SWAMI DAYANANDA

COLLEGE OF ARTS & SCIENCE

Affiliated to Bharathidasan University, Tiruchirappalli.

Accredited by NAAC - 'B++' Grade (With CGPA 2.99) (I Cycle)

UGC Recognized u/s 2(f) & 12 (B)

Dayananda Campus, Manjakkudi – 612 610. Tamilnadu, India.

HAND BOOK

DEPARTMENT OF CHEMISTRY

INDEX

Profile of B.Sc., (Chemistry)

BSc Chemistry is an undergraduate course in chemistry, which is ideal for the students who wish to have an in-depth knowledge of the subject. The course curriculum deals with various aspects of chemistry including chemical reactions and chemical composition of substances. The core subjects of the course include physical chemistry, organic chemistry and inorganic chemistry. Along with that, the students will have to choose from the list of elective subjects.

• Bachelor of Science in Chemistry is a specialized course for students who wish to acquire knowledge on the fundamentals of chemistry and various chemical reactions.

• The course focuses on the various branches of Chemistry which include physical chemistry, organic chemistry and inorganic chemistry.

• The program is meant to prepare the students for a prosperous career in the chemical industry.

• B.Sc Chemistry centres around topics like atomic structure, organic chemistry, molecular chemistry, application of computers in chemistry, green chemistry, chemo informatics and many more.

Career Options and Job Prospects

- There are plenty of B.Sc Chemistry jobs available for potential candidates. The students become eligible enough to get job opportunities in various private and public sectors.
- Here, we have listed some of the most common job profiles of BSc Chemistry students: Chemist, Pharma Assistant, Clinical Research Associate, Lab Assistant, Toxicologist.

Future Scope

There are hardly any limits to B.Sc Chemistry scope as there are plenty available. After successfully completing the course one may pursue an M.Sc in various fields. Apart from looking for jobs in various private and government sectors, there are various opportunities for research in this field as well. There are a number of colleges which offer M.Sc in Chemistry and related fields in India. Some of these courses include

• M.Sc in Organic Chemistry

• M.Sc in Applied Chemistry

• M.Sc in Industrial Chemistry

• M.Sc in Pharmaceutical Chemistry

- M.Sc in Biochemistry

Pursuing any of the above master courses in chemistry will not only enhance the knowledge of the subject, but will also take an individual a step ahead to have a great career prospect both in terms of work and research studies. One may also start their own business or open up a chemical laboratory for experimentations.

BHARATHIDASAN UNIVERSITY  **TIRUCHIRAPPALLI - 620 024.**

B.Sc. CHEMISTRY

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2022-23 onwards)

Sem.	Part	Course	Title	Ins. Hrs	Credit	Exam. Hours	Marks Int.	Marks Ext.	Total
I	I	Language Course – I (Tamil $/Other Languages + #)		6	3	3	25	75	100
	II	English Course - I		6	3	3	25	75	100
	III	Core Course – I (CC)	General Chemistry I	5	5	3	25	75	100
		Core Practical – I (CP)	Volumetric Analysis	4	4	3	40	60	100
		First Allied Course – I (AC)	Botany I / Computer Science I / Zoology I / Mathematics I	4	4	3	25	75	100
		First Allied Practical – I (AP)	Botany / Computer Science / Zoology	3	-	-	-	-	-
		First Allied Course – I (AC)	Mathematics II						
	IV	Value Education		2	2	3	25	75	100
	TOTAL			**30**	**21**	**-**	**-**	**-**	**600**
II	I	Language Course - II (Tamil $/Other Languages + #)		6	3	3	25	75	100
	II	English Course - II		6	3	3	25	75	100
	III	Core Course – II (CC)	General Chemistry II	5	5	3	25	75	100
		Core Practical – II (CP)	Applied Experiments in Volumetric Analysis	4	4	3	40	60	100
		First Allied Practical (AP)	Botany / Computer Science / Zoology	3	2	3	40	60	100
		First Allied Course – II (AC)	Mathematics II			3	25	75	100
		First Allied Course – II (AC)	Botany II / Computer Science II / Zoology II	4	4	3	25	75	100
		First Allied Course – III (AC)	Mathematics III						
		Add on Course – I ##	Professional English I	6*	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	VI	Language Proficiency for Employability (NM) @@	Effective English	-	2	3	25	75	100
	TOTAL			**30**	**29**	**-**	**-**	**-**	**900**

III	I	Language Course – III (Tamil $/Other Languages + #)		6	3	3	25	75	100
	II	English Course - III		6	3	3	25	75	100
	III	Core Course – III (CC)	General Chemistry III	5	5	3	25	75	100
		Core Practical - III (CP)	Semimicro Analysis	4	4	3	40	60	100
		Second Allied Course – I (AC)	Physics I	4	4	3	25	75	100
		Second Allied Practical – I (AP)	Physics	3	-	-	-	-	-
		Add on Course – II ##	Professional English II	6*	4	3	25	75	100
	IV	Non-Major Elective I @ - Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10^{th} & 12^{th} std.	Drugs and Cosmetics	2	2	3	25	75	100
	TOTAL			**30**	**25**	**-**	**-**	**-**	**700**
IV	I	Language Course –IV (Tamil $/Other Languages + #)		6	3	3	25	75	100
	II	English Course – IV		6	3	3	25	75	100
	III	Core Course - IV (CC)	General Chemistry IV	5	5	3	25	75	100
		Core Practical - IV (CP)	Organic Qualitative Analysis and Organic Preparation	4	4	3	40	60	100
		Second Allied Practical – I (AP)	Physics	3	2	3	40	60	100
		Second Allied Course – II (AC)	Physics II	4	4	3	25	75	100
	IV	Non-Major Elective II @ - Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10^{th} & 12^{th} std.	Chemistry in Everyday Life	2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NM) @@	Digital Skills for Employability	-	2	3	25	75	100
	TOTAL			**30**	**25**	**-**	**-**	**-**	**800**

V	III	Core Course - V (CC)	Inorganic Chemistry	5	5	3	25	75	100
		Core Course – VI (CC)	Organic Chemistry I	5	5	3	25	75	100
		Core Course – VII (CC)	Physical Chemistry I	5	5	3	25	75	100
		Core Practical -V (CP)	Physical Chemistry	4	4	3	40	60	100
		Major Based Elective – I (Any one)	1. Analytical Chemistry 2. Material and Nano Chemistry	5	4	3	25	75	100
	IV	Skill Based Elective I	Food Chemistry	4	2	3	25	75	100
		Soft Skills Development		2	2	3	25	75	100
	TOTAL			**30**	**27**	**-**	**-**	**-**	**700**
VI	III	Core Course - VIII (CC)	Organic Chemistry II	6	5	3	25	75	100
		Core Course - IX (CC)	Physical Chemistry II	6	5	3	25	75	100
		Core Practical – VI (CP)	Gravimetric Analysis and Determination of Physical Constant	4	4	3	40	60	100
		Major Based Elective - II (Any one)	1. Nuclear, Industrial Chemistry & Metallic State 2. Polymer Chemistry	5	4	3	25	75	100
		Project		4	3	-	20	80	100
	IV	Skill Based Elective – II	Dyeing Techniques and Water Treatment	4	2	3	25	75	100
	V	Gender Studies		1	1	3	25	75	100
		Extension Activities*		-	1	-	-	-	-
	VI	Naan Mudhalvan Scheme (NM) @@	Employability Readiness	-	-	-	-	-	-
	TOTAL			**30**	**25**	**-**	**-**	**-**	**700**
GRAND TOTAL				**180**	**152**	**-**	**-**	**-**	**4400**

List of Allied Courses

First Allied Course (any one)	**Second Allied Course**
Botany	Physics
Computer Science	
Mathematics	
Zoology	

$ For those who studied Tamil upto 10th +2 (Regular Stream).

+ Syllabus for other Languages should be on par with Tamil at degree level.

Those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part- I should study special Tamil in Part – IV.

The Professional English – Four Streams Course is offered in the 2nd and 3rd Semester (only for 2022-2023 Batch) in all UG Courses. It will be taught apart from the Existing hours of teaching / additional hours of teaching (1 hour /day) as a 4 credit paper as an add on course on par with Major Paper and completion of the paper is must to continue his / her studies further. (As per G.O. No. 76, Higher Education (K2) Department dated: 18.07.2020).

* The Extra 6 hrs / cycle as per the G.O. 76/2020 will be utilized for the Add on Professional English Course.

@ NCC Course is one of the Choices in Non-Major Elective Course. Only the NCC cadets are eligible to choose this course. However, NCC Course is not a Compulsory Course for the NCC Cadets.

** Extension Activities shall be outside instruction hours.

@@ Naan Mudhalvan Scheme.

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	Part	Types of the Courses	No. of Courses	No. of Credits	Marks
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.	III	Core Courses	8	40	800
4.		Core Practical	7	29	700
5.		Allied Courses I & II	4	16	400
6.		Allied Practical	2	4	200
7.		Major Based Elective Courses	2	8	200
8.		Add on Courses	2	8	200
9.		Project	1	3	100
10.	IV	Non-Major Elective Courses (Practical)	2	4	200
11.		Skill Based Elective Courses	2	4	200
12.		Soft Skills Development	1	2	100
13.		Value Education	1	2	100
14.		Environmental Studies	1	2	100
15.	V	Gender Studies	1	1	100
16.		Extension Activities	1	1	--
17.	VI	Naan Mudhalvan Scheme	2	4	200
	Total		**45**	**152**	**4400**

PROGRAMME OBJECTIVES

The programme enable the students

1. To understand basic facts and concepts in chemistry while retaining the exciting aspects of chemistry to develop interest in the study of chemistry as a discipline.
2. Todemonstrate, solve and understanding the major concept in organic, inorganic, physical, industrial, nuclear, polymer, food, pharmaceutical, cosmetics and environmental chemistry. (All disciplines of chemistry).
3. To develop the skill to solve the problems and think methodically, independently and draw the logical conclusion.
4. To understand the importance of the elements in the periodic table including their physical and chemical nature and role in the daily life.
5. To understand concepts of chemistry and apply scientific information to solve problems in all situation so that they get a strong foundation in chemistry.
6. To understand the concepts of chemistry to inter relate and interact to the other subject like mathematics, physics, biological science etc.
7. To develop skills in the proper handling of apparatus, chemicals and instruments.
8. To be exposed to the different processes used in industries and their applications.
9. To learn the laboratory skills and to transfer and interpret knowledge entirely in the working environment.
10. To achieve the skills required to succeed in graduate school, professional school and the chemical industry like cement industries, agro product, paint industries, rubber industries, petrochemical industries, food processing industries, fertilizer industries.
11. To expand the knowledge in available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist etc.
12. To discuss how science and its applications interact with social, economic, political, environmental, cultural and ethical factors.

PROGRAMME OUTCOMES

On successful completion of B.Sc. Chemistry programme, students are expected to

- Gain complete knowledge about all fundamental aspects of chemistry
- Apply chemistry knowledge to solve problems in various fields of chemistry.
- Get a skill for effective and safe handling of apparatus, chemicals and instruments in a laboratory.
- Carry out experiments in the area of organic analysis, Volumetric analysis, inorganic semi-micro analysis, conductometric & potentiometric equipment
- Use technologies and instrumentation together to explore new areas of research.
- Get enormous job opportunities at chemical, pharmaceutical and food product industries.
- Appear in competitive exams conducted by service commissions such as UPSC and TNPSC
- Gain knowledge in the emerging field of nanochemistry and polymer chemistry.

First Year **CORE COURSE I** **Semester I**

GENERAL CHEMISTRY I

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To learn the arrangement of elements in the periodic table and to understand the periodic properties
- To learn the laboratory hygiene, safety measures, principles of qualitative and quantitative analysis
- To learn the various methods of preparation, structure and stability of reaction intermediates.
- To understand the chemistry of cycloalkanes, alkenes and alkynes.
- To learn the types, preparation and properties of sols, colloids and emulsions and the determination of molecular weight of macromolecules

UNIT – I PERIODIC TABLE AND PERIODIC PROPERTIES:

1.1. Quantum Numbers, Filling up of atomic orbitals: Pauli's exclusion principle, Aufbau Principle, Hunds rule of maximum multiplicity – electronic configuration. Stability associated with half-filled and completely filled orbitals.

1.2. Periodic properties of elements – variation of atomic volume, atomic and ionic radii, ionization potential, electron affinity, electro negativity along periods and groups. Pauling scale of electro negativity.

1.3 Classification of elements into s, p, d and f blocks.

UNIT- II LABORATORY HYGIENE, SAFETY MEASURES AND ANALYTICAL METHODS:

2.1 Storage and handling of chemicals – Corrosion, flammable, explosive, carcinogenic and toxic chemicals. Simple first aid procedures for accidents involving acids, alkalis, bromine, fire burns and cut by glass.

2.2 Solubility product, common ion effect, complexation, oxidation-reduction reactions involved in identification of anions and cations – separation of cations into groups – Semi micro analysis of simple salts.

2.3 Volumetric analysis – preparation of standard solutions – normality, molarity and molality - titrimetric reactions – acid-base, redox, precipitation and complexometric titrations – indicators – effect of change in

2.4 pH – selection of suitable indicators.

UNIT - III ALKANES, REACTIVE INTERMEDIATES AND METHODS FOR REACTION MECHANISMS:

3.1 Introduction: Inductive, mesomeric, electromeric effects and hyper conjugation – structure of organic molecules based on sp3, sp2 and sp hybridization. Alkanes – sources of alkanes – general preparation – general properties – conformational analysis of ethane and n-butane.

3.2 Carbocations, Carbanions and Carbenes: Generation and stability of reactive

intermediates – Correlation of reactivity with structure of reactive intermediates. Free radicals: Generation, stability, identification methods – Free radical halogenations reactions and their mechanism.

3.3 Homolytic and Heterolytic cleavages of bonds, Characteristics of nucleophilic, electrophilic and free radical reactions.

UNIT- IV CHEMISTRY OF CYCLOALKANES, ALKENES, DIENES AND ALKYNES:

4.1 Preparation of cycloalkanes – Chemical properties – Relative stability of cyclopropane to cyclooctane – Baeyer's Strain theory – Limitations – Mono and di-substituted cyclohexanes.

4.2 Alkenes: Nomenclature – Petroleum source of alkenes and aromatics – General methods of preparation of alkenes – Chemical properties – Markovnikov's rule and peroxide effect-Uses – Elimination reactions and its mechanisms (E_1, E_2).

4.3 Dienes: Structures and properties – conjugated dienes – stability and resonance– electrophilic addition – 1,2 addition and 1,4 addition. Alkynes: Nomenclature – General methods of preparation – Physical properties – Chemical properties – Uses.

UNIT – V COLLOIDS AND MACROMOLECULES:

5.1 Definition and types of Colloids- preparation, Purification (dialysis, electro dialysis and ultra-filtration) and stability of colloids, gold number.

5.2 Properties of colloids- kinetic, optical and electrical properties.

5.3 Emulsions – Types of emulsions, preparation, properties and applications, Donnan membrane equilibrium.

5.4 Osmosis – reverse osmosis and desalination. Macromolecules- Molecular weight of macromolecules- determination of molecular weight by osmotic pressure and light scattering methods.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Chart preparation on laboratory hygiene with safety measures and s, p, d and f block elements separately with their common properties and applications. Best chart can be placed in the laboratory for students perusal.

REFERENCES:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLalNagin Chand & Co., (1993).
4. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.

5. R. Gopalan, P.S. Subramanian & K. Rengarajan, "Elements of Analytical Chemistry", 2nd edition, Sultan Chand & Sons, 1000.
6. Morrison, R.T. and Boyd, R.N., Bhattacharjee, S. K. Organic Chemistry (7th edition), Pearson, India, (2011).
7. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
8. Jerry March, "Advanced Organic Chemistry, Reaction, Mechanism and Structure", 7th Edition, Wiley Inter Science (2013).
9. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical chemistry, (35th edition), New Delhi: ShobanLalNaginchand and Co. (2013)
10. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan& Co Ltd.
11. https://oms.bdu.ac.in/ec/admin/contents-/316_20211123075240176.pdf
12. https://kanchiuniv.ac.in/coursematerials/Dr.%20RP%20%20Carbocationspdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To predict periodic properties and position of elements in the periodic table.
- To apply theoretical aspects in qualitative and quantitative analysis and work safe and hygienically in laboratories.
- To prepare and predict the stability and reactivities of reaction intermediates.
- To prepare & explain the properties of colloids and emulsions.
- To determine the Molecular Weight of macromolecules.

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First Year **CORE PRACTICAL I** **Semester I**

VOLUMETRIC ANALYSIS

Code: **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To learn the techniques of titrimetric analyses.
- To know the estimation of several cations and anions.
- To know the estimation using neutralization and redox principle.

TITRIMETRIC QUANTITATIVE ANALYSIS:

1. Estimation of HClVsNaOH using a standard oxalic acid solution.
2. Estimation of Na_2CO_3VsHCl using a standard Na_2CO_3 solution.
3. Estimation of Iron (II) sulphateVs $KMnO_4$ using a standard Mohr's salt solution.
4. Estimation of oxalic acid Vs $KMnO_4$ using a standard oxalic acid solution.
5. Estimation of copper (II) sulphate by $K_2Cr_2O_7$ solution.
6. Estimation of $KMnO_4$Vsthio using standard $K_2Cr_2O_7$ solution.

REFERENCES:

Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997).

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To understand the use of volumetric pipette, burette and analytical balance.
- To Explain the principles of volumetric analysis,
- Toprepare standard solution to find out the concentrations of unknown analyte,
- To understand the selection of indicators and can apply the knowledge in chemical experiments.

Scheme of Valuation **Max. Marks**

Record **- 5 (marks)**
Procedure Writing **-10 (marks)**

Results
< 1 % - 45 marks
1-2 % - 35 marks
2-3 % - 25 marks
3-4 % - 15 marks
> 4 % - 10 marks

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First Year **CORE COURSE II** **Semester II**

GENERAL CHEMISTRY II

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To understand the principles of bonding and theories of chemical bonding.
- To understand the chemistry of S-block and Zero group elements.
- To learn the concepts of inorganic semi micro qualitative analysis.
- To understand the aromatic character of benzene type molecules and to learn the reaction mechanisms involved in haloalkanes and halobenzenes.
- To understand the properties of atoms, characteristics, effect of radiations and the significance of wave functions.

UNIT - I CHEMICAL BONDING:

1.1. Ionic bond – formation, variable electro valency – Lattice energy, Born – Haber Cycle. Covalent bond - formation, variable covalency, maximum covalency, covalent character in ionic bond – Fajans' Rule. Polarization – partial ionic character of a covalent bond.

1.2 VB theory, MO theory – Basic principles of bonding and antibonding orbitals, applications of MOT to H_2, He_2, N_2& O_2 – molecular orbital sequence, comparison of VB & MO Theories.

1.3 Hybridization – Formation of $BeCl_2$& BCl_3. VSEPR theory of simple inorganic molecules – $BeCl_2$, $SiCl_4$, PCl_5, SF_6, IF_7, XeF_6, BF_3& H_2O.

1.4 Hydrogen bonding – Intermolecular & Intramolecular H_2 – bonding and consequences.

UNIT - II CHEMISTRY OF s-BLOCK AND ZERO GROUP ELEMENTS:

2.1 General characteristics of s-block elements – comparative study of elements – alkali metals and their hydroxides, oxides and halides, alkaline earth metals and their oxides, carbonates and sulphates.

2.2 Diagonal relationship of Li & Mg, Be & Al, chemistry of NaOH, KI & Mg $(NH_4)PO_4$.

2.3 Qualitative Inorganic Analysis – Dry Test, flame test, cobalt nitrate test wet confirmatory test for acid radicals, interfering acid radicals–elimination of interfering acid radicals.

2.4 Zero group elements – position in the periodic table, occurrence, isolation, applications, compounds of Xe - XeF_4, XeF6& $XeOF_4$.

UNIT - III CHEMISTRY OF BENZENE AND BENZENOID COMPOUNDS:

3.1 Aromaticity – Huckle's rule - structure of benzene – Benzene-preparation, chemical properties and uses. Aromatic electrophilic substitution reactions and mechanism – Orientation and reactivity in substituted benzenes.

3.2 Polynuclear aromatic hydrocarbons – Nomenclature, Naphthalene from coal tar and petroleum – Laboratory preparation, Structure of Naphthalene, Aromatic character, Physical properties, Chemical properties, Uses. Mechanism of Aromatic electrophilic substitution – Theory of orientation and reactivity.

3.3 Anthracene, Phenanthrene from coal tar and petroleum, Laboratory preparation, Molecular Orbital structures, Aromatic Characters, Physical Properties, Chemical properties and uses. Preparation of biphenyls, Physical and Chemical properties and uses.

UNIT - IV ALKYL AND ARYL HALOGENS:

4.1 Nomenclature of haloalkanes – structure - general preparations of haloalkanes - physical and chemical properties and uses.

4.2 Nucleophilic aliphatic substitution reaction mechanisms (SN1 and SN2) – Stereo chemical aspects.

4.3 Halobenzenes: Theory of orientation and reactivity - general preparation – properties - uses. Electrophilic and nucleophilic aromatic substitution reaction mechanisms.

UNIT – V ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS:

5.1 Rutherford's and Bohr's model an atom- Bohr's theory and origin of hydrogen spectrum. Somerfield's extension of Bohr's theory.

5.2 Electromagnetic radiation- definitions for λ, υ and velocity.

5.3 Dualism of light -Particle nature of radiation- black body radiation and Planck's quantum theory, photoelectric effect and Compton effect of matter.

5.4 De Broglie hypothesis and Davisson and Germer experiment. Heisenberg's uncertainty principle. Schrodinger wave equation (Derivation not needed). Physical significance of Ψ and Ψ^2.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

An assignment on applications of hydrogen bonding, various atomic models and evidences for dualism of light. Chart preparations for molecular orbital theory diagram. An exposure to virtual laboratory experiments.

REFERENCES:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLalNagin Chand & Co., (1993).
4. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. R. Gopalan, P.S. Subramanian & K. Rengarajan, "Elements of Analytical Chemistry", 2nd edition, Sultan Chand & Sons, 1991.

6. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).
7. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
8. Jerry March, "Advanced Organic Chemistry, Reaction, Mechanism and Structure", 7th Edition, Wiley Inter Science (2013).
9. Puri B.R., Sharma L.R. and Pathania M.S. (2013) Principles of Physical Chemistry, (35th edition), New Delhi: ShobanLalNaginchand and Co.
10. Bahl B.S., ArunBahl and Tuli G.D. (2012). Essentials of Physical Chemistry, New Delhi: Sultan Chand and Sons.
11. https://oms.bdu.ac.in/ec/courses.php?subject=B.Sc.%20(CHEMISTRY)
12. http://www.chem.ualberta.ca/~vederas/Chem_164/handouts/pdf/sub_elim_rxn.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To explain the principles and theories of chemical bonding.
- To explain the chemistry of S-block elements and Zero group elements.
- To apply the concept of common ion effect, solubility product in inorganic Semi micro qualitative analysis
- To explain the reaction mechanism of haloalkanes and halobenzene.
- To explain atomic models. Atomic spectrum and dual nature of light black body radiation and significances of wavefunctions.

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First Year **CORE PRACTICAL II** **Semester II**

APPLIED EXPERIMENTS IN VOLUMETRIC ANALYSIS

Code: **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To learn the applications of volumetric analysis in consumer product.
- To learn the applications of complexometric titrations.
- To understand estimation of hardness, alkalinity and chlorine in water.

TITRIMETRIC QUANTITATIVE ANALYSIS:

1. Estimation of total hardness of water by EDTA method.
2. Estimation of chloride ion in water (in acidic and alkaline medium).
3. Estimation of calcium in commercial milk powder by EDTA method.
4. Estimation of Mg (II) in water by EDTA method.
5. Estimation of chlorine in bleaching powder.
6. Estimation of saponification value of an oil.
7. Preparation of distilled and deionized water.

REFERENCES:

Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997).

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To Apply the principles of complexometric titrations,
2. To understand the conditions of complex formation.
3. To prepare the buffer solutions at a required pH
4. To select the correct titrimetric procedure along with standard and nonstandard solutions.
5. To perform all sorts of volumetric calculations.

Scheme of Valuation	**Max. Marks**
Record	- 5 (marks)
Procedure Writing	-10 (marks)
Results	
< 1 %	- 45 marks
1-2 %	- 35 marks
2-3 %	- 25 marks
3-4 %	- 15 marks
> 4 %	- 10 marks

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Second Year **CORE COURSE III** **Semester III**

GENERAL CHEMISTRY III

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To learn the chemistry of p-block elements.
- To study about the preparations and properties of compounds of oxygen, Sulphur, halogens and interhalogens.
- To understand the arrangement of atoms in space, isomers and the nomenclature.
- To learn the gas laws, properties of real gases and types of molecular velocities.
- To learn the types, structure and properties of solids and liquid crystals.

UNIT – I CHEMISTRY OF p-BLOCK ELEMENTS:

1.1 General characteristics of p-block elements. Comparative study of elements of III A & their compounds. Compounds of boron –boric acid, borax, borazole.

1.2 Extraction of Al and Pb - alums, alloys of Al. Chemistry of oxides of carbon – CO, CO_2. Allotropic forms of carbon.

1.3 Compounds of nitrogen and phosphorous – $NH_2.NH_2$, H_2NOH, hydrazoic acid, N_2– Cycle, fixation of N_2, PH_3 and P_2O_5.

UNIT – II COMPOUNDS OF OXYGEN, SULPHUR AND HALOGENS:

2.1 Peracids of sulphur, Thionic acids, sodium thiosulphate – preparation, properties, structure and uses.

2.2 Classification of oxides – acidic, amphoteric, neutral oxides, peroxides and superoxides.

2.3 Interhalogen compounds, Pseudo halogens, Oxyacid of halogens, Polyhalides and basic nature of iodine.

UNIT – III STEREOCHEMISTRY:

3.1 Principles of symmetry-symmetry elements (Cn, Ci and Sn) asymmetry and dissymmetry – isomerism – constitutional isomers – stereoisomers - enantiomers - diastereomers – geometrical isomerism -constitutional isomers – stereoisomers -enantiomers - diastereomers - geometrical isomers – meso and dl compounds used in stereochemistry.

3.2 D, L notations to express configurations – chirality-optical isomerism – optical activity – polarimeter – specific rotation.

3.3 Stereo selectivity, stereo specificity in organic reactions with examples. Resolution of racemic mixture – Walden Inversion – conformational analysis of cyclohexane - asymmetric induction.

UNIT – IV GASEOUS STATE:

4.1 Gases – Boyle's law, Charle's law and Avagadro's law- ideal gas equation.
4.2 Real Gases- deviation from ideal behaviour – van der Waals equation of states- derivation –significance of critical constants- law of corresponding states- compressibility factor.
4.3 Inversion temperature and liquefaction of gases- Linde and Claude – demagnetization methods.
4.4 Maxwell's distribution of molecular velocities (Derivation not needed). Types of molecular velocities- mean, most probable and root mean square velocities-Inter relationships. Collision diameter mean free path and collision number.

UNIT – V SOLID STATE AND LIQUID CRYSTALS:

5.1 Classification of solids- Isotropic and anisotropic crystals- elements of symmetry- basic seven crystal systems- laws of crystallography representation of planes- miller indices, space lattice and unit cell.
5.2 X-ray diffraction- derivation of Bragg's equation- determination of structures of NaCl by Debye Scherrer (powder method) and rotating crystal methods.
5.3 Types of crystals, close packing of identical solid spheres, interstitial sites, limiting radius ratios (derivation not needed), radius ratio rule and shapes of ionic crystals, structures of NaCl, CsCl and ZnS.
5.4 Semiconductors- intrinsic and extrinsic semiconductors- n and p-type semiconductors. Liquid crystals- types and applications.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

An assignment on general characteristics of p-block elements. Chart preparation for various symmetry elements – best can be placed for the students perusal. An exposure to crystallography software.

REFERENCES:

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLalNagin Chand & Co., (1993).
2. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
3. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
4. Gurdeep Raj, 'Advanced Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).
6. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
7. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan& Co Ltd.
8. Puri B.R., Sharma L.R. and Pathania M.S. (2013) Principles of Physical

Chemistry, (35th edition), New Delhi: ShobanLalNagin Chand and Co.
9. https://cbpbu.ac.in/userfiles/file/2020/STUDY_MAT/CHEM/liquid%20crystal.pdf.
10. https://youtu.be/hH2Zfucp0oo.
11. https://oms.bdu.ac.in/ec/courses.php?subject=B.Sc.%20(CHEMISTRY)

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To explain the chemistry of p block elements.
- To prepare and to predict the structure and properties of compounds of oxygen, sulphur, halogens & interhalogen compounds.
- To predict the absolute and relative configuration of organic molecules.
- To isolate, resolve the mixture of conformational isomers
- To explain the gas laws, properties of real gases and types of molecular velocities.
- To explain the types, structure and properties of solids and liquid crystals.

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BHARATHIDASAN UNIVERSITY **TIRUCHIRAPPALLI - 620 024**

PART-IV VALUE EDUCATION COURSE

FOR ALL UG ARTS, SCIENCE, COMMERCE AND MANAGEMENT
CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)
(Applicable to the candidates admitted from the academic year 2022-2023 onwards)

First Year	**PART-IV**	**Semester-I**
	VALUE EDUCATION	
Code:	**(Theory)**	**Credit: 2**

OBJECTIVES:

- To understand the philosophy of life and values through Thirukural
- To analyse the components of values education to attain the sense of citizenship
- To understand different types of values towards National Integration and international understanding
- To learn yoga as value education to promote mental and emotional health
- To understand human rights, women rights and other rights to promote peace and harmony

UNIT I : PHILOSOPHY OF LIFE AND SOCIAL VALUES:

Human Life on Earth (Kural 629) -Purpose of Life (Kural 46) -Meaning and Philosophy of Life (Kural 131, 226) -Family (Kural 45), Peace in Family (Kural 1025) Society (Kural 446), The Law of Life (Kural 952), Brotherhood (Kural 807) Five responsibilities / duties of Man (a) to himself (b) to his family (c) to his environment (d) to his society, (e) to the Universe in his lives (Kural 43, 981).

UNIT-II – HUMAN VALUES AND CITIZENSHIP

Aim of education and value education: Evolution of value oriented education, Concept of Human values: types of Values- Character Formation – Components of Value education- A P J Kalam's ten points for enlightened citizenship- The role of media in value building

UNIT-III VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT:

Constitutional or national values: Democracy, socialism, secularism, equality, Justice, liberty, freedom and fraternity - Social Values: Pity and probity, self-control, universal brotherhood - Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith -Religious Values: Tolerance, wisdom, character - Aesthetic Values- Love and appreciation of literature and fine arts and respect for the same- National Integration and International Understanding.

UNIT IV : YOGA AND HEALTH:

Definition, Meaning, Scope of Yoga - Aims and objectives of Yoga - Yoga Education with modern context - Different traditions and schools of Yoga - Yoga practices: Asanas, Pranayama and Meditation.

UNIT V : HUMAN RIGHTS:

Concept of Human Rights: Indian and international perspectives- Evolution of Human Rights- definitions under Indian and International documents -Broad classification of Human Rights and Relevant Constitutional Provisions: Right to Life, liberty ad Dignity- Right to equality- Right against exploitation- Cultural and Educational Right- Economic Rights- Political Rights- Social Rights - Human Rights of Women and Children – Peace and harmony.

UNIT - VI: CURRENT CONTOURS: (for continuous internal assessment only):

BOOKS FOR REFERENCES:

1. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road, Thanjavur 613 004
2. திருக்குறள் - ஜி.யு.போப் - ஆங்கில மொழியாக்கத்துடன் உமா நூல், வெளியீட்டகம், தஞ்சாவூர்,
3. Leah Levin, Human Rights, NBT, 1998
4. V.R. Krishna Iyer, Dialetics and Dynamics of Human Rights in India, Tagore Law Lectures.
5. Yogic Thearpy - Swami Kuvalayananda and Dr.S.L.Vinekar, Government of India, Ministry of Health, New Delhi.
6. SOUND HEALTH THROUGH YOGA - Dr.K.Chandrasekaran, Prem Kalyan Publications, Sedaptti, 1999.
7. Grose. D. N – "A text book of Value Education' New Delhi (2005)
8. Gawande . EN – "Value Oriented Education" – Vision for better living. New Delhi (2002) Saruptsons
9. Brain Trust Aliyar- "Value Education for Health, Happiness and Harmony" Erode (2004) Vethathiri publications

COURSE OUTCOMES: After completion of the course, the student will be able to:

- Apply the values in thirukural to be peaceful, dutiful and responsible in family and society
- Develop character formation and sense of citizenship
- Be secular, self-control, sincere, respectful and moral.
- Master yoga, asana and meditation to promote mental health
- Be attitudinal to follow the constitutional rights

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BHARATHIDASAN UNIVERSITY **TIRUCHIRAPPALLI - 620 024**

PART-IV ENVIRONMENTAL STUDIES COURSE

FOR ALL UG ARTS, SCIENCE, COMMERCE AND MANAGEMENT
CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)
(Applicable to the candidates admitted from the academic year 2022-2023 onwards)

First Year	**PART-IV**	**Semester-II**
	ENVIRONMENTAL STUDIES	
Code:	**(Theory)**	**Credit: 2**

COURSE OBJECTIVES:

- To appreciate the scope of Environmental Studies, Community ecology and the interdisciplinary nature of environmental issues
- To have a basic knowledge of Natural resources its classification, concepts, and natural resources of India.
- The course designed to gain knowledge on values of biodiversity and conservation on global, national, and local scales
- To study about sources and effects of environmental pollution like air, water, soil, thermal, marine, nuclear and noise
- To understand the concerns related to Sustainable Development on environment and health
- To introduce the students in the field of Law and Policies and Acts both at the national and international level relating to environment.

UNIT-1: The Multidisciplinary nature of environmental studies
Definition, scope and importance. (2 lectures)
Need for public awareness

UNIT-2: Natural Resources:
Renewable and non-renewable resources:
Natural resources and associated problems.

a) Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resources, land degradation, man induced Landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

(8 lectures)

Unit: 3 Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession.
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit: 4 Biodiversity and its conservation

- Introduction – Definition : Genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Biological Diversity Act 2002/ BD Rules, 2004

(8 lectures)

Unit: 5 Environmental Pollution

Definition

Causes, effects and control measures of :

a. Air Pollution
b. Water Pollution
c. Soil Pollution
d. Marine Pollution
e. Noise pollution
f. Thermal Pollution
g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.
- Ill-Effects of Fireworks: Firework and Celebrations, Health Hazards, Types of Fire, Firework and Safety

(8 lectures)

Unit: 6 Social Issues and the Environment

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns.

Case studies

- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation
- Public awareness.

(7 lectures)

Unit: 7 Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights - Value Education

- HIV/ AIDS - Women and Child Welfare
- Role of Information Technology in Environment and human health
- Case studies.

Unit: 8 Field Work

- Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

References:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt ltd, Ahamedabad – 380013, India, E-mail: mapin@icenet.net(R)
3. Brunner R.C. 1989, Hazardous Waste Incineration, McGraw Hill Inc 480 p
4. Clark R.S. Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P.Cooper, T.H.Gorhani E & Hepworth, M.T. 2001.
6. De A.K. Environmental Chemistry, Wiley Eastern Ltd
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford University, Press 473p.
9. Hawkins, R.E. Encyclopedia of India Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press 1140 p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & Schoch R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition 639 p.
13. Mhaskar A.K. Matter Hazardous, Techno-Science Publications (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971 Fundamentals of Ecology. W.B. Saunders Co. USA. 574 p
16. Rao MN & Datta, A.K. 1987 Waste Water treatment, Oxford & IBH Publication Co. Pvt Ltd 345 p.
17. Sharma B.K. 2001 Environmental chemistry Goel Publ House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C. Harper, J and Michael Begon, Essentials of Ecology, Blackwell science (TB)
20. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media (R).
21. Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science Publications (TB).
22. Wagner K.D. 1998 Environmental Management. W.B. Saunders Co. Philadelphia USA 499 p

    (M) Magazine (R) Reference (TB) Textbook

23. http://nbaindia.org/uploaded/Biodiversityindia/Legal/33%20Biological%20Diversity%20

Rules,%202004.pdf.

COURSE OUTCOMES:

- Understand the environmental importance including interactions across local to global scales.
- The learners to update and analyze environmental relationships and interactions of environmental components
- The student to gain knowledge on importance of natural resources in a systematic way.

- The course content is introduce the concept of renewable and non-renewable energy resources and its scenario in India and at global level
- The students will know the relationship between biodiversity and ecosystem functions, direct and indirect values of biodiversity resources and their bioprospecting opportunities.
- The learners can gain awareness related on environmental pollution, causes and pollution control with case studies.
- Student to obtain the environmental ethics and gain knowledge about the sustainable development.
- Learners should realize the environmental legislation and policies of national and international regime and know the regulations applicable to industries and other organizations with significant Environmental aspects

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PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES-I

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar

(Outcomes based on guidelines in UGC LOCF – Generic Elective)

UNIT 1: COMMUNICATION

1. **Listening**: Listening to instructions

2. **Speaking**: Telephone etiquette and Official phone conversations

3. **Reading** short passages (3 passages, one from each – Physics, Chemistry, Mathematics/Computer Science)

5. **Writing:** Letters and Emails in professional context

6. **Grammar in Context:**
   - Wh and yes or no,
   - Q tags
   - Imperatives

7, **Vocabulary in Context:** Word formation - .
   i) Creating antonyms using Prefixes
   ii) Intensifying prefixes (E. g inflammable)

Changing words using suffixes

A) Noun Endings
B) Adjective Endings
C) Verb Endings

UNIT 2: DESCRIPTION

Listening – Listening to process description

Speaking - Role play

Formal: With faculty and mentors in academic environment, workplace communication

Informal: With peers in academic environment, workplace communication

Reading –Reading passages on products, equipment and gadgets

Writing – Writing sentence definitions (e.g. computer) and extended definitions (e.g. artificial intelligence)

Picture Description – Description of Natural Phenomena

Grammar in Context: Connectives and linkers.

Vocabulary – Synonyms (register) - Compare & contrast expressions.

UNIT 3: NEGOTIATION STRATEGIES

Listening - Listening to interviews of specialists / inventors in fields (Subject specific)

Speaking – Brainstorming. (mind mapping). Small group discussions (subject-specific)

Reading – longer Reading text. (Comprehensive passages)

Writing – Essay Writing (250 word essay on topics related to subject area, like pollution, use of pesticides in cultivation, merits and demerits of devices like mobile phones, merits and demerits of technology in development)

Grammar in Context: Active voice & Passive voice – If conditional - Collocations –Phrasal verbs

UNIT 4: PRESENTATION SKILLS

Listening - Listening to presentation. Listening to lectures. Watching – documentaries (discovery / history channel)

Speaking –Short speech

- Making formal presentations (PPT)

Reading – Reading a written speech by eminent personalities in the relevant field /Short poems / Short biography.

Writing - Writing Recommendations

Interpreting visuals - charts / tables/flow diagrams/charts

Grammar in Context – Modals

Vocabulary (register) - Single word substitution

UNIT 5: CRITICAL THINKING SKILLS

Listening - Listening to advertisements/news and brief documentary films (with subtitles)

Speaking – Simple problems and suggesting solutions.

Reading: Motivational stories on Professional Competence, Professional Ethics and Life Skills (subject-specific)

Writing Studying problem and finding solutions- (Essay in 200 words)

Grammar-Make simple sentences

Vocabulary -Fixed expressions

SUGGESTED ACTIVITIES

UNIT 1

Listening: Links for formal conversation can be given - Gap filling exercises – Multiple Choice questions – Making notes.

Speaking - Role play activity

Reading – Note making. Note-Taking.

Writing: Guided Writing (developing hints)

Email

Grammar: Vocabulary – Worksheets – Games.

UNIT 2

Listening-

Process Descriptions (Processes of Condensation and Evaporation./Process of Measuring the thickness of a wire using a Screw -Gauge./process of Exaction of sugar from sugarcane)

Speaking – Role Play

Reading – Multiple choice questions - Evaluative answers – Classifying and labeling

Writing - Picture description – Description of natural phenomena (rainbow, earthquake, volcanic eruption, erosion, natural disasters in 150 to 200 words).

Vocabulary: Expansion of compound nouns

UNIT 3

Listening- Gap fill exercises – Listening comprehension

Speaking -Debates

Reading -Reading comprehension

Writing – Essay Writing

Grammar - Vocabulary, Activities, Worksheets & Games.

UNIT 4

Listening - Note taking (of listening & viewing items) - Filling a table based on the listening item.

Speaking – JAM, Presentations. (PPT-TECHNICAL)

Reading-Reading comprehension

Writing– Difference between recommendations and instructions

Questions/MCQs based on graphs/flow diagrams/charts

Grammar: Vocabulary – Activities, Worksheets & Games.

UNIT 5

Listening – Radio News/ TV-News telecast /

Speaking - Watch or listen to documentaries and ask questions

Reading - Reading motivational stories (success stories in subject area)

Writing - Essay writing.

Grammar -Vocabulary –Activities, Worksheets & Games

Second Year	**CORE PRACTICAL III**	**Semester III**
	SEMIMICRO ANALYSIS (P)	
Code	**(Practical)**	**Credit: 4**

COURSE OBJECTIVES:

- To learn the techniques of semimicro qualitative analysis of inorganic salt mixtures.
- To learn confirmatory tests to identify several cations and anions.
- To learn the principles of qualitative analysis of inorganic salts.

SEMIMICRO INORGANIC QUALITATIVE ANALYSIS

Analysis of a mixture containing two cations and two anions of which one will be an interfering acid radical. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.
Cations to be Studied: lead, copper, bismuth, cadmium, iron, aluminum, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.
Anions to be studied: Carbonate, Sulphide, Sulphate, nitrate, chloride, bromide, fluoride, borate, oxalate and phosphate.

REFERENCES:

Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997).

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To understand the systematic steps to perform a qualitative analysis and the logical sequence of each step.
- To understand chemical equilibria involving acid/base, redox, precipitation and complexation.
- To understand the purpose of elimination of interfering acid radical, separation of groups and identifying cations and anions in aqueous solutions.
- To plan, execute and record all the experimental results.

Note:

Internal Marks: 40
External marks:60

Marks Distribution for external

: Practical - 55 marks
: Record - 5 marks
: Total - 60 marks

4 radicals correct with suitable tests:	55 marks
3 radicals correct with suitable tests:	40 marks
2 radicals correct with suitable tests:	30 marks
1 radical correct with suitable tests:	15 marks
Spotting	05 marks

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Second Year **NON-MAJOR ELECTIVE I** **Semester III**

DRUGS AND COSMETICS

Code **(Theory)** **Credit: 2**

- To learn the terminologies used in drugs.
- To know the different types of drugs and to understand their mode of action
- To learn the methods of preparation of house hold cleaning reagents and cosmetics.

UNIT – I TERMINOLOGIES OF DRUGS:

Definition of the terms-drug, pharmacophore, pharmacodynamics, pharmacopoeia, pharmacology, bacteria, virus, fungus, actinomycetes, metabolites, antimetabolites, LD_{50}, ED_{50}.Therapeutic index and its significance.

UNIT – II ANTIBIOTICS:

Antibiotics – Definition-classifications - Antibiotics-penicillin, ampicillin, structure, mode of action and uses.

UNIT – III ANTIPYRETIC ANALGESICS:

Analgesics – definition and actions – narcotic and non – narcotic – morphine, heroin – structure, mode of action and uses.

Antipyretic analgesics – salicylic acid derivatives – methyl salicylate,aspirin.Anti inflammatory agents – structure ,mode of action and uses.

UNIT – IV PREPARATION OF DOMESTICALLY USEFUL PRODUCTS:

Preparation of washing powder, cleaning powder, phenoyls (white, black, yellow and rose colouredphenoyls). Liquid blue and soap oil.

UNIT – V COSMETICS:

Preparation of shampoo, Face powder, soap-manufacturing of soap (kettle process and hydrolysis process).

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

General quiz/seminar/Assignment on - Types, symptoms and preventive measure of communicable diseases– COVID -19, HIV, Malaria and influenza. Small scale preparation training to prepare phenyl, soap and aspirin in the laboratory.

REFERENCES:

1. Industrial Chemistry (Including Chemical Engineering) by B.K. Sharma,2016, Goel Publishing House, 16th Revised and Enlarged Edition.
2. A Text book of Pharmaceutical Chemistry by Jayashree Ghosh, 2010, S. Chand & company Ltd, New Delhi.
3. A Textbook of Pharmaceutical Chemistry by Dr.S. Lakshmi,2004, S. Chand & company Ltd, New Delhi.
4. https://oms.bdu.ac.in/ec/courses.php?subject=B.Sc.%20(CHEMISTRY)

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To state the terminologies used in drugs,
- To explain the mode of action of antibiotics.
- To explain the mode of action of antipyretic and analgesics.
- To prepare domestically useful products like soaps, detergents and cosmetics.

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Second Year **CORE COURSE IV** **Semester IV**

GENERAL CHEMISTRY IV

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

1. To learn the general characteristics of d and f block elements.
2. To know the principles of metallurgy.
3. To understand the reactions of organometallic compounds, alcohols, phenols and ethers.
4. To learn the fundamental concepts of first law of thermodynamics, to relate heat, work and energy and to calculate work from pressure – volume relationships.
5. To learn the fundamental concepts of rate of the reaction, determination of order of the reaction and theories of reaction rates

UNIT – I d-BLOCK, f- BLOCK ELEMENTS AND METALLURGY:

1.1 General characteristics of d-block elements, comparative study of zinc group elements, extraction of Mo & Pt - Alloys of copper, amalgams and galvanization

1.2 General characteristics of f-block elements – Lanthanide contraction and its consequences. Extraction of Th.

1.3 Metallurgy: Occurrence of metals – concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process, purification of metals – electrolysis, zone refining, van Arkel de-Boer process.

UNIT – II CHEMISTRY OF ORGANOMETALLIC COMPOUNDS:

2.1 Introduction – preparation of organomagnesium compounds- physical and chemical properties- uses. Organozinc compounds – general preparation, properties and uses.

2.2 Organolithium, organocopper compounds – preparation, properties and uses.

2.3 Organolead, organophosphorus and organoboron compounds– preparation, properties and uses.

UNIT – III CHEMISTRY OF ALCOHOLS, PHENOLS AND ETHERS:

3.1 Nomenclature – industrial source of alcohols – preparation of alcohols: hydration of alkenes, oxymercuration, hydroboration, Grignard addition, reduction – physical properties – chemical properties - uses – glycols from dihydroxylation, reduction, substitution reactions and glycerol and their uses.

3.2 Preparation of phenols including di- and trihydroxy phenols – physical and chemical properties - uses – aromatic electrophilic substitution mechanism – theory of orientation and reactivity.

3.3 Preparation of ethers: dehydration of alcohols, Williamson's synthesis – silyl

ether. epoxides from peracids - Sharpless asymmetric epoxidation – reactions of epoxides– uses – introduction to crown ethers – structures – applications.

UNIT – IV THERMODYNAMICSI:

4.1 Definitions- system and surrounding- isolated, closed and open system- state of the system- Intensive and extensive variables. Thermodynamic processes-
4.2 reversible and irreversible, isothermal and adiabatic processes- state and path functions.
4.3 Work of expansion at constant pressure and at constant volume. First law of thermodynamics- statement- definition of internal energy (E), enthalpy (H) and heat capacity. Relationship between Cp and Cv.
4.4 Calculation of w, q, dE and dH for expansion of ideal gases under isothermal and adiabatic conditions of reversible and irreversible processes.
4.5 Thermochemistry- relationship between enthalpy of reaction at constant volume (q_v) and at constant pressure (q_p)- temperature dependence of heat of reaction- Kirchhoff's equation.

UNIT – V CHEMICAL KINETICS:

5.1 Rate of reaction- rate equation, order and molecularity of reaction. Rate Laws- rate constants- derivation of first order rate constant and characteristics of zero order, first order and second order reactions- derivation of time for half change (t1/2) with examples.
5.2 Methods of determination of order of reactions- experimental methods- determination of rate constant of a reaction by volumetry, colorimetry and polarimetry.
5.3 Effect of temperature on reaction rate- concept of activation energy, energy barrier, Arrhenius equation. Theories of reaction rates- collision theory- derivation of rate constant of bimolecular reaction- failure of collision theory- Lindemann's theory of unimolecular reaction.
5.4 Theory of absolute reaction rates – derivation of rate constant for a bimolecular reaction- significance of entropy and free energy of activation. Comparison of collision theory and absolute reaction rate theory (ARRT).

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

An assignment on general characteristics organometallic compounds with their applications and recent techniques implemented in metallurgy. Exposure on analysis of alcohols and phenols-hydrometer-breath analysis-chemical tests - active hydrogen method.

REFERENCES:

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLalNagin Chand & Co., (1993).
2. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand &

Company Ltd., 2000.
3. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
4. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson ndia, (2011).
5. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
6. Puri B.R., Sharma L.R. and Pathania M.S. (2013) Principles of Physical Chemistry, (35th edition), New Delhi: ShobanLalNagin Chand and Co.
7. Samuel Glasstone (1974), Thermodynamics for Chemists (3rd printing), East- West Edn.
8. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: ShobanLalNagin Chand and Co.
9. Gurtu J.N. and AmitGurtu (1979), Chemical Kinetics, 5th Edn, Mittal K.K.
10. https://nptel.ac.in/courses/104101128
11. https://youtu.be/AVDSQ0xaBJI
12. https://oms.bdu.ac.in/ec/courses.php?subject=B.Sc.%20(CHEMISTRY)

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To explain the general characteristics of d and f block elements.
- To apply the principles of metallurgy for extraction of metals from ores
- To explain the reactions of organometallic compounds, alcohols, phenols and ethers.
- To relate heat, work and energy and to calculate work from pressure – volume relationships.
- To determine order of the reaction and to explain theories of reaction rates.

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Second Year **CORE PRACTICAL IV** **Semester IV**

ORGANIC QUALITATIVE ANALYSIS AND ORGANIC PREPARATION

Code **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To learn the techniques of qualitative analysis of organic compounds
- To know the preparation methods of them.
- To learn the identification of functional groups in organic compounds.

I ORGANIC QUALITATIVE ANALYSIS:

Analysis of Simple Organic compounds.

(a) Characterization of functional groups
(b) Confirmation by preparation of solid derivatives / characteristic colour reactions.

Note: Mono –functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

II ORGANIC PREPARATION: (ANY FOUR)

Preparation of Organic Compounds involving the following chemical conversions.

1. Oxidation 2. Reduction 3. Hydrolysis 4. Nitration 5. Bromination 6. Diazotization 7. Osazone formation.

REFERENCES:

Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997).

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to

1. Understand the fundamental methods and procedures adopted in organic analysis.
2. Perform systematic qualitative organic analysis of common organic compounds
3. Detect of special elements N, S and halogens
4. Apply chemical tests to identify unknown chemical species
5. Synthesise simple organic compounds on a laboratory scale.
6. Perform Isolation and purification of organic compounds.

Note:

Internal Marks : 40
External marks: 60

Marks Distribution for external

Record:	- 5 marks
Organic Analysis:	-35 marks
Aromatic/Aliphatic	-5 marks
Saturation unsaturation	- 5 marks
Element test	- 7 marks
Functional group	-13 marks
Derivative	- 5 marks
Organic preparation:	- 20 marks
Total:	- 60 marks

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Second Year **NON-MAJOR ELECTIVE II** **Semester IV**

CHEMISTRY IN EVERY DAY LIFE

Code **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- To learn the scientific and chemical principles in water chemistry
- To learn the applications of chemistry in agriculture.
- To learn additives and adulterants used in of food chemistry,
- To know the chemicals used in cosmetics and other materials used in everyday life.
- To understand the chemical used and properties of polymers, fibers and dyes.

Unit-I: Water chemistry:

1.1 Water **–** Characteristics of water, soft water and hard water.
1.2 Removal of hardness – Purification of water by ion exchange and reverse osmosis methods.
1.3 Water pollution: Sources and effects of water pollution (Domestic, Industrial, Agricultural) -Eutrophication.

UNIT – II AGRICULTURAL CHEMISTRY:

2.1 Plant nutrients –Requisites of good fertilizers - Effect of Nitrogen on plant growth, deficiency symptoms - examples for nitrogenous fertilizers: - Effect of Phosphorous on plant growth, deficiency symptoms – -examples for phosphatic fertilizers.
2.2 Effect of potassium on plant growth, deficiency symptoms - examples for potassium fertilizers – Functions of secondary and micro nutrients.
2.3 Pesticides: Classification on the basis of mode of action, types of pests and Chemical nature with examples – safety measures while using pesticides.
2.4 Fungicides, Herbicides, Acaricides, Rodenticides, Repellants, Fumigants, Defoliants (Definitions and Examples).

UNIT – III FOOD CHEMISTRY:

3.1 Food classification and functions- Digestion in mouth, stomach and intestine. Absorption- spoilages, preservation techniques (canning, dehydration, freeze–drying. salting, pickling, pasteurizing, fermenting and carbonating).
3.2 Mineral and water as food-role of water in physiology – water balance – permitted colours (Riboflavin, beta-carotene and amaranth) – description and uses.
3.3 Food additives – colouring (Natural and synthetic colours)-List of permitted colours (Curcumin, Riboflavin, Beta-carotene, Plain Caramel and amaranth)- description and uses.
3.4 Flavouring agents – Anti oxidants – Emulsifiers- Acidulants and beverages. Soft drinks aerated water (ingredients and side effects).

UNIT – IV COSMETICS AND OTHER MATERIALS:

4.1 Cosmetics – Face powder – constituents, uses, side effects. Nail polish, hair dye – composition and side effects.
4.2 Tooth powder – composition and manufacture. Lotions.
4.3 Preparation of phenyl, liquid blue and incense sticks.
4.4 Cleaning agents: Soaps- types and cleaning action – detergents – types – merits and

demerits of soap and detergents –chemical definitions of shampoo, washing powder and bleaching powder.

UNIT – V MATERIAL CHEMISTRY:

5.1 Polymers: Addition polymerization, condensation polymerization, thermoplastics-Vulcanization of rubber.
5.2 Fibers: Natural fibers (cellulosic and pretentious) –Semi synthetic (Rayon) Synthetic fibers (Poly ester, Nylon and Acrylic) –Pretreatment of fibers (Sizing, Desizing, Bleaching).
5.3 Dyes and Dyeing process: Difference between dye and pigment -Witt's colour theory, classification of dyes based on application (Direct, Vat, Acid, Reactive, Mordant and Disperse).

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Assignment and general quiz on - Sources, structure and biological functions of Vitamins – A, B complex, C and D, Carbohydrates and proteins. Hand on training to detect food adulterants in –milk, honey, ground nut oil, turmeric powder, chilli powder.

REFERENCES:

1. K. Kumarasamy, A. Alagappa Moses and M. Vasanthy, "Environmental studies", Bharathidasan University, Thiruchirappalli.
2. Alex Ramani, "Food Chemistry", MJP publishers (2009), Chennai.
3. Jayashree Gosh, "Text book of Pharmaceutical Chemistry" New Delhi, S. Chand & Company Ltd.,(2003).
4. K.BagavathiSundari, "Applied Chemistry" MJP Publishers, (2006) Chennai.
5. A Thankamma Jacob (1979), A Text Book of Applied Chemistry, 1st edition, McMillan India Ltd.
6. Hesse P.R, A text book of soil chemical analysis John Murray, New York, 1971.
7. Buchel K.H, Chemistry of Pesticides, John Wiley & Sons New York 1983.
8. https://oms.bdu.ac.in/ec/search-results.php

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To prepare demineralized and desalinized water.
- To explain the importance and requirements of good pesticides, fertilizers and fungicides used in agriculture.
- To explain food additives and their carcinogenic effects.
- To know the types of polymers and plastics with examples.
- To explain theory of dying processes
- To explain chemical composition of cosmetics

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Second Year **NON MAJOR ELECTIVE COURSE- I** **Semester-III**

TOUR OPERATIONS

Code: **(Theory)** **Credit: 2**

OBJECTIVES:

- To know the definition and concepts of tourism
- To understand the types of travel formalities
- To learn the Preparation of Tour Itinerary

UNIT- I TRANSPORT INDUSTRY:

Introduction to Transport Industry – Road Transport – Rail Transport - Cruise Liners Transportation - Reading of Railway Time Table – Railway Ticket Booking Procedures.

UNIT-II AIR TRANSPORT:

Development of Air Transport – Formation of IATA – Airline Industry (International and Domestic) - Role of Airlines in Tourism.

UNIT-III TRAVEL FORMALITIES:

Passport – VISA – Medical Certificates – Insurance – Customs - Foreign Exchange -Baggage allowance.

UNIT-IV TRAVEL AGENCY:

Evolution of Travel Agency – Departments and Functions of a Travel Agency - Source of income for Travel Agency.

UNIT-V TOURS OPERATIONS:

Origin of Tour Operations – Organising a Tour Program – Package Tours – Car Rentals – Tourist Guide Service -Preparation of Tour Itinerary – Tour Costing.

UNIT - VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Railway Ticket Booking Procedures - Baggage allowance - Organizing a Tour Program - Preparation of Tour Itinerary.

REFERENCE BOOKS:

1. Burkart and Melik, **Tourism -Past, Present and Future**, London, 1995.
2. R.M. Kaul, **Dynamics of Tourism** – **A Triology**, Vol.I., New Delhi, 1997.
3. Seth Pran Nath, Successful Tourism Practices, Vol.I., New Delhi, 1997.
4. Lonely Planet India, Guidebook, Travel literature

COURSE OUTCOME:

- Successful completion of this course will lead the students to appropriate knowledge in Tour operations.

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Second Year **NON MAJOR ELECTIVE COURSE-II** **Semester-IV**

CULTURAL TOURISM

Code: **(Theory)** **Credit: 2**

OBJECTIVES:

1. To gain the knowledge of Cultural Resources.
2. To understand the idea of Cultural Festivals
3. To get the knowledge of Cultural destinations.

UNIT- I CULTURAL TOURISM:

Definition - Meaning and Scope - Significance – Types of CulturalTourism Attractions - Culinary Traditions: North Indian - South Indian -Continental.

UNIT-II ARTS AND CRAFTS :

Music: Hindustani - Carnatic -Classical Dances: Kuchipudi, Odisi, Kathakali, Manipuri,Kadhak and Bharathanattiyam - Folk Dances.

UNIT-III CULTURAL RESOURCES OF NORTH INDIA :

Madura- Jaipur-Vaishnavadevi Temple Deccan Region: Konark – Amaravati- Somnathpur Temple -South India : Belur, Helibidu, Gurauvayur, Thiruppati- Madurai- Case studies: Darasuram, Velankanni.

UNIT-IV FESTIVALS:

Konark Festival in Odisha - Sarang Festival in Kolkata - Music Festival in Chennai- -Dance Festivals in Mamallapuram and Chidambaram - Music Festival in Thiruvaiyaru.

UNIT-V INDIAN CULTURAL DESTINATION – CULTURAL INSTITUTION IN INDIA:

Cultural Event Management – Preservation and Conservation of Monuments – Role of ASI, ICO, MOS -Mutts in India- Unique features of Tamil Culture: Chastity, Equality, Nobility, Charity , Justice.

UNIT - VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Hindustani Music - Culinary traditions of South India - Konark Festival–Role of ASI in heritage conservation.

REFERENCES :

1. V.s. Agarwal, the Heritage of Indian Art, Publications Divisions, Govt. of India, New Delhi.
2. A.L. Basham, The Wonder That was India, 3rd edition, London.
3. L. Basham, A Cultural History of India, Oxford University Press, New Delhi.
4. பண்டையநாகரிகங்கள் - எஸ்.எல். வி . மூர்த்தி
5. Art, Culture and Spirituality - Swami Atmaramananda&Dr.M.Sivaramkrishna.
6. The Book of Hindu Festivals and Ceremonies - Om Lata Bahadur.
7. Cultural Tourism In India- Luvkushmishra

COURSE OUTCOME:

- Successful completion of this course will lead the students to appropriate knowledge in Cultural Tourism.

Professional English [part-III -add on Course]

Weightage: 4 Credits Duration: 90hrs

Objectives:

The Professional Communication Skills Course is intended to help Learners in Arts and Science colleges

- Develop their competence in the use of English with particular reference to the workplace situation.
- Enhance the creativity of the students, which will enable them to think of innovative ways to solve issues in the workplace.
- Develop their competence and competitiveness and thereby improve their employability skills.
- Help students with a research bent of mind develop their skills in writing reports and research proposals.

Unit 1- Communicative Competence (18 hrs)

Listening – Listening to two talks/lectures by specialists on selected subject specific topics -(TED Talks) and answering comprehension exercises (inferential questions)

Speaking: Small group discussions (the discussions could be based on the listening and reading passages- open ended questions

Reading: Two subject-based reading texts followed by comprehension activities/exercises

Writing: Summary writing based on the reading passages.

Grammar and vocabulary exercises/tasks to be designed based on the discourse patterns of the listening and reading texts in the book. This is applicable for all the units.

Unit 2 - Persuasive Communication (18 hrs)

Listening: listening to a product launch- sensitizing learners to the nuances of persuasive communication

Speaking: debates – Just-A Minute Activities

Reading: reading texts on advertisements (on products relevant to the subject areas) and answering inferential questions

Writing: dialogue writing- writing an argumentative /persuasive essay.

Unit 3- Digital Competence **(18 hrs)**

Listening to interviews (subject related)

Speaking: Interviews with subject specialists (usingvideo conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging tonurture interests – subject related)

Reading: Selected sample of Web Page (subject area)

Writing: Creating Web Pages

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

The essay will address all aspects of digital competence in relation to MS Office and how they can be utilized in relation to work in the subject area

Unit 4 - Creativity and Imagination **(18 hrs)**

Listening to short (2 to 5 minutes) academic videos (prepared by EMRC/ other MOOC videos on Indian academic sites – E.g. https://www.youtube.com/watch?v=tpvicScuDyo)

Speaking: Making oral presentations through short films – subject based

Reading: Essay on Creativity and Imagination (subject based)

Writing – Basic Script Writing for short films (subject based)

- Creating blogs, flyers and brochures (subject based)
- Poster making – writing slogans/captions(subject based)

Unit 5- Workplace Communication& Basics of Academic Writing (18 hrs)

Speaking: Short academic presentation using PowerPoint

Reading & Writing: Product Profiles, Circulars, Minutes of Meeting.

Writing an introduction, paraphrasing

Punctuation(period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis)

Capitalization (use of upper case)

Outcomes of the Course.

At the end of the course, learners will be able to,

- Attend interviews with boldness and confidence.
- Adapt easily into the workplace context, having become communicatively competent.
- Apply to the Research &Development organisations/ sections in companies and offices with winning proposals.

Instruction to Course Writers:

1. **Acquisition of subject-related vocabulary should not be overlooked**. Textboxes with relevant vocabulary may be strategically placed as a Pre Task or in Summing Up
2. Grammar may be included if the text lends itself to the teaching of a Grammatical item. However, testing and evaluation does not include Grammar.

Third Year **CORE COURSE V** **Semester V**

INORGANIC CHEMISTRY

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To understand the basics and theories of coordination compounds.
- To study a few biologically important coordination compounds.
- To understand the preparation and properties of nitrosyl compounds
- To learn the basic principles and applications of magnetic properties.

UNIT–I COORDINATION COMPOUNDS I:

1.1 Introduction - Types of ligands: unidentate, bidentate and polydentate ligands, chelating ligands and chelates- IUPAC nomenclature of coordination compounds.

1.2 Isomerism in coordination compounds: Structural isomerism, hydrate isomerism, coordination isomerism, ionization isomerism, linkage isomerism, coordination position isomerism.

1.3 Stereoisomerism: Geometrical isomerism of four and six coordinate complexes, optical isomerism of four and six coordinate complexes, Werner and Sidgwick theories, methods of detecting complex formation.

UNIT – II COORDINATION COMPOUNDS II:

2.1 Theories of coordination compounds: Valence bond theory, limitations of valence bond theory, crystal field theory – splitting of d orbitals in octahedral, tetrahedral and square planar fields, CFSE, factors affecting CFSE, colour, geometry and magnetic properties of coordination compounds, Jahn – Teller distortion (an elementary idea).

2.2 Molecular orbital theory: Molecular orbital diagram for $[Co(NH_3)_6]^{3+}$. Ligand field theory. (An elementary treatment only).

UNIT – III COORDINATION COMPOUNDS III:

3.1 Labile and inert complexes, stability of coordination compounds – thermodynamic and kinetic stability, relationship between stepwise formation constant and overall formation constant, factors affecting the stability of complexes.

3.2 Unimolecular and biomolecular nucleophilic substitution reactions in octahedral and square planar complexes, trans effect – theories of trans effect and applications.

3.3 Few biologically important coordination compounds: Chlorophyll, hemoglobin and vitamin B_{12}.

UNIT – IV METAL CARBONYLS AND ORGANOMETALLIC COMPOUNDS:

4.1 Metal carbonyls: Mono and binuclear carbonyls of Cr, Co and Mn – preparation, structure, reactions, bonding and uses.

4.2 Structure and bonding in -metal alkenyl and-metal alkynyl complexes of $[PtCl_3(C2H_4)]$ $[Co(CO)_6(RC \equiv CR)]$ and ferrocene.

4.3 Binary metallic compounds: borides, carbides, and nitrides – classification, preparation, properties and uses.

UNIT – V NITROSYL COMPOUNDS AND MAGNETIC PROPERTIES:

5.1 Nitrosyl compounds: Classification-nitrosyl chloride and sodium nitroprusside - preparation, properties and structure.
5.2 Magnetic properties-meaning of the terms-magnetic susceptibility-magnetic moment-types of magnetism-Gouy balance-applications of magnetic properties.
5.3 Dipole moment-determination, application in the study of simple inorganic molecules.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

General quiz/seminar on- structure, magnetic, electrical properties, biological functions of the cis-platin.Therapeutic importance of iron, cobalt, copper, silver and gold complexes.

REFERENCES:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. W.U. Malik, G.D. Tuli and R.D. Madan, S.Chand and Company Ltd., 'Selected topics in Inorganic Chemistry', 7th edition, 2001.
3. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
4. P.L. Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
6. J.E. Huheey, 'Inorganic Chemistry', 4th edition, Pearson Education. Inc. 1993.
7. F.A. Cotton, 'Advanced Inorganic Chemistry', 6th edition, John Wiley & Sons, Pvt. Ltd., 2003 – 2004.
8. R. Gopalan, P.S. Subramanian and K. Rengarajan, 'Elements of Analytical Chemsitry', 2nd edition, Sultan Chand & Sons, 1991.
9. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==
10. https://archive.nptel.ac.in/content/storage2/courses/104106064/lectures.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To predict different types of isomerism exhibited by a coordination compounds
- To explain the various theories of coordination compounds to explain their geometry, stability and magnetic properties.
- To explain kinetics and thermodynamic stability of coordination complexes
- To explain preparation, magnetic properties and structure of metal carbonyls.
- To explain preparation, magnetic properties and structure of nitrosyls.

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Third Year **CORE COURSE VI** **Semester V**

ORGANIC CHEMISTRY I

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To learn the reactions of carbonyl compounds, carboxylic acids, amines, heterocycles.
- To know the oxidizing and reducing agents for synthesis.
- To understand chemistry of heterocyclic compounds and dyes.

UNIT–I CHEMISTRY OF CARBONYL COMPOUNDS:

1.1 Nomenclature - structure of carbonyl compounds - chemical properties - nucleophilic addition mechanism at carbonyl group (eg: HCN, ROH, RNH_2)- acidity of alpha hydrogen – keto-enol tautomerism (proof for the two forms).

1.2 Reduction and oxidation reactions of carbonyl compounds – paraformaldehyde, meta formaldehyde - uses of aliphatic carbonyl compound - Claisen condensation – Aldol condensation – Robinson annulation.

1.3 General methods of preparation of aromatic carbonyl compounds - physical and chemical properties – uses - Effect of aryl group on the reactivity of carbonyl group.

UNIT – II CHEMISTRY OF CARBOXYLIC ACIDS:

2.1 Nomenclature - Acidity of carboxylic acids based on substituent effect - comparison of acid strengths of halogen substituted acetic acids - acid strengths of substituted benzoic acids.

2.2 Preparation, properties and uses of acid derivatives: acid chloride, anhydrides, esters, amides - chemistry of compounds containing active methylene group – synthesis and synthetic applications of acetoacetic ester and malonic ester.

2.3 Preparation of dicarboxylic acid - physical and chemical properties - uses. Introduction to oils and fats - fatty acids - manufacture of soap - mechanism of cleaning action of soap.

UNIT – III CHEMISTRY OF NITROGEN COMPOUNDS:

3.1 Nomenclature - nitro alkanes - alkyl nitrites - differences - aromatic nitro compounds - preparation and reduction of nitro benzene under different conditions, TNT.

3.2 Amines – effect of substituents on basicity of aliphatic and aromatic amines - Reactions of amino compounds (primary, secondary, tertiary and quaternary amine compounds) - Mechanism of carbylamines reaction, diazotization and comparison of aliphatic and aromatic amines.

3.3 Diazonium compounds - preparation and synthetic applications of diazomethane, benzene diazonium chloride and diazo acetic ester.

UNIT – IV CHEMISTRY OF HETEROCYCLIC COMPOUNDS AND DYES:

4.1 Introduction – nomenclature of heterocyclic compounds having not more than two heteroatoms such as oxygen, nitrogen and sulphur - structure, synthesis and properties of furan, pyrrole, thiophene. Pyridine – structure, preparation - compare the basicity of pyridine with pyrrole and amines.

4.2 Quinoline - structure and Skraup synthesis. Isoquinoline – structure and Napieralski synthesis and Indole – structure and Ficher-indole syntheses.

4.3 Dyes - color and constitution – chromophore - auxochrome - classification according to application and structure - preparation and uses of - methyl orange, fluorescein, Alizarin, Indigo and malachite green dyes.

UNIT – V REAGENTS FOR OXIDATION AND REDUCTION REACTIONS:

5.1 Oxidation: Osmium tetroxide – Chromyl chloride – Ozone – DDQ – Dioxiranes.
5.2 Lead tetraacetate - selenium dioxide – DMSO either with Ac_2O or oxalyl chloride – Dess-Martin reagent.
5.3 Reduction: Catalytic hydrogenation using Wilkinson Catalyst – Reduction with LAH, $NaBH_4$, tri-tertiarybutoxy aluminum hydride, $NaCNBH_3$, hydrazines.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

An assignment on the topics- significance of keto-enoltautomerism in biochemical reactions, fatty acids composition of vegetable oils and its contribution to dietary energy intake and health impact on dietary intake of fatty acids, industrial applications of diazotization, role of heterocyclic compounds in medicines, redox reactions in everyday life.

REFERENCES:

1. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, addison Wesley Longman Ltd. (1996).
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)
3. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010)
4. Pine S.H., OrganicChemistry, (5th edition) New Delhi, McGraw – Hill International Book Company (1987)
5. Seyhan N. Ege, Organic Chemistry, (5th edition) New York, Houghton Mifflin Co., (2005).
6. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==
7. https://youtu.be/EaGWcnsm05A
8. http://acl.digimat.in/nptel/courses/video/104101127/lec5.pdf
9. http://www.adichemistry.com/inorganic/organometallic/catalysis/wilkinson/wilkinsons-catalyst.html

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To categorize different types of reactions of carbonyl compounds based on the reactive species and products
- To correlate acidity of carboxylic acids based on substituents
- To distinguish the basicity of aromatic amines and aliphatic amines based on substituents
- To compare the properties and reactivities of five, six membered and fused hetero cyclic compounds
- To identify suitable reagent for specific reactions of oxidation and reduction
- To classify the dyes according to application and structure

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Third Year **CORE COURSE VII** **Semester V**

PHYSICAL CHEMISTRY I

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To know the various concepts of photochemistry and group theory.
- To learn the second law of thermodynamics, Carnot cycle, Carnot theorem, entropy, free energy and Maxwell's relations.
- To learn the third law of thermodynamics, van't Hoff isotherm, Claudius–Clapeyron equation and Nernst heat theorem.
- To understand the laws and properties of solutions.
- To learn the fundamental concepts of phase rule and its applications to one, two and three component systems.

UNIT – I PHOTOCHEMISTRY AND GROUP THEORY:

1.1 Consequences of light absorption- Jablonski diagram- radiative and non-radiative transitions. Lambert's Beer law, quantum efficiency.

1.2 Photochemical reactions-Comparison between thermal and photochemical reactions. Photosensitization and quenching. Fluorescence, phosphorescence and chemi luminescence. Laser and uses of lasers.

1.3 Group theory – symmetry elements and symmetry operation- group postulates and types of groups- abelian and non abelian – symmetry operation of H_2O molecule.

1.4 Illustration of group postulates using symmetry operations of H_2O molecule - construction of multiplication table for the operation of H_2O molecule – point group- definition- elements (symmetry operations) of the following molecules- H_2O, BF_3 and NH_3.

UNIT – II THERMODYNAMICS II:

2.1 Second law of thermodynamics – need for the law- different statements of the law- Carnot's cycle and efficiency of heat engine- Carnot's theorem- thermodynamic scale of temperature.

2.2 Concept of entropy- definition and physical significance of entropy- entropy as a function of P, V and T – entropy changes during phase changes- entropy of mixing – entropy criterion for spontaneous and equilibrium processes in isolated system.

2.3 Gibb's free energy (G) and Helmholtz free energy (A) – variation of A and G with P, V and T- Gibb's – Helmholtz equation and its applications.

2.4 Thermodynamic equation of state, Maxwell's relations - ΔA and ΔG as criteria for spontaneity and equilibrium.

UNIT – III THERMODYNAMICS III:

3.1 Equilibrium constant and free energy change- thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and

concentration – NH_3, PCl_5 and $CaCO_3$.

3.2 Thermodynamic interpretation of Lechatelier's principle (Concentration, temperature, pressure and addition of inert gases).

3.3 Systems variable composition- partial molar quantities- chemical potential – variation of chemical potential with T, P and X (mole fraction) – Gibb's Duhem equation. Van't Hoff's reaction isotherm- van't Hoff's isochore. Clapeyron equation and Clausius – Clapeyron equation-Applications.

3.4 Third law of thermodynamics- Nernst heat theorem. Statement of III law and concept of residual entropy – evaluation of absolute entropy from heat capacity data.

UNIT – IV SOLUTIONS:

4.1 Raoult's law, Henry's law, Ideal and non-ideal solutions, completely miscible liquid systems-benzene and toluene. Deviation from Raoult's law and Henry' law. Duhem-Margules equation. Theory of fractional distillation. Azeotropes- HCl – water and ethanol- water system.

4.2 Partially miscible liquids- phenol- water, triethylamine- water and nicotine-water systems. Lower and upper CSTs – effect of impurities on CST. Completely immiscible liquids- principle and applications of steam distillation. Nernst distribution law – derivation.

4.3 Dilute solutions- colligative properties, relative lowering of vapour pressure, osmosis, law of osmotic pressure, derivation of elevation of boiling point and depression in freezing point. Application- determination of molecular mass by Rast method only.

UNIT – V PHASE CHANGES:

5.1 Definitions of terms in the phase rule- derivation and application to one component system – water and sulphur- super cooling, sublimation.

5.2 Two-component systems-solid liquid equilibria, simple eutectic (lead- silver, Bi- Cd), de-silverisation of lead.

5.3 Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (Na-K).

5.4 Solid Solutions-(Ag-Au)-fractional crystallization, freezing mixtures- FeCl3-H_2O systems, $CuSO_4$-H_2O system.

UNIT-VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

A general quiz on classification of molecules as linear planar and non linear based on symmetry elements, applications of colligative properties and phase rule. An assignment on recent advancements in photochemistry and various methods to utilize solar energy to solve energy crisis.

REFERENCES:

1. Gurdeep Chatwal R, Photochemistry, Good publishing House.
2. Raman, K. (1990), Group theory and its application to Chemistry, New Delhi: Tata McGraw-Hill.

3. Samuel Glasstone (1974), Thermodynamics for Chemists (3rd printing), East-West Edn.
4. Rajaram J. and Kuriacose, J.C. (1986) Thermodynamics for students of Chemistry, New Delhi: LalNagin Chand.
5. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition),New Delhi: ShobanLalNagin Chand and Co.
6. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan& Co Ltd.
7. Atkins P.W. (1994), Physical chemistry, (5th edition), Oxford University press.
8. Sangaranarayanan, M.V., Mahadevan, V., Text Book of Physical Chemistry, 2nd Edition, Hyderabad, Universities Press, (India) 2011.
9. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==
10. https://nptel.ac.in/courses/112104220

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To correlate the photo physical processes and their applications
- To apply the principle of Carnot cycle in all types of heat engines and working fluids
- To compute equilibrium constants of PCl_5, NH_3, $CaCO_3$ at constant pressure and concentration
- To apply colligative properties to determine the molecular weight of solutes
- To predict qualitatively the effect of changing temperature, pressure or concentration on heterogeneous system in equilibrium using Phase diagram
- To apply symmetry operations and find point group of molecules H_2O,BF_3,NH_3

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Third Year	**CORE PRACTICAL V**	**Semester V**
	PHYSICAL CHEMISTRY	
Code	**(Practical)**	**Credit: 4**

COURSE OBJECTIVES:

- To learn the fundamentals of conduct metric and potentiometric titrations.
- To understand the method of determination of molecular weight, CST, TT and rate constant
- To learn to determine rate constant of ester hydrolysis reactions.

LIST OF EXPERIMENTS:

1. Critical Solution Temperature
2. Effect of impurity on Critical Solution Temperature
3. Transition Temperature
4. Rast Method
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis
7. Partition Co-efficient
8. Conductometric Acid-Base Titration
9. Potentiometric Redox Titration
10. Determination of cell constant.

REFERENCES:

Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997).

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To apply the principles of physical chemistry to the given system and evaluate the experiments.
2. To understand the colligative properties, chemical kinetics and phase equilibria.
3. To understand the electrochemical methods for acid/base titrations, conductometric/Potentiometric curves and evaluation methods.
4. To describe electrochemical cell and the electrode potentials and explain about reference electrodes.

Internal	: 40
Ext. Evaluation	: 60
Record	: 05
Procedure writing with formula	: 10
Practicals	: 45

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Third Year **MAJOR BASED ELECTIVE I** **Semester V**

1) ANALYTICAL CHEMISTRY

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To learn the purification techniques of solids and liquids.
- To understand data analysis, various separation techniques.
- To learn gravimetric analysis and various thermo analytical methods.
- To learn visible spectrophotometry and colorimetry.
- To know the various electro analytical techniques.

UNIT – I LABORATORY SAFETY AND PURIFICATION OF CHEMICALS:

1.1 Precautions to avoid poisoning-treatment for specific poisons, threshold vapour concentrations-safe limits-laboratory safety measures.
1.2 Waste disposal-fume disposal-precautions for avoiding accidents.
1.3 Purification of solid organic compounds: recrystallisation, extraction, sublimation.
1.4 Purification of liquids: fractional distillation, steam distillation and azeotropic distillation.

UNIT – II DATA ANALYSIS:

2.1 The Mean-significant numbers, the median-precision, accuracy- confidence limits, standard deviation.
2.2 Errors-method for improving accuracy-rejection of data-presentation of tabulated data-Scatter diagram –method of least squares- S.I. units.
2.3 Separation techniques: Precipitation-solvent extraction-chromatography – types, column chromatography-thin layer chromatography.
2.4 Paper chromatography – paper electrophoresis– ion exchange chromatography –Gas liquid chromatography.

UNIT – III GRAVIMETRIC ANALYSIS AND THERMO ANALYTICAL TECHNIQUES:

3.1 Gravimetric analysis - principles-methods of gravimetric analysis - requirement of gravimetric analysis-precipitation-theories of precipitation.
3.2 Types of precipitation – co–precipitation, post precipitation - and precipitation from homogeneous solution-digestion, filtration and washing, drying and ignition. Inorganic and organic precipitating agents.
3.3 Thermo analytical techniques – types-TGA principle-Instrumentation - TGA analysis of CaC_2O_4. H_2O. Differential thermal analysis-principle-DTA of $CaC_2O_4.H_2O$.-factors affecting TGA &DTA.

UNIT – IV VISIBLE SPECTROPHOTOMETRY AND COLORIMETRY:

4.1 Theory of spectrophotometry and colorimetry, Beer-Lambert's law (statement only), Molar absorptivity and absorbance.
4.2 Visual comparators-multiple standard methods, duplication and dilution method, balance method, photoelectric colorimeter, spectrophotometer.
4.3 Criteria for satisfactory colorimetric estimation-advantages of colorimetric estimation, determination of composition of complexes, colorimetric estimation of iron.

UNIT – V ELECTRO ANALYTICAL METHODS:

5.1 Electro gravimetry –theory - electro gravimetric analysis of Fe and Cu.
5.2 Electrolytic separation of metals: principle –separation of copper and nickel, Electro deposition- principle –overvoltage.
5.3 Coulometry -Principle of coulometric analysis –coulometry at controlled potential-apparatus and technique-separation of nickel and cobalt. Amperometry titrations-principle –Instruments –types-applications.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

General quiz on – inter conversion of the units of energy – joules, calories and ergs. Wave properties–wave length, wave number and frequency. Assignment on –electroplating of nickel on steel surface, gravimetric estimation of lactose in milk, preparing rose oil by solvent extraction. Estimation of iron in ground water by colorimetric method. Preparing chart for handling and storage of glassware and chemicals in laboratory.

REFERENCES:

1. Gopalan R, Subramanian PS and Rengarajan K (1993) ``Elements of analytical chemistry" second revised edition, Sultan Chand.
2. Gurdeep R Chatwal, Sham K. Anand (2005) ``Instrumental methods of chemical analysis", Himalaya publishing house.
3. Vogel A.I. Text Book of Quantitative Inorganic analysis," The English Language Book Society, Fourth edition.
4. Douglas A. Skoog, Donald M. West and F. J. Holler, Fundamentals of Analytical chemistry, 7thedition, Harcourt College Publishers.
5. Mendham J., Denny R. C., Barnes J.D., Thomas M., Vogel's Test book of Quantitative Chemical analysis 6th edition, Pearson education.
6. Sharma, B. K., Instrumental methods of chemical analysis, Goel Publishing House, Merrut (1997).
7. https://www.iitk.ac.in/che/pdf/resources/TGA-DSC-reading-material.pdf
8. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000944AC/P001632/M028158/ET/1520585748Q1M21.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

To apply various analytical techniques to analyse the quality of substances used in day today life.

1. To determine various types of error in analysis of data.
2. To apply chromatographic principle to identify and separate the substances from mixture.
3. To predict the factors affecting gravimetric estimation.
4. To characterize thermal stability of a substance using TGA and DTA.
5. To apply spectroscopic principle to analyse the purity and identify the nature of the substances.

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Third Year **MAJOR BASED ELECTIVE I** **Semester V**

2) MATERIAL AND NANO CHEMISTRY

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To study the types of ionic crystals and defects in solids.
- To learn the different kinds magnetic properties.
- To learn the basic concepts of nanomaterial's and their applications.

UNIT – I IONIC CONDUCTIVITY AND SOLID ELECTROLYTES:

Types of ionic crystals – alkali halides – silver chloride-alkali earth fluovider – simple stoichiometric oxides. Types of ionic conductors – halide ion conductors – oxide ion conductors – solid electrolytes – applications of solid electrolytes. Electrochemical cell – principles – batteries, sensors and fuel cells –Inorganic solids – colour, magnetic and optical properties.

UNIT – II MAGNETIC MATERIALS:

Ferrites: Preparation and their applications in microwave –floppy disk – magnetic bibble memory and applications. Insulating Materials: Classification on the basis of temperature – Polymer insulating materials and ceramic insulating materials. Ferro electric materials: examples – applications of ferroelectrics.

UNIT – III MODERN ENGINEERING MATERIALS:

Metallic glasses – introduction –composition, properties and applications. Shape memory alloys: introduction – examples – application of SMA – advantages and disadvantages. Biomaterials: Introduction –metals and alloys in biomaterials – ceramic biomaterials, composite biomaterials-polymer biomaterials.

UNIT – IV NANOPHASE MATERIALS:

Introduction –techniques for synthesis of nanophase materials–sol-gel synthesis-electro deposition –inert gas condensation-mechanical alloying and applications of nanophase materials-composite materials: Introduction –types.

UNIT – V NANO TECHNOLOGY:

Introduction –importance –various stages of nanotechnology –nanotube technology – nanoparticles –fullerenes-nanodendrimers –nano pore channels, fibres and scaffolds – CVD dismond technology –FCVA technology and its applications – nano imaging techniques.

UNIT – VI CURRENT CONTOURS ((For Continuous Internal Assessment Only):

Assignment on preparation of nanomaterials .Magnetic , electrical properties and

applications of graphenes. General quiz on therapeutic applications ofnano metals and metal oxides.

REFERENCES:

1. Aathony R. West, Solidstate chemistry and its applications, john wiley & Sons (1989).
2. RaghavanV.R., Materials Science and Engineering, Printice Hall (India) Ltd., (2001).
3. Kenneth J. Klabunde, Nanoscale materials in chemistry, A. John Wiley and Sons Inc. Publication.
4. https://nptel.ac.in/courses/118104008
5. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=5VgWkgm+I3FGq9cGlsbNmQ==

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To apply solid electrolytes in electrooptical techniques for remote control and communication processes
- To classify and apply magnetic material in electronic and electrical instruments.
- To explain the composition, properties and applications of engineering materials such as glass, composites and biopolymers.
- To synthesisenanomaterials using various top down and bottom up methods
- To compare CVD and FCVD technique for synthesisingnanomaterials
- To explain the applications of nano techniques and nanomaterials in various fields.

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Third Year **SKILL BASED ELECTIVE I** **Semester V**

FOOD CHEMISTRY

Code **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- To know the importance of food and nutrition.
- To know the chemical composition and importance of balanced diet.
- To learn the food adulterants and identification of them.
- To develop the skill in food processing, food preservation technique and in detecting food adulterants

UNIT – I Nutritional food and biological importance of food:

Definition -food, nutrition, nutritional care and health. classification of food-nutrients as body constituents-digestion and absorption of food. Nutritional problems in India.

UNIT – II Basic chemicals constituents of food:

Classification and Biological functions of carbohydrates, proteins, fats, vitamins, minerals and water.

UNIT – III Food adulteration and health problems:

Common adulterants in food-testing methods of all food adulterants (Ghee, Chilli powder, Oil, Milk, Turmeric powder). and its effect on health.

UNIT – IV Food additives:

Food additives: definition, need and classification of food additives, preservatives-Natural and Artificial, antioxidants, chelating agents, coloring agents, curing agents, Emulsions, flavors, sweeteners, , stabilizer and thickeners, humectants, anti-caking agents, firming agent, clarifying agent, flour bleaching agents.

UNIT – V Processing and preservation of food:

Basic concept of food processing and preservation: Reason of food Spoilage and Scope of food processing preservation; principles of food processing and preservation. Principle and preservation by low temperature: (refrigeration and freezing,). Processing and preservation by drying: factors affecting drying, and types of drying technique (freeze drying, vaccum drying), Processing and preservation by heat: (blanching, pasteurization, sterilization, UHT processing, heating, dehydration, canning,

UNIT – VI Current Contours (For continuous internal assessment only):

Assignments and seminar on Hurdle technology: definition, physical, chemical and microbial hurdles in food processing, guide lines of hurdle technology to prepare stable food products

REFERENCES:

1 Alex Ramani V, Food Chemistry, MJP Publishers, Triplicane, Chennai, 2009
2 Thangamma Jacob, Food adulteration, Macmillan company of India limited, New Delhi, 1976
3 Jeyaraman J, Laboratory manual in biochemisty, Wiley Eastern limited, New Delhi, 1981.
4 Branen AL, Davidson PM &Salminen S. 2001. Food Additives. 2nd Ed.Marcel Dekker.
5 https://aissmschmct.in/wp-content/uploads/2020/08/BSC-HS-Sem-V-Advanced-Food-Prod.-System-HS-301-Chapter-8.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To explain properties and reactions of carbohydrates, lipids and proteins during storage and processing of food.
- To explain the importance of water for stability and quality of foods.
- To explain food adulterants and their harmful effect to health.
- To classify the food additives and their role and harmful effect to health.
- To give an over view on food and precautions to avoid food infections and food poisoning and precautions to avoid food infections and food poisoning.

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Third Year | **CORE COURSE VIII** | **Semester VI**

ORGANIC CHEMISTRY II

Code | **(Theory)** | **Credit: 5**

COURSE OBJECTIVES:

- To learn the chemistry of carbohydrates, proteins, vitamins.
- To learn isolation and synthesis of alkaloids and terpenoids.
- To understand the rearrangements and spectroscopy techniques for the elucidation of structures.

UNIT I CHEMISTRY OF CARBOHYDRATES:

1.1 Carbohydrates - classification, properties of mono saccharides (glucose and fructose), structure and configuration of mono saccharides, interconversion.
1.2 Ascending and descending series, mutarotation, epimerization- cyclic structure - determination of size of sugar rings.
1.3 Disaccharides - sucrose, maltose - structure elucidation - polysaccharide - starch and cellulose (elementary treatment).

UNIT – II UNIT II CHEMISTRY OF PROTEINS AND VITAMINS:

2.1 Amino acids – Zwitter ion – isoeletric point - general methods of preparation and reactions of amino acids. Peptides - Peptide linkages – proteins - classification of proteins.
2.2 Structure of proteins - primary structure - end group analysis - Edman method - secondary structure - tertiary structure - denaturation - colour reactions of proteins.
2.3 Nucleic acids - elementary treatment of DNA and RNA - Vitamins - classification, structure and biological importance of vitamins A, B1, B2, B6, B12 and C.

UNIT – III CHEMISTRY OF ALKALOIDS AND TERPENOIDS:

3.1 Chemistry of natural products - alkaloids – classification, isolation - methods for synthesis of coniine, piperine, nicotine and quinine - structural elucidation of nicotine only.
3.2 Terpenoids - classification - isoprene, special isoprene rule, methods for synthesis of citral, limonene, menthol, camphor, structural elucidation of menthol only.

UNIT -IV MOLECULAR REARRANGEMENTS:

4.1 Molecular rearrangements - types of rearrangement (nucleophilic and electrophilic) – mechanism with evidence for the following re-arrangements: pinacol – pinacolone.
4.2 Benzil - benzilic acid, benzidine, Claisen, Fries, Hofmann. Curtius, Lossen, Beckmann and dienone – phenol rearrangements.

UNIT – V ORGANIC SPECTROSCOPY:

5.1 UV - VIS spectroscopy - types of electronic transitions – Instrumentation- solvent effects on λ max - Woodward - Fieser rules for calculation of λ max: dienes only – bathochromic shift and hypochromic shift.
5.2 IR spectroscopy - number and types of fundamental vibrations – selection rules-modes of vibrations and their energies. Instrumentation - position of IR absorption

frequencies for functional groups like aldehyde, ketone, alcohol, acid, amine and amide.

5.3 NMR spectroscopy - principle - chemical shift- factors affecting the chemical shift - inductive effect and hydrogen bonding - TMS, delta scales, splitting of signals - spin-spin coupling, NMR spectrum of EtOH, n -propyl bromide and isopropyl bromide.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Prepare charts on the topic - quantity of carbohydrates, sugars and calorific values in commercially available health drinks and cool drinks, benefits and sources of essential amino acids and vitamins, uses and physiological effects of alkaloids, benefits of terpenoids present in spices, role of Beckmann rearrangement in synthesis of Nylon 66, calculation of λ max for pigments found in plant products.

REFERENCES:

1. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, addison Wesley Longman Ltd. (1996).
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson (India)., (2011)
3. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010)
4. Pine S.H., Organic Chemistry, (5th edition) New Delhi, McGraw – Hill International Book Company (1987)
5. Seyhan N. Ege, Organic Chemistry, (5th edition) New York, Houghton Mifflin Co., (2005).
6. William Kemp, Organic Spectroscopy, 3rd edition, ELBS.
7. Introduction to Spectroscopy by Pavia, D. L. Lampman, G. M, Kriz, G. S, Vyvyan, J.A. 5th edition, Cengage Learning, (2015)
8. Spectroscopy identification of Organic compounds, Silverstein, R. M, Webster, F. M 7th edition, CRC Press, (2015).
9. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==
10. Organic spectroscopy, Sharma Y.R., S.chand& company ltd., 20th edition reprint (2007).

Course Outcomes:

Upon successful completion of this course the students would be able:

- To comprehend the properties, structure and configuration of Carbohydrates
- To apply the biological importance of vitamins in day today life
- To explain the chemistry of alkaloids and terpenoids
- To predict the formation of intermediate and products in rearrangement reactions
- To Illustrate the type of electronic transitions in UV-Visible spectroscopy
- To interpret the NMR and IR spectral data to arrive the structure of molecules.

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Third Year **CORE COURSE IX** **Semester VI**

PHYSICAL CHEMISTRY II

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To learn the various concepts of electrochemistry.
- To know the types and theories of catalysis.
- To learn the adsorption isotherms.
- To know the spectroscopic techniques such as IR, UV-visible, Raman and NMR.

UNIT – I ELECTRICAL CONDUCTANCE:

1.1 Conductance in metal and in electrolytic solution- specific conductance and equivalent conductance. Arrhenius theory of electrolytic dissociation and its limitation. Weak and strong electrolyte according to Arrhenius theory. Ostwald's dilution law- Derivation, applications and limitation.

1.2 Effect of dilution on equivalent conductance and specific conductance. Kohlrausch's law and its applications. The elementary treatment of the Debye- Huckel- Onsager equation for strong electrolytes-evidence for ionic atmosphere.

1.3 Transport number and Hittorf's rule. Determination of transport number by Hittrof's method and moving boundary method.

1.4 Application of conductance measurements- conductometric titrations.

UNIT – II ELECTROCHEMICAL CELLS:

2.1 Galvanic cells - reversible and irreversible cells. Conventional representation of electrochemical cells. Electromotive force of a cell and its measurement – computation of E.M.F.– calculation of thermodynamic quantities of cell reactions (□G, □H, □S and K).

2.2 Types of reversible electrodes- gas/metal ion- metal/metal ion, metal/ insoluble salt/anion and redox electrodes, electrode reactions.

2.3 Nernst equation – derivation of cell E. M. F and single electrode potential – standard hydrogen electrode- reference electrodes- standard electrode potentials- sign convention- electrochemical series and its significance.

2.4 Potentiometric titrations -Acid-Base titrations- Oxidation-reduction (Redox) titrations- Precipitation titrations. Corrosion- general and electrochemical theory – passivity-prevention of corrosion.

UNIT – III CATALYSIS AND SURFACE PHENOMENA:

3.1 Catalyst-Definition and Characteristics - Types of catalysis-Homogeneous and heterogeneous, induced, auto, positive and negative catalysis, catalytic poisons and catalytic promoters.

3.2 Enzyme catalysis – Michaelis-menten equation and Michaelis-menten law.

3.3 Adsorption-types-chemical and physical, characteristics of adsorption. Theories of catalysis- intermediate compound formation theory and adsorption theory. Different types of isomerism -Freundlich and Langmuir adsorption isomerism.

UNIT – IV SPECTROSCOPY I:

4.1 Electromagnetic spectrum- the region of various types of spectra. Microwave spectroscopy- rotational spectra of diatomic molecules treated as rigid rotator, condition for a molecule to be active in microwave region.

4.2 Rotational constants (B) and selection rules for rotational transition. Frequency of spectral lines, calculation of inter-nuclear distance in diatomic molecules.

4.3 Infrared spectroscopy- vibrations of diatomic molecules- harmonic oscillators, zero-point energy, dissociation energy and force constant, condition for molecule to be active in the IR region, selection rules for vibrational transition, fundamental bands, overtones and hot bands.

4.4 UV- Visible spectroscopy-conditions- Franck-Condon principle- pre-dissociation-applications.

UNIT – V SPECTROSCOPY II:

5.1 Raman spectroscopy – Rayleigh scattering and Raman scattering. Stokes and anti-stokes lines in Raman spectra, Raman frequency, quantum theory of Raman effect, conditions for a molecule to be Raman active.

5.2 Comparison of Raman and IR spectra – structural determination from Raman and IR spectroscopy, rule of mutual exclusion.

5.3 NMR spectroscopy- nuclear spin and conditions for a molecule to give rise to NMR spectrum – theory of NMR spectra, number of NMR signals, equivalent and non-equivalent protons.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Prepare charts on the topic - quantity of carbohydrates, sugars and calorific values in commercially available health drinks and cool drinks, benefits and sources of essential amino acids and vitamins, uses and physiological effects of alkaloids, benefits of terpenoids present in spices, role of Beckmann rearrangement in synthesis of Nylon 66, calculation of λ max for pigments found in plant products

REFERENCES:

1. B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Naginchand and Co.
2. Bahl B.S., Arun Bahl and Tuli G.D. (2012). Essentials of Physical Chemistry, New Delhi: Sultan Chand and Sons.
3. Moore W. J. (1972), Physical chemistry, 5th Edition, Orient Longman Ltd.
4. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan& Co Ltd.
5. Colin Bannwell N and Elaine Mc Cash M, Fundamentals of molecular spectroscopy, 4th edition, McGraw hill publishing company limited.
6. Russell S. Drago, (1978), Physical methods in Inorganic chemistry, East-west student edition.
7. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==
8. https://oms.bdu.ac.in/ec/courses.php?subject=B.Sc.%20(CHEMISTRY)

Course Outcomes:

Upon successful completion of this course the students would be able:

- To explain the concepts of Electrochemistry and its applications
- To demonstrate the construction of different kinds of electrochemical cells
- To explain the factors influencing enzyme catalysis
- To predict the nature of adsorption using Langmuir adsorption isotherm
- To identify the functional groups and structure of simple molecules using IR spectroscopy
- To interpret the NMR spectra of simple molecules

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Third Year **CORE PRACTICAL VI** **Semester VI**

GRAVIMETRIC ANALYSIS AND DETERMINATION OF PHYSICAL CONSTANT

Code **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To learn the techniques of gravimetric analysis.
- To learn the methods for determining physical constants of organic compounds.
- To learn the principle of precipitation techniques and application in gravimetry analysis.

GRAVIMETRIC ANALYSIS:

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel - DMG complex.
4. Estimation Calcium as calcium oxalate monohydrate
5. Estimation of Barium as barium sulphate.

ONLY FOR DEMONSTRATION:

1. Estimation of Copper as copper (I) thiocyanate.
2. Estimation of Magnesium as magnesium oxalate.
3. Estimation of Iron as Iron (III) oxide.

DETERMINATION OF PHYSICAL CONSTANTS:

Determination of boiling /melting points of by semimicro method.

REFERENCES:

Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997).

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To recognize the principles of gravimetric analysis.
- To understand the basics of gravimetric analysis of selected cations involving methods, selection of precipitants, nucleation, aggregation of precipitate, removal of contamination and weighing a precipitate.
- To conduct experiments to determine physical constantof unknown compounds.
- To use proper apparatus to minimize the errors.

Mark distribution:

Internal : 40
Ext. Evaluation : 60

Record: - 5 marks

Determination of physical constant: - 10 marks

Gravimetric analysis:

Manipulation - 10 marks

Results error

< 1 %	- 35 marks
1-2 %	-30 marks
2-3 %	-25 marks
3-4 %	-20 marks
> 4 %	- 10 marks

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Third Year **MAJOR BASED ELECTIVE II** **Semester VI**

1) NUCLEAR, INDUSTRIAL CHEMISTRY & METALLIC STATE

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To know the fundamentals of nuclear chemistry.
- To understand the applications of nuclear chemistry.
- To study the metallic bond, theories and applications.
- To understand the applications of inorganic polymers.

UNIT- I NUCLEAR CHEMISTRY I:

1.1 Introduction, nuclear structure – composition of the nucleus, subatomic particles, nuclear forces, nuclear stability – mass defect and binding energy, whole number rule and packing fraction, n-p ratio, odd even rules, nuclear models – liquid drop and shell models, isobars, isotones and isomers.

1.2 Isotopes – detection, physical and chemical methods of separation, isotopic constitution of elements.

1.3 Radioactivity – introduction – radioactive emanations – characteristics of α, β and γ-rays, disintegration theory, modes of decay-group displacement law, rate of integration and half-life period, disintegration series, Geiger- Nuttal rule.

UNIT- II NUCLEAR CHEMISTRY II:

2.1 Detection and measurement of radioactivity – Wilson cloud chamber, Geiger – Muller counter.

2.2 Particle accelerators – linear accelerator and cyclotron.

2.3 Artificial radioactivity – nuclear transformation – classification of nuclear reactions, fission – atom bomb, fusion – hydrogen bomb, Stellar energy – nuclear reactor – atomic power projects in India.

2.4 Applications of radioisotopes as tracers in reaction mechanism, medicine, agriculture, industry and carbon dating. Hazards of radiations.

UNIT – III METALLIC STATE:

3.1 Metallic bond: Packing of atoms in metals (BCC, CCP, HCP) electron gas, Pauling and band theories, structure of alloys, substitutional and interstitial solid solutions, Hume-Rothery ratios, crystal defects –stoichiometric and non- stoichiometric defects.

3.2 Semiconductors - intrinsic and extrinsic – n-type and p-type. Composition, properties, structure and uses in electronic industry.

UNIT – IV INORGANIC POLYMERS AND THERMO ANALYTICAL METHODS:

4.1 Inorganic polymers – coordination polymers, metal alkyls, phosphonitrilic polymers.

4.2 Silicates – classification into discrete anions – one, two- and three-dimensional structures with typical examples.

4.3 Composition, properties and uses of beryl, asbestos, talc, mica, feldspar and zeolite.

UNIT – V INDUSTRIAL CHEMISTRY:

5.1 Gaseous fuels: Natural gas, gobar gas, water gas, semi water gas, carbureted water gas, producer gas and liquified petroleum gas (LPG) – composition, manufacture and applications.
5.2 Fertilizers: Manufacture of nitrogen, phosphorus, potassium and mixed fertilizers, micro nutrients and their role in plant life.
5.3 Safety matches: Introduction, raw materials and manufacturing method.
5.4 Paints and varnishes: Definition, types and composition.
5.5 Glass: Composition, manufacture, types and uses.
5.6 Cement: Manufacture – wet and dry processes, composition and setting of cement.

UNIT- VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

General quiz/Assignment/Seminar on –Environmental impact of fertilizers, plastics and petroleum refining industries-global warming, ozone layer depletion, smog, fog and acid rain. Case studies on accidents in nuclear and chemical industries.

REFERENCES:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. Gilreath, 'Fundamental concepts of Inorganic Chemistry', 18th Printing, McGraw Hill International Book Company, 1985.
3. S. Glasstone, 'Source book on Atomic Energy', East-West Press, 1967.
4. R.Gopalan, P.S. Subramanian and K. Rengarajan, 'Elements of Analytical Chemistry', Sultan Chand & Sons, 2nd edition, 1991.
5. P.L.Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
6. https://www.uou.ac.in/sites/default/files/slm/BSCCH-301.pdf
7. https://zbphysik.univie.ac.at/broda/dokumente/160-Nuclear_Chemistry.pdf
8. Akins, P.w. Physical Chemistry. Oxford, UK. Oxford University press, 8thEdition. (2008).
9. Puri, Sharma, Pathania, Principle of Physical Chemistry. Jalandhar, India. Vishal publication & Co. 47th Edition (2019).
10. https://www.ebooknetworking.net/ebooks/industrial-chemistry-bk-sharma.html

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To identify the mechanisms and characteristics of radioactive decays.
2. To describe the electronic structure of atoms of important semiconductors (Si, Ge, Ga, As) and to distinguish between *intrinsic* and *extrinsic* semiconductors,
3. To explain the origin of energy gap
4. To apply nuclear chemistry in medicine, energy production, environmental protection.
5. To classify and compare the structure, composition of silicates.
6. To compare composition and calorific values of fuels.

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Third Year **MAJOR BASED ELECTIVE II** **Semester VI**

2) POLYMER CHEMISTRY

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To know the chemistry of polymers.
- To study the importance of polymers.
- To study the concepts of polymerization techniques.

UNIT – I INTRODUCTION TO POLYMERS AND RUBBERS:

Basics of polymers – monomers and polymers - definition.classification of polymers on the basis applications - thermosetting and thermoplastics – distinction among plastics. Functionality-Copolymers. Degree of polymerization. Types of polymerization reactions – chain polymerization -free radical and ionic polymerization – coordination and step polymerization reactions- polyaddition and polycondensation – miscellaneous reactions: ring- opening and group transfer polymerization. Basics of rubbers: types - vulcanization of rubber-ebonite- uses of rubbers.

UNIT – II PROPERTIES AND REACTIONS OF POLYMERS:

Properties: Glass transition temperature (Tg) -definition – factors affecting Tg. Relationship between Tg and molecular weight. Importance of Tg. Molecular weight of polymers: number average (Mn), weight average (Mw), sedimentation and viscosity average molecular weights. Reactions: Hydrolysis – hydrogenation – addition – substitutions – cross linking and cyclisations reaction. Polymer degradation- thermal, photo and oxidation degradation of polymers (basics only).

UNIT – III POLYMERIZATION TECHNIQUES AND MOULDING TECHNIQUE:

Polymerization techniques: bulk, solution, emulsion, melt condensation and interfacial polycondensation polymerization. Moulding technique: Injection, compression, extrusion, rotational and calendaring.

UNIT – IV CHEMISTRY OF COMMERCIAL POLYMERS:

Preparation, properties and uses of the polymers: Polyethylene, polypropylene, polystyrene, PVC, teflon and polymethylmethacrylate, polycarbonate, polyurethanes, polyamides (Kevlar), phenol-formaldehyde, urea-formaldehyde resin, epoxy resins, rubber-styrene and neoprene rubbers.

UNIT – V ADVANCES IN POLYMERS:

Biopolymers – biomaterials. Polymers in medical field - High temperature and fire – resistant polymers. Silicones - conducting polymers- carbon fibers. (basic idea only) and polymer composites.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Assignment and seminar on managing plastic wastes - storing, recycling and disposal methods of plastic wastes – challenges and opportunity in recycling of plastics - case studies on environmental impacts of plastic wastes.

REFERENCES:

1. Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1984.
2. Gowariker V.R., Viswanathan N.V. and JayaderSreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi, 1978.
3. Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.
4. Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, anmol Publications Private Ltd., New Delhi, 1989.
5. http://web.mit.edu/5.33/www/lec/poly.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To compare thermoplastics and thermosetting polymers.
- To predict the various mechanism of polymerization
- To describe various techniques of polymerization
- To relate the glass transition temperature and molecular mass of the polymers.
- To synthesise commercially important polymers
- To explain tje applications of biopolymers in medical field.

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Third Year **PROJECT** **Semester-VI**

Code: **Credit: 3**

The candidate shall be required to take up a Project Work by group or individual and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the students in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

ASSESSMENT/EVALUATION/VIVA VOCE:

1. PROJECT REPORT EVALUATION (Both Internal & External)

   I. Plan of the Project - 20 marks

   II. Execution of the Plan/collection of Data / Organisation of Materials / Hypothesis, Testing etc. and presentation of the report. - 45 marks

   III. Individual initiative - 15 marks

2. Viva-Voce / Internal & External - 20 marks

TOTAL **- 100 marks**

PASSING MINIMUM:

	Vivo-Voce 20 Marks	**Dissertation 80 Marks**
Project	40% out of 20 Marks (i.e. 8 Marks)	40% out of 80 marks (i.e. 32 marks)

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

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Third Year **SKILL BASED ELECTIVE II** **Semester VI**

DYEING TECHNIQUES AND WATER TREATMENT

Code **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- To develop the skills in dyeing.
- To understand the water qualities and treatments.
- To know the sewage treatments.

UNIT – I Pretreatment of fibers and theory of dye:

1.1 Textile fiber pretreatments: Sizing and desizing, purpose, desizing methods (Hot water, Acid and enzymatic) - their merits and demerits - Scouring: classification, method of Kier boiling process.
1.2 Dye chemistry: Witt's theory of colour –important dye stuff intermediates- their names- Difference between dye and pigments.
1.3 Chromophore – auxo chromes –batho chromic shift and hypso-chromic shift -classification of dyes based on application.

UNIT – II Terminologies in dyeing process:

2.1 Technical terms in dyeing: M.L. ratio – % of shade – % of exhaustion – equilibrium absorption.
2.2 Dyeing machineries: Description and uses of Padding mangle and Jigger.
2.3 Textile dyeing processes I: Direct cotton dyeing – effect of temperature, Acid dyeing – effect of electrolytes in acid dyeing.

UNIT – III Process and properties of Dying:

3.1 Textile dyeing processes II: Vat dyeing, Pre – mordant dyeing, Post - mordant dyeing.
3.2 Fastness properties – Definition of Light, Washing Rubbings, Perspiration and sublimation fastness - Evaluation procedures for Light and Washing fastness.

UNIT – IV Sewage water treatment methods:

4.1 Sewage & Domestic wastes and their effects - concepts of BOD and COD.
4.2 Eutrophication and their effects- Biological magnification.
4.3 Water treatment methods: General methods of water treatment – Sewage treatment methods: preliminary, Primary, Secondary, Tertiary treatments.

UNIT – V Processes for treatment of Industrial effluents:

5.1 Industrial effluents: Nature of effluents of Chemical, Food, Drug and material industries. Industrial waste water treatment: preliminary, Primary,

Secondary (Biological) treatment. Aerobic process (Lagooning, Trickling Filters, activated Sludge, oxidation ditch).

5.2 Anaerobic digestion ‑ advantages of Anaerobic process ‑ Disposal of sludge – draw backs and effective steps and Tertiary treatments (adsorption, ion-exchange and ultra-filtration).

UNIT – VI Current Contours (For continuous internal assessment only):

General quiz on - sources and effects of water pollutants-Heavy metals and dyes. Case studies on impact of water pollution due to industrial activities.

REFERENCES:

1. Venkataraman. K. The chemistry of synthetic dyes Vol, I, II, III & IV-, Academic Press N.Y., 1949.
2. Shenai, V.A. ,Chemistry of Textile fibres, vol.I, Sevak publication , Mumbai
3. Shenai, V.A. ,Chemistry of Dyes and Principles of dyeing , vol.II, Sevak publication, Mumbai
4. H.Kaur "Environmental Chemistry" 7th Edition, Pragati Prakashan publisher, 2013
5. A.K.De "Environmental Chemistry" 3rd Edition ,New Age International (P) Ltd.Publisher,1997.
6. https://web.iitd.ac.in/~arunku/files/CVL100_Y16/LecSep1220.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To perform the pretreatment of grey fabric.
- To get an experience in dyeing of natural fibers with reactive, direct and acid dyes.
- To explain theory and process of dying textile fibers
- To characterize and find the suitable treatment process of sewage water and industrial effluents
- To compare the effect of aerobic and anaerobic treatment of industrial effluents and sewage water.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

B.Sc. Chemistry Course Structure under CBCS

(For the candidates admitted from the academic year 2016-2017 onwards)

Updated on 07.03.2019

Semester	Part	Course	Title	Inst. Hours/ Week	Credit	Exam Hours	Marks		Total
							Int	Ext	
I	I	Language Course–I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course – I (CC)	General Chemistry I	6	6	3	25	75	100
		Core Practical – I (CP)	Volumetric Analysis (P)	3	-	-	-	-	-
		First Allied Course–I (AC)	Mathematics I / Botany I / Computer Science / Zoology I	4	4	3	25	75	100
		First Allied Course – II (AP)	Mathematics II / Botany / Computer Science / Zoology	3	-	-	-	-	-
	IV	Value Education	Value Education	2	2	3	25	75	100
	Total			**30**	**18**				**500**
II	I	Language Course–II (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course–II (ELC)		6	3	3	25	75	100
	III	Core Course – II (CC)	General Chemistry – II	6	6	3	25	75	100
		Core Practical – I (CP)	Volumetric Analysis (P)	3	3	3	40	60	100
		First Allied Course – II (AP)	Mathematics II / Botany / Computer Science / Zoology	3	3	3	25 40	75 60	100
		First Allied Course – III (AC)	Mathematics III / Botany II / Computer Science / Zoology II	4	2	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
	Total			**30**	**22**				**700**
III	I	Language Course – III (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-III (ELC)		6	3	3	25	75	100
	III	Core Course – III (CC)	General Chemistry - III	6	6	3	25	75	100
		Core Practical – II (CP)	Semimicro Analysis	3	-	-	-	-	-
		Second Allied Course – I (AC)	Physics I	4	4	3	25	75	100
		Second Allied Course-II/ (AP)	Physics (P)	3	-	-	-	-	-
	IV	Non Major Elective I-for those who studied Tamil under Part-I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Chemistry in Every Day Life	2	2	3	25	75	100
	Total			**30**	**18**				**500**

IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course – IV (ELC)		6	3	3	25	75	100
	III	Core Course – IV (CC)	General Chemistry - IV	5	5	3	25	75	100
		Core Practical – II (CP)	Semi Micro Analysis (P)	3	3	3	40	60	100
		Second Allied Course-II (AP)	Physics (P)	3	3	3	40	60	100
		Second Allied Course - III	Physics II	3	2	3	25	75	100
	IV	Non Major Elective II-for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Health Chemistry	2	2	3	25	75	100
		Skill Based Elective - I	Skill Based Elective - I	2	2	3	25	75	100
			Total	**30**	**23**				**800**
V	III	Core Course – V (CC)	Inorganic Chemistry - I	5	5	3	25	75	100
		Core Course – VI (CC)	Organic Chemistry - I	5	5	3	25	75	100
		Core Course – VII (CC)	Physical Chemistry - I	**6**	**5**	3	25	75	100
		Core Practical – III (CP)	Physical Chemistry (P)	3	3	3	40	60	100
		Major Based Elective – I	Analytical Chemistry / Material & Nano Chemistry	**5**	**5**	3	25	75	100
	IV	Skill Based Elective - II	Skill Based Elective - II	2	2	3	25	75	100
		Skill Based Elective – III	Skill Based Elective - III	2	2	3	25	75	100
		Soft Skills Development	Soft Skills Development	2	2	3	25	75	100
			Total	**30**	**29**				**800**
VI	III	Core Course – VIII (CC)	Organic Chemistry - II	6	6	3	25	75	100
		Core Course – IX (CC)	Physical Chemistry - II	6	6	3	25	75	100
		Core Practical – IV (CP)	Gravimetric & Organic Analysis (P)	6	5	6	40	60	100
		Major Based Elective II	Nuclear, Industrial Chemistry & Metallic State	6	6	3	25	75	100
		Major Based Elective III	Polymer Chemistry / Pharmaceutical Chemistry	5	5	3	25	75	100
	V	Extension Activities	Extension Activities	-	1	-	-	-	-
		Gender Studies	Gender Studies	1	1	3	25	75	100
		Total		**30**	**30**				**600**
Grand Total				**180**	**140**				**3900**

Language Part – I	-	4
English Part –II	-	4
Core Paper	-	9
Core Practical	-	4
Allied Paper	-	4
Allied Practical	-	2
Non-Major Elective	-	2

Skill Based Elective	-	3
Major Based Elective	-	3
Environmental Studies	-	1
Value Education	-	1
Soft Skill Development	-	1
Gender Studies	-	1
Extension Activities	-	1 (Credit only)

* for those who studied Tamil upto 10th +2 (Regular Stream)

+ Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be out side instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

a) Basic Tamil I & II for other language students
b) Special Tamil I & II for those who studied Tamil upto 10th or +2 but opt for other languages in degree programme

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]
The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]
The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

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SEMESTER-I **CORE COURSE I**

Hours/Week: 6
Credits: 6

GENERAL CHEMISTRY I

OBJECTIVES

1. To learn the periodic properties of elements and its classifications.
2. To understand the theoretical aspects of qualitative and quantitative analyses.
3. To understand the basics of alkanes, reactive intermediates and reaction mechanisms.
4. To learn about the chemistry of cycloalkanes, alkenes and alkynes.
5. To learn about the types, preparation and properties of sols, colloids and emulsions and the determination of molecular weight of macromolecules.

UNIT I PERIODIC TABLE AND PERIODIC PROPERTIES

1.1 Quantum Numbers, Filling up of atomic orbitals: Pauli's exclusion principle, Aufbau Principle, Hunds rule of maximum multiplicity – electronic configuration. Stability associated with half-filled and completely filled orbitals.

1.2 Periodic properties of elements – variation of atomic volume, atomic and ionic radii, onization potential, electron affinity, electronegativity along periods and groups. Pauling scale of electronegativity.

1.3 Classification of elements into s, p, d and f block elements.

UNIT II ANALYTICAL METHODS

2.1 Qualitative Inorganic Analysis – Dry Test, flame test, cobalt nitrate test–wet confirmatory test for acid radicals, interfering acid radicals – elimination of interfering acid radicals.

2.2 Solubility product, common ion effect, complexation, oxidation-reduction reactions involved in identification of anions and cations – separation of cations into groups – Semi micro analysis of simple salts.

2.3 Volumetric analysis – preparation of standard solutions – normality, molarity and molality by titrimetric reactions – acid-base, redox, precipitation and complex metric titrations – indicators – effect of change in Ph – selection of suitable indicators.

UNIT III ALKANES, REACTIVE INTERMEDIATES AND METHODS FOR REACTION MECHANISMS

3.1 Introduction: Inductive, mesomeric, electromeric effects and hyperconjugation – structure of organic molecules based on sp^3, sp^2 and sp hybridization. Alkanes – sources of alkanes – general preparation – general properties – conformational analysis of ethane and n-butane.

3.2 Carbocations, Carbanions, Carbenes and Nitrenes: Generation and stability of reactive intermediates – Correlation of reactivity with structure of reactive intermediates. Free radicals: Generation, stability, identification methods – Free radical halogenation reactions and their mechanism.

3.3 Homolytic and Heterolytic cleavages of bonds, Characteristics of nucleophilic, electrophilic and free radical reactions. Thermodynamic and kinetic aspects, Hammond's postulates, isotope effects. Energy profile diagrams – Intermediate versus transition state, Product analysis and its importance, crossover experiments, kinetic methods, Isotopic effects.

UNIT IV CHEMISTRY OF CYCLOALKANES, ALKENES, DIENES AND ALKYNES

4.1 Preparation of cycloalkanes – Chemical properties – Relative stability of cyclopropane to cyclooctane – Baeyer's Strain theory – Limitations – Mono and disubstituted cyclohexanes.

4.2 Alkenes: Nomenclature – Petroleum source of alkenes and aromatics – General methods of preparation of alkenes – Chemical properties – Markovnikov's rule and peroxide effect-Uses – Elimination reactions and its mechanisms (E_1,E_2).

4.3 Dienes: Structures and properties – conjugated dienes – stability and resonance – electrophilic addition – 1,2 addition and 1,4 addition. Alkynes: Nomenclature – General methods of preparation – Physical properties – Chemical properties – Uses.

UNIT V COLLOIDS AND MACROMOLECULES

5.1. Definition and types of Colloids- preparation, Purification (dialysis, electrodialysis and ultrafilteration) and stability of colloids, gold number.

5.2. Properties of colloids- kinetic, optical and electrical properties.

5.3. Emulsions – Types of emulsions, preparation, properties and applications, Donnan membrane equilibrium.

5.4 Osmosis – reverse osmosis and desalination. Macromolecules- Molecular weight of macromolecules- determination of molecular weight by osmotic pressure and light scattering methods.

REFERENCES

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
4. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. R. Gopalan, P.S. Subramanian & K. Rengarajan, "Elements of Analytical Chemistry", 2nd edition, Sultan Chand & Sons, 1000.
6. Morrison, R.T. and Boyd, R.N., Bhattacharjee, S. K. Organic Chemistry (7th edition), Pearson, India, (2011).
7. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
8. Jerry March, "Advanced Organic Chemistry, Reaction, Mechanism and Structure", 7th Edition, Wiley Inter Science (2013).
9. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)
10. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.

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SEMESTER I **CORE PRACTICAL I**

Hours/Week: 3
Credits: 3

VOLUMETRIC ANALYSIS (P)

OBJECTIVES

1. To learn the techniques of titrimetric analyses.
2. To know the estimation of several cations and anions.
3. To know the estimation of total hardness of water.

Titrimetric Quantitative Analysis

1. Estimation of HCl Vs NaOH using a standard oxalic acid solution
2. Estimation of Na_2CO_3 Vs HCl using a standard Na_2CO_3 solution
3. Estimation of oxalic acid Vs $KMnO_4$ using a standard oxalic acid solution
4. Estimation of Iron (II) sulphate by $KMnO_4$ using a standard Mohr's salt solution.
5. Estimation of Ca (II) Vs $KMnO_4$ using a standard oxalic acid solution.
6. Estimation of $KMnO_4$ Vs thio using a standard $K_2Cr_2O_7$ solution.
7. Estimation of Fe (III) by using $K_2Cr_2O_7$ using a standard Mohr's salt solution using internal and external indicators.
8. Estimation of copper (II) sulphate by $K_2Cr_2O_7$ solution
9. Estimation of Mg (II) by EDTA solution
10. Estimation of Ca (II) by EDTA solution
11. Estimation of As_2O_3 using I_2 solution and standard Arsenious oxide solution.
12. Estimation of chloride (in neutral and acid media)

II. Applied Experiments

1. Estimation of Total Hardness of water
2. Estimation of Bleaching Powder
3. Estimation of saponification value of an oil
4. Estimation of copper in brass

Scheme of Valuation		Max. marks
Record	-	5 (marks)
Procedure Writing	-	10 marks

Results

< 1 %	- 45 marks
1-2 %	-35 marks
2-3 %	-25 marks
3-4 %	-15 marks
> 4 %	- 10 marks

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SEMESTER II **CORE COURSE II**

Hours/Week: 6
Credits: 6

GENERAL CHEMISTRY – II

OBJECTIVES

1. To understand the principles of bonding and theories of chemical bonding.
2. To understand the chemistry of S-block elements and metallurgy of zero group elements.
3. To understand the aromatic character of benzene type molecules and to learn the reaction mechanisms involved in haloalkanes and halobenzenes.
4. To understand about the properties of atoms, characteristics, effect of radiations and the significance of wave functions.

UNIT I CHEMICAL BONDING

1.1 Ionic bond – formation, variable electrovalency – Lattice energy, Born – Haber Cycle. Covalent bond - formation, variable covalency, maximum covalency, covalent character in ionic bond – Fajans Rule. Polarisation – partial ionic character of a covalent bond.

1.2 VB theory, MO theory – Basic principles of bonding and antibonding orbitals, applications of MOT to H_2 He_2, N_2 & O_2 – molecular orbital sequence, comparison of VB & MO Theories.

1.3 Hybridisation – Formation of $BeCl_2$ & BCl_3. VSEPR theory of simple inorganic molecules – $BeCl_2$, $SiCl_4$, PCl_5, SF_6, IF_7, XeF_6, BF_3 & H_2O.

1.4 Hydrogen bonding – Intermolecular & Intramolecular H_2 – bonding and consequences.

UNIT II CHEMISTRY OF s-BLOCK & ZERO GROUP ELEMENTS AND METALLURGY

2.1 General characteristics of s-block elements – comparative study of elements – alkali metals and their hydroxides, oxides and halides, alkaline earth metals and their oxides, carbonates and sulphates.

2.2 Diagonal relationship of Li & Mg, Be & Al, chemistry of NaOH, KI & $Mg(NH_4)PO_4$.

2.3 Metallurgy : Occurrence of metals – concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process, purification of metals – electrolysis, zone refining, van Arkel de-Boer process.

2.4 Zero group elements – position in the periodic table, occurrence, isolation, applications, compounds of Xe – XeF_6 & $XeOF_4$.

UNIT III CHEMISTRY OF BENZENE AND BENZENOID COMPOUNDS

3.1 Aromaticity – Huckle's rule - structure of benzene – Benzene-preparation, chemical properties and uses. Aromatic electrophilic substitution reactions and mechanism – Orientation and reactivity in substituted benzenes.

3.2 Polynuclear aromatic hydrocarbons – Nomenclature, Naphthalene from coal tar and petroleum – Laboratory preparation, Structure of Naphthalene, Aromatic character, Physical properties, Chemical properties, Uses. Mechanism of Aromatic electrophilic substitution – Theory of orientation and reactivity.

3.3 Anthracene, Phenanthrene from coal tar and petroleum, Laboratory preparation, Molecular Orbital structures, Aromatic Characters, Physical Properties, Chemical

properties and uses. Preparation of biphenyls, Physical and Chemical properties and uses.

UNIT IV ALKYL AND ARYL HALOGENS

4.1 Nomenclature of haloalkanes – structure - general preparations of haloalkanes - physical and chemical properties and uses.
4.2 Nucleophilic aliphatic substitution reaction mechanisms (S_N1 and S_N2) – Stereochemical aspects.
4.3 Halobenzenes: Theory of orientation and reactivity - general preparation – properties - uses. Electrophilic and nucleophilic aromatic substitution reaction mechanisms.

UNIT V ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS

5.1. Rutherford's and Bohr's model an atom- Bohr's theory and origin of hydrogen spectrum. Sommerfield's extension of Bohr's theory.
5.2. Electromagnetic radiation- definitions for λ, υ and velocity.
5.3. Dualism of light -Particle nature of radiation- black body radiation and Planck's quantum theory, photoelectric effect and Compton effect of matter.
5.4. De Broglie hypothesis and Davisson and Germer experiment. Heisenberg's uncertainty principle. Schrodinger wave equation (Derivation not needed). Physical significance of Ψ and Ψ^2.

REFERENCES

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
4. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. R. Gopalan, P.S. Subramanian & K. Rengarajan, "Elements of Analytical Chemistry", 2nd edition, Sultan Chand & Sons, 1991.
6. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).
7. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
8. Jerry March, "Advanced Organic Chemistry, Reaction, Mechanism and Structure", 7th Edition, Wiley Inter Science (2013).
9. Puri B.R., Sharma L.R. and Pathania M.S. (2013) Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co.
10. Bahl B.S., Arun Bahl and Tuli G.D. (2012). Essentials of Physical Chemistry, New Delhi: Sultan Chand and Sons.

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SEMESTER III **CORE COURSE III**

Hours/Week: 6
Credits: 6

GENERAL CHEMISTRY – III

OBJECTIVES

1. To learn the chemistry of p-block elements.
2. To study about the preparations and properties of interhalogen compounds.
3. To understand the arrangement of atoms in space, isomers and their nomenclature.
4. To learn about the gas laws, properties of real gases and types of molecular velocities.
5. To learn the types, structure and properties of solids and liquid crystals.

UNIT I CHEMISTRY OF p-BLOCK ELEMENTS

1.1 General characteristics of p-block elements. Comparative study of elements of III A & their compounds. Compounds of boron –boric acid, borax, borazole.
1.2 Extraction of Al and Pb - alums, alloys of Al. Chemistry of oxides of carbon – CO, CO_2. Allotropic forms of carbon.
1.3 Compounds of nitrogen and phosphorous – $NH_2.NH_2$, H_2NOH, hydrazoic acid, N_2– Cycle, fixation of N_2, PH_3 and P_2O_5.

Unit II INTERHALOGEN COMPOUNDS

2.1 Peracids of sulphur, Thionic acids, sodium thiosulphate – preparation, properties, structure and uses.
2.2 Classification of oxides – acidic, amphoteric, neutral oxides, peroxides and superoxides.
2.3 Interhalogen compounds, Pseudohalogens, Oxyacids of halogens, Polyhalides and basic nature of iodine.

UNIT III STEREOCHEMISTRY

3.1 Principles of symmetry – symmetry elements (Cn, Ci and Sn) - asymmetry and dissymmetry – isomerism – constitutional isomers - stereoisomers – enantiomers – diastereomers - geometrical isomerism – meso and dl compounds - conventions used in stereochemistry: Newman, Sawhorse and Fischer notations and their interconversions.
3.2 Nomenclature, correlation of configuration – Cahn-Ingold-Prelog rules for simple molecules - R,S and D,L notations to express configurations - chirality - optical isomerism - optical activity – polarimeter – specific rotation - stereochemistry of allenes and spiranes
3.3 Atropisomerism - erythro and threo conventions – stereoselectivity, stereospecificity in organic reactions with examples. Resolution of racemic mixture – Walden Inversion – conformational analysis of cyclohexane - asymmetric induction.

UNIT IV GASEOUS STATE

4.1. Gases – Boyle's law, Charle's law and Avagadro's law- ideal gas equation.

4.2. Real Gases- deviation from ideal behaviour – van der Waals equation of states- derivation – significance of critical constants- law of corresponding states- compressibility factor.
4.3. Inversion temperature and liquefaction of gases- Linde and Claude – demagnetization methods.
4.4. Maxwell's distribution of molecular velocities (Derivation not needed).Types of molecular velocities- mean, most probable and root mean square velocities-Inter relationships. Collision diameter, mean free path and collision number.

UNIT V SOLID STATES AND LIQUID CRYSTALS

5.1. Classification of solids- Isotropic and anisotropic crystals- elements of symmetry- basic seven crystal systems- laws of crystallography- representation of planes- miller indices, space lattice and unit cell.
5.2. X-ray diffraction- derivation of Bragg's equation- determination of structures of NaCl by Debye Scherrer (powder method) and rotating crystal methods.
5.3. Types of crystals, close packing of identical solid spheres, interstitial sites, limiting radius ratios (derivation not needed), radius ratio rule and shapes of ionic crystals, structures of NaCl, CsCl and ZnS.
5.4. Semiconductors- intrinsic and extrinsic semi conductors- n and p-type semiconductors.Liquid crystals- types and applications.

REFERENCES

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
3. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
4. Gurdeep Raj, 'Advanced Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).
6. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
7. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.
8. Puri B.R., Sharma L.R. and Pathania M.S. (2013) Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.

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SEMESTER III **CORE PRACTICAL II**

Hours/Week: 3
Credits: 3

SEMIMICRO ANALYSIS (P)

OBJECTIVES

To learn the techniques of semimicro qualitative analysis of inorganic salt mixtures.

SEMIMICRO INORGANIC QUALITATIVE ANALYSIS

Analysis of a mixture containing two cations and two anions of which one will be an interferring acid radical. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations to be Studied: lead, copper, bismuth, cadmium, iron, aluminium, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

Anions to be studied: Carbonate, Sulphide, Sulphate, nitrate, chloride, bromide, fluoride, borate, oxalate and phosphate.

REFERENCE:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997)

Note:

Internal Marks: 40 External marks : 60

Marks Distribution for external	:	Practical	-	55 marks
	:	Record	-	5 marks
	:	Total	-	60 marks

4 radicals correct with suitable tests	:	55 marks
3 radicals correct with suitable tests	;	40 marks
2 radicals correct with suitable tests	:	30 marks
1 radical correct with suitable tests	:	15 marks
Spotting	:	5 marks

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NON MAJOR ELECTIVE I

Hours/Week: 2
Credits: 2

CHEMISTRY IN EVERY DAY LIFE

OBJECTIVES

To learn the scientific and chemical principles underlying in water chemistry, agricultural chemistry, food chemistry, cosmetic and other materials such as drugs, polymers, fibers and dyes.

UNIT-I WATER CHEMISTRY

1.1. Water **–** Characteristics of water, soft water and hard water.
1.2. Removal of hardness – Purification of water by ion exchange and reverse osmosis methods.
1.3. Water pollution: Sources and effects of water pollution (Domestic, Industrial, Agricultural) -Eutrophication.
1.4. Heavy metals such as Hg, Cr, Cd, Zn, Cu and metals like Pb, As, Ba, Temperature, Radio activity, synthetic detergents etc.,).

UNIT-II AGRICULTURAL CHEMISTRY

2.1 Plant nutrients –Requisites of good fertilizers - Effect of Nitrogen on plant growth, deficiency symptoms - examples for nitrogenous fertilizers: - Effect of Phosphorous on plant growth, deficiency symptoms – -examples for phosphatic fertilizers.
2.2 Effect of potassium on plant growth, deficiency symptoms - examples for potassium fertilizers – Functions of secondary and micro nutrients. Manures: Farm yard manure–Compost making – Green manuring - Concentrated organic manures: Oil cakes.
2.3 Difference between fertilizer and manure – Superiority of manure over fertilizer - Biofertilizers: Rhizobium, Azatobacter, Cyano bacteria. Pesticides: Classification on the basis of mode of action, types of pests and Chemical nature with examples – safety measures while using pesticides.
2.4 Fungicides, Herbicides, Acaricides, Rodenticides, Repellants, Fumigants, Defoliants (Definitions and Examples).

UNIT-III: FOOD CHEMISTRY

3.1. Food classification and functions- Digestion in mouth, stomach and intestine. Absorption- spoilages, preservation techniques (canning, dehydration, freeze–drying. salting, pickling, pasteurizing, fermenting and carbonating) .
3.2. Minerals and water as food–role of water in physiology –water balance – water sources, major and trace minerals –biological functions of Ca, P, Fe, Cu, I and Zn.

3.3. Food additives – colouring (Natural and synthetic colours)-List of permitted colours (Curcumin, Riboflavin, Betacarotene, Plain Caramel and amaranth)- description and uses.
3.4. Flavouring agents – Anti oxidants – Emulsifiers- Acidulants and beverages. Soft drinks aerated water (ingredients and side effects).

UNIT IV COSMETIC AND OTHER MATERIALS

4.1. Cosmetics – Face powder – constituents, uses, side effects. Nail polish, hair dye – composition and side effects.
4.2. Tooth powder – composition and manufacture. Lotions.
4.3. Preparation of phenyl, liquid blue and incense sticks.
4.4. Cleaning agents: Soaps- types and cleaning action – detergents – types – merits anddemerits of soap and detergents –chemical definitions of shampoo, washing powder and bleaching powder.

UNIT V MATERIAL CHEMISTRY

5.1. Polymers: Explanations, uses and examples for thermo setting and thermo plastic polymers – Vulcanization of rubber.
5.2. Fibers: Natural fibers (cellulosic and protenious) –Semi synthetic (Rayon) Synthetic fibers (Poly ester, Nylon and Acrylic) –Pretreatment of fibers (Sizing, Desizing, Bleaching).
5.3. Dyes and Dyeing process: Difference between dye and pigment -Witt's colour theory,classification of dyes based on application (Direct, Vat, Acid, Reactive, Mordant and Disperse)

REFERENCES

1. K. Kumarasamy, A. Alagappa Moses and M. Vasanthy, "Environmental studies", Bharathidasan University, Thiruchirappalli.
2. Alex Ramani, "Food Chemistry", MJP publishers (2009), Chennai.
3. Jayashree Gosh, "Text book of Pharmaceutical Chemistry" New Delhi, S. Chand & Company Ltd.,(2003).
4. K. Bagavathi Sundari , "Applied Chemistry" MJP Publishers, (2006) Chennai.
5. A Thankamma Jacob (1979), A Text Book of Applied Chemistry, 1st edition, Mc Millan India Ltd.
6. Hesse P.R, A text book of soil chemical analysis John Murray, New York, 1971.
7. Buchel K.H, Chemistry of Pesticides, John Wiley & Sons New York 1983.

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SEMESTER IV **CORE COURSE IV**

Hours/Week: 5
Credits: 5

GENERAL CHEMISTRY – IV

OBJECTIVES

1. To learn the general characteristics of d and f block elements.
2. To understand the reactions of organometallic compounds, alcohols, phenols and ethers.
3. To learn about the fundamental concepts of first law of thermodynamics, to relate heat, work and energy and to calculate work from pressure – volume relationships.
4. To learn about the fundamental concepts of rate of the reaction, determination of order of the reaction and theories of reaction rates.

UNIT I d-BLOCK & f-BLOCK ELEMENTS

1.1 General characteristics of d-block elements, comparative study of zinc group elements, extraction of Mo & Pt - Alloys of copper, amalgams and galvanization. Evidences for the existence of Hg_2^{2+} ions.

1.2 General characteristics of f-block elements – Lanthanide contraction and its consequences. Extraction of Th.

1.3 Arrhenius, Lowry – Bronsted and Lewis concept of acids and bases.

UNIT II CHEMISTRY OF ORGANOMETALLIC COMPOUNDS

2.1 Introduction – preparation of organomagnesium compounds- physical and chemical properties- uses. Organozinc compounds – general preparation, properties and uses.

2.2 Organolithium, organocopper compounds – preparation, properties and uses.

2.3 Organolead, organophosphorous and organoboron compounds– preparation, properties and uses.

UNIT III CHEMISTRY OF ALCOHOLS, PHENOLS AND ETHERS

3.1 Nomenclature – industrial source of alcohols – preparation of alcohols: hydration of alkenes, oxymercuration, hydroboration, Grignard addition, reduction – physical properties – chemical properties - uses – glycols from dihydroxylation, reduction, substitution reactions and glycerols and their uses.

3.2 Preparation of phenols including di- and trihydroxy phenols – physical and chemical properties - uses – aromatic electrophilic substitution mechanism – theory of orientation and reactivity.

3.3 Preparation of ethers: dehydration of alcohols, Williamson's synthesis – silyl ether. epoxides from peracids - sharpless asymmetric epoxidation – reactions of epoxides – uses – introduction to crown ethers – structures – applications.

UNIT IV THERMODYNAMICS-I

4.1. Definitions- system and surrounding- isolated, closed and open system- state of the system- Intensive and extensive variables. Thermodynamic processes-

reversible and irreversible, isothermal and adiabatic processes- state and path functions.

4.2. Work of expansion at constant pressure and at constant volume. First law of thermodynamics- statement- definition of internal energy (E), enthalpy (H) and heat capacity. Relationship between Cp and Cv.

4.3. Calculation of w, q, dE and dH for expansion of ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes.

4.4. Thermochemistry- relationship between enthalpy of reaction at constant volume (q_v) and at constant pressure (q_p)- temperature dependence of heat of reaction- Kirchoff's equation- bond energy and its calculation from thermochemical data- integral and differential heats of solution and dilution.

UNIT V CHEMICAL KINETICS

5.1. Rate of reaction- rate equation, order and molecularity of reaction. Rate Laws- rate constants- derivation of first order rate constant and characteristics of zero order, first order and second order reactions- derivation of time for half change ($t_{1/2}$) with examples.

5.2. Methods of determination of order of reactions- experimental methods- determination of rate constant of a reaction by volumetry, colorimetry and polarimetry.

5.3. Effect of temperature on reaction rate- concept of activation energy, energy barrier, Arrhenius equation. Theories of reaction rates- collision theory- derivation of rate constant of bimolecular reaction- failure of collision theory- Lindemann's theory of unimolecular reaction.

5.4. Theory of absolute reaction rates – derivation of rate constant for a bimolecular reaction- significance of entropy and free energy of activation. Comparison of collision theory and absolute reaction rate theory (ARRT).

REFERENCES

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
3. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
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8. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.
9. Gurtu J.N. and Amit Gurtu (1979), Chemical Kinetics, 5th Edn, Mittal K.K.

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NON MAJOR ELECTIVE II

Hours/Week: 2
Credits: 2

HEALTH CHEMISTRY

OBJECTIVES

1. To know the essentials of health and drugs.
2. To learn the functions of enzymes, hormones and body fluids
3. To know common diseases and their treatment

UNIT I HEALTH

Definition: Food, Food Pyramid - Health-Hygiene- mal, under and over nutrition, their causes and remedies, sanitation.

UNIT II DRUGS

Drugs - Types of drugs-depressant, anticonvulsant, narcotics, antipyretics, antibiotics, antiseptics, analgesics, muscle relaxants and cardiovascular and vasodepressants, steroids (Only Applications).

UNIT III BODY FLUIDS

Blood volume, groups, coagulation, blood pressure, anaemia, blood sugar, haemoglobin. Chemistry of urine.

UNIT IV ENZYMES AND HORMONES

Types of enzymes and enzyme action, Characters of hormones action, examples of essential hormones.

UNIT V COMMON DISEASES

Common diseases - Jaundice, vomiting, fever, night blindness, ulcer, and diabetes.

REFERENCES

1. Alex V Ramani, Food Chemistry, MJP Publishers, Chennai, 2009
2. Deb A C, Fundamentals of Biochemistry, New Central Book Agency, Calcutta, 1994.
3. Satake M and Mido Y, Chemistry for Health Science, Discovery Publishing House, New Delhi, 2003.
4. Jayashree Ghosh, A Text book of Pharmaceutical Chemistry, S. Chand and Co.Ltd, 1999.
5. Ashutosh Kar, Medicinal Chemistry, Wiley Easterns Limited, New Delhi, 1993.

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SEMESTER V **CORE COURSE V**

Hours/Week: 5
Credits: 5

INORGANIC CHEMISTRY - I

OBJECTIVES

1. To understand the basics and theories of coordination compounds.
2. To study a few biologically important coordination compounds.
3. To understand the preparation and properties of nitrosyl compounds
4. To learn the basic principles and applications of magnetic properties.

UNIT I COORDINATION COMPOUNDS-I

1.1 Introduction - Types of ligands: unidentate, bidentate and polydentate ligands, chelating ligands and chelates- IUPAC nomenclature of coordination compounds.

1.2 Isomerism in coordination compounds: Structural isomerism, hydrate isomerism, coordination isomerism, ionisation isomerism, linkage isomerism, coordination position isomerism.

1.3 Stereoisomerism: Geometrical isomerism of four and six coordinate complexes, optical isomerism of four and six coordinate complexes, Werner and Sidgwick theories, methods of detecting complex formation.

UNIT II COORDINATION COMPOUNDS-II

2.1 Theories of coordination compounds : Valence bond theory, limitations of valence bond theory, crystal field theory – splitting of d orbitals in octahedral, tetrahedral and square planar fields, CFSE, factors affecting CFSE, colour, geometry and magnetic properties of coordination compounds, Jahn – Teller distortion (an elementary idea).

2.2 Molecular orbital theory: Molecular orbital diagram for $[Co(NH_3)_6]^{3+}$. Ligand field theory. (An elementary treatment only).

UNIT III COORDINATION COMPOUNDS-III

3.1 Labile and inert complexes, stability of coordination compounds – thermodynamic and kinetic stability, relationship between stepwise formation constant and overall formation constant, factors affecting the stability of complexes.

3.2 Unimolecular and biomolecular nucleophilic substitution reactions in octahedral and square planar complexes, trans effect – theories of trans effect and applications.

3.3 A few biologically important coordination compounds : Chlorophyll, haemoglobin and vitamin B_{12}.

UNIT IV CARBONYLS AND BINARY METALLIC COMPOUNDS

4.1 Metal carbonyls : Mono and binuclear carbonyls of Ni, Fe, Cr, Co and Mn – preparation, structure, reactions, bonding and uses.
4.2 Structure and bonding in π-metal alkenyl and π-metal alkynyl complexes of $[PtCl_3(C_2H_4)]^-$, $[Co(CO)_6(RC \equiv CR)]$ and ferrocene.
4.3 Binary metallic compounds : borides, carbides, hydrides and nitrides – classification, preparation, properties and uses.

UNIT V NITROSYL COMPOUNDS AND MAGNETIC PROPERTIES

5.1 Nitrosyl compounds: Classification-nitrosyl chloride and sodium nitroprusside - preparation, properties and structure.
5.2 Magnetic properties-meaning of the terms-magnetic susceptibility-magnetic moment-types of magnetism-Gouy balance-applications of magnetic properties.
5.3 Dipole moment-determination, application in the study of simple inorganic molecules.

REFERENCES

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. W.U. Malik, G.D. Tuli and R.D. Madan, S.Chand and Company Ltd., 'Selected topics in Inorganic Chemistry', 7th edition, 2001.
3. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
4. P.L. Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
6. J.E. Huheey, 'Inorganic Chemistry', 4th edition, Pearson Education. Inc. 1993.
7. F.A. Cotton, 'Advanced Inorganic Chemistry', 6th edition, John Wiley & Sons, Pvt. Ltd., 2003 – 2004.
8. R. Gopalan, P.S. Subramanian and K. Rengarajan, 'Elements of Analytical Chemsitry', 2nd edition, Sultan Chand & Sons, 1991.

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SEMESTER V **CORE COURSE VI**

Hours/Week: 5
Credits: 5

ORGANIC CHEMISTRY I

OBJECTIVES

1. To learn the reactions of carbonyl compounds, carboxylic acids, amines, heterocycles.
2. To know the requirement of the oxidation and reducing agents for synthesis.

UNIT I CHEMISTRY OF CARBONYL COMPOUNDS

1.1 Nomenclature - structure of carbonyl compounds - chemical properties - nucleophilic addition mechanism at carbonyl group (eg: HCN, ROH, RNH_2) - acidity of alpha hydrogen – keto-enol Tautomerism (proof for the two forms).

1.2 Reduction and oxidation reactions of carbonyl compounds – paraformaldehyde, metaformaldehyde - uses of aliphatic carbonyl compound - Claisen condensation – Aldol condensation – Robinson annulation.

1.3 General methods of preparation of aromatic carbonyl compounds - physical and chemical properties – uses - Effect of aryl group on the reactivity of carbonyl group.

UNIT II CHEMISTRY OF CARBOXYLIC ACIDS

2.1 Nomenclature - Acidity of carboxylic acids based on substituent effect - comparison of acid strengths of halogen substituted acetic acids - acid strengths of substituted benzoic acids - Acid derivatives - Nucleophilic substitution mechanism at acyl carbon.

2.2 Preparation, properties and uses of acid derivatives: acid chloride, anhydrides, esters, amides - chemistry of compounds containing active methylene group – synthesis and synthetic applications of acetoacetic ester and malonic ester.

2.3 Preparation of dicarboxylic acid - physical and chemical properties - uses. Introduction to oils and fats - fatty acids - manufacture of soap - mechanism of cleaning action of soap.

UNIT III CHEMISTRY OF NITROGEN COMPOUNDS

3.1 Nomenclature - nitro alkanes - alkyl nitrites - differences - aromatic nitro compounds - preparation and reduction of nitro benzene under different conditions, TNT.

3.2 Amines – effect of substituents on basicity of aliphatic and aromatic amines - Reactions of amino compounds (primary, secondary, tertiary and

quaternary amine compounds) - Mechanism of carbylamine reaction, diazotization and comparison of aliphatic and aromatic amines.

3.3 Diazonium compounds - preparation and synthetic applications of diazomethane, benzene diazonium chloride and diazo acetic ester.

UNIT IV CHEMISTRY OF HETEROCYCLIC COMPOUNDS AND DYES

4.1 Introduction – nomenclature of heterocyclic compounds having not more than two heteroatoms such as oxygen, nitrogen and sulphur - structure, synthesis and properties of furan, pyrrole, thiophene. Pyridine – structure, preparation - compare the basicity of pyridine with pyrrole and amines.

4.2 Quinoline - structure and Skraup synthesis. Isoquinoline – structure and Napieralski synthesis and Indole – structure and Ficher-indole syntheses.

4.3 Dyes - color and constitution – chromophore - auxochrome - classification according to application and structure - preparation and uses of - methyl orange, fluorescein, Alizarin, Indigo and malachite green dyes.

UNIT V OXIDATION AND REDUCTION

5.1 Oxidation: Osmium tetroxide – Chromyl chloride – Ozone – DDQ – Dioxiranes.

5.2 Lead tetraacetate - selenium dioxide – DMSO either with Ac_2O or oxalyl chloride – Dess-Martin reagent.

5.3 Reduction: Catalytic hydrogenation using Wilkinson Catalyst – Reduction with LAH, $NaBH_4$, tritertiarybutoxy aluminum hydride, $NaCNBH_3$, hydrazines.

REFERENCES

1. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, addison Wesley Longman Ltd. (1996).
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7^{th} edition), Pearson India, (2011)
3. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12^{th} edition), New Delhi, Sultan Chand & Co., (2010)
5. Pine S.H., Organic Chemistry, (5^{th} edition) New Delhi, McGraw – Hill International Book Company (1987)
6. Seyhan N. Ege, Organic Chemistry, (5^{th} edition) New York, Houghton Mifflin Co., (2005)

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SEMESTER V **CORE COURSE VII**

Hours/Week: 6
Credits: 5

PHYSICAL CHEMISTRY I

OBJECTIVES

1. To know the various concepts of photochemistry and group theory.
2. To learn the second law of thermodynamics, carnot cycle, carnot theorem, entropy, free energy and Maxwell's relations.
3. To learn the third law of thermodynamics, Van't Hoff isotherm, Clausius – Clapeyron equation and Nernst heat theorem.
4. To understand the laws and properties of solutions.
5. To learn the fundamental concepts of phase rule and its applications to one, two and three component systems.

UNIT I PHOTOCHEMISTRY AND GROUP THEORY

1.1. Consequences of light absorption- Jablonski diagram- radiative and non-radiative transitions. Lambert's Beer law, quantum efficiency.

1.2. Photochemical reactions-Comparison between thermal and photochemical reactions. Photosensitization and quenching. Fluorescence, phosphorescence and chemiluminescence. Laser and uses of lasers.

1.3. Group theory – symmetry elements and symmetry operation- group postulates and types of groups- abelian and non abelian – symmetry operation of H_2O molecule.

1.4. Illustration of group postulates using symmetry operations of H_2O molecule - construction of multiplication table for the operation of H_2O molecule – point group- definition- elements (symmetry operations) of the following molecules- H_2O, BF_3 and NH_3.

UNIT II THERMODYNAMICS II

2.1. Second law of thermodynamics – need for the law- different statements of the law- Carnot's cycle and efficiency of heat engine- Carnot's theorem- thermodynamic scale of temperature.

2.2. Concept of entropy- definition and physical significance of entropy- entropy as a function of P, V and T – entropy changes during phase changes- entropy of mixing – entropy criterion for spontaneous and equilibrium processes in isolated system.

2.3. Gibb's free energy (G) and Helmholtz free energy(A) – variation of A and G with P, V and T- Gibb's – Helmholtz equation and its applications.

2.4. Thermodynamic equation of state, Maxwell's relations- ΔA and ΔG as criteria for spontaneity and equilibrium.

UNIT III THERMODYNAMICS III

3.1. Equilibrium constant and free energy change- thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentration – NH_3, PCl_5 and $CaCO_3$.

3.2. Thermodynamic interpretation of Lechatelier's principle (Concentration, temperature, pressure and addition of inert gases).

3.3. Systems variable composition- partial molar quantities- chemical potential – variation of chemical potential with T, P and X (mole fraction) – Gibb's Duhem equation. Van't Hoff's reaction isotherm- van't Hoff's isochore. Clapeyron equation and Clausius – Clapeyron equation- applications.

3.4. Third law of thermodynamics- Nernst heat theorem. Statement of III law and concept of residual entropy – evaluation of absolute entropy from heat capacity data.

UNIT IV SOLUTIONS

4.1. Raoult's law, Henry's law, Ideal and non-ideal solutions, completely miscible liquid systems-benzene and toluene. Deviation from Raoult's law and Henry' law. Duhem-Margules equation. Theory of fractional distillation. Azeotropes- HCl – water and ethanol- water system.

4.2. Partially miscible liquids- phenol- water, triethylamine- water and nicotine- water systems. Lower and upper CSTs – effect of impurities on CST.Completely immiscible liquids- principle and applications of steam distillation. Nernst distribution law – derivation.

4.3. Dilute solutions- colligative properties, relative lowering of vapour pressure, osmosis, law of osmotic pressure, derivation of elevation of boiling point and depression in freezing point.

4.4. Determination of molecular masses using colligative properties. Abnormal molecular masses, molecular dissociation- degree of dissociation- molecular association.

UNIT V PHASE CHANGES

5.1. Definitions of terms in the phase rule- derivation and application to one component system – water and sulphur- super cooling, sublimation.

5.2. Two-component systems-solid liquid equilibria, simple eutectic (lead- silver, Bi-Cd), desilverisation of lead.

5.3. Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (Na-K).

5.4. Solid Solutions-(Ag-Au)-fractional crystallization, freezing mixtures- $FeCl_3$-H_2O systems, $CuSO_4$-H_2O system.

REFERENCES

1. Gurdeep Chatwal R, Photochemistry, Good publishing House.
2. Raman, K. (1990), Group theory and its application to Chemistry, New Delhi: Tata McGraw-Hill.
3. Samuel Glasstone (1974), Thermodynamics for Chemists (3rd printing), East- West Edn.
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8. Sangaranarayanan, M.V., Mahadevan, V., Text Book of Physical Chemistry, 2nd Edition, Hyderabad, Universities Press, (India) 2011.

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SEMESTER V **CORE PRACTICAL III**

Hours/Week: 3
Credits: 3

PHYSICAL CHEMISTRY (P)

OBJECTIVES

1. To learn the fundamentals of conductometric and potentiometric titrations.
2. To understand the method of determination of molecular weight, CST, TT and rate constant.

LIST OF EXPERIMENTS:

1. Critical Solution Temperature
2. Effect of impurity on Critical Solution Temperature
3. Transition Temperature
4. Rast Method
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis
7. Partition Co-efficient of iodine between water and carbon tetrachloride.
8. Conductometric Acid-Base Titration
9. Potentiometic Redox Titration
10. Determination of cell constant

MARK DISTRIBUTION :

Internal : 40 Ext. Evaluation :60
Record :5
Procedure Writting with formula : 10
Practicals :45

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SEMESTER V **MAJOR BASED ELECTIVE I (A)**

Hours/Week: 5
Credits: 5

ANALYTICAL CHEMISTRY

OBJECTIVES

1. To know the storage and handling of various chemicals and first aid procedures.
2. To learn data analysis, various separation techniques.
3. To learn gravimetric analysis and various thermo analytical methods.
4. To learn visible spectrophotometry and colorimetry.
5. To know the various electroanalytical techniques.

UNIT I LABORATORY HYGIENE AND SAFETY

1.1. Storage and handling of chemicals-corrosion, flammable, explosive, toxic, carcinogenic and poisonous chemicals.
1.2. Simple first aid procedures for accidents involving acids, alkalies, bromine, burns and cut by glass.
1.3. Precautions to avoid poisoning-treatment for specific poisons, threshold vapour concentrations-safe limits-laboratory safety measures.
1.4. Waste disposal-fume disposal-precautions for avoiding accidents.

UNIT II DATA ANALYSIS

2.1. The Mean-significant numbers, the median-precision, accuracy- confidence limits, standard deviation.
2.2. Errors-method for improving accuracy-rejection of data-presentation of tabulated data-Scatter diagram –method of least squares- S.I. units.
2.3. Separation techniques: Precipitation-solvent extraction-chromatography – types, column chromatography-thin layer chromatography.
2.4. Paper chromatography – paper electrophoresis –Ion exchange chromatography –Gas liquid chromatography.

UNIT III GRAVIMETRIC ANALYSIS AND THERMO ANALYTICAL METHODS

3.1. Gravimetric analysis - principles-methods of gravimetric analysis - requirement of gravimetric analysis-precipitation-theories of precipitation.
3.2. Types of precipitation – co–precipitation, post precipitation - and precipitation from homogeneous solution-digestion, filtration and washing, drying and ignition. Inorganic and organic precipitating agents.
3.2. Thermo analytical techniques – types-TGA principle-Instrumentation - TGA analysis of CaC_2O_4. H_2O.
3.3. Differential thermal analysis-principle-DTA of $CaC_2O_4.H_2O$.-factors affecting TGA & DTA

UNIT IV VISIBLE SPECTROPHOTOMETRY AND COLORIMETRY

4.1. Theory of spectrophotometry and colorimetry, Beer-Lambert's law (statement only), Molar absorptivity and absorbance.
4.2. Visual comparators-multiple standard methods, duplication and dilution method, balance method, photoelectric colorimeter, spectrophotometer.
4.3. Criteria for satisfactory colorimetric estimation-advantages of colorimetric estimation, determination of composition of complexes, colorimetric estimation of iron.

UNIT V ELECTROANALYTICAL TECHNIQUES

5.1. Electro gravimetry –theory - electro gravimetric analysis of Fe and Cu.
5.2. Electrolytic separation of metals: principle –separation of copper and nickel, Electro deposition- principle –overvoltage.
5.3. Coulometry -Principle of coulometric analysis –coulometry at controlled potential- apparatus and technique-separation of nickel and cobalt. Amperometry titrations-principle –Instruments –types-applications.

REFERENCES

1. Gopalan R, Subramanian PS and Rengarajan K (1993) ``Elements of analytical chemistry" second revised edition, Sultan Chand.
2. Gurdeep R Chatwal, Sham K. Anand (2005) ``Instrumental methods of chemical analysis", Himalaya publishing house.
3. Vogel A.I. Text Book of Quantitative Inorganic analysis," The English Language Book Society, Fourth edition.
4. Douglas A. Skoog, Donald M. West and F. J. Holler, Fundamentals of Analytical chemistry, 7thedition, Harcourt College Publishers.
5. Mendham J., Denny R. C., Barnes J.D., Thomas M., Vogel's Test book of Quantitative Chemical analysis 6th edition, Pearson education.
6. Sharma, B. K., Instrumental methods of chemical analysis, Goel Publishing House, Merrut (1997).

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SEMESTER V **MAJOR BASED ELECTIVE I (B)**

Hours/Week: 5
Credits: 5

MATERIAL & NANO CHEMISTRY

OBJECTIVES

1. To study the types of ionic crystals and defects in solids.
2. To learn the different kinds magnetic properties.
3. To learn the basic concepts of nanomaterial's and their applications.

UNIT I IONIC CONDUCTIVITY AND SOLID ELECTROLYTES

Types of ionic crystals – alkali halides – silver chloride-alkali earth fluovider –simple stoichiometric oxides. Types of ionic conductors – halide ion conductors – oxide ion conductors – solid electrolytes – applications of solid electrolytes. Electrochemical cell – principles – batteries, sensors and fuel cells –Inorganic solids – colour, magnetic and optical properties.

UNIT II MAGNETIC MATERIALS

Ferrites : Preparation and their applications in microwave –floppy disk – magnetic bibble memory and applications. Insulating Materials: Classification on the basis of temperature – Polymer insulating materials and ceramic insulating materials. Ferro electric materials: examples – applications of ferroelectrics.

UNIT III MODERN ENGINEERING MATERIALS

Metallic glasses – introduction –composition, properties and applications. Shape memory alloys: introduction – examples – application of SMA – advantages and disadvantages. Biomaterials :
Introduction –metals and alloys in biomaterials –ceramic biomaterials, composite biomaterials-polymer biomaterials.

UNIT IV NANOPHASE MATERIALS

Introduction – techniques for synthesis of nanophase materials–sol-gel synthsis-electrodeposition –inert gas condensation-mechanical alloying and applications of nanophase materials-composite materials: Introduction –types.

UNIT V NANO TECHNOLOGY

Introduction –importance –various stages of nanotechnology –nanotube technology – nanoparticles –fullerenes-nano dendrimers –nano pore channels, fibres and scaffolds – CVD dismond technology –FCVA technology and its applications – nano imaging techniques.

REFERENCES

1. Aathony R. West, Solidstate chemistry and its applications, john wiley & Sons(1989).
2. Raghavan V.R.,Materials Science and Engineering, Printice Hall (India) Ltd., (2001).
3. Kenneth J. Klabunde, Nanoscale materials in chemistry, A. John Wiley and Sons Inc. Publication.

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SEMESTER VI **CORE COURSE VIII**

Hours/Week:6
Credits:6

ORGANIC CHEMISTRY II

OBJECTIVES

1. To learn the chemistry of carbohydrates, proteins, vitamins, alkaloids and terpenoids.
2. To understand the rearrangements and spectroscopy techniques for the elucidation of structures.

UNIT I CHEMISTRY OF CARBOHYDRATES

1.1 Carbohydrate - classification, properties of mono saccharides (glucose and fructose), structure and configuration of mono saccharides, interconversion.
1.2 Ascending and descending series, muta rotation, epimerization- cyclic structure - determination of size of sugar rings.
1.3 Disaccharides - sucrose, maltose - structure elucidation - polysaccharide - starch and cellulose (elementary treatment).

UNIT II CHEMISTRY OF PROTEINS AND VITAMINS

2.1 Amino acids – Zwitter ion – isoeletric point - general methods of preparation and reactions of amino acids. Peptides - Peptide linkages – proteins - classification of proteins.
2.2 Structure of proteins - primary structure - end group analysis - Edman method - secondary structure - tertiary structure - denaturation - colour reactions of proteins.
2.3 Nucleic acids - elementary treatment of DNA and RNA - Vitamins - classification, structure and biological importance of vitamins A, B_1, B_2, B_6, B_{12} and C.

UNIT III CHEMISTRY OF ALKALOIDS AND TERPENOIDS

3.1 Chemistry of natural products - alkaloids – classification, isolation - methods for synthesis of coniine, piperine, nicotine and quinine.
3.2 Terpenoids - classification - isoprene, special isoprene rule, methods for synthesis of citral, limonene, menthol, camphor.

UNIT IV MOLECULAR REARRANGEMENTS

4.1 Molecular rearrangements - types of rearrangement (nucleophilic and electrophilic) – mechanism with evidence for the following re-arrangements: pinacol – pinacolone.
4.2 Benzil - benzilic acid, benzidine, Claisen, Fries, Hofmann. Curtius, Lossen, Beckmann and dienone – phenol rearrangements.

UNIT V ORGANIC SPECTROSCOPY

5.1 UV - VIS spectroscopy - types of electronic transitions – Instrumentation- solvent effects on λ max - Woodward - Fieser rules for calculation of λ max : dienes only – bathochromic shift and hypsochromic shift.

5.2 IR spectroscopy - number and types of fundamental vibrations – selection rules- modes of vibrations and their energies. Instrumentation - position of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid, amine and amide.

5.3 NMR spectroscopy - principle - chemical shift- factors affecting the chemical shift - inductive effect and hydrogen bonding - TMS, delta scales, splitting of signals - spin-spin coupling, NMR spectrum of EtOH, n -propyl bromide and isopropyl bromide.

REFERENCES

1. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, addison Wesley Longman Ltd. (1996).
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson (India)., (2011)
3. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010)
4. Pine S.H., Organic Chemistry, (5th edition) New Delhi, McGraw – Hill International Book Company (1987)
5. Seyhan N. Ege, Organic Chemistry, (5th edition) New York, Houghton Mifflin Co., (2005)
6. William Kemp, Organic Spectroscopy, 3rd edition, ELBS.
7. Introduction to Spectroscopy by Pavia, D. L. Lampman, G. M, Kriz, G. S, Vyvyan, J. A. 5th edition, Cengage Learning, (2015)
8. Spectroscopy identification of Organic compounds, Silverstein, R. M, Webster, F. M 7th edition, CRC Press, (2015)

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SEMESTER VI **CORE COURSE IX**

Hours/Week: 6
Credits: 6

PHYSICAL CHEMISTRY II

OBJECTIVES

1. To learn the various concepts of electrochemistry.
2. To know the types and theories of catalysis.
3. To learn the adsorption isotherms.
4. To know the spectroscopic techniques such as IR, UV-visible, Raman and NMR.

UNIT I ELECTRICAL CONDUCTANCE

1.1. Conductance in metal and in electrolytic solution- specific conductance and equivalent conductance. Arrhenius theory of electrolytic dissociation and its limitation. Weak and strong electrolyte according to Arrhenius theory. Ostwald's dilution law- Derivation, applications and limitation.

1.2 Effect of dilution on equivalent conductance and specific conductance. Kohlrausch's law and its applications. The elementary treatment of the Debye-Huckel- Onsager equation for strong electrolytes-evidence for ionic atmosphere.

1.3. Transport number and Hittorf's rule. Determination of transport number by Hittrof's method and moving boundary method.

1.4. Application of conductance measurements- determination of degree of dissociation of weak electrolytes -determination of solubility product of a sparingly soluble salt. common ion effect, conductometric titrations.

UNIT II ELECTROCHEMICAL CELLS

2.1. Galvanic cells - reversible and irreversible cells. Conventional representation of electrochemical cells. Electromotive force of a cell and its measurement – computation of E.M. F. – calculation of thermodynamic quantities of cell reactions (ΔG, ΔH, ΔS and K).

2.2. Types of reversible electrodes- gas/metal ion- metal/metal ion, metal/ insoluble salt/anion and redox electrodes, electrode reactions.

2.3. Nernst equation – derivation of cell E. M. F and single electrode potential – standard hydrogen electrode- reference electrodes- standard electrode potentials-sign convention- electrochemical series and its significance.

2.4. Potentiometric titrations -Acid-Base titrations- Oxidation-reduction (Redox) titrations- Precipitation titrations.Corrosion- general and electrochemical theory – passivity-prevention of corrosion.

UNIT III CATALYSIS AND SURFACE PHENOMENA

3.1. Catalyst-Definition and Characteristics - Types of catalysis-Homogeneous and heterogeneous, induced, auto, positive and negative catalysis, catalytic poisons and catalytic promoters.

3.2. Enzyme catalysis – Michaelis-menten equation and Michaelis-menten law.

3.3. Adsorption-types-chemical and physical, characteristics of adsorption. Theories of catalysis- intermediate compound formation theory and adsorption theory.

3.4. Different types of isotherms- Freundlich and Langmuir adsorption isotherms.

UNIT IV SPECTROSCOPY I

4.1. Electromagnetic spectrum- the region of various types of spectra. Microwave spectroscopy- rotational spectra of diatomic molecules treated as rigid rotator, condition for a molecule to be active in microwave region.
4.2. Rotational constants (B) and selection rules for rotational transition. Frequency of spectral lines, calculation of inter-nuclear distance in diatomic molecules.
4.3. Infrared spectroscopy- vibrations of diatomic molecules- harmonic oscillators, zero point energy, dissociation energy and force constant, condition for molecule to be active in the IR region, selection rules for vibrational transition, fundamental bands, overtones and hot bands.
4.4. UV- Visible spectroscopy-conditions- Franck-Condon principle- pre dissociation-applications.

UNIT 5 SPECTROSCOPY II

5.1. Raman spectroscopy – Rayleigh scattering and Raman scattering. Stokes and anti-stokes lines in Raman spectra, Raman frequency, quantum theory of Raman effect, conditions for a molecule to be Raman active.
5.2. Comparison of Raman and IR spectra – structural determination from Raman and IR spectroscopy, rule of mutual exclusion.
5.3. NMR spectroscopy- nuclear spin and conditions for a molecule to give rise to NMR spectrum – theory of NMR spectra, number of NMR signals, equivalent and non-equivalent protons.

REFERENCES

1. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co.
2. Bahl B.S., Arun Bahl and Tuli G.D. (2012). Essentials of Physical Chemistry, New Delhi: Sultan Chand and Sons.
3. Moore W. J. (1972), Physical chemistry, 5th Edition, Orient Longman Ltd.
4. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.
5. Colin Bannwell N and Elaine Mc Cash M, Fundamentals of molecular spectroscopy, 4th edition, Mc Graw hill publishing company limited.
6. Russell S. Drago, (1978), Physical methods in Inorganic chemistry, East-west student edition.

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SEMESTER VI **CORE PRACTICAL IV**

Hours/Week: 6
Credits: 5

GRAVIMETRIC & ORGANIC ANALYSIS (P)

OBJECTIVES

1. To learn the techniques of gravimetric analysis.
2. To learn the methods of different organic compounds preparation and analysis.

GRAVIMETRIC ANALYSIS:

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel - DMG complex.
4. Estimation Calcium as calcium oxalate monohydrate
5. Estimation of Barium as barium sulphate.

ONLY FOR DEMONSTRATION:

1. Estimation of Copper as copper (I) thiocyanate
2. Estimation of Magnesium as magnesium oxinate
3. Estimation of Iron as Iron (III) oxide.

ORGANIC QUALITATIVE ANALYSIS AND ORGANIC PREPARATION:

Organic Analysis
Analysis of Simple Organic compounds (a) characterization of functional groups (b) confirmation by preparation of solid derivatives / characteristic colour reactions.
Note: Mono –functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

ORGANIC PREPARATION: (ANY FOUR)

Preparation of Organic Compounds involving the following chemical conversions.
1.Oxidation 2. Reduction 3. Hydrolysis 4. Nitration 5. Bromination 6. Diazotization 7. Osazone formation

DETERMINATION OF PHYSICAL CONSTANTS

Determination of boiling /melting points by semimicro method.

MARK DISTRIBUTION:

Internal : 40 Ext. Evaluation : 60
Record : 5+5 = 10
Gravimetry : 25
org. preparation & org Analysis : 25
Org. preparation : 6
Phy Contant : 4
Org. analysis :15
Armatic/ Alphatic –2
Sat/Unsat – 2
Spl. Element –3
functinonal group –5
Derivatives - 3

REFERENCE

1. Venkateswaran V, Veeraswamy R., Kulandaively A.R., Basic principles of practical chemistry, 2nd edition, New Delhi, sultan chand & sons, (1997)

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SEMESTER VI MAJOR BASED ELECTIVE II

Hours/Week: 6
Credits: 6

NUCLEAR, INDUSTRIAL CHEMISTRY & METALLIC STATE

OBJECTIVES

1. To know the fundamentals of nuclear chemistry.
2. To understand the applications of nuclear chemistry.
3. To study the metallic bond, theories and applications.
4. To understand the applications of inorganic polymers.

UNIT I NUCLEAR CHEMISTRY I

1.1 Introduction, nuclear structure – composition of the nucleus, subatomic particles, nuclear forces, nuclear stability – mass defect and binding energy, whole number rule and packing fraction, n-p ratio, odd even rules, nuclear models – liquid drop and shell models, isobars, isotones and isomers.

1.2 Isotopes – detection, physical and chemical methods of separation, isotopic constitution of elements.

1.3 Radioactivity – introduction – radioactive emanations – characteristics of α, β and γ-rays, disintegration theory, modes of decay-group displacement law, rate of integration and half-life period, disintegration series, Geiger-Nuttal rule.

UNIT II NUCLEAR CHEMISTRY II

2.1 Detection and measurement of radioactivity – Wilson cloud chamber, Geiger – Muller counter.

2.2 Particle accelerators – linear accelerator and cyclotron.

2.3 Artificial radioactivity – nuclear transformation – classification of nuclear reactions, fission – atom bomb, fusion – hydrogen bomb, Stellar energy – nuclear reactor – atomic power projects in India.

2.4 Applications of radioisotopes as tracers in reaction mechanism, medicine, agriculture, industry and carbon dating. Hazards of radiations.

UNIT III METALLIC STATE

3.1 Metallic bond : Packing of atoms in metals (BCC, CCP, HCP) electron gas, Pauling and band theories, structure of alloys, substitutional and interstitial solid solutions, Hume-Rothery ratios, crystal defects – stoichiometric and non- stoichiometric defects.

3.2 Semi conductors - intrinsic and extrinsic – n-type and p-type. Composition, properties, structure and uses in electronic industry.

UNIT IV INORGANIC POLYMERS AND THERMO ANALYTICAL METHODS

4.1 Inorganic polymers – coordination polymers, metal alkyls, phosphonitrilic polymers.
4.2 Silicates – classification into discrete anions – one, two and three dimensional structures with typical examples.
4.3 Composition, properties and uses of beryl, asbestos, talc, mica, feldspar and zeolite.

UNIT V INDUSTRIAL CHEMISTRY

5.1 Gaseous fuels : Natural gas, gobar gas, water gas, semi water gas, carburetted water gas, producer gas and liquified petroleum gas (LPG) – composition, manufacture and applications.
5.2 Fertilizers : Manufacture of nitrogen, phosphorus, potassium and mixed fertilizers, micro nutrients and their role in plant life.
5.3 Safety matches : Introduction, raw materials and manufacturing method.
5.4 Paints and varnishes : Definition, types and composition.
5.5 Glass : Composition, manufacture, types and uses.
5.6 Cement : Manufacture – wet and dry processes, composition and setting of cement.

BOOKS FOR REFERENCE:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. Gilreath, 'Fundamental concepts of Inorganic Chemistry', 18th Printing, McGraw Hill International Book Company, 1985.
3. S. Glasstone, 'Source book on Atomic Energy', East-West Press, 1967.
4. R.Gopalan, P.S. Subramanian and K. Rengarajan, 'Elements of Analytical Chemsitry', Sultan Chand & Sons, 2nd edition, 1991.
5. P.L.Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.

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SEMESTER VI MAJOR BASED ELECTIVE III (A)

Hours/Week: 5
Credits: 5

POLYMER CHEMISTRY

OBJECTIVES

1. To know the chemistry of polymers.
2. To study the importance of polymers.
3. To study the concepts of polymerization and techniques.

POLYMER CHEMISTRY

UNIT 1 INTRODUCTION TO POLYMERS AND RUBBERS

Basics of polymers – monomers and polymers - definition .classification of polymers on the basis applications - thermosetting and thermoplastics - distinction among plastics. Functionality -. Copolymers. Degree of polymerization. Types of polymerization reactions – chain polymerization -free radical and ionic polymerization – coordination and step polymerization reactions- polyaddition and polycondensation – miscellaneous reactions: ring-opening and group transfer polymerization. Basics of rubbers: types - vulcanization of rubber- ebonite- uses of rubbers.

UNIT II PROPERTIES AND REACTIONS OF POLYMERS

Properties: Glass transition temperature (Tg) -definition – factors affecting Tg. Relationship between Tg and molecular weight. Importance of Tg. Molecular weight of polymers: number average (Mn), weight average (Mw), sedimentation and viscosity average molecular weights. Reactions: Hydrolysis – hydrogenation – addition – substitutions – cross linking and cyclisations reaction. Polymer degradation- thermal, photo and oxidation degradation of polymers (basics only)

UNIT III POLYMERIZATION TECHNIQUES AND MOULDING TECHNIQUE

Polymerization techniques: bulk, solution, emulsion, melt condensation and interfacial polycondensation polymerization. Moulding technique: Injection, compression, extrusion, rotational and calendaring.

UNIT IV CHEMISTRY OF COMMERCIAL POLYMERS

Preparation, properties and uses of the polymers: Polyethylene, polypropylene, polystyrene, PVC, teflon and polymethylmethacrylate, polycarbonate, polyurethanes, polyamides (Kevlar), phenol-formaldehyde, urea-formaldehyde resin, epoxy resins, rubber-styrene and neoprene rubbers.

UNIT V ADVANCES IN POLYMERS

Biopolymers – biomaterials. Polymers in medical field - High temperature and fire – resistant polymers. Silicones - conducting polymers- carbon fibers.(basic idea only) and polymer composites.

TEXT BOOK :

Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1984.

BOOKS FOR REFERENCE

1. Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi, 1978.
2. Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.
3. Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, anmol Publications Private Ltd., New Delhi, 1989.

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SEMESTER VI MAJOR BASED ELECTIVE III (B)

Hours/Week: 5
Credits: 5

PHARMACEUTICAL CHEMISTRY

OBJECTIVES

1. To study the principles and functioning of drugs.
2. To know the importance and functioning of antibiotics.
3. To study the impact of poisons.

UNIT I DRUGS TERMINOLOGY

Terminology: Drugs, pharmacy, pharmacology, pharmacognosy , theraupties, toxicology, chemotherapy, pharmacopoeia - first aid for bleeding for blood, maintain breathing, Cuts, Abrasions and Bruises, Fractures, Burns and Fainting. First aid box for aceident, plaster of paris. Symptoms treatment for Anemia, Diapeties, T.B, Asthma, Jaundice, Piles, Leprosy, Typhoid, Malaria, Cholera, Filariasis. Medicinally important compound Aluminum, phosphorus, Arsenic, Mercury, Iron, Milk of maganesia, Aluminum Hydroxide gel.

UNIT II ANTIBIOTICS

Antibiotics: Introduction, classification – based on biological action, chemical struicture- Biosynthesis and degradation of penicillin. an account of semi synthetic penicillin, different types of penicilium, SAR chloroamphenicol, synthesis, SAR and Assay – chloroamphenicol, Streptomycin – structure assay – structure Activity relationship.

UNIT III ANALGESIC AND ANTIPYRETICS

Analgesic and Antipyretics: Analgesic - Norcotic analgesics, synthetic analegises pethidine and methadone, Narcotic antasonist, Nalarphine, Non-narcotic - antipyretic analgsesics. Pyrazole, salicylic acid, P- amino phenol derivative asprin and Ibu profen, Ketoprofen, Naproxen.

UNIT IV ANASTHETICS, ANTISEPTICS AND DISINFECTANTS

Anasthetics : Definition, classification of anesthetics, Ethers, Halohydro carbons, chloroform Halo ethane, Ferqusen principle- Intravenous anesthetics. Structure of thiopental sodium – Local anesthetics – cocaine- source and structure – preparation and uses of procaine. Amethocanie and Benzocaine.
Antiseptics and Disinfectants – phenol co-efficient. Phenolic component transquilizers –definition and example. Pschodelic drugs. LSD and Marijuna, AIDS HIV, propagation prevention and treatment. Definition– cancer – and antineoplastics drugs– antimetapolite – Natural substance, alkylation agent. Definition Hyperglycemic drug type and causes for diabetics.

UNIT V POISONS

Poisons: Poison Investigation Definition kinds of poison – Aceidental suicidal andomicidal death – action of poison – general condition that control action of poison – general condition that control action of poison Hints of Investigation. Industrial gases and volatile poison, synthetic gases – carbon di sulphide – petroleum distillate, aromatic compounds, chlorinated hydro carbons.

REFERENCES

1. Lakshmi S, pharmaceutical chemistry 2011.
2. Jaya shree Ghosh, A text book of pharmaceutical chemistry, 3rd ed., S.Chand & Company Ltd., New Delhi (2008)

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI- 620 024.

Applicable to the candidates admitted from the Academic year 2015-16 onwards

Part IV - VALUE EDUCATION (Revised syllabus)

Unit I Philosophy of Life and Social Values

Human Life on Earth (Kural 629) Purpose of Life (Kural 46) Meaning and Philosophy of Life (Kural 131, 226) Family (Kural 45), Peace in Family (Kural 1025) Society (Kural 446), The Law of Life (Kural 952), Brotherhood (Kural 807) Five responsibilities / duties of Man (a) to himself (b) to his family (c) to his environment (d) to his society, (e) to the Universe in his lives (Kural 43, 981).

Unit II Human Rights and Organisations

Definitions, Nature of Human Rights. Universal Declaration of Human Rights, International covenent on Civil and Political Rights - International covenent of Economic, Social and Cultural Rights. Amnesty International Red Cross.

Unit III Human Rights : Contemporary Challenges

Child labour - Womens Right - Bonded labour - Problems of refugees - Capital punishment. National and State Human Rights Commissions

Unit IV Yoga and Health

Definition, Meaning, Scope of Yoga - Aims and objectives of Yoga - Yoga Education with modern context - Different traditions and schools of Yoga - Yoga practices: Asanas, Pranayama and Meditation.

Unit V Role of State Public Service Commission

Constitutional provisions and formation - Powers and Functions - Methods of recruitment - Rules and notification, syllabi for different exams - written and oral - placement.

BOOKS FOR REFERENCES:

1. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road, Thanjavur 613 004
2. திருக்குறள் - ஜி.யு.போப் - ஆங்கில மொழியாக்கத்துடன் உமா நூல். வெளியீட்டகம், தஞ்சாவூர்.
3. Leah Levin, Human Rights, NBT, 1998
4. V.R. Krishna Iyer, Dialetics and Dynamics of Human Rights in India, Tagore Law Lectures.
5. Yogic Thearpy - Swami Kuvalayananda and Dr.S.L.Vinekar, Government of India, Ministry of Health, New Delhi.
6. SOUND HEALTH THROUGH YOGA - Dr.K.Chandrasekaran, Prem Kalyan Publications, Sedaptti, 1999.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI- 620 024

ENVIRONMENTAL STUDIES

(Applicable to the candidates admitted from the Academic year 2019-20 onwards)

Unit: 1 The Multidisciplinary nature of environmental studies
Definition, scope and importance. (2 lectures)
Need for public awareness

Unit: 2 Natural Resources:
Renewable and non-renewable resources:
Natural resources and associated problems.

a) Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resources, land degradation, man induced Landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

(8 lectures)

Unit: 3 **Ecosystems**

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession.
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:-

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit: 4 Biodiversity and its conservation

- Introduction – Definition : Genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Biological Diversity Act 2002/ BD Rules, 2004

(8 lectures)

Unit: 5 Environmental Pollution

Definition

Causes, effects and control measures of :

a. Air Pollution
b. Water Pollution
c. Soil Pollution
d. Marine Pollution
e. Noise pollution
f. Thermal Pollution
g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.
- Ill-Effects of Fireworks: Firework and Celebrations, Health Hazards, Types of Fire, Firework and Safety

(8 lectures)

Unit: 6 Social Issues and the Environment

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns.

Case studies

- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation
- Public awareness.

(7 lectures)

Unit: 7 Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights - Value Education
- HIV/ AIDS - Women and Child Welfare
- Role of Information Technology in Environment and human health
- Case studies.

Unit: 8 Field Work

- Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

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    (M) Magazine (R) Reference (TB) Textbook

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PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES-I

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar

(Outcomes based on guidelines in UGC LOCF – Generic Elective)

UNIT 1: COMMUNICATION

1. **Listening**: Listening to instructions

2. **Speaking**: Telephone etiquette and Official phone conversations

3. **Reading** short passages (3 passages, one from each – Physics, Chemistry, Mathematics/Computer Science)

5. **Writing:** Letters and Emails in professional context

6. **Grammar in Context:**
   - Wh and yes or no,
   - Q tags
   - Imperatives

7, **Vocabulary in Context:** Word formation - .
   i) Creating antonyms using Prefixes
   ii) Intensifying prefixes (E. g inflammable)

Changing words using suffixes

A) Noun Endings
B) Adjective Endings
C) Verb Endings

UNIT 2: DESCRIPTION

Listening – Listening to process description

Speaking - Role play

Formal: With faculty and mentors in academic environment, workplace communication

Informal: With peers in academic environment, workplace communication

Reading –Reading passages on products, equipment and gadgets

Writing – Writing sentence definitions (e.g. computer) and extended definitions (e.g. artificial intelligence)

Picture Description – Description of Natural Phenomena

Grammar in Context: Connectives and linkers.

Vocabulary – Synonyms (register) - Compare & contrast expressions.

UNIT 3: NEGOTIATION STRATEGIES

Listening - Listening to interviews of specialists / inventors in fields (Subject specific)

Speaking – Brainstorming. (mind mapping). Small group discussions (subject-specific)

Reading – longer Reading text. (Comprehensive passages)

Writing – Essay Writing (250 word essay on topics related to subject area, like pollution, use of pesticides in cultivation, merits and demerits of devices like mobile phones, merits and demerits of technology in development)

Grammar in Context: Active voice & Passive voice – If conditional - Collocations –Phrasal verbs

UNIT 4: PRESENTATION SKILLS

Listening - Listening to presentation. Listening to lectures. Watching – documentaries (discovery / history channel)

Speaking –Short speech

- Making formal presentations (PPT)

Reading – Reading a written speech by eminent personalities in the relevant field /Short poems / Short biography.

Writing - Writing Recommendations

Interpreting visuals - charts / tables/flow diagrams/charts

Grammar in Context – Modals

Vocabulary (register) - Single word substitution

UNIT 5: CRITICAL THINKING SKILLS

Listening - Listening to advertisements/news and brief documentary films (with subtitles)

Speaking – Simple problems and suggesting solutions.

Reading: Motivational stories on Professional Competence, Professional Ethics and Life Skills (subject-specific)

Writing Studying problem and finding solutions- (Essay in 200 words)

Grammar-Make simple sentences

Vocabulary -Fixed expressions

SUGGESTED ACTIVITIES

UNIT 1

Listening: Links for formal conversation can be given - Gap filling exercises – Multiple Choice questions – Making notes.

Speaking - Role play activity

Reading – Note making. Note-Taking.

Writing: Guided Writing (developing hints)

Email

Grammar: Vocabulary – Worksheets – Games.

UNIT 2

Listening-

Process Descriptions (Processes of Condensation and Evaporation./Process of Measuring the thickness of a wire using a Screw -Gauge./process of Exaction of sugar from sugarcane)

Speaking – Role Play

Reading – Multiple choice questions - Evaluative answers – Classifying and labeling

Writing - Picture description – Description of natural phenomena (rainbow, earthquake, volcanic eruption, erosion, natural disasters in 150 to 200 words).

Vocabulary: Expansion of compound nouns

UNIT 3

Listening- Gap fill exercises – Listening comprehension

Speaking -Debates

Reading -Reading comprehension

Writing – Essay Writing

Grammar - Vocabulary, Activities, Worksheets & Games.

UNIT 4

Listening - Note taking (of listening & viewing items) - Filling a table based on the listening item.

Speaking – JAM, Presentations. (PPT-TECHNICAL)

Reading-Reading comprehension

Writing– Difference between recommendations and instructions

Questions/MCQs based on graphs/flow diagrams/charts

Grammar: Vocabulary – Activities, Worksheets & Games.

UNIT 5

Listening – Radio News/ TV-News telecast /

Speaking - Watch or listen to documentaries and ask questions

Reading - Reading motivational stories (success stories in subject area)

Writing - Essay writing.

Grammar -Vocabulary –Activities, Worksheets & Games

Professional English-Semester-II [part-III -add on Course]

Weightage: 4 Credits **Duration: 90hrs**

Objectives:

The Professional Communication Skills Course is intended to help Learners in Arts and Science colleges

- Develop their competence in the use of English with particular reference to the workplace situation.
- Enhance the creativity of the students, which will enable them to think of innovative ways to solve issues in the workplace.
- Develop their competence and competitiveness and thereby improve their employability skills.
- Help students with a research bent of mind develop their skills in writing reports and research proposals.

Unit 1- Communicative Competence (18 hrs)

Listening – Listening to two talks/lectures by specialists on selected subject specific topics -(TED Talks) and answering comprehension exercises (inferential questions)

Speaking: Small group discussions (the discussions could be based on the listening and reading passages- open ended questions

Reading: Two subject-based reading texts followed by comprehension activities/exercises

Writing: Summary writing based on the reading passages.

Grammar and vocabulary exercises/tasks to be designed based on the discourse patterns of the listening and reading texts in the book. This is applicable for all the units.

Unit 2 - Persuasive Communication (18 hrs)

Listening: listening to a product launch- sensitizing learners to the nuances of persuasive communication

Speaking: debates – Just-A Minute Activities

Reading: reading texts on advertisements (on products relevant to the subject areas) and answering inferential questions

Writing: dialogue writing- writing an argumentative /persuasive essay.

Unit 3- Digital Competence **(18 hrs)**

Listening to interviews (subject related)

Speaking: Interviews with subject specialists (usingvideo conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging tonurture interests – subject related)

Reading: Selected sample of Web Page (subject area)

Writing: Creating Web Pages

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

The essay will address all aspects of digital competence in relation to MS Office and how they can be utilized in relation to work in the subject area

Unit 4 - Creativity and Imagination **(18 hrs)**

Listening to short (2 to 5 minutes) academic videos (prepared by EMRC/ other MOOC videos on Indian academic sites – E.g. https://www.youtube.com/watch?v=tpvicScuDyo)

Speaking: Making oral presentations through short films – subject based

Reading: Essay on Creativity and Imagination (subject based)

Writing – Basic Script Writing for short films (subject based)

- Creating blogs, flyers and brochures (subject based)
- Poster making – writing slogans/captions(subject based)

Unit 5- Workplace Communication& Basics of Academic Writing (18 hrs)

Speaking: Short academic presentation using PowerPoint

Reading & Writing: Product Profiles, Circulars, Minutes of Meeting.

Writing an introduction, paraphrasing

Punctuation(period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis)

Capitalization (use of upper case)

Outcomes of the Course.

At the end of the course, learners will be able to,

- Attend interviews with boldness and confidence.
- Adapt easily into the workplace context, having become communicatively competent.
- Apply to the Research &Development organisations/ sections in companies and offices with winning proposals.

Instruction to Course Writers:

1. **Acquisition of subject-related vocabulary should not be overlooked**. Textboxes with relevant vocabulary may be strategically placed as a Pre Task or in Summing Up
2. Grammar may be included if the text lends itself to the teaching of a Grammatical item. However, testing and evaluation does not include Grammar.

NON MAJOR ELECTIVES (ARTS)

(For the candidates admitted from the academic year 2016-2017)

SI. No.	DEPARTMENT OFFERING THE NON-MAJOR ELECTIVE COURSES	TITLE OF THE NON-MAJOR ELECTIVE COURSES
1.	Applied Tamil	I. தமிழ் நடைக்கூறுகள் II. சிந்தனையியல்
2.	B.Litt.	
3.	Pulavar Degree	
4.	Tamil	
5.	B.B.A. (Bachelor of Business Administration)	I. Management Principles **(or)** Stock Exchange Practices II. Banking Practices **(or)** International Business
6.	B.Com.	I. Personal Investment **(or)** Elements of Insurance II. Introduction to Accountancy **(or)** Salesmanship
7.	B.Com. (Applied)	
8.	B.Com. (Computer Applications)	
9.	B.Com. (Bank Management)	I. Banking Practices **(or)** Indian Banking System II. Rural Banking **(or)** Elements of Insurance
10.	B.Com (Corporate Secretaryship)	I. Elements of Company Law II. Stock Markets in India
11.	B.Com (Co-operation)	I. Fundamentals of Cooperation **(or)** Cooperative Finance and Banking II. Cooperatives in Foreign Countries **(or)** Cooperative Bookkeeping System
12.	Economics	I. Advertisement Management II. Economics of Transportation
13.	English	I. Presentation Skills II. Functional Skills
14.	History	I. Freedom Movement in India II. Working of Indian Constitution
15.	Journalism & Mass Communication	I. Basic Photography II. Freelance Journalism
16.	Public Administration	I. Public Administration for Civil Services II. Indian Government and Administration
17.	Sanskrit	I. Introduction to Early Sanskrit Literature **(or)** History of fables & Popular tales and Didactic Literature Pub. R.S. Vadhyer Pub. Palakad II. Scientific Literature **(or)** Indian Aesthetics
18.	Social Work	I. Human Rights II. Contemporary Social Issues and Problems
19.	Sociology	I. Dynamics of Society II. Women Empowerment
20.	Tourism And Travel Management	I. Basics of Tourism II. Cultural Tourism

NON MAJOR ELECTIVES (SCIENCE)

(For the candidates admitted from the academic year 2016-2017 onwards)

SI. No.	DEPARTMENT OFFERING THE NON-MAJOR ELECTIVE COURSES	TITLE OF THE NON-MAJOR ELECTIVE COURSES
1.	Apparel and Fashion Technology	I. Hand Embroidery (P) II. Jewellery Making (P)
2.	BCA	I. Working Principles of Internet II. Fundamentals of Information Technology
3.	Biochemistry	I. Health and diseases II. Hospital Management
4.	Biotechnology	I. Biotechnology for Human Welfare II. Food Processing
5.	Botany	I. Biofertilizers & Biopesticides II. Horticulture
6.	Chemistry	I. Chemistry in Everyday Life II. Health Chemistry
7.	Computer Science	I. Working Principles of Internet II. Fundamentals of Information Technology
8.	Electronics	I. Principles of Electronics II. Everyday Electronics
9.	Fashion Technology & Costume Designing	I. Fashion Accessories Designing II. Visual Merchandising
10.	Geography	I. Geography of Tourism II. Disaster Management
11.	Geology	I. Fundamentals of Geology II. Introduction to Minerals, Rocks and Fossils
12.	Home Science	I. Bakery and Food Preservation II. Apparel Designing
13.	Hospital Administration	I. Personal Hygiene II. Role of Hospital Services
14.	Hotel Management & Catering Science	I. Basic Tamil / Special Tamil II. Basic Tamil / Special Tamil
15.	Information Technology	I. Fundamentals of Information Technology II. Information Security : Principles and Practices
16.	Mathematics	I. Quantitative Aptitude I II. Quantitative Aptitude II
17.	Microbiology	I. Mushroom Technology II. Biofertilizer Technology
18.	Nutrition & Dietetics	I. Nutrition for Women II. Nutrition for Health and Fitness

19.	Physics	I. Energy Physics II. Laser Physics
20.	Software Development	I. Working Principles of Internet II. Fundamentals of Information Technology
21.	Textile Science	I. Management and Entrepreneurship II. Marketing and Merchandising
22.	Visual Communication	I. Basics of Communication II. Communication Personality Development
23.	Zoology	I. Public Health and Hygiene II. Ornamental fish farming

NON-MAJOR ELECTIVE - I

PUBLIC ADMINISTRATION FOR CIVIL SERVICES

Objectives :

1. Students studying other majors may get familiarize with the basic concepts of Public Administration
2. To expose the students to various basic theories in Public administration.

Unit I - Introduction Meaning, Nature, Scope and Significance of Public Administration - Comparative Public Administration - Public and Private Administration - New Public Management.

Unit II - Basic Concepts Organisation - Hierarchy - Unity of command - Span of control - Co-ordination - Centralization and Decentralization - Line and Staff.

Unit III - Theories of Administration Scientific Management (Taylor and the Scientific Management Movement) - Classical Theory (Fayol, Urwick, Gulick and others) - Bureaucratic Theory (Weber and his critics) - Behavoural Approach - Systems approach.

Unit IV - Administrative Behaviour Decision making - Communication and control, Leadership.

Unit V - Accountability and Control The concepts of Accountability and control : Legislative, Executive and Judicial control - Citizen and Administration : Role of civil society - People's Participation and Right to Information.

Reference :

1. Avasthi and S.R. Maheswari , " Public Administration', Lakshmi Navas, Agra, 2006
2. Rumki Basu, Concepts and Theories of Administration, Sterling Publication,New delhi2004.
3. Lakshmi Kanth P, Public Administration for UPSC McGraw Hill, New Delhi-2011.

NON-MAJOR ELECTIVE - II

INDIAN GOVERNMENT AND ADMINISTRATION

Objective : It facilitates the students to understand its various aspects of the subjects - evolution and constitutional frame work, salient features of Indian Administration, Union executive, State executive, District Administration.

Unit - I Evolution of Indian Administration - Constitutional Development Framework – Salient Feature of Indian constitution

Unit - II Union Administration – President - Prime Minister - Council of Ministers – Ministries and Departments – Supreme Court.

Unit - III State Administration – Executive – Council of Ministers – Departments and Directorate – State Public Service Commission – High Court – District Administration – Local Government.

Unit - IV Constitutional Authorities - Finance Commission - Union Public Service Commission - Election Commission - Comptroller and Auditor General of India

Unit - V Issues in Indian Administration - Generalists vs. Specialists - Centre-State relations Corruption – Lokpal, Lokayuktha - Administrative Reforms in India

References:

1. Dr.Vishnoo Bhagwan and Dr.Vidya Bhushan Indian Administration, S.Chand and Company Ltd., New Delhi, 2011.

2. M.Sharma ,Indian Administration ,Anmol Publications Pvt. Ltd., New Delhi, 2007.

3. S.R. Maheswari ,Indian Administration, S.Chand Co., New Delhi, 2010.

பாரதிதாசன் பல்கலைக்கழகம், திருச்சிராப்பள்ளி - 620 024
(2016-17ஆம் கல்வியாண்டு முதல் சேர்க்கை பெறும் மாணாக்கர்களுக்கு)

மூன்றாம் பருவம்

அடிப்படைத் தமிழ் - I
(Basic Tamil – I)

நோக்கம்: தமிழ்மொழியின் அடிப்படைகளை அறிந்துகொள்ளுதல். தமிழ் மொழியை எழுதவும் படிக்கவும் கற்றுக்கொள்ளுதல்.

அலகு 1

எழுத்துக்கள் அறிமுகம் - எழுத்துக்களின் வகைப்பாடு, எண்ணிக்கை - உயிரெழுத்துக்கள் - மெய்யெழுத்துக்கள் - உயிர்மெய்யெழுத்துக்கள் - ஆய்த எழுத்து - இனஎழுத்துக்கள் - வடமொழி எழுத்துக்கள்.

அலகு 2

எழுதும் பயிற்சி - தமிழ் எழுத்து வடிவங்களைக் காட்டி - அவற்றை இனங்காணவும் - வேறுபடுத்தி அறியவும் பயிற்சி தருதல் - ஒலிப்பு - பொருத்தமான எழுத்தைத் தேர்ந்தெடுக்கப் பரிசோதித்தல் - எழுத்துக்களை எழுதப் பயிற்றுவித்தல்.

அலகு 3

சொற்கள் கற்றல் - கோடிட்ட இடங்களை நிரப்புவதன் மூலம் எழுத்துகளையும் சொற்களையும் பயிற்றுவித்தல். வாசித்தல் - படம் ஒலிபெயர்ப்புச் சொல், இணையான ஆங்கிலச்சொல் முதலியவற்றைத் தந்து எழுத்துகளையும் சொற்களையும் பயிற்றுவித்தல்.

அலகு 4

சிறுதொடர் கற்றல் - எளிய தொடர்களை அறிமுகப்படுத்துதல் - சிறு தொடரின் உறுப்புகளைக் கற்றுத்தருதல் - அவ்வுறுப்புக்களைத் தொடரில் இனங்காணச்செய்தல் - சிறு தொடர்களை எழுதும் பயிற்சி தருதல்.

அலகு 5

மழலைப் பாடல்கள், அறநெறிக்கதைகள் - பாடல்களையும் கதைகளையும் பிழையின்றி வாசிக்கச் செய்தல் - பிழையின்றி எழுதச்செய்தல்.

பார்வை :

தமிழ் இணையப் பல்கலைக்கழகச் சான்றிதழ்க் கல்விப்பாடத்திட்டத்தில் உள்ள முதல் அலகான "அடிப்படைநிலை" (www.tamilvu.org)

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நான்காம்பருவம்

அடிப்படைத் தமிழ் - II
(Basic Tamil – II)

நோக்கம்: இப்பாடத்தில் கீழே தடித்த எழுத்துக்களில் தரப்பட்டுள்ள பாடங்களின் வழியாகத் தமிழ்மொழியை எழுதவும் வாசிக்கவும் பழக்குதல்.

அலகு 1

சந்தை - மலர்கள், காய்கறிகள், பழங்கள் முதலியன குறித்த செய்திகளை அறியச் செய்தல் - அவை தொடர்பான வாக்கியம் அமைக்கப் பழக்குதல் எங்கள் குடும்பம் - குடும்ப உறுப்பினர், குடும்ப உறவு முறைகள் பற்றி அறியச் செய்தல் - தொடர்பான சொற்கள், தொடர்கள் முதலியவற்றை வாசிக்கவும் எழுதவும் பழக்குதல்.

அலகு 2

விருந்தோம்பல் - உணவு பரிமாறும் முறை - உணவு வகைகள் முதலியன பற்றி விளக்கமாக அறியச் செய்தல் - ஆறு, குளம், கடல், வானம், மேகம், மலை, மழை முதலியன பற்றி அறியச் செய்தல் : இவை தொடர்பான சொற்கள், தொடர்கள் முதலியவற்றை வாசிக்கவும் எழுதவும் பழக்குதல்.

அலகு 3

பாரதியார் - பாரதியார் பற்றிய வரலாறு, அவரது ஓரிரு கவிதைகள் பற்றி அறியச்செய்தல் - கணைக்கால் இரும்பொறை - இம்மன்னனின் தன்மான உணர்வினை நாடகத்தின் வழியாக உணர்த்துதல். இப்பாடங்கள் தொடர்பான சொற்கள், தொடர்களை வாசிக்கவும் எழுதவும் பழக்குதல்.

அலகு 4

மாமல்லபுரம் - மாமல்லபுரம் அமைந்துள்ள இடம் மற்றும் கலைக்கோயில்கள் பற்றி விளக்குதல் - பயணம் - பேருந்தில் பயணம் செய்யும் முறையை விளங்க வைத்தல்இ வாசிக்கவும் எழுதவும் பழக்குதல்.

அலகு 5

மொழி - விளக்கம் - மொழிக்குடும்பங்கள் - உலகச் செம்மொழிகள் - இந்தியச் செம்மொழிகள் - செம்மொழித் தகுதிகள் - வரையறைகள் - வாழும் தமிழ்ச் செம்மொழி - தமிழின் தொன்மை - தமிழின் சிறப்புகள் - தமிழ்ச் செம்மொழி நூல்கள் - தமிழ்ச் செம்மொழி அறிந்தேற்பு பரிதிமாற்கலைஞர் அவர்கள் முதல் கலைஞர் திரு.மு.கருணாநிதி அவர்கள் வரை (அறிஞர்கள் - அமைப்புகள் - நிறுவனங்கள் - இயக்கங்கள் தொடர் முயற்சிகள் - அறப்போராட்டங்கள் - உலகத் தமிழ்ச் செம்மொழி மாநாடு, கோவை 2010)

பார்வை :

தமிழ் இணையப் பல்கலைக்கழகச் சான்றிதழ்க் கல்வி பாடத்திட்டத்தில் உள்ள இரண்டாம் அலகு மற்றும் மூன்றாம் அலகுகளான முறையே இடைநிலை, மேல்நிலை ஆகியவை (www.tamilvu.org).

*****

பாரதிதாசன் பல்கலைக்கழகம், திருச்சிராப்பள்ளி - 620 024
(2016-17ஆம் கல்வியாண்டு முதல் சேர்க்கை பெறும் மாணாக்கர்களுக்கு)

மூன்றாம் பருவம்

சிறப்புத் தமிழ் - தாள் I
(Special Tamil – I)

(பத்து அல்லது பன்னிரண்டாம் வகுப்பு வரை தமிழ் படித்திருந்து **இளநிலைப் பட்டப்படிப்பில் (UG) பகுதி I இல் இதர மொழிப்பாடங்கள் படிக்கின்ற மாணவ / மாணவியர்** படிக்க வேண்டிய **சிறப்புத் தமிழ் முதலாம் தாளுக்குரியபாடத்திட்டம்.** இப்பாடத்திட்டப் பகுதிகள் பல்கலைக்கழக இளங்கலை முதலாமாண்டு செய்யுள் திரட்டு நூலை அடிப்படையாகக் கொண்டது.)

அலகு - I

பாரதியார் 1. செந்தமிழ்நாடு 2. புதுமைப்பெண்
பாரதிதாசன் 1. அழகு 2. தமிழனுக்கு வீழ்ச்சியில்லை
கவிமணி தேசிகவிநாயகம் பிள்ளை 1. சுகாதாரக்கும்மி
சுரதா 1. கலப்பை

அலகு - II

கவி காமு ஷெரீப் 1. நிலவே சொல் 2. அறிய முயல்
கண்ணதாசன் 1. நட்பு
வாணிதாசன் 1. வாழ்க இளம்பரிதி

அலகு - III

நாட்டுப்புறப்பாடல்கள் 1. தாலாட்டுப் பாடல் 2. ஒப்பாரிப் பாடல்

புதுக்கவிதைகள்
1. அப்துல் ரகுமான் - வெற்றி
2. அறிவுமதி - நட்புக்காலம்
3. ஆண்டாள் பிரியதர்ஷினி - நிலாச்சோறு
4. சிற்பி - ஓடு ஓடு சங்கிலி
5. தாமரை - தீர்ப்பு
6. மீரா - தலைகுனிவு
7. மேத்தா.மு - வெளிச்சம் வெளியே இல்லை
8. வைரமுத்து – ருசி

ஐக்கூ கவிதைகள்

1. அமுதபாரதி 2. அரிமதி இளம்பரிதி 3. அரிமதி தென்னகன்
4. அன்பாதவன் 5. இராசன்.எ.மு. 6. உயிர்வேலி ஆலா
7. கார்முகில் 8. செந்தமிழன் 9. புதுவை இளவேனில்
10. புதுவை தமிழ் நெஞ்சன்

அலகு - IV

சிறுகதை 1. **கைவண்ணம்...(தேர்ந்தெடுக்கப்பட்டசிறுகதைகள்)**
தொகுப்பாசிரியர் முனைவர் தங்க. செந்தில்குமார்
அய்யா நிலையம்,கதவு எண், 1603,
ஆரோக்கிய நகர்,ஐந்தாம் தெரு,E.B. காலனி,
நாஞ்சிக்கோட்டைச் சாலை, தஞ்சாவூர் - 613 006
விலை ரூ.70/-

அலகு - V

இலக்கிய வரலாறு 1. மரபுக் கவிதை 2. புதுக்கவிதை 3. சிறுகதை

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நான்காம்பருவம்

சிறப்புத் தமிழ் - தாள் II
(Special Tamil – II)

(பத்து அல்லது பன்னிரண்டாம் வகுப்பு வரை தமிழ் படித்திருந்து பகுதி I இல் இதர மொழிப்பாடங்கள் படிக்கின்ற மாணவ / மாணவியர் படிக்க வேண்டிய **சிறப்புத் தமிழ் இரண்டாம் தாளுக்குரிய பாடத்திட்டம்.** இப்பாடத்திட்டப் பகுதிகள் பல்கலைக்கழக இளங்கலை இரண்டாமாண்டு செய்யுள் திரட்டு நூலை அடிப்படையாகக் கொண்டது.)

அலகு – I

புறநானூறு
1. 'வள்ளியோர் படர்ந்து' எனத் தொடங்கும் பாடல் (பாடல் எண். 47)
2. 'நின்னயந்துறைஞர்க்கும்' எனத் தொடங்கும் பாடல் (பாடல் எண். 163)

குறுந்தொகை
1. 'வில்லோன் காலன கழலே' எனத் தொடங்கும் பாடல் (பாடல் எண். 07)
2. 'அகவன் மகளே! அகவன் மகளே' எனத் தொடங்கும் பாடல் (பாடல் எண். 23)

அலகு – II

சிறுபாணாற்றுப்படை (முழுவதும்)

அலகு – III

திருக்குறள்
1. புறங்கூறாமை (அதிகாரம் 19) 2. மானம் (அதிகாரம் 97)

நாலடியார்
1. 'அரும்பெறல்' எனத் தொடங்கும் பாடல் (பாடல் எண். 34)
2. 'கல்லாதுபோகிய நாளும்' எனத் தொடங்கும் பாடல் (பாடல் எண். 169)

அலகு – IV

சிலப்பதிகாரம் - அடைக்கலக் காதை **(பல்கலைக்கழக செய்யுள் திரட்டில் உள்ள பகுதி மட்டும்)**

கம்பராமாயணம் - குகப் படலம் **(பல்கலைக்கழக செய்யுள் திரட்டில் உள்ள பகுதி மட்டும்)**

அலகு – V

இலக்கிய வரலாறு - அற இலக்கியம்,
சங்க இலக்கியம்
காப்பிய இலக்கியம்

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SKILL BASED ELECTIVE PAPERS

(2016 onwards)

Updated on 19.02.2018

Sl. No.	Skill Based Elective Paper	Paper	Semester	Title of the Paper
1.	Clinical Microbiology	I	IV	Clinical Bacteriology
		II	V	Clinical Mycology and Virology
		III	V	Clinical Parasitology
2.	Computer Application	I	IV	Hardware Troubleshooting
		II	V	Ruby on Rails
		III	V	Web Services
3.	Customer Relationship Management	I	IV	Overview of Customer Relationship Management (CRM)
		II	V	CRM in Services Marketing & its Tools
		III	V	E – CRM (Virtual Marketing)
4.	Desktop Publishing	I	IV	Page Maker
		II	V	Corel Draw
		III	V	Dream weaver
5.	Herbal Medicine	I	IV	Ethno Medicine
		II	V	Pharmacognosy
		III	V	Herbs and Drug Action
6.	Journalism and Public Relations	I	IV	Journalism and Mass Media
		II	V	Reporting and Editing
		III	V	Public Relations
7.	Office Management	I	IV	Introduction to Office Management
		II	V	Office Management Tools
		III	V	Communication & Interpersonal Skills
8.	Sales and Marketing Management	I	IV	Introduction to Marketing Management
		II	V	Sales Management
		III	V	Retail Management
9.	Tourism and Travel Management	I	IV	Tourism and Travel Agency
		II	V	Cultural Tourism in India
		III	V	Tourism Product – 3
10.	Yoga and Stress Management	I	IV	Fundamentals of Yogic Practices
		II	V	Stress Management Through Yoga
		III	V	Asanas and Pranayamas – Practical
11.	அச்சு ஊடகங்கள்	I	IV	தமிழ் இதழியல் வரலாறு
		II	V	நாளிதழ் உருவாக்கமும் வடிவமைப்பும்
		III	V	இலக்கிய இதழ்கள்
12.	**Biotechnology**	I	IV	Aqua Culture
		II	V	Biofertilizer
		III	V	Mushroom Cultivation and Value Addition
13.	**Chemistry**	I	IV	Food and Nutrition
		II	V	Agricultural Chemistry
		III	V	Dyeing Techniques and Water Treatment

14.	**Electronics**	I	IV	Home Appliance Maintenance and Servicing
		II	V	Computer Hardware and Networking
		III	V	Mobile Servicing
15.	**Hotel Management and Catering Science**	I	IV	Hospitality Marketing
		II	V	Information Technology in Hotel Industry
		III	V	Information Technology in Hotel Industry (P)
16.	**Microbiology**	I	IV	Microbial Nanotechnology
		II	V	Diagnostic Microbiology
		III	V	Antimicrobial agents
17.	**Zoology**	I	IV	Apiculture
				Aquaculture
		II	V	Sericulture
				Poultry Farming
		III	V	Vermiculture
				Dairy farming

SKILL BASED ELECTIVE PAPERS
(2016 onwards)

Sl. No.	Skill Based Elective Paper	Paper	Semester	Title of the Paper
1.	அச்சு ஊடகங்கள்	I	IV	தமிழ் இதழியல் வரலாறு
		II	V	நாளிதழ் உருவாக்கமும் வடிவமைப்பும்
		III	V	இலக்கிய இதழ்கள்
2.	**Biotechnology**	I	IV	Aqua Culture
		II	V	Biofertilizer
		III	V	Mushroom Cultivation and Value Addition
3.	**Chemistry**	I	IV	Food and Nutrition
		II	V	Agricultural Chemistry
		III	V	Dyeing Techniques and Water Treatment
4.	Clinical Microbiology	I	IV	Clinical Bacteriology
		II	V	Clinical Mycology and Virology
		III	V	Clinical Parasitology
5.	Computer Application	I	IV	Hardware Troubleshooting
		II	V	Ruby on Rails
		III	V	Web Services
6.	Customer Relationship Management	I	IV	Overview of Customer Relationship Management (CRM)
		II	V	CRM in Services Marketing & its Tools
		III	V	E – CRM (Virtual Marketing)
7.	Desktop Publishing	I	IV	Page Maker
		II	V	Corel Draw
		III	V	Dream weaver
8.	**Electronics**	I	IV	Home Appliance Maintenance and Servicing
		II	V	Computer Hardware and Networking
		III	V	Mobile Servicing
9.	Herbal Medicine	I	IV	Ethno Medicine
		II	V	Pharmacognosy
		III	V	Herbs and Drug Action
10.	**Hotel Management and Catering Science**	I	IV	Hospitality Marketing
		II	V	Information Technology in Hotel Industry
		III	V	Information Technology in Hotel Industry (P)
11.	Journalism and Public Relations	I	IV	Journalism and Mass Media
		II	V	Reporting and Editing
		III	V	Public Relations
12.	**Microbiology**	I	IV	Microbial Nanotechnology
		II	V	Diagnostic Microbiology
		III	V	Antimicrobial agents

13.	Office Management	I	IV	Introduction to Office Management
		II	V	Office Management Tools
		III	V	Communication & Interpersonal Skills
14.	Sales and Marketing Management	I	IV	Introduction to Marketing Management
		II	V	Sales Management
		III	V	Retail Management
15.	Travel and Tourism Management	I	IV	Tourism and Travel Agency
		II	V	Cultural Tourism in India
		III	V	Tourism Product – 3
16.	Yoga and Stress Management	I	IV	Fundamentals of Yogic Practices
		II	V	Stress Management Through Yoga
		III	V	Asanas and Pranayamas – Practical
17.	**Zoology**	I	IV	Apiculture
				Aquaculture
		II	V	Sericulture
				Poultry Farming
		III	V	Vermiculture
				Dairy farming

YOGA AND STRESS MANAGEMENT

Skill Based Elective I (Semester-IV)

FUNDAMENTALS OF YOGIC PRACTICES

Unit I

Meaning and definition of Yoga – aims & objectives of yoga – misconception about yoga. Historical perceptive on yoga – yoga before the time of Patanjali (Indus valley civilization, Vedas, Brahmnas, Upanishads, Epics, Puranas). Contributions of Patanjali and Thirumular to yoga. Yoga practices and other systems of exercises.

Unit II

Schools of Yoga: Bhakthi Yoga, Jnana Yoga, Karma Yoga, Kundalini Yoga, Mantra Yoga, Hatha Yoga, Raja Yoga. Eight Limbs of Yoga: Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana & Samathi. General principles of practicing Asana, Pranayama, Meditation, Kriyas Bandhas and Mudra.

Unit III

Classification of Asanas - Meditative Asanas – Relaxative Asanas – Cultural Asanas. - safety measure and precautions while performing asanas. Pranayama – different phases in Pranayama practices: Puraka (Inhalation), Kumbhaka (Retention) and Recaka (Exhalation), - safety measures and precautions while performing pranayama. Meditation - Its techniques & benefits. Practicing methods and benefits of Kriyas, Bandha and Mudra.

Unit IV

Impact of Yoga on Muscular system, Respiratory System, Circulatory system, Nervous system, Digestive system and Endocrine system

Unit V

Yoga and development of Social qualities of personality – Co-operation – Simplicity – Tolerance – Social adjustments – Yoga and personal efficiency. Improvement of personal efficiency through yoga.

Reference

Author's guide, (2003). Yoga – The Science of Holistic living. Chennai: Vivekananda Kendra Prakashana trust

Chandrasekaran, K., (1999) Sound Health through Yoga. Sedapatti: Prem Kalyan Publications.

Maguire, Imelda., (2005) Yoga for a Healthy Body. London: Greenwich Editions.

Mariayyah, P., (2000). Suriyanamaskar. Perunthurai: Jaya Publishing House.

Tummers, Nanette. E., (2009) Teaching Yoga for Life. Champaign: Human Kinetics.

Skill Based Elective II (Semester V)

STRESS MANAGEMENT THROUGH YOGA

Unit I

Meaning and Definition of Stress. Types: Eutress, Distress, Anticipatory Anxiety, Intense Anxiety and Depression. Meaning of Management – Stress Management.

Unit II

Concept of Stress according to Yoga: Patanjali aphorism (PYS II - 3) Avidya Asmita. Bhagavad – Gita (Gita II 62-63) Dhayato Visayam Punsah … Yoga Vasistha and Upanishad.

Unit III

Physiology of Stress on: Autonomic Nervous System (ANS), Endocrine System, Hypothalamus, Cerebral Cortex and Neurohumours.

Unit IV

Mechanism of Stress related diseases: Psychic, Psychosomatic, Somatic and Organic phase. Role of Meditation & Pranayama on stress – physiological aspect of Meditation. Constant stress & strain, anxiety, conflicts resulting in fatigue among Executive. Contribution of Yoga to solve the stress related problems of Executive.

Unit V

Meaning and definition of Health – various dimensions of health (Physical, Mental, Social and Spiritual) – Yoga and health – Yoga as therapy. Physical fitness. Stress control exercise – Sitting meditation, Walking meditation, Progressive muscular relaxation, Gentle stretches and Massage.

Reference

Andrews, Linda Wasmer., (2005). Stress Control for peace of Mind. London: Greenwich Editions

Lalvani, Vimla., (1998). Yoga for stress. London: Hamlyn

Nagendra, H.R., and Nagarathana, R., (2004). Yoga perspective in stress management. Bangalore: Swami Vivekananda Yoga Prakashana.

Nagendra, H.R., and Nagarathana, R., (2004). Yoga practices for anxiety & depression. Bangalore: Swami Sukhabodhanandha Yoga Prakashana.

Sukhabodhanandha, Swami., (2002). Stress Management. Banglore: Prasanna trust.

Udupa, K.N., (1996). Stress management by Yoga. NewDelhi: Motilal Banaridass Publishers Private Limited.

Skill Based Elective III (Semester V)

ASANAS AND PRANAYAMAS – PRACTICAL

UNIT I

Meditative Asanas: 1. Sukhasana, 2. Siddhaasana (or) Siddhayoniasana, 3.Ardha Padmasana (or) Padmasana 4.Vajrasana **Relaxative Asanas** 5. Makarasana 6. Advasana 7. Matsya Kridasana 8. Shavasana,9. Jyestikasana

UNIT II

Cultural Asanas: 10.Tadasana, 11.Ardha Katti Chakarasana, 12. Pada Hastasana, 13. Utkattasana 14. Parivruthu Trikonasana, 15. Garudasana, 16. Bakasana, 17. Sithilai Tadasana 18. Ardha Chakrasana 19. Vrksasana 20. Trikonasana, 21. Natarajasana, 22. Virabhadrasana

Sitting Postures: 23. Machiyasana, 24. Sasangasana 25. Parvatasana, 26. Dandasana, 27. Janu Sirshasana 28. Ardha Padma Pachimottasana, 29. Ustrasana, 30. Baddha Padmasana,31.Tolasana 32. Tolangulasana, 33. Supta Vajrasana, 34. Vakrasana, 35. Ardha Sirsasana, 36. Baddha Konasana 37.Sithilai Dandasana, 38. Pachimottasana, 39. Ardha Ustrasana, 40. Yoga Mudra, 41. Saithalyasana 42. Gomukasana, 43. Veerasana, 44. Baddha Padmasana.

UNIT III

Prone Postures: 45. Bhujangasana, 46. Salabhasana, 47. Naukasana, 48 Ardha Salabasana, 49. Dhanurasana, 50.Sarpasana.

Supine Postures:

51. Navasana
52. Viparitha Karani
53. Uttana Padasana
54. Chakrasana
55. Tolangulasana
56. Matsyasana
57. Ardha Padma Halasana
58. Sethu Bandhasana
59. Pawanamuktasana
60. Padma sarvangasana
61. Halasana
62. Marjariasana
63. Sarvangasana
64. Ardha Hanlasana
65. Uttana Padasna

UNIT IV

Pranayamas

1.Suha Pranayama
2.Chandra Bhedana Pranayama
3.Sitkari Pranayama
4.Surya Bhedana Pranayama
5.Sitali Pranayama
6.Chandra Anuloma Viloma
7.Nadi Shodhana
8.Surya Anuloma Viloma Pranayama
9.Bharamari Pranayama

UNIT V

Preparation for Meditation, (sitting in meditative Asanas with Concentration on Tip of the Nose and Centre of eye brow) pranadarana (Body awareness) - Yoga Nidra.

Reference

Iyengar, BKS., (2003). The Art of Yoga. New Delhi: Harper Collins Publishers.

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Tummers, Nanette, E., (2009) Teaching Yoga for Life. Champaign: Human Kinetics.

Yogendra, Hansa Jayadeva and Desai, Armaiti Neriosand., (1991) Yoga for back and joint disorders. Mumbai: Dr.Jayadeva Yogendra for the yoga institute.

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI - 24.
UNDER GRADUATE DEGREE PROGRAMMES

SOFT SKILLS DEVELOPMENT

Learning Objective

Today's world is all about relationship, communication and presenting oneself, one's ideas and the company in the most positive and impactful way. This course intends to enable students to achieve excellence in both personal and professional life.

Unit I
Know Thyself/ Understanding Self
Introduction to Soft skills-Self discovery-Developing positive attitude-Improving perceptions-Forming values

Unit II
Interpersonal Skills/ Understanding Others
Developing interpersonal relationship-Team building-group dynamics-Net working-Improved work relationship

Unit III
Communication Skills / Communication with others
Art of listening-Art of reading-Art of speaking-Art of writing-Art of writing e-mails-e mail etiquette

Unit IV
Corporate Skills / Working with Others
Developing body language-Practising etiquette and mannerism-Time management-Stress management

Unit V
Selling Self / Job Hunting
Writing resume/cv-interview skills-Group discussion- Mock interview-Mock GD – Goal setting - Career planning

TEXT BOOKS:

Meena.K and V.Ayothi (2013) A Book on Development of Soft Skills (Soft Skills : A Road Map to Success), P.R. Publishers & Distributors, No, B-20 & 21, V.M.M. Complex, Chatiram Bus Stand, Tiruchirappalli- 620 002.
(Phone No: 0431-2702824: Mobile No: 94433 70597, 98430 74472)

Alex K. (2012) Soft Skills – Know Yourself & Know the World, S.Chand & Company LTD, Ram Nagar, New Delhi- 110 055.
Mobile No : 94425 14814 (Dr.K.Alex)

REFERENCE BOOKS:

(i) Developing the leader within you John c Maxwell
(ii) Good to Great by *Jim Collins*
(iii) The seven habits of highly effective people Stephen Covey
(iv) Emotional Intelligence Daniel Goleman
(v) You can win Shive Khera
(vi) Principle centred leadership Stephen Covey

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Bharathidasan University, Tiruchirappalli – 24

Gender Studies

Objectives

- To make boys and girls aware of each others strengths and Weakness.
- To develop sensitivity towards both genders in order to lead an ethically enriched life.
- To promote attitudinal change towards a gender balanced ambience and women empowerment .

Unit – I

Concepts of Gender: Sex – Gender – Biological Determinism – Patriarchy – Feminism – Gender Discrimination – Gender Division of labour – Gender Stereotyping – Gender Sensitivity – Gender Equity – Equality – Gender Mainstreaming - Empowerment.

Unit – II

Women's Studies vs Gender Studies : UGC's Guidelines – VII to XI Plans – Gender Studies : Beijing Conference and CEDAW – Exclusiveness and Inclusiveness.

Unit – III

Areas of Gender Discrimination : Family – Sex Ratio – Literacy – Health – Governance – Religion Work Vs Employment – Market – Media – Politics – Law – Domestic Violence – Sexual Harassment – State Policies and Planning .

Unit – IV

Women Development and Gender Empowerment : Initiatives – International Women's Decade – International Women's Year – National Policy for Empowerment of Women – Women Empowerment Year 2001 – Mainstreaming Global Policies .

Unit – V

Women's Movements and Safeguarding Mechanism : In India National /State Commission for Women(NCW) – All Women Police Station – Family Court – Domestic Violence Act – Prevention of Sexual Harassment at Work Place Supreme Court Guidelines – Maternity Benefit Act – PNDT Act – Hindu Succession Act 2005 – Eve Teasing Prevention Act – Self Help Groups – 73rd and 74th Amendment for PRIS

பாலின சமத்துவம்

அலகு - I

பாலினம் தொடர்பான கோட்பாடுகள் :பாலியல் - பாலினம் - உடற்கூறுரீதியாக நிர்ணயித்தல் - ஆணாதிக்கம் - பெண்ணியம் - பாலின பாகுபாடு – பாலின வேலைப்பாகுபாடு – பாலின ஒருபடித்தானவைகள் - பாலின உணர்வூட்டல் - பாலின சமவாய்ப்பு – பாலின சமத்துவம் - பாலின மையநீரோட்டமாக்கல் - அதிகாரப்படுத்துதல்

அலகு -II

மகளிரியல் Vs பாலின சமத்துவக்கல்வி – பல்கலைக்கழக மானியக்குழுவின் வழிக்காட்டுதல்கள் - ஏழாவது ஐந்தாண்டுதிட்டம் முதல் பதினோராவது ஐந்தாண்டுதிட்டம் - பாலின சமத்துவக்கல்வி : பெய்ஜிங் மாநாடு மற்றும் பெண்களுக்கு எதிரான அனைத்து வன்முறைகளையும் ஒழிப்பதற்கான சர்வதேச உடன்படிக்கை - இணைத்தல் /உட்படுத்துதல் - ஒதுக்கல் -

அலகு – III

பாலியல் பாகுபாட்டிற்கான தளங்கள் : குடும்பம் - பாலின விகிதாச்சாரம் - கல்வி – ஆரோக்கியம் - ஆளுமை –மதம் - வேலை Vs வேலை வாய்ப்பு – சந்தை – ஊடகங்கள் - அரசியல் - சட்டம் -குடும்ப வன்முறை –பாலியல் துன்புறுத்தல் - அரசு கொள்கைகள் மற்றும் திட்டங்கள் .

அலகு – IV

பெண்கள் மேம்பாடு மற்றும் பாலின சமத்துவ மேம்பாடு : முயற்சிகள் - சர்வதேச பெண்களுக்கான தசாப்தம் - சர்வதேச பெண்கள் ஆண்டு – பெண்களின் மேம்பாட்டிற்கான தேசிய கொள்கை – பெண்கள் அதிகார ஆண்டு 2001 – சர்வதேச கொள்கைகளை மைய நீரோட்டமாக்கல்

அலகு – V

பெண்கள் இயக்கங்கள் மற்றும் பாதுகாப்பு நிறுவன ஏற்பாடுகள் : தேசிய மற்றும் மாநில மகளிர் ஆணையம் - அனைத்து மகளிர் காவல் நிலையங்கள் - குடும்ப நீதி மன்றங்கள் - குடும்ப வன்முறையிலிருந்து பெண்களைப் பாதுகாக்கும் சட்டம் 2005 – பணியிடங்களில் பெண்கள் மீதான பாலியல் துன்புறுத்தல்களை தடுப்பதற்கான உச்சநீதிமன்ற வழிகாட்டுதல்கள் - தாய்சேய் சேமநலச்சட்டம் - பெண்சிசுவை கருவிலேயே கண்டறியும் தொழில் நுட்பம் (முறைப்படுத்துதல் மற்றும் தவறாக பயன்படுத்துதலை தடை செய்திடும்) சட்டம் - ஈவ்டீசிங் (பெண்களை தொல்லை செய்தல்) தடுப்புச்சட்டம் - சுய உதவிக் குழுக்கள் - பஞ்சாயத்து அமைப்புகளுக்கான 73வது மற்றும் 74வது சட்டத்திருத்தம்.

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22. பொன்.கிருஷ்ணசாமி,ஜே.பால் பாஸ்கர்&ஆ.ஜான் வின்சென்ட், பெண்களும் உச்ச நீதிமன்றமும், மதுரை :சோக்கோ வாசகர் வட்டம், 2004
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CODE OF CONDUCT FOR STUDENTS

1. Students should not leave the College premises during class hours without written permission of the Principal / Competent authority.
2. Students should be punctual in attending classes and other co-curricular and extra-curricular activities. Late comers will not be allowed in the class.
3. Students will be responsible for all equipment entrusted to them. Students should not cause any damage to any property, equipment, instruments, tools etc., of the College. An amount of Rs.150 towards General maintenance, is payable by each Student at the end of the Academic Year, prior to Examinations. In case of any damage, the actual cost will be recovered from the student along with a fine.
4. Students should take care of their belongings while within the campus. The College will not be responsible for any loss of such belongings.
5. Use of Mobile phones, Pagers, Cameras, etc., are prohibited inside the campus, during College hours, from 10am to 4pm. If found in contravention, they will be confiscated.

   Smoking and consumption of pan is prohibited inside the campus. Consumption of any intoxicants or drugs is totally prohibited, and will lead to immediate dismissal from the College.
6. Students should display their Identity Card prominently, while they are within the campus and while travelling in the College bus. The security staff will not permit any student inside the campus without their identity card.
7. All Students should dress in a presentable manner. T-shirts and sleeveless dresses are not permitted.
8. The management reserves the right to modify the class timings and schedule.
9. Students should not hold any meetings or collect any money from other students without proper permission from the Principal / HOD.
10. Students should not involve themselves in any political or religious activity inside the Campus.

    Ragging in any form is totally banned and is punishable as per the Government Order. If any student is found to be indulging in any sort of ragging or harassment to juniors or other fellow students, inside or outside the campus, bus, he/she will be dismissed immediately from the College, and criminal action will be taken against them as per the rules.
11. The following acts of misconduct will result in immediate dismissal from the College:

    (i) Assault of any person
    (ii) Willful damage to College property
    (iii) Intimidation, coercion and/or interference with other students
    (iv) Misbehavior with other students and/or Staff

12. The decision of the Principal decision is final and binding on all the students, in all matters pertaining to the College.
13. All other rules, regulations and guidelines prescribed by University / Government agencies will be implemented.
14. Attendance
    1. Absence from class without proper reason and without prior permission from the HOD is tantamount to breach of discipline and such absence will attract punishment and should be avoided. One period of absence in the forenoon or afternoon session will be treated as half a day of absence.
    2. Absence for more than 10 days without prior permission from the HOD may lead to removal from the nominal roll.
    3. Students appearing for the University examinations must have at least 80% of attendance as per the rules of the University. A minimum of 70% attendance is required to appear for examinations.

RULES OF CONDUCT AND DISCIPLINE

1. All students should conduct themselves with DECENCY, DECORUM and DIGNITY at all times and in all places.
2. Students must co-operate in protecting and taking care of all college property and equipments. They are expected to keep the building, playfield and their rooms neat and tidy.
3. Difficulties experienced by the students and suggestions for improving their welfare may be brought to the notice of the principal or any other staff member for consideration and necessary action.
4. Students who want to participate in matches and competitions not conducted by the college can do so only after getting the permission of the principal.
5. Students are forbidden from taking any part in political activities of any kind particularly those directed against the authority of the government.
6. Students who are found damaging college property will be expelled from the college. If any damage to the college property is caused by the student who is not identified minimum collective fine of Rs.100/- per student will be levied at the end of the year.

RULES REGARDING ATTENDANCE & LEAVE OF ABSENCE

1. A Candidates other then private one shall be required to put in seventy five percent to qualify for admission to any prescribed examination of the university.
2. If a student is absent for one or more hours during a session (Forenoon or afternoon) he/she will lose the attendance for half-a-day.
3. The Principal of the college shall have a power to condone shortage of attendance of students to be admitted for university examinations upto a maximum of a 10 percent, ie., nine days each semester on valid reasons as ill health etc., on payment of the prescribed condonation fee of Rs.500/-.

4. Statement of attendance of the students shall be displayed in the college notice board every month.
5. In case the shortage of attendance of a student exceeds the limit prescribed for purpose of condonation of attendance, he/she will not be presented to the University examinations.
6. A student will be given only one opportunity to carry forward the deficiency in attendance of one semester to the next semester during the degree course, failing which he/she will have to re-do the course.

DISCIPLINE REGULATIONS

The following rules shall be on force in the college as per the Tamilnadu Educational rules.

1. No Student who has been convicted of any offence in a criminal court will be allowed to continue his studies in the college.
2. Students should abstain from active participation in party or communal politics.
3. Students who indulge in political propaganda or who organize fellow students in to political factions in the premises of the college or who otherwise engage themselves in party politics are liable to be expelled from the college.
4. Principal or other constituted college authorities may frame and issue from time to time disciplinary rules of a permanent or temporary nature relating to the conduct, inside and outside the college premises, of students.
5. Principal and other constituted college authorities shall have full powers to inflict the following punishments in the interest of the students or of the institution concerned fine, denial of attendance, denial of terms certificates, suspensions and expulsion.
6. Students should not indulge in any activity leading to the disruption of peace and discipline and dislocation of normal work in the college premises. Those who are guilty of violation of this rule will be severely dealt with.
7. Ragging is strictly forbidden. Anyone who is guilty of ragging will be severely punished.
8. Students who are guilty of (a) rude language towards the staff of the college or (b) assault or attempt to assault the staff or fellow students of the college, will be expelled from the institution.

RAGGING – WARNING

- Ragging of any sort is banned.
- Ragging is illegal and punishable.
- Ragging in any form at any place in the college campus or outside is strictly prohibited.
- Ragging is punishable with imprisonment upto 7 years with a fine of Rs.25,000. Strict disciplinary action will be taken against any student found indulging in an act of ragging.

- Any complaint about ragging has to be reported to the respective HODs or authorities.
- Ragging of any sort will be informed to the Police authorities.

IDENTITY CARD

Every student will be provided with an identity card with his photo duly attested by the principal. Students are required to keep their identity card with them always.