

G.B. TECHNICAL UNIVERSITY LUCKNOW



Syllabus

[Effective from Session 2013-14]

(1st Year)

**[Common to all B.Tech. Branch except
Agricultural Engineering]**

B.Tech. First Year (Common to all B.Tech. Courses except B.Tech. Agricultural Engg.)

(Effective from the session 2013-14)

Semester-I											
S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS 103	Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2	NEC-101/ NAS-104	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS102/ NME102	Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-101/ NCS 101	Basic Electrical Engg./Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
6	NME-101/ EAS-105	Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-152/ NME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-151/ NCS-151	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NEW-151/ NCE-151	Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-151/ NAS-154	Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	NGP-101	GP						50		50	
		TOTAL	16	6	9					1000	26

L- Lecture

T -Tutorial

P-Practical

CT-Cumulative Test

TA-Teacher's Assessment

ESE-End Semester Examination

Semester-II

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-203	Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2	NEC-201/ NAS-204	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS-202/ NME-202	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-201/ NCS-201	Basic Electrical Engg./ Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-201	Engg. Physics-II	2	1	0	15	10	25	50	75	3
6	NME-201 / NAS-205	Basic Manufacturing Processes / Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	AMS-252/ NME-252	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-251/ NCS-251	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NWS-251/ NCE-251	Workshop Practice / Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-251/ NAS-254	Engg. Physics Lab / Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	NGP-201	GP						50		50	
		TOTAL	16	6	9					1000	26

Engineering Mathematics - I
(NAS-103)

L	T	P
3	1	0

Unit - 1: Differential Calculus - I

Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra

Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigen vectors, Cayley-Hamilton Theorem,A brief introduction to Vector Spaces,Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Volumes and Surface areas – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus

Point function, Gradient,Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line,Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

- 1. E. Kreyszig :Advanced Engineering Mathematics-Volume-I,JohnWiley & Sons**
- 2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
- 3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.**

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

NEC-101/NEC-201: ELECTRONICS ENGINEERING

Chapters/ Books L T P 3 1 0

Unit -1	1 st Book	10 Lecture
Semiconductor Diode Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche)	Chapter 1/1	2
Diode Application Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits	Chapter 2/1	6
Special Purpose two terminal Devices Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	Chapter 16/1	2
Unit II	1 st Book	12 Lecture
Bipolar Junction Transistor Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration	Chapter 3/1	2
DC Biasing BJTs Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE,CB,CC amplifiers and analysis of single stage CE amplifier	Chapter 4/1	6
Field Effect Transistor Construction and Characteristic of JFETs. Transfer Characteristic. CS,CD,CG amplifier and analysis of CS amplifier MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	Chapter 6/1	4
Unit III	1 st Book	6 Lecture
Operational Amplifiers Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation	Chapter 10 10.1,10.4, 10.5, 10.9 1 st Book	6
Unit IV	2 nd Book	4 Lecture
Digital Voltmeter : Introduction, RAMP Techniques	5.1, 5.2 2 nd Book	4
Digital Multimeters:	6.2 2 nd Book	
Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency using CRO	7.1,7.2,7.3, 7.4,7.5,7.20 2 nd Books	
Unit V	3 rd Book	8 Lecture
Fundamentals of Communication Engineering : Elements of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of amplitude and angle modulation, modulation and demodulation techniques.	Chapter 1, 2 3 rd Book	8

Text Books

1. Robert L. Boylestad & Louis Nashelsky “**Electronic Devices and Circuit Theory**”, Tenth Edition, Pearson Education, 2013
2. H S Kalsi, “**Electronics Instrumentation**,” Third Edition, TMH Publication 2012

3. George Kennedy, “**Electronic Communication System**”, Fifth Edition , TMH Publication, 2012

Reference Books

4. Devid A. Bell “ **Electronics Devices and Circuits**”, 5th Edition, OXFORD University Press 2008
5. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit “**Electronics Devices and Circuits**”, 3rd Edition , TMH 2008

Unit-1 Fundamentals of Communication

Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; **Correct Usage:** all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III Business Communication

Principles, Sales & Credit letters;

Claim and Adjustment Letters; Job application and Resumes.

Reports: Types; Significance; Structure, Style & Writing of Reports.

Technical Proposal; Parts; Types; Writing of Proposal; Significance.

Negotiation & Business Presentation skills.

Unit-IV Presentation Strategies and Listening Skills.

Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-V Value-Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing.

(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior

(ii) The Language of Literature and Science by A. Huxley

(iii) Man and Nature by J.Bronowski

(iv) The Social Function of Literature by Ian Watt

(v) Science and Survival by Barry Commoner

(vi) The Mother of the Sciences by A.J.Bahm

(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Book

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

NAS 102/ NAS 202
ENGINEERING CHEMISTRY

L T P
3 1 0

UNIT-I

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Liquid crystals. Application of liquid crystals. Types of unit cell, space lattice (only cubes), Bragg's equation. Calculation of density of unit cell. One and two dimensional imperfections in solids. Structure and applications of Graphite and Fullerenes.

UNIT-II

Polymers, its classification and their applications. Chain and Step growth polymerization. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization and catalysis.

UNIT-III

Stereochemistry with special reference to optical isomerism. Types of organic reactions with special reference to elimination and substitution reaction. Elementary ideas and simple applications of UV, Visible, IR and ^1H NMR spectral Techniques.

UNIT-IV

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Water treatment method for boiler feed by internal process. Phase Rule and its application to one component system (water and sulphur).

UNIT-V

Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass. Cement and its application. Plaster of paris. Lubricant. Corrosion; causes and prevention.

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India
9. Fundamentals of Engineering Chemistry by S.K.Singh, New Age International Publication
10. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
11. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
12. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
13. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press.

NME-102/202: Engineering Mechanics: L T P [3 1 0]

Unit	Topic	Contact Hours
I	<p>Force Systems:</p> <ul style="list-style-type: none"> • Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors. • Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces • Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem • Couple, Vector representation, Resolution of a force into a force and a couple. • Force Systems: Coplanar Concurrent Force system and Coplanar Non Concurrent force systems, Resultant of coplanar force system. • Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem. <p>Friction:</p> <ul style="list-style-type: none"> • Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction. 	8
II	<p>Basic Structural Analysis:</p> <ul style="list-style-type: none"> • Plane Truss, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss, Method of joints, Method of section, Zero force members. • Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment. 	8
III	<p>Centroid and Moment of Inertia:</p> <ul style="list-style-type: none"> • Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies. • Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas. • Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies. 	8
IV	<p>Kinematics of Rigid Body:</p> <ul style="list-style-type: none"> • Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity <p>Kinetics of Rigid Body:</p> <ul style="list-style-type: none"> • Introduction, Force, Mass and Acceleration, Newton's law of 	9

	<p>motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion.</p> <ul style="list-style-type: none"> • Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy, • Linear Impulse and Momentum, Conservation of linear momentum. 	
V	<p>Mechanics of Deformable Solids:</p> <ul style="list-style-type: none"> • Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy. • Bending of Beams: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. • Theory of Torsion, Torque and twist, Shear stress due to torsion circular sections. 	08

References:

1. "Engineering Mechanics: Statics", J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics", J.L Meriam , Wiley
3. "Engineering Mechanics", F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics", Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI
11. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiyah, University Press.
12. "Engineering Mechanics", K L Kumar and V. Kumar, McGraw Hill
13. "Engineering Mechanics", Bhattacharya , Oxford Press
14. "Engineering Mechanics", Dr Sadhu Singh , Umesh Publications
15. "Engineering Mechanics", Bhavikatti , New Age
16. "Strength of Materials" F. L.Singer
17. "Strength of Materials" Thimoshenko & Young
18. "Mechanics of Solids", R. C. Hibbler, Pearson
19. "Mechanics of Solids", A. Mubeen, Pearson

Unit-I

1. D C 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 laws; 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, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement (Simple numerical problems) 8

Unit-III

3. Three Phase AC Circuits:

Three phase system-its necessity and advantages, 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 voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers) 4

Unit-IV

5. Introduction to Earthing and Electrical Safety:

Need of Earthing of equipment and devices, important electrical safety issues. 2

6. Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. 3

7. Single Phase Transformer:

Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer. 3

Unit-V

8. Electrical Machines:

Concept of electro mechanical energy conversion

DC machines: Types, EMF equation of generator and torque equation of motor, Characteristics and applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications. 8

Text Books:

1. "Principles of Electrical Engineering", V. Del Toro,; Prentice Hall International
2. "Basic Electrical Engineering", D P Kothari, I.J. Nagarath; Tata McGraw Hill
3. "Basic Electrical Engineering", S N Singh; Prentice Hall International
4. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
5. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar, M.S. Shukhija; Oxford University Press

NCS-101/NCS-201 Computer System and Programming in C

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Unit1 (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2 (8 Lectures)

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, components of C language. Standard I/O in C.

Unit3 (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4 (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5 (8 Lectures)

Pointers: Introduction, declaration, applications

File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Text Books:

1. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
2. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
3. C programming by Kernighan and Ritchie, PHI
4. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication
7. Programming in C A Practical approach by Ajay Mittal, Pearson Publication
8. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

Reference:

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.

NAS-101: ENGINEERING PHYSICS-I

Unit - I

Relativistic Mechanics

06 Hrs.

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II

06 Hrs.

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III

10 Hrs.

Wave Optics

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - IV

08 Hrs.

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics –Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

Unit-I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications. 1

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep. 2

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. 2

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zinc, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys. 2

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube-drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications.

Hot-working versus cold-working 4

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. 3

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. 4

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. 3

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity. 1

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. 3

Misc. Processes: Introduction to Galvanizing and Electroplating. 1

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital, New Age

UNIT-I: Nature of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems

Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.

Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution,

Climate change– Greenhouse effect and global warming, acid rain, ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education

Indicators and Impact Assessment – Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring

Environmental Protection– Role of individuals, organizations and government in pollution control

Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection

Environmental education–women and value education

Recommended Reference Books:

1. Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.
2. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology , Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

NAS-203 : Engineering Mathematics - II

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Unit - 1: Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Fourier series of period 2π , Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis. Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. **E. Kreyszig, : Advanced Engineering Mathematics, Volume-II, John Wiley & Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.**

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

NAS-202: ENGINEERING PHYSICS- II

Unit - I

07 Hrs

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II

08 Hrs

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Clausius Mussoiti-Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III

06 Hrs.

Electromagnetic Theory

Displacement

Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV

09 Hrs

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density (electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Superconductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NAS 152/ NAS 252 : ENGINEERING CHEMISTRY PRACTICALS

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 water sample.
5. Determination of iron content in the given water sample by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by calorimetric method. The method involves the use of KCN as a colour developing agent and the measurements are carried out at λ_{\max} 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

(Any 10 experiments of the following or similar experiments suitably designed)

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Torsion of Rod/wire

List of Experiments

Note : A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test \
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch

NCS-151/NCS-252 : Computer Programming Lab

7-5-13

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula $C/5=(F-32)/9$.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%-----Print 'A'

80-90%-----Print 'B'

60-80%-----Print 'C'

Below 60%-----Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain

Train No.: integer type

Train name: string

Departure Time: aggregate type TIME

Arrival Time : aggregate type TIME

Start station: string

End station : string

The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

- (i) List all the trains (sorted according to train number) that depart from a particular section.
- (ii) List all the trains that depart from a particular station at a particular time.
- (iii) List all the trains that depart from a particular station within the next one hour of a given time.
- (iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

NEW-151/251 : WORKSHOP PRACTICE

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1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1. Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

Introduction Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing,

AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. **2 - Sheets**

Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes **2 - Sheets**

Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only. **1 - Sheet**

Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. **2-Sheets**

Sections And Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **1 - Sheet**

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. **1-Sheet**

Text Books

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

Reference Books

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition, 2

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
- 14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

NAS-154/NAS-254 : PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

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Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/ Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.