

# **Harcourt Butler Technological Institute, Kanpur**

**Course Structure & Syllabus of 1<sup>st</sup> Year B.Tech./MCA approved by BOS**

**For**

**Academic Session 2009-10**

Year: I Semester: I Branch : Common to all branches

S.No.	CourseCode	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
Theory											
1	HMA101	Mathematics I	3	1	0	30	20	50	100	150	4
2	HPH101/HCY101	Physics/Chemistry	3	1	0	30	20	50	100	150	4
3	HEE101/HET101	Electrical Engg./Electronics Engg.	3	1	0	30	20	50	100	150	4
4	HME101/HCS101	Engg. Mechanics/ Concepts of Computer and C programming	3	1	0	30	20	50	100	150	4
5	HHU101/HCE101	Professional communication/ Engineering Graphics	3	1	0	30	20	50	100	150	4
6	HHU102/HCE102	Remedial english/Environment and ecology	2	0	0				50	50	Audit
Practical/Training/Project											
7	HPH151/HCY151	Physics/Chemistry	0	0	3	10	10	20	30	50	1
8	HHU151/HCS151	Language lab/Computer lab	0	0	3	10	10	20	30	50	1
9	HEE151/HWS151	Electrical Engg./Workshop practice	0	1	3	30	20	50	50	100	2
10	HGP101	General proficiency						50		50	

Year: I Semester: II Branch : Common to all branches

S.No.	CourseCode	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
Theory											
1	HMA201	Mathematics II	3	1	0	30	20	50	100	150	4
2	HPH201/HCY201	Physics/Chemistry	3	1	0	30	20	50	100	150	4
3	HEE201/HET201	Electrical Engg./Electronics Engg.	3	1	0	30	20	50	100	150	4
4	HME201/HCS201	Engg. Mechanics/ Concepts of Computer and C programming	3	1	0	30	20	50	100	150	4
5	HHU201/HCE201	Professional communication/ Engineering Graphics	3	1	0	30	20	50	100	150	4
6	HHU202/HCE202	Remedial english/Environment and ecology	2	0	0				50	50	Audit
Practical/Training/Project											
7	HPH251/HCY251	Physics/Chemistry	0	0	3	10	10	20	30	50	1
8	HHU251/HCS251	Language lab/Computer lab	0	0	3	10	10	20	30	50	1
9	HEE251/HWS251	Electrical Engg./Workshop practice	0	1	3	30	20	50	50	100	2
10	HGP201	General proficiency						50		50	

Year: I Semester: I Branch : MCA

S.No.	CourseCode	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
Theory											
1	MCA -101	Professional Communication	3	1	0	30	20	50	100	150	
2	MCA -102	Accounting & Financial Management	3	1	0	30	20	50	100	150	
3	MCA -103	Computer Concepts & Programming in C	3	1	0	30	20	50	100	150	
4	MCA -104	Discrete Structures	3	1	0	30	20	50	100	150	
5	MCA -105	Computer Organization	3	1	0	30	20	50	100	150	
Practical/Training/Project											
6	MCA151	Programming Lab	0	0	3	30	20	50	50	100	
7	MCA152	Language Lab	0	0	3	30	20	50	50	100	
8	GP-101	General Proficiency						50		50	

Year: I Semester: II Branch : MCA

S.No.	CourseCode	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
Theory											
1	MCA -201	Environmental Science & Ethics	3	1	0	30	20	50	100	150	
2	MCA -202	Computer Based Numerical & Statistical Techniques	3	1	0	30	20	50	100	150	
3	MCA -203	Data Structures Using C	3	1	0	30	20	50	100	150	
4	MCA -204	Organizational Structure & Personnel Management	3	1	0	30	20	50	100	150	
5	MCA -205	Operating Systems	3	1	0	30	20	50	100	150	
Practical/Training/Project											
6	MCA -251	Data Structures Lab	0	0	3	30	20	50	50	100	
7	MCA -252	Computer Based Numerical & Statistical Techniques Lab	0	0	3	30	20	50	50	100	
8	GP-201	General Proficiency						50		50	

## **HMA-101: MATHEMATICS -1**

### **Unit I- Functions of One Real Variable:**

Successive differentiation, Leibnitz theorem, Differentials and approximations, Mean value theorms, Convergence of series, Expansion of functions, Improper integrals, Convergence, Beta and Gamma functions.

### **Unit II- Functions of Several Real Variables:**

Limit, Continuity, Partial differentiation, Total differential and approximations, Jacobian, Euler's theorem, Expansion of functions, Multiple integrals, Change of order, Change of variables, Applications to area, volume, mass, surface area etc. Dirichlet's Integral & Applications.

### **Unit III- Vector Calculus:**

Overview of solid geometry, Point functions, differentiation, Gradient, Directional derivative, Divergence and Curl of a vector and their physical interpretations, Solenoidal & irrotational fields, Integration, Line, Surface and Volume integrals, Green's, Stoke's and Gauss Divergence theorems and applications.

### **Unit IV – Matrices and Linear Algebra:**

Vector space and subspace, linear dependence, dimensions and basis, Linear transformation, Elementary transformations, Echelon form, rank & nullity, Consistency of linear system of equations and their solutions, characteristic equation, Cayley Hamilton theorem, Real and complex eigenvalues and eigenvectors, diagonalisation, quadratic forms, complex, orthogonal, and unitary matrices, Cryptography, An error correcting code, discrete compartmental models, system stability.

### **Unit V – Optimization:**

Engineering applications of optimization, statement and classification of optimization problems, optimization techniques, single variable optimization, multi variable optimization with no constraint, with equality and inequality constraints, Linear Programming Problems, Graphical method and Simplex method.

### **Books Recommended:**

1. R. K. Jain & S. R. K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
2. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons 8<sup>th</sup> Edition.
3. Dennis G, Zill & Michael R. Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers. 2<sup>nd</sup> Edition.
4. S. S. Rao; Optimization: Theory & Applications, Wiley Eastern Limited.

## HPH-101: PHYSICS

- 1 **Statistical Mechanics -I (Classical Statistics)**  
Phase space, the probability of a distribution, most probable distribution, Maxwell- Boltzmann Statistics, Application to find out energy distribution, momentum distribution and velocity distribution (among the molecules of an ideal gas), derivation of average velocity, r. m .s. velocity, and most probable velocity in the above case
- 2 **Statistical Mechanics -II (Quantum Statistics)**  
Bose Einstein Statistics, Application to black body radiation (distribution law of energy, Planck's radiation formula, and Stefan's law), Fermi Dirac Statistics, Application to electrons in metals (energy distribution, Fermi energy, specific heat of electron gas)
- 3 **Quantum Mechanics-I**  
De Broglie waves and Group velocity concept, uncertainty principle and its application, Davission-Germer experiment, Derivation of Schrödinger equation for time independent and time dependent cases. Postulates of quantum mechanics, significance of wave function
- 4 **Quantum Mechanics -II**  
Application of Schrödinger wave Equation for a free particle (one dimensional and three dimensional case), particle in a box ( one dimensional and three dimensional), simple harmonic oscillator( one dimensional and three dimensional), hydrogen atom(qualitative only)
- 5 **Relativistic Mechanics-I**  
Concept of inertial and non inertial frame of reference. Galilean transformations, Michelson Morley experiment, Einstein's theory of relativity, Derivation of Lorentz's transformation in case of special theory of relativity
- 6 **Relativistic Mechanics-II**  
Application of Lorentz's transformation to derive expressions for the new velocity addition law, time dilation, length contraction, mass variation with velocity, kinetic energy and total relativistic energy, momentum energy relation
- 7 **Electrodynamics-I**  
Basic concepts of Gauss's law, Ampere's law and faradays law of electromagnetic induction. Correction of Ampere's law by Maxwell (concept of displacement current). Maxwell's equation, transformation from integral form to differential form, physical significance of each equation
- 8 **Electrodynamics -II**  
Maxwell's equation in free space, velocity of electromagnetic wave, transverse character of the wave and orthogonality of E, H and  $\mathbf{v}$  vectors, Maxwell's equations in dielectric medium and velocity of e. m. wave, comparison with free space, Maxwell's equations in conducting media, solution of differential equation in this case and derivation of penetration depth
- 9 **Dielectric Materials**  
Electric field in presence of dielectric medium: concept of electric polarization, different types of polarization, derivation of polarizability in case of electronic and orientation polarization, dielectric in a. c. field: concept of dielectric loss and loss of energy
- 10 **Magnetic Materials**  
Magnetic field in matter-concept of Dia, Para, Ferromagnetism. Derivation of susceptibility in case of Dia and Para magnetism by Langevin theory. Origin of

ferromagnetism, hysteresis curve and loss of energy , explanation in terms of Weiss theory of ferromagnetism

11 **Lasers**

Spontaneous and stimulated emission of radiations, Einstein's coefficient and relation between them, population inversion, components of laser, ruby laser, He-

12 Ne laser.

**Fiber Optics**

Fundamental ideas of optical fiber, types of optical fibers, acceptance angle and cone, numerical aperture, propagation mechanisms and communication in fiber,

13 single mode and multimode fiber, step index and graded index fibers.

**Introduction to Nano-Materials**

Basic principles of nanoscience and technology. Preparation, structure and properties of fullerene and carbon nanotubes. Application of nanotechnology.

### **HPH-151: PHYSICS (Practical)**

1. To determine the wavelength of mercury light using diffraction grating.
2. To determine the wavelength of sodium light using Newton' ring experiment.
3. To determination of concentration of sugar solution using half shade polarimeter.
4. To determine the charge sensitivity of a ballistic galvanometer.
5. To determine the band gap of germanium using temperature dependence of conductivity.
6. To determine the value of  $e/m$  using Magnetron valve.
7. To study resonance in L-C-R circuit with a. c. source.
8. To study electromagnetic induction using bar magnets moving through a coil.
9. To determine the temperature dependence thermo e. m. f of copper constantan thermocouple.
10. To study the charging and discharging in an R-C circuit with d. c. source.
11. To study the R-C circuit with a. c. source.
12. To determine the Hall coefficient of a given sample.

## H CY-101: CHEMISTRY

### Unit (I)

#### Chemical Bonding

(i) Schrodinger wave equation (ii) Single electron wave function (iii) Particle in a box and three dimensional box (iv) Band theory of solids

#### Electrochemistry

(i) Electrochemical, concentration and fuel cells, (ii) Free energy and EMF, (iii) Corrosion (Theory and protection methods).

(Lectures: 7-8)

### Unit (II)

#### Reaction Kinetics and Dynamics

(i) Order and molecularity of reactions, (ii) Zero, first and second order reactions, (iii) Integrated rate laws, (iv) Experimental methods for determining the reaction rates, (v) Theories of reaction rate 1 and reaction rate 2, (vi) Potential energy surfaces (PESs)

(Lectures: 6-7)

### Unit (III)

#### Organic Chemistry

(i) Geometrical Isomerism, (ii) E-Z Nomenclature of geometrical isomers, (iii) R S Configuration, (iv) Optical isomerism, (v) Chirality and its implications, (vi) Conformations of Ethane, Propane and Butane (viii) Elementary ideas of oils and Fats

(Lectures: 5-6)

### Unit (IV)

#### Polymers

(i) Classification of polymers and polymerizations (Addition and condensation polymerization Free radical, anionic and cationic polymerization, thermoplastic and thermosetting polymers) (ii) Initiators, inhibitors and chain transfer agents (iii) Copolymers (iv) Tacticity of polymers (v) Fibres, Plastics and elastomers.

#### Hard water and its treatment methods

(i) Definition, units and numerical problems, (ii) Zeolite, (iii) Ion-Exchange, (iv) Reverse osmosis

(Lectures: 9-10)

### Unit (V)

#### Molecular Spectroscopy

Introduction and applications of (i) UV-VIS Spectroscopy, (ii) IR Spectroscopy, (iii) NMR Spectroscopy

(Lectures: 5-6)

#### Recommended Books:

1. Physical Chemistry by Keih J. Laidler, John H. Meiser, CBS publishers and distribution, New Delhi
2. Physical Chemistry by P. W. Atkins.
3. Text book of Organic Chemistry, R. T. Morrison and R. N. Boyd, Prentice Hall of India, New Delhi
4. Organic Chemistry, Vol. I & II by I. L. Finar, Longman, London.
5. Instrumental Analysis by Douglas A. Skoog, F. James Holler and Stanley R. Crouch.
6. Application of absorption spectroscopy of organic Compounds by J. R. Dyer
7. Engineering Chemistry

## HCY-151: CHEMISTRY (Practical)

### List of Experiments

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in bleaching powder.
5. Determination of iron content in the given water sample by Mohr's methods.
6. pH-metric titration.
7. To find out the percentage composition of given solution by viscosity measurement with the help of Ostwald viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KSCN as a colour developing agent and the measurements are carried out at  $\lambda_{\text{max}}$  480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite resin.
11. Determination of surface tension using Stalagmometer.

# HEE-101: ELECTRICAL ENGINEERING

## Unit I

### 1. DC Circuit Analysis and Network Theorems:

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 Law; loop and nodal methods of analysis; star – delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem. (Simple Numerical Problems) 9

## Unit II

### 2. Steady – State Analysis of Single Phase AC Circuits:

AC Fundamentals: Sinusoidal, Square and Triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel, and series – parallel RLC Circuits: Apparent, Active & Reactive Powers, Power factor, causes and problems of low power factor, power factor improvement. Resonance in Series and Parallel Circuits, Bandwidth and Quality Factor. (Simple Numerical Problems) 8

## Unit III

### 3. Three Phase AC Circuits:

Three Phase System – its necessity and advantages, meaning of phase sequence and star and delta connections, balanced supply and balanced load, line and phase voltage / current relations, three phase power and its measurement. (Simple Numerical Problems) 3

### 4. Measuring Instruments:

Types of instruments: Construction and Working Principles of PMMC and Moving Iron type Voltmeter & Ammeters, Single Phase Dynamometer Wattmeter and Induction Type Energy Meter, use of Shunts and Multipliers. (Simple Numerical Problems on Energy Meter, Shunts and Multipliers) 4

## Unit IV

### 5. Introduction To Power System:

General layout of Electrical Power system and functions of its elements, standard transmission and distribution voltages, concept of grid. 2

### 6. Magnetic Circuit:

Magnetic circuit concepts, analogy between Electric & Magnetic circuits, Magnetic circuits with DC and AC excitations, Magnetic leakage. B-H curve, Hysteresis and Eddy Current losses, Magnetic circuit calculations mutual Coupling. 3

## **7. Single Phase Transformer:**

Principle of Operation, Construction, e.m.f. equation, equivalent circuit, Power losses, efficiency, introduction to auto transformer. (Simple Numerical Problems) 3

## **Unit V**

### **8. Electrical Machines:**

Principles of electro mechanical energy conversion.

### **9. DC Machines**

Types of dc machines, e.m.f. equation of generator and torque equation of motor, characteristics and applications of dc motors. (Simple Numerical Problems)

### **10. Three Phase Induction Motor**

Types, Principle of Operation, Slip – torque Characteristics, applications. (Simple Numerical Problems)

### **11. Single Phase Induction Motor**

Principle of Operation and introduction to methods of starting, applications.

### **12. Three Phase Synchronous Machines**

Principle of Operation of alternator and synchronous motor and their applications.

8

#### Text Books:

1. V. Del Toro, “Principles of Electrical Engineering” Prentice Hall International
2. I.J. Nagarith, “ Basic Electrical Engineering” Tata Mc - Graw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, “Basic Electrical Engineering” Mc - Graw Hill

#### Reference Books:

1. Edward Hughes, “Electrical Technology” Longman
2. T.K. Nagsarkar & M.S. Sukhija, “Basic Electrical Engineering” Oxford University Press
3. H. Cotton, “ Advanced Electrical Technology” Wheeler Publishing
4. W.H. Hayt & J.E. Kennely, “Engineering Circuit Analysis” Mc - Graw Hill

## **HEE-151: ELECTRICAL ENGINEERING (Practical)**

Note: A Minimum Ten experiments out of the following list.

1. Verification of Kirchhoff's laws.
2. Verification of (1) Superposition Theorem (2) Thevenin's Theorem (3) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a 1 –  $\emptyset$  ac series inductive circuit and study improvement of power factor using capacitor.
4. Study of phenomenon of resonance in RLC series circuit and obtain the resonant frequency.
5. Measurement of power in 3 –  $\emptyset$  circuit by Two Wattmeter method and determination of its power factor.
6. Determination of parameter of ac 1 –  $\emptyset$  series RLC Circuit.
7. Determination of (1) Voltage Ratio (2) Polarity and (3) Efficiency by load test of a 1 –  $\emptyset$  Transformer.
8. To Study speed control of dc shunt motor using (1) Armature Voltage Control (2) Field Flux Control.
9. Determination of Efficiency of a dc shunt motor by load test.
10. To study running and speed reversal of a 3 –  $\emptyset$  induction motor and record its speed in both direction.
11. To measure energy by a 1 –  $\emptyset$  energy meter and determine error.
12. Department may add any three experiments in the above list.

## **HET-101: ELECTRONICS ENGINEERING**

Introduction to Semiconductors, P-N Junction Diode, V-I Characteristics, Diode Models and Ideal Diode, Diode Application as Rectifier (Half Wave & Full Wave), Diode Circuits- Clippers and Clampers, Zener Diode and its Applications.  
Bipolar Junction Transistor, CE Configuration, Characteristic Curves (Cut-Off, Active and Saturation Region), Biasing, Transistor as a Switch, Transistor as an Amplifier: Concept of Voltage Gain, Current Gain and Power Gain.  
Operational Amplifiers: Concepts of Ideal Op-Amp, Inverting, Non-Inverting and Unity Gain Amplifiers, Adders, Difference Amplifier, Integrators and Differentiators, Introduction to Oscillators, 555 Timer; Astable and Monostable Multivibrators, Boolean Algebra, Logic Gates, Concept of Universal Gate.  
Basic Combinational Circuits, Adder, Subtractor,  
Sequential Circuits: Flip-Flops, Registers & Ripple Counter  
Electronics Instruments: Digital Multi-meter, CRO, Function Generator & its Applications

### **Text Books:**

1. Malvino, A.P. / “Electronics Principles” / Tata McGraw -Hill / 6<sup>th</sup> Ed.
2. Boylestad, Robert & Nashelsky, Louis / “Electronic Devices & Circuit Theory” / Prentice Hall of India / 8<sup>th</sup> Ed.
3. Bhargava , Kulshreshtha & Gupta / “Basic Electronics & Linear Circuits” / Tata McGraw-Hill
4. Malvino & Leach / “Digital Principles & Applications” / Tata McGraw-Hill / 5<sup>th</sup> Edition

### **Reference Books:**

1. Sedra, Adel S., Smith, Kenneth C. / “Microelectronic Circuits”/ Oxford University Press / 5<sup>th</sup> Edition
2. Grob, Bernard & Schultz, Mitchel E. / “Basic Electronics,” / Tata McGraw-Hill
3. Neamen, Donald A. / “ Semiconductor Physics & Devices”/ Tata McGraw-Hill
4. Millman and Grabel / “Microelectronics”/ McGraw –Hill.

## HME-101: ENGINEERING MECHANICS

### Unit I

**Two Dimensional Force Systems:** Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position, Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications.

8

**Friction:** Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application.

4

### Unit II

**Beam:** Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams.

5

**Trusses:** Introduction, Simple Truss and Solution of Simple truss, Method of Joints and Method of Sections.

3

### Unit III

**Centroid and Moment of Inertia:** Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

6

### Unit IV

**Simple Stress and Strain:** Introduction, Normal and Shear stresses, Stress- Strain Diagrams for ductile and brittle material, Elastic Constants, One Dimensional Loading of members of varying cross-sections, Strain energy.

4

**Compound stress and strains:** Introduction, state of plane stress, Principal stress and strain, Mohr's stress circle. Theories of Failure

3

### Unit V

**Pure Bending of Beams:** Introduction, Simple Bending Theory, Stress in beams of different cross sections.

4

**Torsion:** Introduction to Torsion of circular shaft, combined bending & torsion of solid & hollow shafts.

4

### Text books:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Engineering Mechanics by Irving H. Shames & Rao, Pearson Education
3. Mechanics of Materials by E.P.Popov, Prentice Hall of India Private Limited.
4. Elements of Strength of Material by Timoshenko and Young
5. Engineering Mechanics by R.K.Bansal
6. Strength of Materials by Ryder

## HWS-151: WORKSHOP PRACTICE

### 1. **Carpentry Shop :**

Practice ( I ): To prepare half lap corner joint from given pieces of mango wood.

Practice ( II ) : To prepare mortise and tenon joint from given pieces of mango wood.

Instructions: Description and demonstration of different tools, joints along with advanced Carpentry joints, classification and definition of timber, wood seasoning, demonstration of wood working lathe and advanced power tools used in carpentry work, safety precaution during actual working

### 2. **Fitting and Bench working Shop :**

Practice ( I ): To prepare male-female joint from given pieces of mild steel.

Practice ( II ): To prepare practice work piece involving marking , measuring , sawing, drilling and tapping operations

Instructions: Classification and description of different tools used in fitting shop e.g. marking and measuring tools , holding and supporting tools, striking tools and cutting tools etc , safety precaution during actual working.

### 3. **Black Smithy Shop :**

Practice ( I ): To prepare ‘ L ’ shape job from given piece of mild steel rod by hand forging.

Practice ( II ): To prepare a ‘ Ring ’ from given piece of mild steel rod by hand forging.

Instructions: Description of various forging processes done in black-smithy work e.g. upsetting, drawing down, punching, bending, fullering etc, classification and description of different tools, equipments used in black-smithy shop, safety precaution during actual working.

### 4. **Welding Shop :**

Practice ( I ): To prepare simple butt joint and lap joint by electric arc welding from given pieces of mild steel

Practice ( II ): To prepare simple lap joint by oxy-acetylene gas welding and gas flame cutting practice.

Instructions: Concept of welding, classification and explanation of various types of welding with the help of flow chart, description of different tools. Equipments required for arc welding and gas welding, demonstration of various types of flames in Oxy-acetylene gas welding, setting of current and selection of electrodes along with different welding joints, safety precaution during actual working.

**5. Sheet Metal Shop :**

Practice ( I ): To prepare a funnel complete with soldering from given G.I. sheet.

Practice ( II ): To fabricate tray / tool box or electric panel box from given G.I. sheet.

Instructions: Classification and description of different types of tools, equipments used in sheet metal work, different types of metals used in sheet metal shop e.g. Galvanized iron, black iron, copper, aluminum etc, concept of development of surfaces along with different types of joints in sheet metal work, safety precaution during actual working

**6. Machine Shop :**

Practice ( I ): To prepare a job by plain turning, facing, step turning and chamfering operation from given mild steel rod.

Practice ( II ): To prepare a job by taper turning, threading, knurling operations from given mild steel rod.

Instructions: Classification of lathe machines, different parts of lathe machine, tools and equipments used, explanation and demonstration of various operations on lathe machine, tool geometry of single point cutting tool, cutting speed, feed and depth of cut in turning, safety precaution during actual working.

## HHU-101: PROFESSIONAL COMMUNICATION

**Fundamentals of Technical Communication :** process of communication, language as a tool of communication, levels of communication , flow of communication, barriers to communication, communication across cultures; Technical Communication: meaning, significance, characteristics, difference between technical and general communication.

**Elements of Written Communication:** words and phrases, word formation, synonyms and antonyms, homophones, one word substitution, sentence construction, paragraph construction,

**Forms of Technical Communication:** business letters, job application letter and resume, business letters: sales & credit letters, letters of enquiry, letters of quotation, order, claim and adjustment letters, official letters: D.O. letters, government letters, letters to authorities, etc. ,

Technical Reports: general format of a report, formal and informal reports, memo report, progress report, status report, survey report, trip report, trouble report, laboratory report, research papers, dissertations and theses.

Technical Proposals: purpose, characteristics, types, structure.

**Presentation Strategies:** defining the subject, scope and purpose, analysing audience & locale, collecting materials, preparing outlines, organising the contents, visual aids, nuances of delivery, extemporaneous, manuscripts, impromptu, memorization and non- verbal strategies.

### **Value-based Text Reading :**

(A) Study of the following essays from the text book with emphasis on writing skills:

- |   |                     |
|---|---------------------|
| 1.. Man and His Environment                             | by Robert Arvill    |
| 2. The Language of Literature and Science               | by Aldous Huxley    |
| 3. Humanistic and Scientific Approach to Human Activity | by Moody E Prior    |
| 4. Gods in this Godless Universe                        | by Bertrand Russell |
| 5. Religion- An Inevitable Part of Human Life           | by J Milton Yinger  |

(B) Readings of selected short stories:

- |                             |                        |
|-----------------------------|------------------------|
| 1. The Renunciation         | by Rabindranath Tagore |
| 2. The Lament               | by Anton P. Chekhov    |
| 3. The Barber's Trade Union | by Mulk Raj Anand      |
| 4. The Eyes Are Not Here    | by Rus kin Bond        |

### **Text Books:**

1. 'Improve Your Writing' ed. By V N Arora and Laxmi Chandra, Oxford University Press, New Delhi
2. 'A Anthology of English Short Stories', edited by R P Singh, Oxford University Press.
3. 'Technical Communication- Principles and Practices' by M R S Sharma, Oxford University Press, New Delhi.

## HHU-151: LANGUAGE LAB

Interactive practical sessions with emphasis on oral presentations/ spoken communication:

Practical Sessions on:

1. Group Discussions: selected topical issues to be discussed in groups.
2. Mock interviews
3. Communication skills for seminars/conferences/workshops with emphasis on non-verbal skills.
4. Presentation skills for technical papers/project reports/professional reports.
5. Theme presentation/ key note presentation based on correct argumentation methodologies.
6. Argumentative skills
7. Role play
8. Comprehension skills based on reading and listening practice, Asking questions.
9. Introduction to IPA

### References:

1. **Sethi and Dhamija**, ' A Course in Phonetics and Spoken English', Prentice Hall, New Delhi.
2. **Joans Daniel**, ' English Pronouncing Dictionary', Cambridge University Press.
3. **Asha Kaul**, 'Professional Communication'

## HHU-102: REMEDIAL ENGLISH

**Basic Applied Grammar and Usage-** Sentence structure-1: constituent of a sentence- noun, verb, adjective, preposition, etc.; use of articles, adjectival forms, prepositions, adverbs; verb forms; finite and non-finite verbs, gerund and participles, auxiliary verbs. Tense and mood. Subject- verb concord, pronoun concord.

Sentence Structure-2: (i) adverb clause, adjective clause, noun-clause; (ii) negation and interrogation; (iii) passive; (iv) exclamatory; (v) transformations; (vi) tense forms; (vii) simple and complex sentences; (viii) placement of modifiers.

### **Comprehension and précis Writing**

Reading and listening comprehension, improving comprehension skills, précis writing,

### **Short Essay Writing**

Dimension of essay writing- literary, scientific, sociological, narrative, descriptive, reflective, expository, argumentative and imaginative.

### **Text Books**

1. Das, B K and A David, ' A Remedial Course in English for Colleges', Oxford University Press, New Delhi.
2. Sinha, R P, 'Current English Grammar and Usage with Composition', Oxford University Press, New Delhi.
3. Wren, P C & Martin, 'English Grammar and Composition', S Chand & Co Ltd. New Delhi.

## **HCE-101: ENGINEERING GRAPHICS**

Graphics as a tool to communicate ideas, Lettering and dimensioning, Plain and Diagonal Scales, Construction of geometrical figures like pentagon and hexagon.

Principles of orthographic projections, Principal and auxiliary planes, First and Third angle projections, Projection of points. Pictorial view.

Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems.

Projection of solid in simple position, Axis or slant edge inclined to one and parallel to other plane, Solids lying on a face or generator on a plane.

Sectioning of solids lying in various positions, True shape of the section.

Development of lateral surfaces, sheet metal drawing.

Principles of isometric projection, Problems using box & offset methods.

## **HCE-102: ENVIRONMENT AND ECOLOGY**

### **Unit-I**

Definition, Scope and Importance, Need for Public awareness, Environment definition, Ecosystem, Concept of ecosystem, Structure and function of an ecosystem, Energy flow in ecosystem, Ecological succession, Balanced ecosystem, Human activities, Food shelter, Economic and Social Security.

Effects of Human Activities on environment-Agriculture, Housing, Industry, Mining and Transportation Activities, Basic of Environmental Impact Assessment, Sustainable Development.

### **Unit-II**

Natural Resources: Water Resources – Availability and Quality Aspects, Conservation of water, Water Borne Diseases, Water Induced Diseases, Fluoride Problem in Drinking Water; Mineral Resources, Forest Wealth, Material Cycles-Carbon, Nitrogen and Sulphur Cycles.

Energy-Different Types of Energy, Electro-magnetic Radiation, Conventional and Non-Conventional Sources, Hydro Electric Fossil Fuel Based, Nuclear, Solar, Biomass, Bio-gas, Hydrogen as an Alternative Future Source of energy.

### **Unit-III**

Environmental Pollution and their Effects, Water Pollution, Land Pollution, Noise Pollution, Public Health aspects, Air Pollution, Solid Waste Management.

Current Environmental Issue of Importance: Population Growth, Climate Change and Global Warming-Effects, Urbanization, Automobile Pollution.  
Acid Rain, Ozone Layer Depletion.

### **Unit-IV**

Environmental Protection-Role of Government, Legal Aspects, Initiatives by Non-Governmental Organizations (NGO), Environmental Education, Women Education.

Field Work: Visit to local area to document environmental assets-rivers/forest/grassland/ hill/mountain, Visit to a local polluted site-Urban/Rural/Industries/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-ponds, river, hill slopes etc.

## HCS-101 : COMPUTER CONCEPT & C PROGRAMMING

### Unit -I

**Introduction To Computers:** Computer hardware Components, Disk Storage, memory, keyboard, mouse, printers, monitors, CD etc., and their functions, Comparison Based analysis of various hardware components.

### Unit -II

**Basic operating System Concepts:** MS-DOS, WINDOWS, Functional Knowledge of these operating systems. Introduction to Basic Commands of DOS, Managing File and Directories in various operating Systems, Introduction to Internet, Basic terms related with Internet, TCP/IP.

### Unit -III

**Programming in C:** History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

### Unit -IV

**Operators:** Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.

**Control statements:** if-else, switch, break, and continue, the comma operator, goto statement.

**Loops:** for, while, do-while. **Functions:** built-in and user-defined, function declaration, definition and function call, and parameter passing: call by value, call by reference, recursive functions, multi file programs. **Arrays:** linear arrays, multidimensional arrays, passing arrays to functions, Arrays and strings.

### Unit -V

**Structure and Union:** definition and differences, self-referential structure. **Pointers:** value at (\*) and address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers. **File Handling in C:** opening and closing a data file, creating a data file, read and write functions, unformatted data files.

### Text and References Books:

1. V. Rajaraman, "Fundamentals of Computers", PHI
2. Peter Norton's, "Introduction to Computers", TMH
3. Hahn, "The Internet complete reference", TMH
4. Peter Norton's, "DOS Guide", Prentice Hall of India
5. Gottfried, "Programming in C", Schaum's Series, Tata McGraw Hill
6. Kernighan, Ritchie, "The C Programming Language", PHI
7. Yashwant Kanitkar, "Working with C", BPB
8. Yashwant Kanitkar, "Pointer in C", BPB
9. Yashwant Kanitkar, "Let us C", BPB .
10. Bajpai, Kushwaha, Yadav, "Computers & C Programming", New Age
11. E. Balagurusamy, "Programming in ANSI C", TMH

## **HCS 151: COMPUTER PROGRAMMING LAB**

Suggested Assignments to be conducted on a 3-hour slot. It will be conducted in tandem with the theory course so the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately be sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below:

1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Linked lists
10. Data structures

It is suggested that some problems related to continuous domain problems in engineering and their numerical solutions are given as laboratory assignments. It may be noted that some of basic numerical methods are taught in the Mathematics course.

## MCA-101: PROFESSIONAL COMMUNICATION

**Fundamentals of Technical Communication :** process of communication, language as a tool of communication, levels of communication , flow of communication, barriers to communication, communication across cultures; Technical Communication: meaning, significance, characteristics, difference between technical and general communication.

**Elements of Written Communication:** words and phrases, word formation, synonyms and antonyms, homophones, one word substitution, sentence construction, paragraph construction,

**Forms of Technical Communication:** business letters, job application letter and resume, business letters: sales & credit letters, letters of enquiry, letters of quotation, order, claim and adjustment letters, official letters: D.O. letters, government letters, letters to authorities, etc. ,

Technical Reports: general format of a report, formal and informal reports, memo report, progress report, status report, survey report, trip report, trouble report, laboratory report, research papers, dissertations and theses.

Technical Proposals: purpose, characteristics, types, structure.

**Presentation Strategies:** defining the subject, scope and purpose, analysing audience & locale, collecting materials, preparing outlines, organising the contents, visual aids, nuances of delivery, extemporaneous, manuscripts, impromptu, memorization and non- verbal strategies.

### **Value-based Text Reading :**

(A) Study of the following essays from the text book with emphasis on writing skills:

1. Man and His Environment by Robert Arvill
2. The Language of Literature and Science by Aldous Huxley
3. Humanistic and Scientific Approach to Human Activity by Moody E Prior
4. Gods in this Godless Universe by Bertrand Russell
5. Religion- An Inevitable Part of Human Life by J Milton Yinger

(B) Readings of selected short stories:

1. The Renunciation by Rabindranath Tagore
2. The Lament by Anton P. Chekhov
3. The Barber's Trade Union by Mulk Raj Anand
4. The Eyes Are Not Here by Ruskin Bond

### **Text Books:**

1. 'Improve Your Writing' ed. By V N Arora and Laxmi Chandra, Oxford University Press, New Delhi
2. 'A Anthology of English Short Stories', edited by R P Singh, Oxford University Press.
3. 'Technical Communication- Principles and Practices' by M R S Sharma, Oxford University Press, New Delhi.

## **MCA-102: ACCOUNTING AND FINANCIAL MANAGEMENT**

**Introduction to Accounting:** concept and objectives of accounting and bookkeeping; financial and management accounting; ledger and ledger page, ledger entries: debit and credit entries; double entry principle; trial balance and its use; journal and journal entries; accounting of sole proprietorship, partnership and limited companies.

**Types of Final Accounts:** trading account and profit-loss account; closing of ledger accounts; and balance sheet.

**Cost Accounting:** classification of costs: primary and secondary costs; determination of unit cost; methods of charging overhead: marginal costing and standard costing methods.

**Introduction to Finance :** meaning, objectives and functions of financial management; Ltd. companies' formation and classification; capital structure of companies: shares, debentures and bonds; financial analysis: balance sheet statement and income statement; financial ratios: liquidity, debt, profitability and coverage ratios; common size and index analysis.

**Capital Budgeting:** concept and procedures of capital budgeting, cash flow analysis, methods of evaluation of projects- average return method, payback period method, internal rate of return method, net present value method, cost of capital and estimation of required rate of return.

### **Reference**

**Favell, A J** , 'Practical Bookkeeping and Accounts', Harper Collins Publishers, 1985

**Horne, James C Van** , 'Fundamentals of Financial Management', Prentice-Hall of India Private Limited, New Delhi

**Armstrong, Michel** "A Handbook Of Management Techniques", Kogan Page Limited

Pandey, I M , 'An Introduction to Financial Management' Vikash Publishing House, New Delhi.

## MCA-103: COMPUTER CONCEPT & PROGRAMMING IN C

### Unit – I

**Introduction To Computers:** Computer hardware Components, Disk Storage, memory, keyboard, mouse, printers, monitors, CD etc., and their functions, Comparison Based analysis of various hardware components.

### Unit – II

**Basic operating System Concepts:** MS-DOS, WINDOWS, Functional Knowledge of these operating systems. Introduction to Basic Commands of DOS, Managing File and Directories in various operating Systems, Introduction to Internet, Basic terms related with Internet, TCP/IP.

### Unit – III

**Programming in C:** History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

### Unit – IV

**Operators:** Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.

**Control statements:** if-else, switch, break, and continue, the comma operator, goto statement.

**Loops:** for, while, do-while. **Functions:** built-in and user-defined, function declaration, definition and function call, and parameter passing: call by value, call by reference, recursive functions, multi file programs. **Arrays:** linear arrays, multidimensional arrays, passing arrays to functions, Arrays and strings.

### Unit – V

**Structure and Union:** definition and differences, self-referential structure. **Pointers:** value at (\*) and address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers. **File Handling in C:** opening and closing a data file, creating a data file, read and write functions, unformatted data files.

### *Text and References Books:*

1. V. Rajaraman, “Fundamentals of Computers”, PHI
2. Peter Norton’s, “Introduction to Computers”, TMH
3. Hahn, “The Internet complete reference”, TMH
4. Peter Norton’s, “DOS Guide”, Prentice Hall of India
5. Gottfried, “Programming in C”, Schaum’s Series, Tata McGraw Hill
6. Kernighan, Ritchie, “The C Programming Language”, PHI
7. Yashwant Kanitkar, “Working with C”, BPB
8. Yashwant Kanitkar, “Pointer in C”, BPB
9. Yashwant Kanitkar, “Let us C”, BPB
10. Bajpai, Kushwaha, Yadav, “Computers & C Programming”, New Age
11. E. Balagurusamy, “Programming in ANSI C”, TMH

## MCA-104: DISCRETE STRUCTURES

### UNIT I: Fundamentals of Logic:

**Propositional Logic:** Propositions, Basic logic operations and truth tables, Tautologies, Contradictions, Contingency, Algebra of propositions, Logical equivalence: the laws of logic, Logical implication: Rules of inference, Logical analysis of arguments, Some computing applications (Normal forms), Functionally complete set of operations, Formal proofs.

**First Order Logic:** Predicates & quantifiers, Nested quantifiers, Use of quantifiers, Rules of inference, Validity of arguments.

**Notion of Proofs:** Proof by counter example, the contraposition, proof by contradiction, inductive proofs.

### UNIT II: Set Theory, Relations and Functions

**Set Theory:** sets & subsets, Venn diagrams, Set operations and laws, countable and uncountable sets, Cartesian product, Cardinality, Principle of inclusion-exclusion.

**Relations:** Relation, Representation & properties, n-ary relations and applications, Composition of relations, Closures of relations, Equivalence relation & partitions, partial orders, compatibility relation.

**Functions:** Functions and its types, Inverse function, Composition of functions, Special functions, Recursively defined functions, Computational Complexity, Analysis of algorithms.

**Theorem Proving Techniques:** Mathematical induction, strong induction, and well ordering, structural induction, Pigeonhole principle.

### UNIT III: Algebraic Structures and Coding Theory

**Algebraic Structures:** Definition, Properties, Semi group, Monoid, Group, Properties of groups, Subgroup, Cyclic group, Cosets and Lagrange's theorem, Permutation groups, Normal subgroup, Homomorphism and isomorphism of groups, Congruence relation, Rings and Fields. Example and standard results.

**Coding Theory:** Elements of coding theory, Hamming matrix, Parity-check and generator matrices, Coding and error detection, Group codes: decoding with coset leaders and error correction, Hamming matrices.

### UNIT IV: Partially Ordered Structures

**Posets,:** Definitions, ordered set, Hasse diagram, isomorphic ordered set, well ordered set, Minimal and Maximal elements, LUB & GLB etc.

**Lattices:** Definition & Properties, Product Lattices, Isomorphic Lattices, Applications, Types of Lattices

**Boolean Algebras:** Definitions & Properties, SOP & POS forms, Logic gates and minimization of circuits, Karnaugh maps, Quine-McClusky method.

**Trees:** Definition & Examples and Properties, Rooted tree, Binary tree, Tree traversal, application in computer science and engineering.

## **UNIT V: Combinatorics and Graph Theory:**

**Combinatorics:** Basic counting techniques, Discrete numeric functions and properties, Recurrence relations and their applications (modelling), various methods of solutions, system of recurrence relations, OGF & EGF, properties, applications: solution of recurrence relations and combinatorial problems. Polya's enumeration theorem and applications.

**Graphs:** Graphs and graph models, terminology, matrices associated with graphs, Isomorphism, Special types of graphs, connectedness, Euler and Hamilton graphs with their applications, trees with properties, MST, planer graphs and applications, criteria of planarity, Graph coloring and coloring models, directed graphs.

### **Books Recommended:**

1. Trembley, J.P. & R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill.
3. Ralph, P. Garimaldi, "Discrete & Combinatorial Mathematics" Pearson Publication, Asia.
4. Deo, Narsingh, "Graph Theory with applications to Engineering & Computer Science", PHI.
5. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.

## **MCA-105 : COMPUTER ORGANIZATION**

### **Unit-I (Representation of Information and Basic Building Blocks)**

Introduction to Computer, Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry lookahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (synchronous & asynchronous), ALU, Micro-Operation.

ALU- chip, Faster Algorithm and Implementation (multiplication & Division)

### **Unit-II (Basic Organization)**

Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers

### **Unit-III (Memory Organization)**

Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

### **Unit-IV (I/O Organization)**

Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication. I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.

### **Unit-V (Process Organization)**

Basic Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086), Assembly Instruction Set, Assembly language program of (8085): Addition of two numbers, Subtraction, Block Transfer, find greatest number, Table search, Numeric Manipulation, Introductory Concept of pipeline, Flynn's and Feng's Classification, Parallel Architectural classification, Concept of Pipelining and Multi-Core.

### **Text and Reference Books:**

1. William Stalling, "Computer Organization & Architecture", Pearson education Asia
2. Mano Morris, "Computer System Architecture", PHI
3. Zaky & Hamacher, "Computer Organization", McGraw Hill
4. B. Ram, "Computer Fundamental Architecture & Organization", New Age
5. Tannenbaum, "Structured Computer Organization", PHI.

## MCA-151: PROGRAMMING LAB

1. Write C program to find largest of three integers.
2. Write C program to check whether the given string is palindrome or not.
3. Write C program to find whether the given integer is
  - (i). a prime number
  - (ii). an Armstrong number.
4. Write C program for Pascal triangle.
5. Write C program to find sum and average of n integer using linear array.
6. Write C program to perform addition, multiplication, transpose on matrices.
7. Write C program to find fibonacci series of iterative method using user-defined function.
8. Write C program to find factorial of n by recursion using user-defined functions.
9. Write C program to perform following operations by using user defined functions:
  - (i) Concatenation
  - (ii) Reverse
  - (iii) String Matching
10. Write C program to find sum of n terms of series:  
 $n - n*2/2! + n*3/3! - n*4/4! + \dots$
11. Write C program to interchange two values using
  - (i). Call by value.
  - (ii). Call by reference.
12. Write C program to sort the list of integers using dynamic memory allocation.
13. Write C program to display the mark sheet of a student using structure.
14. Write C program to perform following operations on data files:
  - (i) read from data file.
  - (ii) write to data file.
15. Write C program to copy the content of one file to another file using command line argument.

## **MCA -152: LANGUAGE LAB**

Interactive practical sessions with emphasis on oral presentations/ spoken communication:

Practical Sessions on:

1. Group Discussions: selected topical issues to be discussed in groups.
2. Mock interviews
3. Communication skills for seminars/conferences/workshops with emphasis on non-verbal skills.
4. Presentation skills for technical papers/project reports/professional reports.
5. Theme presentation/ key note presentation based on correct argumentation methodologies.
6. Argumentative skills
7. Role play
8. Comprehension skills based on reading and listening practice, Asking questions.
9. Introduction to IPA

### **References:**

1. **Sethi and Dhamija**, ' A Course in Phonetics and Spoken English', Prentice Hall, New Delhi.
2. **Joans Daniel**, ' English Pronouncing Dictionary', Cambridge University Press.
3. **Asha Kaul**, 'Professional Communication'