BEC - 201
ENGINEERING MATHEMATICS-II

UNIT-I

Ordinary Differential Equations: Second Order linear differential equation with variable coefficients, Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series method, Solution of ordinary differential Equation (Taylor Series, Picard Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector Method)

UNIT-II

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula(without proof), Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals.

UNIT- III

Numerical Analysis : Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi, Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods, Jacobi's and Gauss-Siedel Iterative methods.

UNIT-IV

Probability and Statistics : Probability Mass function, Probability density function. Discrete Distribution, Binomial, Poisson's, Continuous Distribution, Normal Distribution, Exponential Distribution ,Gamma Distribution, Beta Distribution, Baye's Theorem ,Testing of Hypothesis [Students t-test,Fisher's z-test, Chi-Square Method], Correlation and Regression , Curve – Fitting (Method of Least square).

UNIT-V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem.

REFERENCE BOOKS

1. Higher Engineering Mathematics by B.S Grewal, Khanna Publication
2. Engineering Mathematics-II & III by D.K. Jain
3. Engineering Mathematics-II & III by D.C. Agarwal
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India OR D.G. Guffy

BEC -202
APPLIED CHEMISTRY

UNIT - I

Water : Specifications for water, analysis of water –alkalinity, hardness and its determination (EDTA method only). Water for domestic use, Water softening processes –Lime –Soda process, Ion exchange method, boiler feed water, boiler problems-scale, sludge, priming and foaming, caustic embitterment and corrosion, their causes and prevention, removal of silica, removal of dissolved gases, carbonate and phosphate conditioning, colloidal conditioning, calgon treatment, Numerical problems on alkalinity, hardness, Lime-Soda process and Ion exchange method, EDTA method.

UNIT - II

Fuels : Classification, combustion and chemical principles involved in it, calorific value: gross and net calorific values and their determination by bomb calorimeter.

Solid Fuels: Proximate and ultimate analysis of coal and their importance, High and low temperature carbonisation, Coke: Its manufacture by Otto Hoffman oven. Liquid Fuels: Conversion of coal into liquid fuels (Bergius process and Fisher-Tropsch Process) and mechanism, Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues–thermal and catalytic cracking, knocking and chemical structure, octane number and cetane number and their significance, power alcohol,Numerical on calorific value, combustion, proximate and ultimate analysis of coal.

UNIT - III

Environmental Pollution and Control: Air Pollution : Types of pollutants, source effects, sink and control of primary pollutants –CO, Nox, HC, Sox and particulates, effects of pollutants on man and environment –photochemical smog and acid rain. **Water Pollution:** Classification of pollutants, their sources, waste water treatment –domestic and industrial. **Soil Pollution:** Composition of soil, classification and effects of soil pollutants and their control. **Solid Waste Pollution:** Classification, waste treatment & Disposal methods (Composting, sanitary landfilling, thermal processes, recycling and reuse). **Hazardous Wastes:** Classification –radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes.

UNIT - IV

Polymers : Introduction to Polymer chemistry: Classification of Polymers and Types of polymerization Plastics: Constituents of plastics, Thermosets and Thermoplastics, Preparation, Properties and Uses of Polyethylene, Bakelite, Teflon, Teryleneand Nylon Elastomers: Natural rubber, Vulcanization, Synthetic rubber- Preparation, Properties and Applications of SBR, Buna-N, Butyl and Neoprene rubber. Fibers (nylon 6, nylon 66, cellulose fibers, Dacron) Glass: Introduction, Definition of glass, its Properties, Manufacturing of glass, Importance of annealing in glass making, Types of silicate glasses and their commercial uses.

UNIT – V

Materials Chemistry: Lubricants: Principles and function of lubricants - Types of Lubrication and Mechanism - Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication, Viscosity, Redwood Viscometer, Viscosity, flash and fire point, cloud and pour point, aniline point, Neutralization Number and mechanical.Mechanism of lubrication, solid and liquid lubricant, Properties of lubricants, Numerical problems based on viscosity index.

Cement: Definition, composition, basic constituents and their significance Manufacturing of Portland cement by Rotary Kiln technologyChemistry of setting and hardening of cement (reactions). **Refractory:** Definition, classification, Properties of good refractory detailed study of silica and fire clay refractory and their applications.

Reference Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.), By J.C. Kuriacose& J. Rajaram
2. Environmental Chemistry & Pollution Control (Latest ed.), By S.S. Dara
3. Applied Chemistry (Latest ed.), By H.D. Gesser
4. Engineering Chemistry(Latest ed.), By Jain & Jain
5. Basics of Engineering Chemistry(Latest ed.),By S.S. Dara
6. Text of Engineering Chemistry by S.S. Dara&Mukkati S. Chand &Co,New Delhi(2006)
7. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited,NewDelhi.
8. Engineering Chemistry J.C. Kuriacase& J. Rajaram, Tata McGraw Hills co., New Delhi.
9. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.
10. Chemistry of Engineering Materials by R.P Mani and K.N.Mishra, cengagelearning.
11. Applied Chemistry –A text for Engineering & Technology –Springar (2005).
12. Text Book of Engineering Chemistry – Shasi Chawla, Dhantpat Rai publishing Company ,NewDelhi.
13. Engineering Chemistry – R. Gopalan, D. Venkatappayya, and D.V. SulochanaNagarajan– VikasPublishers.

LIST OF EXPERIMENTS :

NOTE: At least 10 of the following core experiments must be performed during the session.

1. WATER TESTING

(i) Determination of Total hardness by Complex metric titration method.

(ii) Determination of mixed alkalinity

(a) OH^- & $C0_3^{--}$

(b) $C0_3^{--}$ & $HC0_3^{--}$

(iii) Chloride ion estimation by Argent metric method.

2. FUELS & LUBRICANT TESTING

(i) Flash & fire points determinatio n by
(a) Pensky Martin Apparatus,
(b) Abel's Apparatus,
(c) Cleveland's open cup Apparatus.
(d) Calorific value by bomb calorimeter
(ii) Viscosity and Viscosity index determination by
(a) Redwood viscometer No. 1
(b) Redwood viscometer No. 2
(iii) Proximate analysis of coal
(a) Moisture content
(b) Ash content
(c) Volatile matter content
(d) Carbon residue

BEC - 203
BASIC CIVIL ENGINEERING

UNIT- I

Overview of Civil Engineering : Types of Infrastructures, Effect of infrastructure facilities on economy and environment, Role of Civil Engineers in the infrastructural Development Introduction to sub-domains of Civil Engineering, Size of Infrastructure Industry, emerging trends in infra spending through public and public-private partnership (PPP), talent shortage, and global trends in workforce mobility and skill-demands.

UNIT - II

Stages in the life of construction : Design, Construction, Maintenance, Repair, Demolition/Recycling; an overview of Indian Standards, units and conversion factors for Lengths, Areas, Volumes and Weights; Opportunities and challenge of India's Infrastructure, Interdisciplinary nature of Civil Engineering Projects.

UNIT - III

Roads : Types of Roads, Nagpur Road Plan, Components of Road and their function; Bridges: Important parts of bridges, classification of bridges; Types of Dams.

UNIT - IV

Properties and classification of building materials : Stones, Bricks, Sand, Limes, Cement, Mortar, Concrete, Steel.

UNIT - V

Overview of Indian Road Congress: National Highway Authority of India (NHAI) and American Society of Civil Engineers (ASCE), Emerging areas and new technologies in the field of civil engineering.

REFERENCES

1. Elements of Civil Engineering by MD Saikia, B Mohan Das, MM Das, PHI Learning Private Limited, 2015
2. Prakash M.N. Shesha, Ganesh B., A Textbook on Elements of Civil Engineering, PHI Learning Pvt. Ltd. Study material provided by the instructor
3. "Basic Civil Engineering", Ramamrutham. S, Dhanpat Rai Publishing Co. (P) Ltd.

List of Practicals :

1. To perform leveling exercise by height of instrument of Rise and fall method.
2. To measure horizontal and vertical angles in the field by using Theodolite.
3. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
4. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
5. To determine the Compressive Strength of brick .
6. To determine particle size distribution and fineness modulus of course and fine Aggregate.
7. To verify bending moment at a given section of a simply supported beam.

BEC - 204
BASICS ELECTRICAL & ELECTRONICS ENGINEERING

UNIT I

Introduction : Sources of energy Circuit Concepts - Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements - R, L and C as linear elements, Source transformation Kirchhoff's laws; Loop and nodal methods of analysis; Delta-star and star-delta conversion; Network theorems - Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem.

UNIT II

Single Phase AC Circuits : Single phase EMF generation, average and effective values of sinusoids, j operations, complex representation of impedances, phasor diagrams, power factor, power in complex notation, solution of series and parallel circuits. Introduction to resonance in series RLC circuit, Numerical problems; Introduction to domestic wiring. Three Phase AC Circuits: Three-phase systems: Star and delta connections, three-phase three wire and three-phase four-wire systems, analysis of balanced and unbalanced star and delta connected loads, power in three-phase balanced circuits. Numerical problems.

UNIT III

Measuring Instruments : Types of instruments, Construction and working principles of PMMC and Moving Iron type voltmeters & ammeters, Use of shunts and multipliers; dynamometer, wattmeter, AC watt-hour meter. Magnetic circuits: Ampere's circuital law, B – H curve, Hysteresis, Permeability and Reluctance, Solution of magnetic circuits, Hysteresis and eddy current losses.

UNIT IV

Single Phase Transformer : Transformers: Construction and operation of single phase transformer, EMF equation, ratings, phasor diagram on no load and full load, equivalent circuit, regulation and efficiency calculations, open and short circuit tests, single phase auto-transformer

UNIT V

Electric Machines : Working principle, Construction and applications of DC machines and AC machines, Single phase induction motors - split phase, capacitor start and capacitor start & run motors; EMF and Torque equations, Characteristics of DC generators and motors, Speed control of DC motors and DC motor starters.

REFERENCES :

1. E. Hughes, "Electrical Technology," Pearson Education, 2010.
2. I. J. Nagrath & D. P. Kothari, 'Basic Electrical Engineering' TATA McGraw Hill Edu.
3. V. Del Toro, "Electrical Engg Fundamentals," PHI Learning.
4. B. Dwivedi & A. Tripathi "Fundamentals of Electrical Engineering" Wiley India.
5. D. A. Bell, "Electric Circuits," 7th Ed., Oxford Higher Education.

LIST OF EXPERIMENTS:

1. To study the steady state response of series R-L circuit with AC supply and to find impedance, power and power factor of the circuit.
2. To study the steady state response of series R-C circuit with AC supply and to find impedance, power and power factor of the circuit.
3. (a) To verify "Thevenin's Theorem" by finding its Thevenin's equivalent circuit 5,10, 15V.
   (b) Determine the load current for RL = 120 Ohm, 1 K Ohm & 390 Ohm.
4. To study the construction and basic principle of working of a single-phase induction motor.
5. To verify the law of resistance connected in parallel circuit.
6. To verify the law of resistance connected in series.
7. To analyze a two Mesh circuit and to determine the current in each branch of the circuit.

BEC - 205
ENVIRONMENT AND ETHICS

UNIT I

ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY: Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment, concept of an ecosystem, structure and function of an ecosystem. Energy flow in the ecosystem. Ecological succession processes. Introduction to biodiversity, value of biodiversity. Biodiversity at global, national and local levels. In-situ and ex-situ conservation of biodiversity.

UNIT II

ENVIRONMENTAL POLLUTION: Definition – causes, effects and control measures of: (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Role of an individual in prevention of pollution. Pollution case studies. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III

NATURAL RESOURCES : Forest resources: Use and over-exploitation, deforestation, Water resources: Use and overutilization of surface and ground water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV

SOCIAL ISSUES AND THE ENVIRONMENT : From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics, Enforcement machinery involved in environmental legislation- central and state pollution control boards disaster management: floods, earthquake, cyclone and landslides. Public awareness.

UNIT V

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations – population explosion – family welfare programme – environment and human health, Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health, Public participation is an important aspect which serves the environmental Protection.

REFERENCE BOOKS :

1. Trivedi R.K. „Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P.Cooper., T.H. Gorhani, „Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.
3. Dharmendra S. Sengar, „Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan. R, „Environmental Studies - From Crisis to Cure", Oxford University Press, 2005.
5. Gilbert M.Masters, „Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education,2004.
6. Benny Joseph, „Environmental Science and Engineering", Tata McGraw Hill, New Delhi, 2006.

BEC - 206 (A)
Energy Sources

UNIT I

Introduction to Energy : Definition and units of energy, power, Forms of energy, Conservation of energy. Energy flow diagram to the earth. Origin of fossil fuels, time scale of fossil fuels, Renewable Energy Resources, Role of energy in economic development and social transformation.

UNIT II

Energy Scenario : Role of energy in economic development and social transformation: Energy & GDP, GNP and its dynamics. Indian Energy Scenario**,** Commercial and noncommercial forms of energy, Fossil fuels, Renewable sources including Bio-fuels in India, their utilization pattern in the past, present and future projections of consumption pattern. Development and Environment, Energy for Sustainable Development. Global Energy Issues, National & State Level Energy Issues.

UNIT III

Non-Conventional Source of Energy : Forms & characteristics of renewable energy sources, Solar energy, Thermal Applications of solar energy, Photovoltaics technology and applications. Energy from biomass, Thermochemical, Biochemical conversion to fuels, biogas and its applications. Wind Energy, Wind characteristics, Resource assessment, Horizontal & vertical axis wind turbines, Electricity generation and water pumping. Ocean Thermal Energy Conversion (OTEC), Geothermal, Tidal and Wave energies.

UNIT IV

Introduction Hydrogen & Nuclear Energy :

Hydrogen Energy: Hydrogen pathways introduction – current uses, General introduction to infrastructure requirement for hydrogen production, storage, dispensing and utilization, and hydrogen production power plants. Nuclear Energy: Introduction: Scope of nuclear energy (fission and fusion energy), Typical Nuclear reactions Basics Concepts: Binding Energy of a nuclear reaction, mass energy equivalence and conservation laws, nuclear stability and radioactive decay, radioactivity calculations.

UNIT V

Direct Energy Conversion Methods : Energy classification, Sources and utilization, Principle of energy conversion, Indirect / direct energy conversion, Basic principles of design and operations of (i) Thermoelectric (ii) Thermionic convertors (iii) Photovoltaic energy systems (iv) Fuel cells (v) Plasma diodes (vi) Magneto hydrodynamic Power generators and (vii) Advanced energy conversion systems.

Reference Books :

1. Energy for a sustainable world: Jose Goldenberg, Thomas Johansson, A.K.N.Reddy, Robert Williams (Wiley Eastern).
2. Energy policy for : B.V.Desai (Weiley Eastern)
3. Modeling approach to long term demand and energy implication : J.K.Parikh.
4. Energy Policy and Planning : B.Bukhootsow.
5. TEDDY Year Book Published by Tata Energy Research Institute (TERI)
6. World Energy Resources : Charles E. Brown, Springer2002.
7. 'International Energy Outlook' - EIA annual Publication
8. Non conventional energy sources, G.D.Rai Khanna Publishers
9. Non Conventional Energy Resources, D.S. Chauhan and S.K.Srivastava, New Age International Publishers.
10. Fundamentals of Renewable Energy Systems, D. Mukherjee and S. Chakrabarti, New Age International Publishers.
11. Heat and Thermodynamics – M.W. Zemansky (McGraw Hill Publication) 9. Principles of Energy Conversion: A.W. Culp (McGraw Hill Intern.

BEC - 206(B)
Constitution of India

UNIT – I

Constitution : Definition of Constitution and its Classification , Sources and Framing of the Indian Constitution , Salient features of Indian Constitution , Is Indian Constitution Federal in Nature ? , Parliament , Executive Power: Power of President and Governor

UNIT - II

Distribution of Powers between Centre and States : Legislative Relations between Union and the States, Administrative Relations between Union and the States , Financial Relations between Union and the States , Relevant Doctrines, Territorial Nexus , Harmonious Construction, Pith and Substance , Doctrine of Repugnancy , Colourable Legislation

UNIT - III

Fundamental Rights – I : Definition of 'State' for Enforcement of Fundamental Rights: Justifiability of Fundamentals Rights, Doctrine of Eclipse, Severability, Waiver Right to Equality (Articles14-18) Doctrine of 1Doctrine of Reasonable Classification and the Principle of Absence of Arbitrariness, Legitimate ExpectationExpectations, Principle of Compensatory Discrimination , Fundamental Freedom (Article 19): Freedom of Speech and Expression, Freedom of Press and Media; Expansion by Judicial Interpretation of Article19; freedom offfReasonable Restrictions(Article19 clause (2)to(5) ,Right to Life and Personal Liberty (Articles 20-22): Scope and Content (Expansive Iinterpretation-Right to Privacy, Gays' Rights, Live-in Relationshi ps, etc.) Right to Education (Article 21 RTE Act, 2009 ,Right against Exploitation (Articles 23- 24): Forced Labour, Child Employment and Human Trafficking Freedom of Religion and Cultural and Educational Rights of Minorities(Articles 25-30)

UNIT -IV

Right to Constitutional Remedies Writs: Habeas Corpus,Mandamus, Certiorari, Prohibition and Quo-warranto **,** Art. 32 and Art. 226 , Judicial Review **,** Writ Jurisdiction and Private Sector

UNIT - V

Directive Principles and Fundamental Duties : Nature and Justiciability of the Directive Principles Detailed Analysis of Directive Principles (Articles 37-51) Fundamental Duties , Inter-Relationship between Fundamental Rights and Directive Principles.

Books:

1. V.N. Shukla, Constitution of India, Eastern Book Agency, 2014
2. M.P. Jain, Indian Constitutional Law, Lexis Nexis, 2013
3. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 21st Edn., 2013.
4. H. M. Seervai, Constitutional Law of India, Universal Law .

BEC - 206 (C)
ENTREPRENEURSHIP DEVELOPMENT

UNIT-I

CONCEPT OF ENTREPRENEURSHIP - Entrepreneurship and small scale industry, need for promotion of entrepreneurship, entrepreneurship development programmes (EDP), personality characteristics of entrepreneur, Infrastructure facilities available for entrepreneurship development in India.

UNIT-II

IDENTIFICATION OF INVESTMENT OPPORTUNITIES - Governmental regulatory framework, industrial policy, industrial development and regulation act, regulation of foreign collaboration and investment, foreign exchange regulation act, incentives for export oriented units, incentives for units in industrially backward areas, incentives for small scale industry, government assistance to SSI, how to start SSI, list of items reserved for SSI, Scouting for project ideas, preliminary screening, project identification for an existing company, Characteristics of MSME, Financial assistance to MSME, Role of MSME in developing countries.

UNIT - III

MARKET AND DEMAND ANALYSIS - Information required for market and demand analysis, market survey, demand forecasting, uncertainties in demand forecasting.

UNIT- IV

COST OF PROJECT AND FINANCIAL MANAGEMENT - Cost of project, means of financing, planning the capital structure of a new company, Term loan financial institutions, cost of production. Concept and definition of financial management, types of capital, finance, reserve and surplus, concepts and liabilities, profit and loss statement and break even analysis.

UNIT-V

PRODUCT DESIGN & SMALL SCALE INDUSTRIES - Elements of concurrent engineering, Infrastructure facilities in small scale industries , Role and scope of small scale industries, Steps in launching own venture procedure for registration of small scale industries, various developmental agencies-their functions and role in industrial and entrepreneurship development, Introduction, Requirement of a good product design, product development approaches, Product development process, product licensing, patenting and Quality function development.

REFERENCE BOOKS:

1. E.D.I. Ahmedabad, Publication regarding Entrepreneurship.
2. Project Preparation, Appraisal Budgeting and Implementation, Prasanna chandra,TMH
3. Entrepreneurship, NITTR
4. Entrepreneurial Development, C.S.Gupta & N.P.Srinivasan.
5. Entrepreneurship Development Practice & Planning, S.Chand.
6. Entrepreneurship of Small Scale Industries. M.U.Deshpanda C.B.I.

7. Engineering Economics-By Tarachand
8. Industrial Engineering and Production Management - By Telsang Martand T.
9. Industrial Engineering and Management-By O.P. Khanna

BEC - 207
WORKSHOP PRACTICES

UNIT I

INTRODUCTION : Log out of various basic engineering shapes. Basic fundamentals of cutting tools, Basic metrology and precautions to be taken in engineering workshop.

UNIT II

CARPENTRY SHOP: Introduction of Timber .Type, Qualities of timber disease, Timber grains, Structure of timber, Timber, Timber seasoning, Timber preservation .Wood Working tools: Wood working machinery, joints & joinery. Various operations of planning using various carpentry planes sawing & marking of various carpentry joints.

UNIT III

FITTING SHOP: Study and use of Measuring instruments, Engineer steel rule, Surface gauges caliper, Height gauges, feeler gauges, micro meter. Different types of files, File cuts, File grades, Use of surface plate, Surface gauges drilling tapping Fitting operations: Chipping filling, Drilling and tapping .

Suggested Jobs :-Preparation of job piece by making use of filling, sawing and chipping , drilling and tapping operations.

UNIT IV

FOUNDRY: Pattern Making: Study of Pattern materials, pattern allowances and types of patterns. Core box and core print

MOULDING: Properties of good mould & Core sand, Composition of Green , Dry and Loam sand. Methods used to prepare simple green and bench and pit moulding

UNIT V

Welding : Study and use of tools used for Brazing, Soldering, Gas & Arc welding. Preparing Lap & Butt joints using gas and arc welding methods, Study of Safety precautions.

REFERENCE BOOKS:

1. Bawa HS; Workshop Practice, TMH
2. Rao PN; Manufacturing Technology- Vol.1& 2, TMH
3. John KC; Mechanical workshop practice; PHI
4. Hazara Choudhary; Workshop Practices -, Vol. I & II.
5. Jain. R.K. Production Technology.

LIST OF PRACTICALS :

1. To prepare a cross Lap Joint.
2. To prepare Butt Weld and Lap weld.
3. To perform Drilling & Tapping on a square 50 x 50 Meld Steel Plate.
4. To prepare Green Sand Mould.
5. To develop a gripper mechanism by wooden link.
6. To develop useful origami structure.
7. To develop linkage mechanism of shaper machine.
8. To develop a scaled size furniture using gas welding technology.