

Bachelor of Science - Chemistry(Honours)

Syllabus - Second Semester

ANALYTICAL CHEMISTRY LAB

Course Code: CHY2204

CreditUnits: 01

Course Contents:

Module I: Separation Techniques

1. Chromatography: (a) Separation of mixtures
 - (i) Paper chromatographic separation of Fe^{3+} , Al^{3+} , and Cr^{3+}
 - (ii) Separate and identify the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Report the R_f values.(b) Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their R_f values.
(c) Chromatographic separation of the active ingredients of plants, flowers and juices by TLC
2. Solvent Extractions:
To separate a mixture of Ni^{2+} & Fe^{3+} by complexing with DMG and extracting the Ni^{2+} DMG complex in chloroform, and determine its concentration with spectrophotometry.
3. Determine the pH of given aerated drinks fruit juices, shampoos and soaps.
4. Analysis of soil:
 - (i) Determination of pH of soil.
 - (ii) Total soluble salt
 - (iii) Estimation of calcium, magnesium, phosphate, nitrate
6. Ion exchange:
 - (i) Determination of exchange capacity of cation exchange resins and anion exchange resins.
 - (ii) Separation of metal ions from their binary mixture.
 - (iii) Separation of amino acids from organic acids by ion exchange chromatography.
7. Determination of pKa values of indicator using spectrophotometry.
8. Determination of dissolved oxygen in water.
9. Determination of chemical oxygen demand (COD).
10. Determination of Biological oxygen demand (BOD).

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Syllabus- Third Semester

INORGANIC CHEMISTRY LAB-II

Course Code: CHY2305

CreditUnits: 01

Course Objective: To provide training and experience in practical aspects of inorganic chemistry including preparation of some important inorganic compounds and estimation of some ions like Cu(II) ion etc

Course Contents:

Module I: Iodo / Iodimetric Titrations

- (i) Estimation of Cu (II) and $K_2Cr_2O_7$ Using sodium thiosulphate solution (Iodimetrically).
- (ii) Estimation of (i) arsenite and (ii) antimony in tartar-emetic iodimetrically
- (iii) Estimation of available chlorine in bleaching powder iodometrically.

Module II: Inorganic preparations

- (i) Cuprous Chloride, Cu_2Cl_2
- (ii) Preparation of Manganese (III) phosphate, $MnPO_4 \cdot H_2O$
- (iii) Preparation of Aluminium Potassium sulphate $KAl(SO_4)_2 \cdot 12H_2O$ (Potash alum) or Chrome alum.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Recommended Texts:

1. Vogel, A.I. A text book of quantitative Inorganic Analysis, ELBS. 1978.

ORGANIC CHEMISTRY LAB-II

Course Code: CHY2306

CreditUnits: 01

Course Objective: To provide experience in practical aspects of qualitative analysis of unknown organic compounds and detection of functional groups present.

Course Contents:

1. Systematic analysis of extra elements in the given unknown compounds
2. Tests for following functional groups and unsaturation.
3. Qualitative analysis of the following types of unknown organic compounds
 - a. Carboxylic acids
 - b. Phenols
 - c. Alcohols
 - d. Aldehydes
 - e. Ketones
 - f. Esters
 - a. Carbohydrates
 - b. Primary, secondary and tertiary amines
 - c. Nitro compounds
 - d. Amides
 - e. Aryl halides
 - f. Hydrocarbons

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PHYSICAL CHEMISTRY LAB-II

Course Code: CHY2307

CreditUnits: 01

Course Objective: To provide training in practical aspects of physical chemistry including determination of heat capacity, enthalpy of ionization, enthalpy of hydration of given compound. The course also involves determination of basicity/proticity of a polyprotic acid by the thermochemical method.

Course Contents:

(I) Thermochemistry

- (a) Determination of heat capacity of a calorimeter for different volumes using change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution or enthalpy of neutralization).
- (b) Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
- (c) Calculation of the enthalpy of ionization of ethanoic acid.
- (d) Determination of heat capacity of the calorimeter and integral enthalpy (endothermic and exothermic) solution of salts.
- (e) Determination of basicity/proticity of a polyprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.
- (f) Determination of enthalpy of hydration of copper sulphate.
- (g) Study of the solubility of benzoic acid in water and determination of ΔH .

(II) Indexing of given powder diffraction pattern of a cubic crystalline system.

(III) To determine the enthalpy of neutralization of a weak acid/ weak base versus base/ strong acid and determine the enthalpy of ionization of the weak acid base.

(IV) Determination of critical solution temperature and composition of the phenol-water system and to study the effect of impurities on it.

(V) Phase equilibria: Construction of the phase diagram of (i) simple eutectic and (ii) congruently melting systems, using cooling curves and ignition tube methods.

Any other experiment carried out in the class.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA – Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

INDUSTRIAL CHEMISTRY

Course Code: CHY2308

CreditUnits: 03

Course Objective: To enable a student to understand the generation of energy from various types of fuels and various manufacturing methods and types of glass, sugar, cement and soap & detergent.

Course Contents:

Module I: Industrial fuels

Energy: Sources: non-renewable, classification of fuels: solid, liquid and gaseous, Calorific value of fuels and its determination.

Solid fuels: Coal: types – properties and uses – lignite, sub-bituminous coal, bituminous coal and anthracite Coking and non-coking coal.

Liquid fuels: Refining of crude petroleum and uses of fractions, Hydrodesulphurisation, Cracking: thermal and catalytic (fixed bed and fluidised bed catalysis), Octane number, Cetane number.

Gaseous fuels: Natural gas and gobar gas: production, composition and uses, Gobar electric cell.

Module II: Glass industry

Introduction, classification of glass, basic raw materials of glass, manufacturing processes including chemical reactions, some special glasses: optical glass, coloured glass, fibre glass, laminate glass, safety glass, photosensitive glass, photochromatic glass, lead glass, borosilicate glass and glass wool.

Module III: Cement industry

Types of cement, manufacture of Portland cement, composition, setting and hardening of cement, Mortars and concrete, gypsum, plaster of paris, estimation of silica, alumina, calcium oxide and sulphates in Portland cement.

Module IV: Soaps and synthetic detergents

Manufacture of detergent, types of detergents, anionic, cationic, nonionic and amphoteric detergents, manufacture of soap, Liquid soap.

Module V: Sugar industry

Double sulphitation process, Refining and grading of sugar, Saccharin: synthesis and uses as a sugar substitute – aspartame, Ethanol: manufacture from molasses by fermentation.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. R. Norris Shreve and A. Joseph ,*Chemical process industries*, 4th ed.; Mc graw – hill Kogakusha, ltd: 1977.
2. George t. Austin. *Shreve's chemical process industries*, 5th ed.; Mc graw – hill: 1984.
- 3 P. C. Jain and M. Jain, *Engineering chemistry*, 10th ed.; Dhanpat Rai and sons, 1993.
4. P. Kamaraj, R. Jeyalakshmi and V. Narayanan, *Chemistry in engineering and technology*; sudhandhira publications, 2001.
5. J.C. Kuriakose and J. Rajaram, *Chemistry in engineering and technology. Vol 2.*; Mc Graw-hill: new delhi, 1988.
6. Jugal Kishore Agrawal, *Practicals in Engineering Chemistry*; Oxford and IBH Publishing Co., New Delhi, 1976.
7. Organic Chemistry Vol.2 IL Finar 5th Edn. Longmans 1975
- 8.Industrial Chemistry by BK Sharma, Goel Publishing house Meerut.

Syllabus- Fourth Semester

POLYMER CHEMISTRY

Course Code: CHY2404

CreditUnits: 03

Course Objective: To know about the types of polymers, polymerization techniques and commercial polymers.

Course Contents:

Module I:

Polymers: Basic Concept, classification of polymers on the basis of structures and applications. Distinction among plastics, elastomers, and fibers, Homo and hetero polymers, copolymers, properties of polymers, glass transition temp. (T_g) - definition, factors affecting T_g , Relationship between T_g and molecular weight.

Module II:

Molecular Weight of polymers, Number average, weight average, sedimentation and viscosity, average molecular weights, Molecular weights and degree of polymerization. Reactions - Hydrolysis, Hydrogenation, addition, substitution, cross linking - vulcanization and cyclisation.

Module III:

Polymerization techniques: Bulk, solution, suspension & emulsion polymerization, melt polycondensation, Polymer processing, calendaring, die casting, rotational casting.

Module IV:

Chemistry of commercial polymers- General methods of preparation, properties and uses of the following - Teflon, polyethylene, polystyrene, polyesters, poly amides, polycarbonates and PVC.

Module V:

Advances in polymers; Bio-Polymers, biomaterials, polymers in medical field, High temperature and fire resistant polymers – synthesis, structural aspects and applications of silicones and siloxanes. Borazines, silicates and phosphazenes and polysulphates.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

1. Text Book of Polymer Science, Bill meyer F.W. Jr. John Wiley & Sons 1984.
2. Polymer Science, Gowarikar. V.R. Viswanathan, N.V. JayaderSreedhar.
3. Wiley Eastern Ltd., New Delhi, 2005
4. Polymer Chemistry, Sharma.B.KGoel Publishing House, Meerut- 1989.
5. Polymer Chemistry. Arora M.G. Vadar M.S. - Anmol publications (p) Ltd., New Delhi 1989.
7. Polymer Chemistry - An introduction - M.P. Stevens, oxford.

INORGANIC CHEMISTRY LAB-III

Course Code: CHY2405

CreditUnits: 01

Course Objective: To provide training and experience in practical aspects of inorganic chemistry including estimation of Ca/Mg by complexometric titration and Cl⁻ ion determination.

Course Contents:

(a) Complexometric Titrations:

- (i) Complexometric estimation of (i) Mg²⁺ (ii) Zn²⁺ using EDTA
- (ii) Estimation of total hardness of water samples
- (iii) Estimation of Ca²⁺ in solution by (substitution method) using Erio-chrome black-T as indicator.
- (ii) Estimation of Ca/Mg in drugs and Biological samples.

(b) Argentometry

Estimation of Cl⁻ (i) By Mohr's method, (ii) By Vohlard's method, (iii) By Fajan's method.

(c) Paper Chromatographic separation of Ni (II) and Co(II); Cu(II) and Cd (II)

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Recommended Texts:

1. Vogel, A.I. A text book of quantitative Inorganic Analysis, ELBS. 1978.

ORGANIC CHEMISTRY LAB-III

Course Code: CHY2406

CreditUnits: 01

Course Objective: To provide experience in separation techniques of mixture of organic compounds by means of thin layer chromatography and paper chromatography. Also it gives students a hands on experience involving preparation of synthetically important organic compounds.

Course Contents:

1. Thin Layer Chromatography:

Determination of R_f values and identification of organic compounds.

- Separation of green leaf pigments (spinach leaves may be used)
- Preparation and separation of 2,4 - dinitrophenylhydrazones of acetone, 2-butanone, hexane-2 and 3-one using toluene and light petroleum (40:60) as solvent system.
- Separation of a mixture of dyes using cyclohexane and ethylacetate (8.5:1.5) as solvent system.

2. Paper Chromatography: Ascending and Circular

- Determination of R_f values and identification of organic compounds.
- Separation of a mixture of phenylalanine and glycine. Alanine and aspartic acid. Leucine and glutamic acid. Spray reagent-ninhydrin.
- Separation of a mixture of D, L-alanine, glycine and L-Leucine using n-butanol:acetic acid : water (4:1:5) Spray reagent-ninhydrin.
- Separation of monosaccharides- A mixture of D-galactose and D-fructose using n-butanol:acetone:water (4:1:5) Spray reagent aniline hydrogen phthalate.

3. Organic preparations

- Acetylation of amines and phenols
- Benzoylation of amines and phenols by Schotten-Baumann reaction
- Hydrolysis of amides and esters to obtain benzoic acid.
- 2,4-DNP, semicarbazone and oxime derivative of carbonyl compound
- Nitration of nitrobenzene, chlorobenzene & bromobenzene
- Oxidation of the benzaldehyde, benzyl alcohol acetophenone to benzoic

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PHYSICAL CHEMISTRY LAB-III

Course Code: CHY2407

CreditUnits: 01

Course Objective:

To provide training which involves determination of important property of fluids like surface tension, viscosity. It also enables student to compare strength of two acids and also to perform the potentiometric titration.

Course Contents:

1. To determine the velocity constant (specific reaction rate) of hydrolysis of methylacetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To compare the strength of HCl and H₂ SO₄ by studying the kinetics of hydrolysis of ester.
3. To study kinetically the reaction rate of decomposition of iodide by H₂O₂.
4. Determination of surface tension/percentage composition of given organic mixture using surface tension method.
5. Determination of viscosity/percentage composition of given organic mixture using viscosity method.
(I) Study the equilibrium of at least one of the following reactions by the distribution method:
(i) $I_2(aq) + I^- \rightarrow I_3^- (aq)$
(ii) $Cu^{2+}(aq) + nNH_3 \rightarrow Cu(NH_3)_n^{2+}$
(II) Perform the following potentiometric titrations (at least two):
(i) Strong acid with strong base (ii) weak acid with strong base and (iii) dibasic acid with strong base
(III) Potentiometric titration of Mohr's salt with potassium dichromate.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

AGRICULTURAL CHEMISTRY

Course Code: CHY2409

CreditUnits: 03

Course Objective: To give the students the importance of Agricultural chemistry and an exposure to find, analyse and find a suitable method to cultivate and promote agricultural methods.

Course Contents:

Module I: Soil Chemistry

Introduction: Formation of Soil. Classification of soil and properties of soil - soil Acidity - Causes of acidity - soil alkalinity - determination of soil pH - Buffering of soils - Amending the soil - Reclamation of acid soil - Liming agents.

Module II: Soil Fertility and Productivity

Organic Manures - Farmyard Manure - Compost - Oil cakes - Bone meal - Meat meal - Fish meal - Blood meal and green Manures - Fertilizers - Classification of fertilizers - Requisites of a good fertilizers - Nitrogenous fertilizers - Phosphatic fertilizers - super Phosphate of lime - Triple super phosphate - NPK fertilizers - ill effects of fertilizers - effect of mixed fertilizers on soil pH - Micronutrients - role of micronutrients sources - Need for nutrient balance - Soil management and Micronutrients needs.

Module III: Pesticides

Classification of Insecticides - Stomach poisons - Contact poisons and Fumigants - Insecticides - Organic Insecticides - DDT - Gammexane - Malathion - Parathion - Fungicides - Herbicides - Rodenticides - Pesticides in India - Adverse environmental effects of pesticides.

Module IV: Plant growth regulators

3-Indole acetic acid, Naphthalene Acetic Acid, Ethepon (2-chloroethyl phosphoric acid), Alar (succinin acid-2, 2-dimethylhydrazine) their function, Plant hormones: Gibberlin, Cyclocel, Phosphon, Defoliant

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

1. Industrial Chemistry by B.K. Sharma. Goel Publishing House, Meerut.
2. Applied Chemistry by K.Bagavathi - Sundari, MJP Publishers.
3. Fundamental concept of Applied Chemistry by Jayashree Ghosh, S. Chand & Company Ltd.,
4. Chemical treatment of hides a leather by J. Partridge Noyes, Park Ridge,N.J.
5. Agricultural Chemistry Vol I & Vol II edited by B.A. Yagodin - New Century books (P) Ltd.,
6. The nature and properties of soils - IX Edition - Nyle.C.Bready - S.Chand. and Company Ltd.,
7. Soils and soil fertility - Louis M.Thompson - and Frederick. R.Troch - Tata Mc. Graw hill.
8. Text book of Soil Science - T.D. Biswas and S.K. Mukerijee - II Edition.
9. Soil Science - A.Sankara.
10. Nature and properties of soils - Harry, O. Buckman.

TERM PAPER

Course Code: CHY2431

Credit Units: 02

Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of Chemistry & its application at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for term paper (List is indicative, not exhaustive)
 - Inorganic chemistry
 - Organic chemistry
 - Physical chemistry
 - Green chemistry
 - Agriculture chemistry

Evaluation Scheme

Organisation and relevance of content	Literature Review	Bibliography	Presentation	Total
30	30	20	20	100

PROJECT

Course Code: CHY2432

Credit Units: 03

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information/data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4)Body of the Report: The body of the report should have these four logical divisions

a)Introduction: This will cover the background, rationale/need/justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b)Conceptual Framework/National and International Scenario: (relating to the topic of the Project).

c) Presentation of Data,Analysis and Findings:(using the tools and techniques mentioned in the methodology).

d)Conclusion and Recommendations: In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

STEP I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

STEP II :Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

STEP III : Collection of information and data relating to the topic and analysis of the same.

STEP IV : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings,

Chapter 4: Conclusion and Recommendations,

Chapter 5: Bibliography.

STEP V: The following documents are to be attached with the Final Project Report.

- Approval letter from the supervisor (Annexure-IA)
- Student’s declaration (Annexure-IB)
- Certificate from the Competent Authority of the Organisation/Institution, if the student undertakes the Project Work in any Organisation/Institution.

Guidelines for evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as “Absent” in the Examination. He/she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate. The evaluation scheme shall be as follows:

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Annexure-IB
Student's Declaration

Ihereby declare that the Project Work with the title (in block letters).....
submitted by me for the partial fulfilment of the degree of B.Sc. Honours in Chemistry is my original work and has not been submitted earlier to any other University /Institution for the fulfilment of the requirement for any course of study.

I also declare that no chapter of this manuscript in whole or in part has been incorporated in this report from any earlier work done by others or by me. However, extracts of any literature which has been used for this report has been duly acknowledged providing details of such literature in the references.

Signature of Supervisor:
Name

Signature of Student

Registration No.

Place:

Date:

WORKSHOP

Course Code: CHY2433

Credit Units: 01

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Nuclear Chemistry
- Modern trend in Inorganic Chemistry
- Modern trend in Organic Chemistry
- Modern trend in Physical Chemistry
- Nanotechnology and its application
- Polymer Chemistry
- Pharmaceuticals
- Food Technology
- Agriculture Chemistry
- Computational Chemistry
- Green Chemistry

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

- Case Study
- Simulation
- Quiz
- Quality analysis& characterization
- Identification and preparation of materials

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

Syllabus- Fifth Semester

INORGANIC CHEMISTRY LAB-IV

Course Code: CHY2504

CreditUnits: 01

Course Objective: To provide training and experience in practical aspects of **inorganic chemistry** including preparation of some important inorganic compounds and estimation of some ions like Cu (II) ion, Ni(II) ion etc

Course Contents:

- (a) Quantitative Analysis: The following quantitative estimations are to be carried out.
- (i) Estimation of nickel(II) using Dimethylglyoxime as the precipitant.
 - (ii) Estimation of copper as CuSCN
 - (iii) Estimation of iron as Fe_2O_3 by precipitating iron as $\text{Fe}(\text{OH})_3$ through (i) Heterogeneous and (ii) Homogeneous media.
 - (iv) Estimation of Al (III) by precipitating with oxine and weighing as $\text{Al}(\text{oxine})_3$ (aluminiumoxinate).
- (b) Inorganic Preparations
- (i) Tetraammine copper (II) sulphate, $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4\cdot\text{H}_2\text{O}$
 - (ii) Potassium trisoxalatochromate (III), $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$
 - (iii) Cis and trans $\text{K}[\text{Cr}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2]$ Potassium dioxalato diaquachromate
 - (iv) PentaamminecarbonatoCobalt(III) ion
- (c) Spectrophotometric estimation of Ferrous ions by using 1,10phenanthroline

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Recommended Texts:

1. Vogel, A.I. A text book of Quantitative Analysis, ELBS 1986.

ORGANIC CHEMISTRY LAB-IV

Course Code: CHY2505

CreditUnits: 01

Course Objective:

To provide practical experience in organic preparation of azobenzene, benzopinacol and some other selected valuable organic compounds.

Course Contents:

Module 1: Organic Preparations

1. Diels-Alder reaction between anthracene and maleic anhydride
2. Reduction: nitrobenzene to azobenzene (TLC of the mixture), m-dinitrobenzene to m-nitroaniline
3. S-benzylisothiuronium salts of any one water soluble and one water insoluble acid: acetic acid, phenyl acetic acid, oxalic acid, benzoic acid, phthalic acid
4. Photochemical reduction of benzophenone to benzopinacol
5. Benzoin condensation of benzaldehyde (using thiamine hydrochloride)
6. Condensation of p-toluidine with benzaldehyde/salicylaldehyde/2-hydroxy-3-methoxy benzaldehyde to get Schiff's base (solventless condensation)

Estimation of:

1. Phenol and aniline by bromination with potassium bromate-potassium bromide method
2. Glycine by formylation method
3. Saponification value of an oil/fat

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA – Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PHYSICAL CHEMISTRY LAB-IV

Course Code: CHY2506

CreditUnits: 01

(I) To study changes in conductance in the following systems

- (i) strong acid-strong base
- (ii) weak acid-strong base and
- (iii) mixture of strong acid and weak acid-strong base

(II) Study the kinetics of the following reactions.

1. Initial rate method: Iodide-persulphate reaction

2. Integrated rate method:

- (a) Acid hydrolysis of methyl acetate with hydrochloric acid, volumetrically or conductometrically.
- (b) Iodide-persulphate reaction
- (c) Saponification of ethyl acetate.

Any other experiment carried out in the class.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

FOOD & NUTRITION CHEMISTRY

Course Code: CHY2507

CreditUnits: 03

Course Objective: To obtain knowledge about different foods, their nutritive values and food preservation.

Course Contents:

Module I:

Cereals definition - Classification, Processing - Structure of Cereals - Composition and nutritive value. Pulses definition - Classification - Processing - Structure of Pulses - Composition and nutritive value - Toxic Constituents in pulses - medicinal value of cereals and pulses. Sugar and related products. Sugar Structure and Properties. Nutritive value - Sugar composition in different food items. Sugar related product - Classification & nutritive value. Artificial sweeteners - example - advantages and disadvantages.

Module II:

Vegetables - classification - composition & nutritive values - Fruits- Classification - Composition & nutritive values. Fungi and algae as food - enzymatic browning and non enzymatic browning - Nutritive value of some common foods - milk, egg, soyabeans

Module III:

Beverages - definition and examples - Classification of beverages Fruit beverages - Milk based beverages - malted beverages - examples. Alcoholic and non alcoholic beverages - examples. Appetizers - definition - classification - examples - Water - functions and deficiency.

Module IV:

Food Preservatives - definition - classification - Food Spoilage - definition - Prevention. Methods of preservation - classification - Low and high temperature - preservatives examples - Dehydration - osmotic pressure - food irradiation.

Module V:

Food additives - Definition – classification - their functions - chemical substance. Packaging of foods - classification - Materials used for packaging.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

1. Food Science - III Edition - B. Sri Lakshmi, New Age International Publisher, 2005.
2. Food Chemistry - Lilian Hoagland Meyer CBS Publishers & Distributors, 2004.
3. Food Science, Nutrition and Health - Brian.A.Fox, Allan G.Cameron Edward Arnold, London.
4. Fundamentals of Foods and Nutrition - Mudambi. R.Sumathi, and Raja gopal, M.V. – Wiley Eastern Ltd., Madras.
5. Handbook of Food and Nutrition - M. Swaminathan - Bangalore Printing and Publishing Co. Ltd., Bangalore.

QUANTUM CHEMISTRY

Course Code: CHY2508

CreditUnits: 03

Course Objective: To obtain knowledge about quantum mechanics and LCAO-MO treatment of single electron system hydrogen.

Course Contents:

Module I:

Postulates of quantum mechanics, quantum mechanical operators, Schrodinger equation and its application to free particle and “particle-in-a-box” (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wave functions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy.

Module II:

Angular momentum: Commutation rules, quantization of square of total angular momentum and z-component. Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrodinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression), radial distribution functions of $1s$, $2s$, $2p$, $3s$, $3p$ and $3d$ orbitals. Average and most probable distances of electron from nucleus.

Module III:

Covalent bonding, valence bond and molecular orbital approaches, LCAO-MO treatment of H_2^+ . Bonding and antibonding orbitals. Qualitative extension to H_2 .

Comparison of LCAO-MO and VB treatments of H_2 and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB). Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF , LiH). Localised and non-localised molecular orbitals treatment of triatomic (BeH_2 , H_2O) molecules. Qualitative MO theory and its application to AH_2 type molecules. Simple Huckel Molecular Orbital (HMO) theory and its application to simple polyenes (ethene, butadiene).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & Reference:

1. Banwell, C. N. & McCash, E. M. *Fundamentals of Molecular Spectroscopy* 4th Ed. Tata McGraw-Hill: New Delhi (2006).
2. Chandra, A. K. *Introductory Quantum Chemistry* Tata McGraw-Hill (2001).
3. House, J. E. *Fundamentals of Quantum Chemistry* 2nd Ed. Elsevier: USA (2004).
4. Lowe, J. P. & Peterson, K. *Quantum Chemistry* Academic Press (2005).

TECHNICAL WRITING IN SCIENCE-I

Course Code: CHY2509

CreditUnits: 02

Course Objective:

Students will be introduced to learning the written and oral communication of technical information. Assignments include writing and presenting proposals, reports, and documentation. Emphasis on use of rhetorical analysis, computer applications, collaborative writing, and usability testing to complete technical communication tasks in the workplace.

Module I:

Writing Skills; Selection of topic, thesis statement, developing the thesis; introductory, developmental, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, expository and argumentative writing.

Module II:

Technical Writing: Scientific and technical subjects; formal and informal writings; formal writings/reports, handbooks, manuals, letters, memorandum, notices, agenda, minutes; common errors to be avoided.

Module III: Documentation Process

Understanding Audience/Readers, Collecting and Organizing information, Drafting information verbally and visually, Producing Information.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

1. M. Frank. Writing as thinking: *A guided process approach*, Englewood Cliffs, Prentice Hall Regents.
2. L. Hamp-Lyons and B. Heasley: *Study Writing; A course in written English*. For academic and professional purposes, Cambridge Univ. Press.
3. R. Quirk, S. Greenbaum, G. Leech and J. Svartik: *A comprehensive grammar of the English language*, Longman, London.
4. Daniel G. Riordan & Steven A. Panley: "*Technical Report Writing Today*" - Biztantra.
5. Daniel G. Riordan, Steven E. Pauley, Biztantra: *Technical Report Writing Today*, 8th Edition (2004).
6. *Contemporary Business Communication*, Scot Ober, Biztantra, 5th Edition (2004)

TERM PAPER

Course Code: CHY2531

Credit Units: 02

Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of chemistry and applied chemistry at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
 - Inorganic chemistry
 - Organic chemistry
 - Physical chemistry
 - Green chemistry
 - Agriculture chemistry
 - Food and Nutrition Chemistry
 - Quantum Chemistry

Evaluation Scheme

Organisation and relevance of content	Literature Review	Bibliography	Presentation	Total
30	30	20	20	100

WORKSHOP

Course Code: CHY2533

Credit Units: 01

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Nuclear Chemistry
- Modern trend in Inorganic Chemistry
- Modern trend in Organic Chemistry
- Modern trend in Physical Chemistry
- Nanotechnology and its application
- Polymer Chemistry
- Pharmaceuticals
- Food Technology
- Agriculture Chemistry
- Computational Chemistry
- Green Chemistry
- Environmental Chemistry

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

- Relevant study material and references will be provided by the trainer in advance.
- The participants are expected to explore the topic in advance and take active part in the discussions held
- Attending and Participating in all activities of the workshop
- Group Activities have to be undertaken by students as guided by the trainer.
- Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
- Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

- Case Study
- Simulation
- Quiz
- Quality analysis & characterization
- Identification and preparation of materials

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

Syllabus- Sixth Semester

SPECTROSCOPY

Course Code: CHY2604

CreditUnits: 03

Course Objective: To impart knowledge about different spectroscopic techniques

Course Contents:

Module I:

Definition of spectrum - Electromagnetic radiation - quantization of different forms of energies in molecules (translational, rotational, vibrational and electronic).

Microwave Spectroscopy - theory of microwave spectroscopy - selection rule - Calculation of moment of inertia and bond length of diatomic molecules.

Module II: UV - Visible Spectroscopy

Absorption laws. Calculations involving Beer Lambert's law - instrumentation - photo colorimeter and spectrophotometer- block diagrams with description of components - theory - types of electronic transitions - chromophore and auxochromes - Absorption bands and intensity -factors governing absorption maximum and intensity.

Module III: I.R. Spectroscopy

Principle - modes of vibration of diatomic, triatomic linear (CO_2) and nonlinear triatomic molecules (H_2O) - stretching and bending vibrations - selection rules. Expression for vibrational frequency (derivation not needed), instrumentation - sampling techniques. Applications of IR Spectroscopy - interpretation of the spectra of alcohols, aldehydes, ketones and esters - aliphatic and aromatic. Hydrogen bonding.

Module IV: Raman Spectroscopy

Rayleigh and Raman scattering, Stokes and anti-Stokes lines. Differences between Raman and I.R. Spectroscopy. Rotational Raman spectra of Noncentrosymmetric molecules (HCl). Mutual exclusion principle (CO_2 and N_2O)

Module V: NMR Spectroscopy

Basic principles of Proton Magnetic Resonance, chemical shift and factors influencing it, equivalent and non equivalent protons.; Spin - Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpretation of NMR spectra of simple compounds. Applications of IR, UV and NMR for identification of simple organic molecules.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

1. Elements of Analytical Chemistry - R. Gopalan, P.S. Subramanian, K. Rengarajan - S. Chand and sons (1997).

2. Fundamentals of Analytical Chemistry - D.A. Skoog and D.M. West - Holt Reinhard and Winston Publication - IV Edition (1982).
3. Principles of Instrumental Methods of Analysis - D.A Skoog and Saunders - College publications - III edition (1985).
4. Analytical Chemistry - S.M. Khopkar - New Age International.
5. Instrumental Methods of Chemical Analysis - Chatwaal - Anand -Himalaya Publishing House - (2000).
6. Analytical Chemistry - R.Gopalan - Sultan Chand.
7. Analytical Chemistry S.Usharani, Macmillan.
8. Instrumental Methods of Analysis - Willard Merit Dean and Settle – Saunders College Publication.
9. Physico Chemical Techniques of Analysis - P.B. Janarthanam-Vol- I & II - Asian Publishing.
10. Instrumental Methods of Chemical Analysis – B.K. Sharma - Goel Publications.
11. Spectrscopy by PS Kalsi

BASICS OF COMPUTER PROGRAMMING IN C AND ITS APPLICATIONS IN CHEMISTRY

Course Code: CHY2605

CreditUnits: 02

Course Objective: To introduce the basics of computers and to learn C language and its applications in solving problems in Chemistry.

Course Contents:

Module I:

Basic computer organization, processor and memory – main memory, secondary storage devices and storage hierarchy. Software – relationship between hardware and software – types of software. Planning the computer program – algorithm and flowcharts. Basics of operating systems.

Module II:

Computer languages – machine language, assembly language, assembler, compiler, interpreter and programming languages - C language – introduction, C compiler, operating systems and preprocessor directives - variables, constants, operators, input and output functions.

Module III:

Applications in Chemistry – calculation of the radius of the first Bohr orbit for an electron, calculation of half-life time for an integral order reaction, calculation of molarity, molality and normality of a solution, calculation of pressure of ideal or Vanderwaal's gas, Calculation of electronegativity of an element using Pauling's relation.

Module IV:

Applications in Chemistry - Calculation of empirical formulae of hydro carbon, calculation of reduced mass of a few diatomic molecules, determination of the wave numbers of spectral lines of hydrogen atom, calculation of work of expansion in adiabatic process, calculation of pH, solubility product and bond energy using Born - Lande equation, calculation of standard deviation and correlation coefficient.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

1. K.V. Raman, Computers in Chemistry, 8th Edition, Tata McGraw Hill, 2005.
2. Venugopal and Prasad, Programming with C, 11th Edition, 1971.
3. E. Balaguruswamy, Programming in C, 2nd Edition, 1989

INORGANIC CHEMISTRY LAB-V

Course Code: CHY2606

CreditUnits: 01

Course Objective: To provide students an experience in qualitative analysis of various cations and anions in a given mixture.

Course Contents:

Qualitative analysis:

Using H₂S /PTC/ Thioacetamide or any other reagent. Identification of cations and simple anions in a mixture of salts containing not more than six ions (Three cations and three anions) interfering anions using semimicro scheme of analysis. If combination of cations or anions is given in the mixture, insoluble should be avoided. Spot tests should be carried out for final identifications wherever feasible.

Cation : Pb²⁺, Bi³⁺, Cu²⁺, Cd²⁺, As³⁺, Sb³⁺, Sn²⁺ or Sn⁴⁺, Fe²⁺ OR Fe³⁺, Al³⁺, Cr³⁺, Co²⁺, Ni²⁺, Zn²⁺, Mn²⁺, Ba²⁺, Sr²⁺, Ca²⁺, Mg²⁺, NH⁴⁺, K⁺

Anion : CO₃²⁻, SO₃²⁻, CO₃²⁻, SO₃²⁻, S²⁻, NO₂⁻, CH₃COO⁻, NO₃⁻, Cl⁻, Br⁻, I⁻, SO₄²⁻, PO₄³⁻, BO₃³⁻, F⁻, C₂O₄²⁻

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Recommended Texts:

1. Vogel, A.I. A text book of Quantitative Analysis, ELBS 1986.

ORGANIC CHEMISTRY LAB-V

Course Code: CHY2607

CreditUnits: 01

Course Objective:

To provide experience in practical aspects of qualitative analysis of given organic mixture and detection of functional groups present.

Course Contents:

Qualitative analysis of organic mixture containing two solid component using water, NaOH, NaHCO₃ for separation, prepare suitable derivative.

Identification of the functional groups, C-C and C-N triple bonds, sp³, sp² and sp hybridized C-H bonds by IR spectroscopy, NMR spectroscopy (IR & NMR spectra to be provided)

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA – Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PHYSICAL CHEMISTRY LAB-V

Course Code: CHY2608

CreditUnits: 01

Course Objective:

To provide training in practical aspects of physical chemistry including determination of transition temperature of given compound, verification of Lambert- Beer law. Record UV spectrum.

Course Contents:

Paper

Physical Chemistry (12+12 marks)Two experiments

Transition Temperature

1. Determination of the transition temperature of the given substance by thermometric method (e.g. $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}/\text{SrBr}_2 \cdot \text{H}_2\text{O}$).

Colourimetry

- Verification of Lambert-Beer's Law
 - Determination of pK (indicator) for phenolphthalein or methyl red
 - Study the formation of a complex between ferric and thiocyanate (or salicylate) ions.
 - Study the kinetics of interaction of crystal violet with sodium hydroxide colourimetrically.
 - Analysis of the given vibration-rotation spectrum of $\text{HCl}(\text{g})$
 - Record the UV spectrum of p-nitrophenol (in 1:4 ethanol:water mixture). Repeat after adding a small crystal of NaOH. Comment on the difference, if any.
 - Record the U.V. spectrum of a given compound (acetone) in cyclohexane
- (a) Plot transmittance *versus* wavelength.
(b) Plot absorbance *versus* wavelength.
(c) Calculate the energy involved in the electronic transition in different units, i.e. cm^{-1} , kJ/mol, kcal/mol & eV.

Any other experiment carried out in the class.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PROGRAMMING IN C LAB

Course Code: **CHY2609**

CreditUnits: **01**

Course Contents:

- DOS commands
- Creation of batch files
- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

TECHNICAL WRITING IN SCIENCE-II

Course Code: CHY2612

CreditUnits: 02

Course Objective:

Students will be introducing to learning the written and oral communication of technical information. Assignments include writing and presenting proposals, reports, and documentation. Emphasis on use of rhetorical analysis, computer applications, collaborative writing, and usability testing to complete technical communication tasks in the workplace.

Course Contents:

Module I: Technical Writing Process

Document development process, Estimating Technical Documentation, Documentation Planning, Selection of Tools, Information Architecture, Templates and Page design, Audience Profiling.

Module II:

Journal paper writing: Abstract for paper and poster, different kind of journal for chemistry, impact factors of journals, ISBN number, Citation, H-index.

Module III:

Analytical report, Project Management in Technical Communication, Project writing, project proposal writing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

1. M. Frank. Writing as thinking: *A guided process approach*, Englewood Cliffs, Prentice Hall Regents.
2. L. Hamp-Lyons and B. Heasley: Study Writing; *A course in written English*. For academic and professional purposes, Cambridge Univ. Press.
3. R. Quirk, S. Greenbaum, G. Leech and J. Svartik: *A comprehensive grammar of the English language*, Longman, London.
4. Daniel G. Riordan & Steven A. Panley: "Technical Report Writing Today" - Biztantra.
5. Daniel G. Riordan, Steven E. Pauley, Biztantra: *Technical Report Writing Today*, 8th Edition (2004).
6. *Contemporary Business Communication*, Scot Ober, Biztantra, 5th Edition (2004).

TERM PAPER

Course Code: CHY2631

Credit Units: 02

Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of chemistry and its application at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Guidelines:

1. The term paper will be related to the contemporary issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
 - Inorganic chemistry
 - Organic chemistry
 - Physical chemistry
 - Green chemistry
 - Agriculture chemistry
 - Nanochemistry

Evaluation Scheme

Organisation and relevance of content	Literature Review	Bibliography	Presentation	Total
30	30	20	20	100

PROJECT

Course Code: CHY2632

Credit Units: 03

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4)Body of the Report: The body of the report should have these four logical divisions

a)Introduction: This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b)Conceptual Framework / National and International Scenario: (relating to the topic of the Project).

c) Presentation of Data,Analysis and Findings:(using the tools and techniques mentioned in the methodology).

d)Conclusion and Recommendations: In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

STEP I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

- Time available at the disposal.
 - Feasibility of data collection within the given time limit.
 - Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)
- STEP II** :Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
- STEP III** : Collection of information and data relating to the topic and analysis of the same.
- STEP IV** : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Chapter 5: Bibliography

STEP V : The following documents are to be attached with the Final Project Report.

- Approval letter from the supervisor (Annexure-IA)
- Student’s declaration (Annexure-IB)
- Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as “Absent” in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate. The evaluation scheme shall be as follows:

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Annexure-IB
Student's Declaration

Ihereby declare that the Project Work with the title (in block letters).....
submitted by me for the partial fulfilment of the degree of B.Sc. Honours in Chemistry is my original work and has not been submitted earlier to any other University /Institution for the fulfilment of the requirement for any course of study.

I also declare that no chapter of this manuscript in whole or in part has been incorporated in this report from any earlier work done by others or by me. However, extracts of any literature which has been used for this report has been duly acknowledged providing details of such literature in the references.

Signature of Supervisor:
Name
Registration No.

Signature of Student

Place:
Date:

WORKSHOP

Course Code: CHY2633

Credit Units: 01

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Nuclear Chemistry• Modern trend in Inorganic Chemistry
- Modern trend in Physical Chemistry• Modern trend in Organic Chemistry
- Nanotechnology and its applications• Green Chemistry
- Polymer Chemistry• Environmental Chemistry
- Pharmaceuticals
- Food Technology
- Agriculture Chemistry
- Computational Chemistry

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

- Case Study
- Simulation
- Business Planning
- Quiz
- Quality analysis & characterization
- Identification and preparation of materials

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100