process and procedures involved in setting up an small scale Industrial unit or a bigger unit

6. To impart basic managerial skills and understandings to run the project efficiently and effectively.

7. To analyst the environmental issues to be addressed relating to the proposed project.

Industrial Project

Following activities related to project are required to be dealt with, during this semester :

1. Form project batches & allot project guide to each batch. (Max. 4 students per batch)

2. Each project batch should select topic / problem / work by consulting the guide & / or industry. Topic / Problem / work should be approved by Head of department.

3. Each project batch should prepare action plan of project activities & submit the same to respective guide.

4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.

5. Action Plan should be part of the project report.

Entrepreneurship Development : OBJECTIVES : Students will be able to

1) Identify entrepreneurship opportunity.

2) Acquire entrepreneurial values and attitude.

3) Use the information to prepare project report for business venture.

4) Develop awareness about enterprise management

PRACTICAL : LABORATORY EXPERIMENTS :

1.0 Entrepreneurship, Creativity & Opportunities .

1.1 Concept, Classification & Characteristics of Entrepreneur

1.2 Creativity and Risk taking , Concept of Creativity & Qualities of Creative person.

1.3 Risk Situation, Types of risk & risk takers.

1.4 Business Reforms , Process of Liberalization , Reform Policies , Impact of Liberalization , Emerging high growth areas , Business Idea , Methods and techniques to generate business idea , Transforming Ideas in to opportunities , transformation involves . Assessment of idea , & Feasibility of opportunity , SWOT Analysis .

2.0 Information And Support Systems

2.1 Information Needed and Their Sources , Information related to project, Information related to support system, Information related to procedures and formalities .

2.2 SUPPORT SYSTEMS : Small Scale Business Planning, Requirements , Govt. & Institutional Agencies, Formalities Statutory Requirements and Agencies.

3.0 Market Assessment .

3.1 Marketing -Concept and Importance , Market Identification, Survey Key components , Market Assessment.

4.0 Business Finance & Accounts .

4.1 Cost of Project , Sources of Finance , Assessment of working capital , Product costing , Profitability , Break Even Analysis , Financial Ratios and Significance , Business Account , Accounting Principles, Methodology , Book Keeping , Financial Statements , Concept of Audit .

5.0 Business Plan & Project Report .

5.1 Business plan steps involved from concept to commissioning , Activity Recourses, Time, Cost .

5.2 Project Report - Meaning and Importance , Components of project report/profile (Give list) .

5.3 Project Apprisial - Meaning and definition , Technical, Economic feasibility , Cost benefit Analysis .

6.0 Enterprise Management And Modern Trends.

6.1 Enterprise Management , Essential roles of Entrepreneur in managing enterprise , Product Cycle: Concept And Importance , Probable Causes Of Sickness , Quality Assurance , Importance of Quality, Importance of testing , E-Commerce , Concept and process , Global Entrepreneur .

7.0 Project Report & its Components .

7.1 Project Summary (One page summary of entire project)

Introduction (Promoters, Market Scope/ requirement)

Project Concept & Product (Details of product)

Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)

Manufacturing Process & Technology

Plant & Machinery Required

Location & Infrastructure required

Manpower (Skilled, unskilled)

Raw materials, Consumables & Utilities

Working Capital Requirement (Assumptions, requirements)

Market (Survey, Demand & Supply)

Cost of Project, Source of Finance

Projected Profitability & Break Even Analysis

Conclusion.

Code: DIPMETPP 508,CCP-3 ,PROFESSIONAL PRACTICE – III

Objective :- Student will be able to :

1. Acquire information from different sources

2. Prepare notes for given topic

3. Present given topic in a seminar

4. Interact with peers to share thoughts

5. Prepare a report on industrial visit, expert lecture

PRACTICAL : LABORATORY EXPERIMENTS :

1.0 Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work .

1.1 TWO industrial visits may be arranged in the following areas / industries :

    i) Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant .

    ii) Machine shop having CNC machines.

    iii) ST workshop / Auto service station

    iv) City water supply pumping station

    v) Manufacturing unit to observe finishing and super finishing processes.

2.0 Lectures by Professional / Industrial Expert / Student Seminars based on information .

2.1 Search to be organized from any THO of the following areas :

    i) Interview Techniques.

ii) Modern Boilers – Provisions in IBR

iii) Applications of Sensors and Transducers

iv) Alternate fuels – CNG / LPG , Biodiesel, Ethanol, hydrogen, Piping technology .

3.0 Information Search : Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic .

3.1 Following topics are suggested :

i) Engine lubricants & additives

ii) Automotive gaskets and sealants

iii) Engine coolants and additives

iv) Two and Four wheeler carburetor.

v) Power steering

vi) Filters

vii) Different drives / Transmission systems in two wheelers.

viii) Types of bearings – applications and suppliers.

ix) Heat Exchangers

x) Maintenance procedure for solar equipment.

xi) Tools holder on general purpose machines and drilling machines.

4.0 Seminar : Seminar topic shall be related to the subjects of fifth semester .

4.1 Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes) .

5.0 Mini Project / Activities : (any one) .

5.1 a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as :

i) Elliptical Trammel ;

ii) Pantograph ;

iii) Coupling ;

iv) Cams and Followers ;

v) Geneva mechanism .

b) Dismantling of assembly (e.g. jig / fixtures , tool post , valves etc.) Take measurement and prepare drawings / sketches of different parts.

C) Make a small decorative water fountain unit.

d) Toy making with simple operating mechanisms.

METALLURGICAL ENGINEERING

THIRD YEAR 6TH SEMESTER

Code: DIPMETCR 601,CC-1, ENGINEERING MATERIALS & CORROSION METALLURGY

O B J E C T I V E

1. Gather concept about applied engineering materials .

2. Understand about different developed engineering materials like , ceramic,glass , magnetic materials.

3. To be aware about Nano – materials.

4. To be aware about Corrosion & its prevention process.

Theory :

1.0 Classification of Engineering materials

1.1 Selection of Engineering materials

1.2 Properties of Engineering materials

1.3 Application of different Engineering materials

2.0 Ceramic materials

2.1 Introduction

2.2 Classification of ceramic materials

2.3 Advanced and application of ceramic materials

2.4 Structure and properties of ceramic material

2.5 Advanced ceramics , chararacteristics , uses

3.0 Glass materials

3.1 Introduction

3.2 Constituents of glass

3.3 Properties of glass

3.4 The furnace used for glass

3.5 Uses of glass

4.0 Electrical materials

4.1 Materials of Low resistivity and high conductivity

4.2 Materials of Semiconductor and insulator

4.3 Name commonly used conductor, Semiconductor and insulator materials .

4.4 State possible application of superconductivity materials.

5.0 Magnetic materials

5.1 Differentiate between the characteristics of soft and hard magnetic materials .

5.2 Example of different magnetic materials .

5.3 Properties of magnetic materials .

6.0 Nano – Materials

6.1 Definition

6.2 Different types of nano – materials used

6.3 Characteristics of nano – materials .

6.4 Actual application of nano – materials .

7.0 CORROSION & ITS PREVENTION

7.1 Corrosion of materials in natural environments .

7.2 Atmospheric corrosion – general characteristics, mechanism and prevention.

7.3 Localized corrosion damages and materials failure .

7.4 Passivity and trans passivity of metals. Breakdown of passivity and pitting corrosion.

7.5 Stress – corrosion cracking of materials. Intergranular corrosion failure.

7.6 Effects of metallurgical structure on corrosion.

7.7 Methods for protection of materials , Overview of corrosion prevention methods.

7.8 Chemical and electrochemical surface treatment of metals. Metallic, inorganic and organic protective coatings.

7.9 Application of inhibitors. Electrochemical methods for corrosion protection .

Code:DIPMETHT 602,CC-2,HEAT TREATMENT TECHNOLOGY

O B J E C T I V E

1. Gather concept about principles & importance of heat treatment .

2. Understand about different processes of heat treatment of steel .

3. Gather knowledge about quenchants, furnaces & atmosphere .

4. State about different defects & remedial measures in heat treatment processes .

Theory:

1.0 Introduction

1.1 Phase changes of alloys with temperature – basis of heat treatment

1.2 Heat treatment process variables .

2.0 Principles of Heat Treatment .

2.1 Formation of austenite on heating , austenite grain size & its importance .

2.2 Annealing – types; Normalizing, hardening and tempering

2.3 Review of TTT. & CCT diagrams ; practical applications

2.4 Effect of alloying elements on hardenability and heat treatment of carbon steels

2.4 Bainite transformation & its mechanism.

2.5 Martensite transformation , mechanism , M_s – M_f temp., Hardness .

3.0 Heat Treatment processes for steel .

3.1 Heat treatment cycle as time temperature plots – low and medium carbon steels.

3.2 Annealing and Normalizing – different methods , comparison .

3.3 Hardening , methods & factors .

3.4 Tempering , methods , structural change , temper brittleness & effect of alloying elements .

3.5 Austempering , Martempering , Patenting .

3.6 Heat treatment of weldments – structural changes precautions.

3.7 Properties of steels after tempering

3.8 Characteristics of quenchants .

3.9 Different quenching media , like water, aquas solution, oil ,air , gases , salt baths , synthetic quenchants .

4.0 Surface hardening of steel

4.1 Basic principle involved in surface hardening –chemical and non-chemical methods

4.2 Brief description of Pack, Gas and Liquid carburising, parameters involved, heat treatment

4.3 Nitriding, Cynaniding & Carbonitriding – brief process description; factors involved,

4.4 Non-chemical methods of hardening - Induction hardening, flame hardening

4.5 Case depth measurement after hardening and Process control

5.0 Heat Treatment furnaces & atmospheres .

5.1 Classification of heat treatment furnaces .

5.2 Batch furnaces ,continuous furnaces , salt bath furnaces .

5.3 Control of furnace atmosphere .

5.4 Chemistry of controlled atmosphere processes .

5.5 Commercially available atmosphere .

6.0 Defects & remedies in heat treatment .

6.1 Anomalies in hardness and structure after quenching and tempering

6.2 soft spot ,oxidation , decarburisation , overheating & burning .

6.3 Quench cracks , distortion & warping .

6.4 Remedial measures of above problems .

PRACTICAL : LABORATORY EXPERIMENTS

1.0 Study of TTT & CCT diagram .

1.1 To draw TTT & CCT diagram for hypo , hyper & eutectoid steel .

1.2 Diagram showing effect of alloying elements on TTT & CCT diagram.

2.0 Study about effects of heat treatment on mechanical properties & metallurgical microstructure.

2.1 Annealing of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.

2.2 Normalising of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.

2.3 Hardening of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.

2.4 Tempering of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.

3.0 Surface hardening of steel

3.1 To experiment on pack carburizing& study depth of carburization and hardness .

Code: DIPMETFA 603,CC-3,FERRO ALLOYS & Solid State REDUCTIN of IRON

O B J E C T I V E

1. Gather concept about application of ferro alloys & its importance .

2. Understand about principles & different processes of ferro alloy production .

3. Gather knowledge about sponge iron & production procedure .

Theory:

1.0 Survey on ferro alloys .

1.1 Definition , classification , applications .

1.2 Deoxidation & alloying .

1.3 Mode of addition .

1.4 Raw materials .

2.0 Principles & processes of ferro alloys.

2.1 Principles .

2.2 Mineral beneficiation & exploration .

2.3 Alluminothermic reduction process .

2.4 Thermit process & operation .

3.0 Aluminothermic process .

3.1 Physical chemistry & raw materials .

3.2 Smelting technology , commercial alloy composition .

3.3 Physical chemistry for production of high and low-carbon Ferrosilicon, Ferrochrome, ferromanganese .

4.0 Solid State Reduction of Iron (Sponge Iron) .

4.1 Defination & degree of metallisation .

4.2 Physical chemistry of sponge iron making .

4.3 Description of different Sponge iron making processes .

4.4 HyL process , Midrex process , Fludised Bed process , Rotary Kiln process ,SL / RN process .

4.5 Use of sponge iron .

4.6 Indian scenario of sponge iron making .

Code :DIPMETNF 604,CC-4,PHYSICAL METALLURGY OF NON - FERROUS METALS & ALLOYS

O B J E C T I V E

1. Gather knowledge about Non ferrous metals & alloys and its importance.

2. Gather knowledge about Copper & its Alloys .

3. Gather knowledge about Aluminum & its Alloys .

4. Gather knowledge about Babbitt Metal .

Theory:

1.0 Introduction

1.1 Review and listing of Important commercial applications of Non ferrous metals & alloys .

1.2 Review of industries associated with Non ferrous metals & alloys , their product and market .

2.0 Copper & its Alloys

2.1 Properties of pure Copper , pure Zinc , pure Tin .

2 2 Equilibrium diagrams of Cu – Zn binary system & discussion on its different phase .

2.3 Composition, properties, microstructure and uses of important industrial Cu – Zn alloys .

2.4 Equilibrium diagrams of Cu – Sn binary system & discussion on its different phase

2.5 Composition, properties, microstructure and uses of important industrial Cu – Sn alloys .

2.6 Heat treatment of important copper base alloys .

2.7 Effect of adding other alloying element with Cu – Zn & Cu – Sn alloys.

3.0 Aluminum & its Alloys

3.1 Properties of pure Aluminum , pure Silicon .

3.2 Equilibrium diagrams of Al – Cu binary system & discussion on its different phase

3.3 Composition, properties, microstructure and uses of important industrial Al – Cu alloys .

3.4 Heat treatment of important Al – Cu alloys .

3.5 Precipitation hardening phenomenon of Al - Cu alloys .

3.6 Equilibrium diagrams of Al – Si binary system & discussion on its different phase .

3.7 Composition, properties, microstructure and uses of important industrial Al – Si alloys .

3.8 Heat treatment & modification of important Al – Si alloys .

4.0 Babbitt Metal

4.1 Composition , microstructure and application of Tin base – Antimony – Copper Babbitt metal .

4.2 Composition , microstructure and application of Lead base – Antimony – Tin Babbitt metal .

Code: DIPMETIM 605,GC-1,I N D U S T R I A L M A N A G E M E N T

O B J E C T I V E

This subject provides the students of polytechnics with an exposure to the art and science of management principles, functions, techniques and skills that are essential for maximising attainment of the organisational goals with the available manpower and resources. Upon successful completion of this subject, the students shall be equipped with the fundamental knowledge of management which should make them confident in facing the challenges of their responsibilities in the different organisational scenarios

Theory :

1.0 Introduction to Management Science

1.1 Principles & functions of management .

1.2 Contributions of F.W. Taylor, Henry Fayol, Max Weber and Elton Mayo & Roethlisburger in development of the theories of management science.

2.0 Organisational Behaviour

2.1 Objectives — Brief introduction to: Motivation & Morale – Perception .

2.2 Leadership & Leadership Styles .

2.3 Communication – Team Building –

2.4 Work Culture.

3.0 Human Resources Management

3.1 Scope & Functions – Human Resources Planning .

3.2 Selection & Recruitment .

3.3 Training & Development .

3.4 Performance Appraisal .

4.0 Production Management

4.1 Production Planning: Routing – Loading – Scheduling — Production Control .

4.2 Expediting – Dispatching — Materials Handling — Work Study — Productivity .

4.3 Quality Management: Tools & Techniques – Quality Management System.

5.0 Materials Management

5.1 Objectives & functions: Purchase function .

5.2 Stores function , Inventory Management .

5.3 ABC, VED analyses.

6.0 Financial Management

6.1 Financial Ratios .

6.2 Elements of Costing .

6.3 Auditing

8.0 Marketing & Sales Management

8.1 Objectives & Functions — Marketing of products & Services .

8.2 Advertising & Sales Promotion .

8.3 Consumer Behaviour

9.0 Quantitative techniques

9.1 Linear programming (graphical method only) .

9.2 Network Analysis : PERT – CPM

Code:DIPMETPW 606,CCP-1,PROJECT WORK & SEMINAR

O B J E C T I V E

1. Project Work is intended to provide opportunity for students to develop understanding of the interrelationship between

different courses learnt in the entire diploma programme and to apply the knowledge gained in a way that enables them to develop & demonstrate higher order skills.

2. The basic objective of a project class would be to ignite the potential of students' creative ability by enabling them to develop something which has social relevance, aging. It should provide a taste of real life problem that a diploma-holder may encounter as a professional. It will be appreciated if the polytechnics develop interaction with local industry and local developmental agencies viz. different Panchayet bodies, the municipalities etc. for choosing topics of projects and / or for case study.

3. The course further includes preparation of a Project Report which, among other things, consists of technical description of the project. The Report should be submitted in two copies, one to be retained in the library of the institute. The Report needs to be prepared in computer using Word and other software wherever necessary.

4. Seminar on Project Work is intended to provide opportunity for students to present the Project Work in front of a technical gathering with the help of different oral & visual communication aids which they learnt through different courses in the Parts – I , II & III of the diploma course. In the Seminar, students are not only expected to present their Project Work, but also to defend the same while answering questions arising out of their presentation .

G E N E R A L G U I D E L I N E

1. Project Work is conceived as a group work through which the spirit of team building is expected to be developed. Students will be required to carry out their Project Works in groups under supervision of a lecturer of their core discipline who will work as a Project Guide.

2. It is expected that most of the lecturers of the core discipline will act as project guide and each should supervise the work of at least two groups. Number of students per group will vary with the number of lecturers acting as Project Guide and student strength of that particular class.

3. The subject of the project may be chosen by the faculties and students as per need and demand of the industry and future propects.

3. The practice of giving seminar on ' Project Work ' has to be performed every week on rotation basis. . Some examples of the topics of project work are :

1. Hardenability of Steel .

2. Pack carburising of Steel .

3. Structure - property co-relation of carbon – steel .

4. Study on alloy cast iron .

5. Melting practices on Induction furnace .

6. Melting practices on Arc furnace .

7. Foundry sand properties .

8. Sponge iron preparation .

9. Ferroalloys .

10. Powder metallurgy .

11. Special alloy steel .

12. High strength low alloy steel .

13. Rolling & forging .

14. Metallurgical analysis .

15. Heat treatment practices .

16. Applications of different cast iron .

17. Survey on metallurgical industries .

18. Thermal analysis .

THE PROJECT REPORT SHOULD CONTAIN :

1. Brief synopsis of the Project.

2. Detail theoretical back – up .

3. Machinery and Instrument details .

4. Details of experiments carried .

5. Results

6. Inference .

7. Bibliography .

SEMINAR ON PROJECT WORK

1. Practice of giving seminar on Project project work .

2. Practice of using audio visual aids in seminar .

3. Practice of using charts , sketches , datas in support of seminar .

4. Practice of speech presentation in English .

5. Entertain Questioning - Answering as a part of seminar .

Code:DIPMETPP 607,CCP-2,PROFESSIONAL PRACTICE – IV

Objective :- Student will be able to :

1. Acquire information from different sources

2. Prepare notes for given topic

3. Present given topic in a seminar

4. Interact with peers to share thoughts

5. Prepare a report on industrial visit, expert lecture

PRACTICAL : LABORATORY EXPERIMENTS :

1.0 Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work .

1.1 TWO industrial visits may be arranged in the following areas / industries :

    i) Automobile manufacturing / auto component manufacturing units to observe the working of SPM .

    ii) Refrigeration and air conditioning manufacturing / servicing units / industries / workshops .

    iii) Automobile service stations for four wheelers .

    iv) Co-ordinate measuring machine to observe its construction working specifications and applications.

    v) Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc.

    vi) Wheel Balancing unit for light and/or heavy motor vehicles.

    vii) Food processing unit.

    viii) Textile industry machinery manufacturing / servicing units.

    ix) Hydro electric and Thermal power plants.

    x) Engine testing, exhaust gas analysis and vehicle testing

    xii) PWD workshop.

2.0 The Guest Lecture/s From field /industry experts, professionals .

2.1 To be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work .

    a) Electronic fuel injection systems

    b) Exhaust gas analysis.

    c) Vehicle testing.

    d) Transducer application in automobiles.

    e) Environmental pollution & control.

    f) Vehicle aerodynamics & design.

    g) Earth moving machines.

    h) Automobile pollution, norms of pollution control.

i) Biotechnology

j) Nanotechnology

k) Rapid prototyping

l) Programmable logic controllers

m) TQM

n) MPFI

o) Hybrid motor vehicles

p) Packaging technology

q) Appropriate technology

r) Six sigma systems

s) LPG / CNG conversion kit.

3.0 Group Discussion

3.1 The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (any one) - Following topics are suggested :

i) CNG versus LPG as a fuel.

ii) Petrol versus Diesel as a fuel for cars.

iii) Trends in automobile market.

iv) Load shading and remedial measures.

v) Rain water harvesting.

vi) Trends in refrigeration Technology.

vii) Disaster management.

viii) Safety in day to day life.

ix) Energy Saving in Institute.

x) Nano technology.

4.0 Seminar

4.1 Seminar topic **(any 2 topics)** should be related to the subjects of fifth semester / topics from guest lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes for a group of 2 students).

5.0 Mini Projects : (in a group of 4-5 students) : any one

1) Design / drawing of simple jigs, fixtures

2) Thermocouple based temperature controller.

3) Pump on / off timer

4) Models of jigs / fixtures

5) Layout design of SSI units / factory / workshop of the institute

6) Models of material handling route systems

Code: DIPMETGV 608, CCP-3, GENERAL VIVA – VOCE

C O U R S E C O N T E N T

The syllabi of all the theoretical and sessional subjects taught in the three years of diploma education.