

Faculty of Engineering and Technology
P.K. University
Shivpuri (MP)



Evaluation Scheme & Syllabus

Diploma in Chemical Engineering
(I Semester)

(Effective from session 2025-26)

EVALUATION SCHEME
DIPLOMA –CHEMICAL ENGINEERING (1st SEM)

STUDY AND EVALUATION SCHEME FOR DIPLOMA CHEMICAL ENGINEERING
SEMESTER-I

SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
DCOMMCH101	Communication Skills-I	2	-	-	2	30	-	30	70	-	70	100
DAPPLCH102	Applied Mathematics-1	3	1	-	4	30	-	30	70	-	70	100
DAPPLCH103	Applied Physics-1	2	1	-	3	30	-	30	70	-	70	100
DAPPLCH104	Applied Chemistry	2	1	-	3	30	-	30	70	-	70	100
DENGICH105	Engineering Drawing	3	-	-	3	30	-	30	70	-	70	100
DMEASCH106	Measuring Instruments & Measurement	2	1		3	-	25	25	-	25	25	50
DAPPLCH107	Applied Physics-1 Lab	0	0	2	1	-	25	25	-	25	25	50
DAPPLCH108	Applied Chemistry Lab	0	0	2	1	-	25	25	-	25	25	50
DGENECH109	General Workshop Practice-1 Lab	-	-	4	2	-	25	25	-	25	25	50
DCOMMCH110	Communication Skills-I Lab	0	0	2	1	30	-	30	70	-	70	100
Total		14	4	10	23	180	100	280	420	100	520	800

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DCOMMCH101: COMMUNICATION SKILLS

L	T	P
2	0	0

PART I : COMMUNICATION IN ENGLISH (50 Marks)

1.1 Concept of communication, importance of effective communication, types of communication, formal, informal, verbal and nonverbal, spoken and written. Techniques of communication, Listening, reading, writing and speaking, Barriers in communication, Modern tools of communication-Fax, e-mail, Telephone, telegram, etc.

1.2 Technical communication Vs. General Communication :Development of comprehension and knowledge of English through the study of text material and language exercises based on the prescribed text book of English.

1.3 Development of expression through:

1.3.1 Paragraph writing, Essay writing, Proposal writing.

1.3.2 Business and personal correspondence (Letters) :

Kinds of letters:-

Official, demi-official, unofficial , for reply or in reply, quotation, tender and order giving letters.
Application for a job, Resume.

1.3.3 Report writing and Note making and minutes writing.

1.4 Functional Grammar : Study of sentences and parts of speech
(word class), Preposition, Verb, Articles, Abbreviations.

1.5 Vocabulary Building : Homophones, One word substitution,
Idioms and Phrases.

1.6 Composition on narrative, descriptive, imaginative, argumentative, discussion and factual topics.

2. PART II : COMMUNICATION IN HINDI (20 Marks)

2.1 Development of comprehension and knowledge of Hindi usage through rapid reading and language exercises based on prescribed text material developed by IRDT.

2.2 Development of expression through ;Letter writing in Hindi:

Kinds of letters:-Official, demi-official, unofficial , for reply or in reply, quotation, tender and order giving letters,

Application for a job, Press release in Hindi, Report writing.

Note: Paper should be in two parts,

part I - English and part II Hindi.

REFERENCE BOOKS

1.Book shelf worksheet of Professional Communication, New Delhi: Bookshelf 2008

2. Functional Skills in language and literature by R. P. Singh, New Delhi : Oxford University Press.

3. Oxford English Hindi English Dictionary, New Delhi : Oxford 2008

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DAPPLCH102: APPLIED MATHEMATICS -I

L	T	P
3	1	0

1. ALGEBRA-I:

1.1 Series : AP and GP; Sum, nth term, Mean

1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. ALGEBRA-II:

2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.

2.2 Complex number : Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. TRIGONOMETRY :

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I :

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.

5. DIFFERENTIAL CALCULUS -II :

5.1 Higher order derivatives, Leibnitz theorem.

5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.

5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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L	T	P
2	1	0

DAPPLCH103: APPLIED PHYSICS-I

1. UNITS AND DIMENSIONS (4 MARKS)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to: (i) Checking the correctness of physical equations, (ii) Deriving relations among various physical quantities, (iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement (Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

3. CIRCULAR MOTION (5 MARKS)

Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES :(5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kepler's Law, Escape and orbital velocity, Time period of satellite, Geo- stationary, Polar satellites.

5. DYNAMICS OF RIGID BODY (ROTATIONAL MOTION) (6 MARKS)

Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindrical), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane. Concept of Fly wheel.

6. FLUID MECHANICS :(5 MARKS)

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ($A_1V_1=A_2V_2$), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. FRICTION :(4 MARKS)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in everyday life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. HARMONIC MOTION (6 MARKS)

Periodic Motion, characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum.

Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. HEAT & THERMODYNAMICS: (6 MARKS)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. ACOUSTICS (5 MARKS)

Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

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L	T	P
2	1	0

DAPPLCH104:APPLIED CHEMISTRY

1. ATOMIC STRUCTURE :

Basic concept of atomic structure, Matter wave concept, Quantum number, Haiseberg's Uncertainty Principle, Shapes of orbitals.

2. CHEMICAL BONDING :

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS :

Modern classification of elements (s,p,d and f block elements), Periodic properties : Ionization potential, electronegativity, Electron affinity.

4. ELECTRO CHEMISTRY-I:

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numerical. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II:

Redox reactions, Electrode potential(Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electrochemical series and its application. Chemical and Electrochemical theory of corrosion, Galvanic Series. Prevention of corrosion by various methods.

6. CHEMICAL KINETICS :

Law of mass action, order and molecularity of reaction. Activation energy, rate constants, 1st order reactions and 2nd order reactions.

7. CATALYSIS :

Definition Characteristics of catalytic reactions, Catalytic promoters and poison, Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE :

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS :

Definition, its classification, high & low calorific value. Determination of calorific value of solid and liquid fuels by Bomb calorimeter. Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Diesel and Petrol), Benzol and Power alcohol. Knocking, Anti-knocking agents, Octane number and Cetane number. Cracking and its type, Gasolining from hydrogenation of coal (Bergius process and Fischer tropesch's process) Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG. Numerical Problems based on topics.

10. WATER TREATMENT :

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Soda lime, Zeolite and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, priming and foaming in boilers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorination, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER :

Concept of colloidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electro dialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, Tyndal effect, Electro phoresis and coagulation. relative stability

Of hydrophilic and hydrophobic colloids. Protection and protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS :

Definition, classification, Necessity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compounds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS:

A. Classification and IUPAC nomenclature of organic compounds homologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. ORGANIC REACTIONS & MECHANISM:

1. Fundamental aspects -

A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion

B. Inductive effect, Mesomeric effect, Electromeric effect.

2.A. Mechanism of addition reaction (Markonikov's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Craft reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.

15. POLYMERS :

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)

2. Thermosetting and Thermoplastic resins -

A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

B. Condensation polymer and their industrial application :

Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers (Silicon)

16. SYNTHETIC MATERIALS :

A. Introduction - Fats and Oils

B. Saponification of fats and oils, Manufacturing of soap.

C. Synthetic detergents, types of detergents and its manufacturing.

3. EXPLOSIVES: TNT, RDX, Dynamite.

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L	T	P
3	0	0

DENGICH105
ENGINEERING DRAWING

[Common to Three years Diploma Course in Civil Engg.,
Electrical Engg., Chemical Engg., Textile Technology,]

C O N T E N T S

NOTE :Latest Indian Standards Code of Practice to be followed.

1. Drawing, instruments and their uses. 1 Sheet

- 1.1 Introduction to various drawing, instruments.
- 1.2 Correct use and care of Instruments.
- 1.3 Sizes of drawing sheets and their layouts.

2. (a) Lettering Techniques 2 Sheet

Printing of vertical and inclined, normal single stroke capital letters. Printing of vertical and inclined normal single stroke numbers. Stencils and their use.

(b) Introduction to Scales 2Sheet

Necessity and use, R F Types of scales used in general engineering drawing. Plane, diagonal and chord scales.

3. Conventional Presentation :

1 Sheet

Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.

4. (a) Principles of Projection 1 Sheet

Orthographic, Pictorial and perspective. Concept of horizontal and vertical planes. Difference between I and III angle projections. Dimensioning techniques.

(b) Projections of points, lines and planes. 1 Sheet

5. Orthographic Projections of Simple Geometrical Solids

Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with reference planes.

- (b) Orthographic views of simple composite solids from their isometric views.
- (c) Exercises on missing surfaces and views

1. Section of Solids **2 Sheet**

Concept of sectioning Cases involving cutting plane parallel to one of the reference planes and perpendicular to the others. Cases involving cutting plane perpendicular to one of the reference planes And inclined to the others plane, true shape of the section

2. Isometric Projection. 2 Sheet

Isometric scale, Isometric projection of solids.

3. Free hand sketching 2 Sheet

Use of squared paper Orthographic views of simple solids Isometric views of simple job like carpentry joints.

4. *Development of Surfaces* 2 Sheet

Parallel line and radial line methods of developments. Development of simple and truncated surfaces (Cube,prism, cylinder, cone and pyramid).

5. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: **2 Sheet**

Nut and Bolt, Locking device, Wall bracket

6. **PRACTICE ON AUTO CAD :** **2 Sheet**

Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

NOTE :-

- A. The drawing should include dimension with tolerance where ever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure
- B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

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L	T	P
2	1	0

DMEASCH106: MEASURING INSTRUMENT AND MEASUREMENTS

1. **INTRODUCTION & CLASSIFICATION OF INSTRUMENTS:**

Importance of instruments in chemical process industries. General classification of industrial instruments. Indicating and recording type of instruments. Static & Dynamic characteristics of instruments. Description and constructional details, working principle, ranges and application of following instruments.

2. **PRESSURE AND VACUUM GAUGES:**

Liquid column gauges, Bourdantube gauge, Melleod gauge, Ionization and thermal conductivity meters.

3. **THERMO METERS AND PYROMETERS:**

Bimetallic thermometers, liquid expansion thermometers, thermocouples, resistance thermometers, optical and radiation pyrometers.

4. **MASS & WEIGHT MEASUREMENT:**

Measurement equipment - Two pan balance and single pan
mechanical balances, Single pan electronic balance.

5. **LIQUID LEVELMETERS:**

Visual indicators, Float actuated level meters, static pressure type instruments. The bubbler system, diaphragm box and air trap system. Electrical contact type liquid level indicators. Hydrostatic head density compensator level meter, Hydrostep, Radar or microwave level indicator, Ultrasonic or Sonic level indicator.

REFERENCE BOOKS:

1. Industrial instrumentation by Donald, P.Ekman
2. Instrumentation by Krikand Ramboi.

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L	T	P
0	0	2

DAPPLCH107: APPLIED PHYSICS-I LAB

List of Experiments:- (Any eight)

1. Vernier Calipers: To determine the volume of a spherical / cylindrical body and a test tube by measuring its dimensions using vernier calipers.
2. Screw gauge: To determine diameter of a wire, a solid ball and thickness of glass plate using screw gauge.
3. Spherometer: To determine radius of curvature of a spherical surface using a spherometer
4. Mercury thermometer: To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.
- 5 To find the time period of a simple pendulum and determine acceleration due to gravity
6. Stoke's law: To find the coefficient of viscosity of a given liquid by measuring the terminal velocity of a spherical body.
7. Parallelogram law of forces: To verify parallelogram law of forces and find the mass of the given body.
8. Moment bar: To determine the mass of the given body using moment bar.
9. U-tube apparatus: To determine the relative density of liquid using U-tube apparatus.
10. Flywheel: To find the moment of inertia of a flywheel.
11. Simple pendulum: To determine acceleration due to gravity at a place by measuring the time period of a simple pendulum
12. Resonance column: To determine the velocity of sound in air at room temperature using resonance column apparatus
13. Cantilever: To find the time period of oscillations of a cantilever.

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L	T	P
0	0	2

DAPPLCH108: APPLIED CHEMISTRY LAB

LIST OF PRACTICALS

1. To analyses inorganic mixture for two acid and basic radicals from following radicals

A. Basic Radicals :

NH₄⁺, Pb⁺⁺, Cu⁺⁺, Bi⁺⁺⁺, Cd⁺⁺, As⁺⁺⁺, Sb⁺⁺⁺, Sn⁺⁺, Al⁺⁺⁺, Fe⁺⁺⁺, Cr⁺⁺⁺, Mn⁺⁺, Zn⁺⁺, Co⁺⁺, Ni⁺⁺, Ba⁺⁺, Sr⁺⁺, Ca⁺⁺, Mg⁺⁺

B. Acid Radicals :

CO₃⁻⁻, S⁻⁻, SO₃⁻⁻, CH₃COO⁻, NO₂⁻, NO₃⁻, Cl⁻, Br⁻, I⁻, So₄⁻⁻

2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.
3. To determine the total hardness of water sample in terms of CaCO₃ by EDTA titration method using Eriochroma black-T indicator.
4. To determine the strength of given HCl solution by titration against NaOH solution Using Phenolphthaleum as indicator.
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination of temporary hardness of water sample by O-Henry's method

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L	T	P
0	0	4

DENGICH109: General Workshop Practice-1 Lab

1. Carpentry Shop :

EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood

EX-2 Planing and sawing practice

EX-3 Making of lap joint

EX-4 Making of mortise and tenon joint

EX-5 Making of any one utility article such as wooden- picture frame, hanger, peg, name plate, etc.

2. Painting and Polishing Shop:

EX-1 Introduction of paints, varnishes, Reason for surface preparation, Advantages of painting, other method of surface coating i.e. electroplating etc.

EX-2 To prepare a wooden surface for painting apply primer on one side and to paint the same side, To prepare french polish for wooden surface and polish the other side.

EX-3 To prepare metal surface for painting, apply primer and paint the same.

EX-4 To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

* The sequence of polishing will be as below:

i) Abrasive cutting by leather wheel.

ii) Polishing with hard cotton wheel and with polishing material.

iii) Buffing with cotton wheel or buff wheel.

3 Fitting Shop, Plumbing Shop & Fastening Shop:

EX-1 Study of materials, limits, fits and tolerances.

EX-2 Introduction & demonstration of tools used in Fitting Shop.

EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.

EX-4 Making bolt & nut by tap and die set and make its joints

EX-5 To drill a hole in M.S. Plate and tapping the same to create threads as per need.

EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.

EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.

EX-8 Study of bib cock, cistern or stop cock, wheel valve and gate valve etc.

EX-9 Practice of bolted joints

EX-10 To prepare a rivetted joint

EX-11 To make a pipe joint

EX-12 To make a threaded joint

EX-13 Practice of sleeve joint

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L	T	P
0	0	2

DCOMMCH110: COMMUNICATION SKILLS-I LAB

LANGUAGE LAB PRACTICE

For the practice/exercise the following is suggested :-

1. A. Phonetic transcription

B. Stress and intonation :

(At least 10 word for writing and 10 word for pronunciation)

2. **ASSIGNMENT** : (Written Communication)

Two assignment of approximately 400 word each decided by the teacher concerned.

THE FOLLOWING MODEL IS PROPOSED :

1. a picture/photograph

2. an opening sentence or phrase

3. a newspaper/magazine clipping or report

4. factual writing which should be informative or argumentative.

(The students may refer to "Bookshelf worksheet" for technical communication)

3. Oral Conversation:

1. Short speeches/declamation : Bid farewell, Felicitate somebody, Celebrate a public event, Offer condolences

2. Debate on current problems/topics

3. Mock Interview : Preparation, Unfolding of personality and Expressing ideas effectively

4. Group discussion on current topics/problems

5. Role Play/ general conversation : Making polite enquiries at Railway Station, Post Office, Banks and other Public places, Replying to such enquiries, enquiring about various goods sold in the market and discussing their prices. Complaining about service at Hotel, restaurant, Offering apologies in reply to such complaints, complain to a company about a defective product you have brought, reply to such complaints.

6. Presentation skill, Use of OHP and LCD.

7. Through drilling of model words involving different phonetic symbols
(Vowels, Consonants, Diphthongs).

4. Aural :

Listening to conversation/talk/reading of short passage and then writing down the relevant or main points in the specified number of words and answering the given questions The assignments/project work are to be evaluated by the internal/ external examiner. The distribution of 30 marks

e.g.10 marks for assignment (Given by subject teacher as sessional marks)

10 marks for conversation and viva-voice marks for phonetic transcription