Department of Chemistry

B.Sc Chemistry (3 years)/
B.Sc Chemistry (Honors) (4 years)/
B.Sc Chemistry (Honors with Research)(4 years)

CURRICULUM
FOR THE FIRST YEAR
(with effect from 2023-24)

- After successful completion of the programme, the degree will be awarded the following classification based on CGPA.
- For the first class with distinction the student should have passed all the courses on the first attempt and obtained a minimum CGPA of 8.25.

  For the first class, the student must have earned a minimum CGPA of 6.5 within four years from the time of admission.
- For the second class the student must have completed the course within six years from the time of admission.
- For the third class, the student must have completed the course after the sixth year from the time of admission.

Pattern of Question Paper (Theory):

All units carry equal marks i.e. 20 marks from each unit

Time 3 hours Max Marks: 100

Part – A (10 * 2 = 20 Marks)

(2 Questions from each unit) Theory

Part – B (5 * 16 = 80 Marks)

(1 Set from each Unit (Either or Pattern)

Marks secured by the candidate will be converted to 60 to make the aggregate 100 while adding with continuous Internal Assessment 40.

Department of Chemistry

B.Sc Chemistry (3 years)/
B.Sc Chemistry (Honors) (4 years)/
B.Sc Chemistry (Honors with Research)(4 years)

CURRICULUM FOR THE FIRST YEAR

(with effect from 2023-24)

Semester	Subject type	Subject Code	Title of the paper	Credit	IA	EA	Total
I	Multidisciplinary		Tamil – I	3	40	60	100
	Ability Enhancement		English I	3	40	60	100
	Major		Principles of Chemistry – I	5	40	60	100
	Minor		Applied Physics-I	4	40	60	100
	Valued added		Indian culture	1	10	-	100
	Valued added		Principles of Environmental Science	2	40	60	100
	Skill Enhancement		Major Practical – I Volumetric analysis	2	40	60	100
	Skill Enhancement		Applied Physics lab-I	2	40	60	100
				22			
II	Multidisciplinary		Tamil – II	3	40	60	100
	Ability Enhancement		English II	3	40	60	100
	Major		Principles of Chemistry – II	5	40	60	100
	Minor		Applied Physics-II	4	40	60	100
	Valued added		Computers for Chemists	2	40	60	100
	Valued added		Fundamentals of Cyber Security	1	10	-	100
	Skill Enhancement		Major Practical – II Organic and Physical Chemistry Lab	2	40	60	100
	Skill Enhancement		Applied Physics lab -II	2	40	60	100
				22			

Semester-I

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		Tamil -I	3	-	1	3

Objective:

பக்தி இலக்கியங்கள் வழி சமயச் சான்றோர்களின் கருத்துக்களை உணர்த்துதல்

புதுக்கவிதையின்மூலம் வாழ்வியல் விழுமியங்களை உணர்க்குகல்

இலக்கணமும் மொழித் திறனும் மொழியை பிழையின்றி பேச எழுத கற்க தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்த்துதல்

மாணவர்களின் வாசிப்பு திறனையும் படைப்புத் திறனையும் மேம்படுத்த சமூகப் பிரச்சனைகளை அறிய வைத்தல்

மொழியினைப் பிழையின்றி கற்பதற்கும் பிறத்துரைச் சார்ந்த கலைச் சொற்களையும் அறிய வைத்தல்

Outcome:

பக்தி இலக்கியங்கள் வழி பக்தி நெறிகளை உணர்ந்து கொள்ளுதல்

புதுக்கவிதையின் மூலம் வாழ்வியல் விழுமியங்களை உணர்ந்து கொள்ளுதல்

இலக்கணமும் மொழித்திறனும் மொழியை பிழையின்றிப் பேச எழுத கற்கத் தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்ந்து கொள்ளுதல்

மாணவர்களின் வாசிப்பு திறனையும் படைப்புத்திறனையும் மேம்படுத்த சமூகப் பிரச்சனைகளை அறிந்து கொள்ளுதல்

மொழினை பிழையின்றி கற்பதற்கும் பிற துறைச் சார்ந்த கலைச் சொற்களையும் அறிந்து கொள்ளுதல்

அலகு :-1 பக்தி இலக்கியம்

காஞ்சிமகாபெரியவர் - தெய்வத்தின் குரல் அறிமுகம் - விநாயகர் - தத்துவமயமானவிநாயகர் - பக்தி–பக்திசெய்வதுஎதற்காக - ஸ்ரீராமன் - அம்மா–குருபரம்பரை–சரணாகதியேமுக்கியம் - மஹான்கள் காட்டும் குருபக்தி–எழுத்துப் பணியில் விநாயகர் துணை - சைவசமயம் - திருக்குறிப்புத் தொண்டநாயனார் - சாக்கியநாயனார் - ஜயடிகள் காடவர் கோன் நாயனார் - வைணவசமயம் - பொய்கையாழ்வார் - சாக்தம் - காஞ்சிகாமாட்சிஅம்மன் - ஆதிசங்கரரும் காமாட்சிஅம்மனும்

அலகு: 2. இக்கால இலக்கியம்

தமிழ்த் தாய் வாழ்த்து- மனோன்மணியம் சுந்தரனார் போகின்ற பாரதமும் வருகின்ற பாரதம் , பாரதியார் வருகின்ற பாரதத்தை வாழ்த்துதல் தமிழின் இனிமை- பாரதிதாசன் , ஒரு கிராமத்து நதி - சிற்பி பாலசுப்ரமணியம் ,அனுபவம்- கண்ணதாசன், -**காடு-பழனிபாரதி**, சென்னிமலை கிளியோ பாத்ரா ஈரோடு தமிழன்பன் - தொழில் பாடல்கள் -கொண்டாட்டப் பாடல்கள் -வழிபாட்டு பாடல்கள்

அலகு- 3. இலக்கணம்

எழுத்தின் விளக்கம் - எழுத்தின் வகைகள் - வினா எழுத்துக்கள் – சுட்டெழுத்துக்கள் - வல்லினம் மிகும் இடங்கள் - வல்லினம் மிகா இடங்கள் - ஒலிப்பு மாறுபாடுகளும் பொருள் வேறுபாடுகளும் .

அலகு-4:. சிறுகதைமற்றும் நாவல்

செவ்வாழை- அறிஞர் அண்ணா , குலத்தங்கரை அரசமரம் - வ.வே.சு ஐயர்,*அகலிகை*- புதுமைப்பித்தன், தனிமை - ராஜம் கிருஷ்ணன் ,யாருக்காக அழுதான் ஜெயகாந்தன்

அலகு - 5:. மொழிப் பயிற்சி

பொருந்திய சொல்லைத் தேர்வு செய்தல் மரபுத்தொடர் நேர்காணல் கலைச்சொல் பிறமொழிச் சொற்களை நீக்கி எழுதுதல்

பாடநூல்:-

1. தெய்வத்தின் குரல் தொகுப்பாசிரியர் ரா கணபதி வானதி பதிப்பகம் சென்னை -17
2. பாரதியார் கவிதைகள் 2007 எட்டாம் பதிப்பு தென்றல் நிலையம்
3. சு சக்திவேல் நாட்டுப்புறவியல் ஆய்வு மணிவாசகர் பதிப்பகம் சிதம்பரம்
4. ரா வள்ளிக்கண்ணன் 1999 புதுக்கவிதையில் தோற்றமும் வளர்ச்சியும் நான்காம் பதிப்பு அகரம் வெளியீடு கும்பகோணம்
5. தமிழர் நாட்டுப் பாடல்கள் நியூ செஞ்சுரி புத்தக நிறுவனம்

பார்வை நூல்:-

1. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு நியூ செஞ்சுரி புக் ஹவுஸ் சென்னை
2. நாட்டுப்புறவியல் ஆய்வுவானமாமலை
3. சு சக்திவேல் மணிவாசகர் பதிப்பகம் பாரிமுனை சென்னை108
4. சிற்பி பாலசுப்ரமணியம் இருபதாம் நூற்றாண்டு தமிழ் கவிதைகள்
5. பாரதிதாசன் பாடல்கள் பாவை பப்ளிகேஷன்ஸ் சென்னை
6. அற இலக்கியத்தில் வாழ்வியல் விழுமியங்கள் செம்முதாய்பதிப்பகம் சென்னை

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		English –I	3	-	1	3

Objectives:

- To get inspiration from the life history of great scientists
- To get exposed to the genre of poetry
- To provide students with basic grammar of English
- To understand grammatically correct sentences and make use of it
- To groom the students to become a successful personality

Course Outcome:

Students will be able to:

- Read and interpret the text in English language
- Appreciate the poetic language.
- Comprehend the Basic English grammar and its usage.
- Write sentences without errors.
- develop an integrated sense of personal identity, a positive sense of self, and a personal code of ethics.

Unit I: Biography

1. Sir C.V. Raman
2. Srinivasa Ramanujan
3. APJ. Abdul Kalam

Unit II: Poetry

1. Edgar Allan Poe : Sonnet –To Science
2. Walt Whitman : When I heard the Learn'd Astronomer
3. Rudyard Kipling : The Secret of machine

Unit III: Basic Grammar - I

1. Articles
2. Pronouns –Personal & Impersonal
3. Adjectives
4. Synonyms & Antonyms
5. Sentence Structure

Unit IV: Basic Grammar - II

1. Tense forms
2. Idioms &Phrases
3. Suitability & Verbs
4. E-Mail
5. Patterns of Greeting

Unit V: Personality Development

1. Know your personality
2. Leadership qualities
3. Enhance your effectiveness
4. Career planning

5. Time management

Text Books:

1. Aggarwala, N.K. A Senior English Grammar and Composition. Chennai: Goyal Brothers Prakashan, 2014.
2. Rajiv K. Mishra. *Personality Development*. Delhi: Rupa Publications, 2004

Reference Books:

1. https://igniteindiaeducation.com/biography-of-dr-a-p-j-abdul-kalam/
2. https://www.britannica.com/biography/C-V-Raman
3. https://www.britannica.com/biography/Srinivasa-Ramanujan
4. Kurant, Wendy. Becoming America: An Exploration of American Literature from Precolonial to Post-Revolution. Georgia: University of North Georgia Press, 2019.

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		Principles of Chemistry – I	4	0	1	5

Objectives

- *To learn the basics of atomic structure, chemical bonding, and periodic classification of elements.*
- *To understand the chemistry of Benzene and Benzenoid compounds.*
- *To understand the properties of gaseous molecules.*

Outcome

- Understanding of classification and properties of elements.
- Knowledge of various types of chemical bonding.
- Understanding on properties of gaseous molecules.
- Skills in designing and synthesizing aromatic compounds.

Unit I: Electron occupancy and periodic properties **(15 hrs)**

Electron Occupancy Quantum numbers - Principal, azimuthal, magnetic and spin Quantum numbers - their significance governing the occupancy of electrons- Aufbau Principle- Hund's rule -Pauli's exclusion principle, (n+l) rule, stability of half-filled and fully filled orbitals- Classification as s, p, d & f block elements, variation of atomic volume, atomic and ionic radii, ionisation potential, electron affinity, and electro negativity along periods and groups – Variation of metallic characters - Factors influencing the periodic properties.

Unit II: Chemical Bonding **(15 hrs)**

Ionic bond - Lattice Energy - Born - Haber Cycle - Pauling and Muliken's Scales of electro negativity - Polarizing power and Polarisability - partial ionic character from electro negativity - Transitions from ionic to covalent character and vice versa - Fajan's rule. Theories of Bonding-Shapes of simple inorganic molecules based on VSEPR theory ($BeCl_2$, $SiCl_4$, PCl_5, SF_6, IF_7, NH_3, XeF_6, BF_3, H_2O) - VB Theory - Principles of hybridization - a structure of $BeCl_2$, NH_3, H_2O – Basics of MO Theory -Bonding and antibonding orbitals - Application of MO Theory to H_2, He_2, N_2, O_2, HF and CO - Comparison of VB and MO Theories -H - bonding-types.

Unit III: Gaseous state **(15 hrs)**

Maxwell's distribution of Molecular velocities (Derivation not required). Types of Molecular velocities – Mean, Most probable, and root mean square velocities. Graphical representation and its significance – Collision diameter, Mean free path, and collision number – Transport properties – Thermal conductivity, Viscosity, and Diffusion – Law of equipartition of energies – Degree of freedom. Molecular basis of Heat capacity – Real gases – van der Waal's equation of states – derivation – Significance of critical constants – Virial equations of state – Law of corresponding states – Compressibility factor.

Unit IV: Bonding in Organic Molecules **(15 hrs)**

Covalent Bonding: Catenation- Concept of Hybridization-Types of hybridization-sp^3, sp^2, and sp - Examples -CH_4, C_2H_4 and C_2H_2 bonding structures.

Electronic Effects: Inductive, mesomeric, electromeric, resonance, and hyperconjugative effects. Steric effect. Effect on the properties and reactivities of organic compounds. **Reactive Intermediates:** Structure and Stability-Types of organic reactions - General concept

of reactions. Substrate-Intermediate-TS energy profile diagram (Basic treatment) - Nomenclature of organic compounds.

Unit V: Chemistry of Hydrocarbons **(15 hrs)**

Petroleum source of alkanes – Methods of preparing alkanes and cycloalkanes -Mechanism of free radical substitution in alkanes by halogenation- chemical properties of cycloalkanes- Relative stability -Bayer's Strain theory and Sache Mohr Theory.
General methods of preparation of benzene – Chemical properties – Uses – Electrophilic substitution mechanism – Orientation and reactivity in substituted benzenes. Types of Polynuclear Aromatic compounds –Chemistry of Naphthalene- preparation and properties.

Text Books:

1. Puri B.R.., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993)
2. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997)
3. Puri B.R.., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993)

Reference Books:

1. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006)
2. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd. (1976)
3. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976)
4. Frank J. Welcher and Richard B. Hahn, Semi micro Qualitative Analysis, New Delhi, Affiliated East-west Press pvt. Ltd.(1969)

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		Applied Physics – I	3	0	1	4

Objective

- Gain knowledge in the elastic behaviour of a material and bending behaviour of beams and analyse the expression for young's modulus.
- Analyse waves and oscillations. Study the basic properties and production of Ultrasonics by different methods.
- Understand the basic principle of laser and characteristics. Understand the theory of types of lasers.
- Understand the basic concepts of optical fibres. Understand the applications part of optical fibre into communications systems.
- Learn the basic knowledge on the working of various semi-conductor devices and knowledge on basic digital electronic gates

Course Outcome:

- Understand the properties, elastic behaviour of a material and bending of beams and analyse the expression for young's modulus.
- Experience the diverse applications of acoustics and sound waves. Learn the basic properties and production of ultrasonic's by different methods.
- Have gained adequate knowledge on laser fundamentals types & applications
- Acquire basic knowledge on various types fiber and signal propagation through fiber optics.
- Understand the principles and concepts of Electronics, Electrical devices like PN Junction diodes, Zener diode as Peak Clipper and FET .

Unit 1:

Properties of matter

Elasticity - Stress – Strain – Hooke's law –Moduli of elasticity- Poisson's ratio- Elastic behaviour of Material – Factors affecting Elasticity – Young's modulus by cantilever-Non - uniform Bending

Unit 2:

Technical acoustics

Reverberation time - Acoustics of buildings – Reverberation, echo, creep, focusing, standing wave, Principles to be observed in the Acoustical design of an Auditorium – Noise Pollution – Absorption coefficient - Ultrasonics -Generation – Piezoelectric method –Applications of Ultrasonics in industries.

Unit 3:

Laser

Principles – Einstein theory of spontaneous and stimulated emission – Population inversion - Nd: YAG laser, CO_2 laser – Applications of Lasers in 3D profiling, computer peripherals such as CD-ROM.

Unit 4:

Fiber optics

Types of Optical Fibers – step index – graded index single mode – multiple mode fiber – acceptance angle – Numerical aperture – applications in engineering and medicine.

Unit 5:

Electronics

P-N Junction and P-N Junction Diode - Zener Diode – V-I Characteristics –Zener diode as Peak Clipper- Field Effect Transistors (FET) –Types – Junction Field Effect Transistor (JFET)– Static and Transfer Characteristics.

Text Books:

[1]. Venkatramanan, Raja, Sundarrajan, "Applied Physics for Engineers", SCITECH Publishers, 2011

[2]. R.K.Gaur & S.L.Gupta , "Modern Engineering Physics", Dhanpat Rai publications, 2011

[3]. A.S.Vasudeva, "Modern Engineering Physics", S.Chand & Company Ltd., 1999

[4]. Bhatacharya, Bhaskaran, "Engineering Physics", Oxford Publications, 2010

References:

[1]. Properties of Matter - D.S.Mathur. (Unit I), 2008

[2]. Sound - Brijilal & Subramanian. (Unit II), 1985

[3]. Engineering Physics - Rubhan Kumar. (Unit II & III)

[4]. Engineering Physics - M.N.Avadhanulu. (Unit II &III), 1992

[5]. Fiber Optics - R.Agarwal. (Unit IV), 2012

[6]. Basic Electronics (Solid State) – B.L Thereja (Unit V), 2007

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		Indian Culture – I	1	-	-	1

Objectives:

In an endeavour to understand theAncient Indian systems and Culture in all the parameters, this paper aims to create an awareness about the importance of early Indian systemsand traditions. The rich literary heritage of India and various scientific fields in which Indians have made their contributions included in this paper to draw linkages between modern science and rich Vedic scientific heritage.

Unit I

Introduction to Vedic Cultures; significance & how it is different from the other cultures. whywe have to follow? Important features.

Unit II

Literary Heritage of India – significance of Indian Literature; Chronology of Indian literature;Literature in Sanskrit and other Indian languages;

Unit III

Early Indian Education – significance & advantages. Gurukulas and Guru-sishya parampara. Learning methods. Evolution of script and languages; important early scripts and writing materials; important early educational centers (ghattikas, universities) & their unique features. Important personalities and their Contribution – Devarishies, Maharishies, Rishies, Seers and contribution of their institutions to protect the cultural heritage.

Unit IV

Scientific thoughts of Early Indian Sages;

Unit V

Importance and significance of Upavedas – Ayurveda, Dhanurveda, Gandhravaveda, stapatya &Arthasastra.

Reference Books

1. Joshi,K. 1992(rp). The Veda and Indian Culture. Rastriya Veda Vidya Pratishthana. NewDelhi.
2. Kangle, R.P. 1992 (rp). The Kautilya Arthasastra. Delhi.
3. Kulkarni, R.P. 1983. Geometry according to Sulba Sutra. Samsodhana Mandal. Pune.
4. Majumdar, R.C. 1994 (rp). Ancient India. Motilal Banarsidas Publishers. Delhi.
5. Patel, I.S. (ed). 1984. Science and the Vedas. Bombay.
6. Majumdar, R.C. 1996 (ed) (rp). The History and Culture of the Indian People. Vol I-IV.Bharatriya Vidya Bhavan. Mumbai
8. Radhakrishna, S. 1993(rp). Indian Philosophy. Vol I & II. Oxford University Press. Delhi.
9. Sri Chandrasekarendra Sarasvati Swamihi. 1991. The Guru Tradition. Bharatiya VidyaBhavan. Bombay.
10. Sri Jayendra Saraswatiji Maharaj. 1951. The Vedas and Vedangas. Prakashan Kendra.Lucknow. Winternize, M. 1996(rp). History of Indian Literature. Delhi.

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		Principles of Environmental Science	2	0	1	2

Objectives:

- **Foundational Understanding**: Introduce the fundamental components of the environment and its role in sustaining life, emphasizing the interconnectedness of natural systems.
- **Environmental Awareness:** Foster awareness of environmental issues, the reasons behind them, and different perspectives on the environment, including anthropocentric and ecocentric views.
- **Multidisciplinary Approach:** Highlight the multidisciplinary nature of environmental studies, emphasizing its scope and aims in addressing complex environmental challenges.
- **Sustainability Principles:** Introduce principles of sustainable development, focusing on the need to balance economic, social, and environmental factors for long-term well-being.
- **Resource Conservation and Pollution Control:** Define and classify natural resources and explore strategies for their conservation. Address various types of pollution, their causes, effects, and remedies to emphasize pollution control and mitigation.

Outcomes:

Upon completing the Environmental Science course, students should be able to:

- **Demonstrate Comprehensive Environmental Knowledge:** Understand and explain the fundamental components of the environment, various types of natural resources, and the multidisciplinary nature of environmental studies.
- **Recognize Environmental Issues**: Identify and analyze the causes and consequences of environmental problems, demonstrating an awareness of the need for environmental conservation and sustainability.
- **Evaluate Perspectives:** Compare and contrast anthropocentric and ecocentric views on the environment, and understand how ethical considerations play a crucial role in environmental decision-making.
- **Apply Sustainable Principles:** Apply principles of sustainable development to evaluate and propose solutions for environmental issues, considering economic, social, and environmental factors.
- **Resource Conservation:** Distinguish between different types of natural resources, assess the consequences of their depletion, and propose strategies for resource conservation.
- **Pollution Management:** Recognize, evaluate, and propose solutions for various forms of pollution, including air, water, soil, noise, nuclear, and thermal pollution.
- **Engage with Global Agreements:** Understand the significance of international environmental agreements and their role in addressing global environmental challenges.
- **Environmental Ethics and Social Awareness:** Apply principles of environmental ethics to make ethically informed decisions related to environmental issues and understand the social and ethical dimensions of environmental challenges.

Unit - 1: Introduction to environmental studies & Natural resources

Introduction to environment – components – nature of environment - need of awareness – reasons for environmental problems – anthropocentric and eco centric views. Environmental studies - multidisciplinary nature – scope and aim – sustainable development- principles – RRR concept-Indian environmental movements – environmental calendar.

Natural resources – definition – types – forest resources – uses –deforestation- reasons – effects. Water resources – dams – effects of dams - food resources – modern agriculture– ill effects of agrochemicals – integrated pest management- GMO- energy resources- types – hydel –nuclear – solar –wind and biomass energy.

Unit-2: Environmental Pollution

Pollution – definition – types – air pollution – causes and effects – effects of CO2 – CO – NOx –SOx – particulates – control of air pollution – water pollution – causes – effects – remedies – soil pollution – solid waste management – e waste – ill effects of e-waste – proper recycling- Noise pollution – reasons – effects – control – nuclear pollution – cases – effects and control –thermal pollution causes – effects and remedies.

Unit – 3: Social issues and environmental ethics

Present environmental scenario – greenhouse effect – climate change – The Kyoto Protocol- ozone layer depletion-The Montreal Protocol - acid rain – causes – effects - disparity among the nations – The Copenhagen UNFCCC summit – carbon currency- virtual water-genetically modified organisms, Disaster management. Environmental ethics – introduction – people getting affected - resettlement and rehabilitation.

Text Book

- Anubha Kaushik and C.P. Kaushik," Prospects of Environmental Science", New Age International publishers, 2013.

Reference books

- Environmental Studies, N. Nandini, N. Sunitha and Sucharita Tandon, Sapna Book House, 2007.
- Text book of Environmental Science, Ragavan Nambiar, Scitech Publications, 2009.
- Text book of Environmental Chemistry and Pollution Control, S.S.Dara, S.Chand and Co., 2002.
- Environmental Chemistry, Colin Baird, W.H.Freeman and company, New York,1999.
- Environmental Chemistry, Gary W. VanLoon and Stephen J.Duffy, Oxford University Press, 2000.
- New Trends in Green Chemistry, V.K. Ahluwalia and M. Kidwai, Anamaya Publishers, 2006.

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		Major Practical- I Volumetric analysis	-	3	-	2

MAJOR PRACTICAL – I- VOLUMETRIC ANALYSIS

I Titrimetric Quantitative Analysis

1. Estimation of HCl by NaOH using a standard oxalic acid solution
2. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 solution
3. Estimation of oxalic acid by $KMnO_4$ 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) by $KMnO_4$ using a standard oxalic acid solution.
6. Estimation of $KMnO_4$ by 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 Total Hardness of water
11. Estimation of chlorine in Bleaching Powder

Reference:

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

Scheme of Valuation	
Record	**10 marks**
Procedure Writing	**20 marks**
Experiment	**30 marks**
Calculation	**20 marks**
Results < 2 % - 10 marks 3 % - 8 marks 4 % - 6 marks 5 % - 4 marks >5 % - 2 marks	**10 marks**
Viva	**10 marks**
Total	**100 MARKS**

Semester-II

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		Tamil -II	3	-	1	3

Objective:

பக்தி இலக்கியங்கள் வழி சமயச் சான்றோர்களின் கருத்துக்களை உணர்த்துதல்

வாழ்வை மேம்படுத்தும் அற சிந்தனைகளை நீதி இலக்கியம் வழி உணர்த்துதல்

இலக்கணமும் மொழித் திறனும் மொழியை பிழையின்றி பேச எழுத கற்க தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்த்துதல்

மாணவர்களின் வாசிப்பு திறனையும் படைப்புத் திறனையும் மேம்படுத்த சமூகப் பிரச்சனைகளை அறிய வைத்தல்

மொழியினைப் பிழையின்றி கற்பதற்கும் ஒரு பொருள் குறித்த பல சொற்கள் பல பொருள் குறித்த ஒரு சொல் குறித்து அறிய செய்தல்

Outcome:

பக்தி இலக்கியங்கள் வழி பக்தி நெறிகளை உணர்ந்து கொள்ளுதல்

அற இலக்கியங்கள் வழி ஒழுக்கங்களை கற்றுக் கொள்ளுதல்

இலக்கணமும் மொழித்திறனும் மொழியை பிழையின்றிப் பேச எழுத கற்கத் தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்ந்து கொள்ளுதல்

அறிவியல் தமிழ் மற்றும் தனித்தமிழ் குறித்த அறிவையும் இணைய கல்வி குறித்து அறிவினையும் பெறுதல்

மொழினை பிழையின்றி கற்பதற்கும் பிற துறைச் சார்ந்த கலைச் சொற்களையும் அறிந்து கொள்ளுதல்

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
I		Applied Physics Lab - I	-	3	-	2

List of Experiments:

1. Torsional pendulum
2. Young's modulus – non uniform bending
3. Ultrasonic Interferometer
4. Determine wavelength of LASER source
5. Determine particle size - LASER
6. Optical Fibre – Numerical aperture & acceptance angle
7. p-n junction diode – V-I Characteristics
8. Zener diode - V-I Characteristics
9. Zener diode as peak clipper
10. Field Effect Transistors
11. Study of CRO

Text Books:

[1]. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, "A Textbook of Practical Physics", Sultan Chand & Sons, 2015

References:

[1]. C.C. Ouseph, U.J. Rao and V. Vijayendran, "Practical Physics and Electronics", S. Viswanathan Publishers, Pvt. Lt.d, 2011

[2]. K. Venkatramanan, M. Sundarrajan, R. Raja,"Experimental Physics for Engineers", SciTech Publications, Chennai, 2011

[3]. Harnam Singh, "B.Sc. Practical Physics", S. Chand Publishing, 2000

அலகு-1 பக்தி இலக்கியம்

தெய்வத்தின் குரல்-குரு பக்தி-குருகுல வாசம்-உலக படைப்பின் காரணம்-ஆச்சாரியா இலக்கணம்-குரு இலக்கணம்-சுவாமிநாதன் ஜனனம்-குருவிடம் சரணம்-13 வயதில் பீடாதிபதி-பட்டாபிஷேகம்-வித்வான்கள் மத்தியில்-எளியவரிடம் இரக்கம்-பைரவனின் பக்தி-யானையிடம் பரிவு-பெருமாளே சாட்சி-அமுதமாகும் மோர்-அன்னதான சிவன்-அகிம்சை முறையில் தயாரித்த பட்டு-அம்பாளின் வஸ்திரம்-கனகாபிஷேகம்-கௌமாரம் சமயம்-திருப்புகழ் அருணகிரிநாதர்- கணாபத்தியம்-விநாயகர் அகவல்கள்-சரஸ்வதி அந்தாதி கம்பர்

அலகு 2 அற இலக்கியம்

திருக்குறள் - நட்பு, கூடா நட்பு ,உழவு, மருந்து,
நாலடியார் - 1 ,29, 100, 125, 139
கொன்றைவேந்தன் - முதல் 20 பாடல்களுக்கு கதை எழுதுதல்
ஆசாரக்கோவை -10, 25

அலகு -3 இலக்கணம்

சொல் - இலக்கணம் வகைகள் - பெயர்ச்சொல் - வினைச்சொல் - இடைச்சொல் - உரிச்சொல்

அலகு-4 அறிவியல் தமிழ் மற்றும் கனித்தமிழ்

அறிவியல் தமிழின் வளர்ச்சி - தனித்தமிழ் வளர்ச்சி -தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்களை உருவாக்கும் - தமிழ் இணைய கல்விக் கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் -சொற்குவைத் திட்டம்

அலகு-5 மொழிப் பயிற்சி

இலக்கண குறிப்புகள் ஒரு பொருள் குறித்த பல சொற்கள் பல பொருள் குறித்த ஒரு சொல் அகர வரிசைப்படுத்துதல் ஒருமை பன்மை மயக்கம்

பாடநூல் :-

1. தெய்வத்தின் குரல் தொகுப்பாசிரியர் ரா கணபதி வானதி பதிப்பகம் சென்னை -17
2. பதினெண் கீழ்க்கணக்கு முல்லை நிலையம் 2009 பதிப்புசென்னை
3. ஸ்ரீ பெரியவாளின் ஆன்மீக அனுபவங்கள் கங்கா ராமமூர்த்தி அல்லயன்ஸ் கம்பெனி மைலாப்பூர் சென்னை - 4
4. கணினி தமிழ் முனைவர் இல சுந்தரம் விகடன் பிரசுரம்
5. வகைமை நோக்கி இலக்கிய வரலாறு நியூ செஞ்சுரி புக் ஹவுஸ் சென்னை

பார்வை நூல் :-

1. க. த. திருநாவுக்கரசு திருக்குறள் நீதி இலக்கியம் சென்னை பல்கலைக்கழகம் வெளியீடு
2. தமிழ் இலக்கிய வரலாறு ஜெயம் ஜனகா பதிப்பகம்
3. அற இலக்கியத்தில் வாழ்வியல் விழுமியங்கள் செம்முதாய்பதிப்பகம் சென்னை

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		English –II	3	-	1	3

Objectives:

1. To encourage the students to read English essays and appreciate it
2. To get inspiration from the great speeches by elite personalities
3. To enhance the language skills through literature
4. To be familiar with English grammar and its usage
5. To get the ability to construct grammatically correct and meaningful sentences

Outcomes:

Students will be able to:

- Read and appreciate the text in English language
- Present the ideas in their own words
- Comprehend the significance of literature in learning language
- Understand that grammar and vocabulary can create different meanings.
- Write and speak with proper usage of grammar.

Unit I: Prose

1. Stephen Leacock : My Lost Dollar
2. O.Henry : The Last Leaf
3. G.K.Chesterton : On Running after One's Hat

Unit II: Great Speeches

1. Steve Jobs : Stanford Commencement Address
2. Albert Einstein : The Common language of science
3. Bill Gates : The Future of Innovation

Unit III: One Act Play

Rabindranath Tagore : Chitra (A Play in One Act)

Unit IV: Grammar I

1. Relative pronouns
2. Adverbs
3. Prepositions
4. Phrasal verbs
5. Idioms

Unit V: Grammar II

6. Active Voice & Passive Voice
7. Infinitives & Gerunds
8. Conditionals
9. Collocations
10. American and British words

Book prescribed:

1. Aggarwala, N. K. *A senior English Grammar & Composition.* New Delhi: Goyal Brothers. 1995.
2. http://www.theatrehistory.com/plays/chitra001.html

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		Principles of Chemistry – II	4	0	1	5

Objectives

- *To learn the basics of Qualitative analysis, solid state, and colloids.*
- *To understand the chemistry of organic halogen compounds and phenols.*
- *To understand the basics of chemical kinetics and catalysis.*

Outcome

- *The students are expected to gain knowledge about Qualitative analysis, chemical kinetics and catalysis.*

Unit I: Stoichiometry and Redox reactions **(15 hrs)**

Covalency: Oxidation number, Oxidation state, stoichiometry, and its calculations, Limiting Reagents, Equivalent mass concept (Acid and Bases only) -Redox Reactions and their types-Half Reactions-oxidizing and reducing agents-Equivalent weight of oxidizing and reducing agents- Balancing Redox equations by oxidation number method-Ion electron method.

Unit II: Organohalogen Compounds **(15 hrs)**

Nomenclature – general methods of preparation of haloalkanes – physical and chemical properties – nucleophilic substitution mechanisms (S_N1, S_N2, and S_Ni) – evidence – stereochemical aspects of nucleophilic substitution mechanisms – Elimination reactions (E_1 and E_2) – Hoffmann Saytzeff rule-general methods of preparation of benzyl chloride – physical and chemical properties.

Unit III: Chemistry of Phenols and Ethers **(15 hrs)**

Preparation of phenols including di and tri hydric phenols – physical and chemical properties – uses –derivatives of phenol (aspirin, methyl salicylate, salol) - laboratory preparation of ethers, epoxides – 1,4 dioxane - physical and chemical properties – uses.

Unit IV: Solid state and Colloids **(15 hrs)**

Classification of solids – Laws of crystallography – representation of planes – Miller indices, space lattice, crystal systems – seven primitive, unit cells – X-ray diffraction – derivation of Bragg's equation – determination of structure of NaCl by Debye Scherrer (powder method) and rotating crystal method-Colloids-definition-classification – general methods of preparation (double decomposition, Mechanical dispersion methods only)–Purification-Mechanical, optical and electrical Properties of colloids –coagulation-peptization - gold number – applications of colloids.

Unit V: Chemical Kinetics and Catalysis **(15 hrs)**

Rate of reaction, average and instantaneous rates, rate equation, order of reaction. Rate laws: rate constants – derivation of rate constants and characteristics for zero, first, and second order (equal initial concentration) – derivation of half-life period.

Methods of determination of the order of reactions – half-life period and graphical method – experimental methods of determination of rate constant of a reaction – volumetry, manometry, polarimetry.

Effect of temperature on reaction rate - concept of activation energy, energy barrier, Arrhenius equation. Theories of reaction rates - collision theory - derivation of the rate constant of bimolecular gases reaction - failure of collision theory – Lindemann's treatment- Theory of absolute reaction rates. Catalysis –Introduction, types, and Examples.

Text Books:

1. Puri B.R.., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993)
2. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997)
3. Puri B.R.., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993)

Reference Books:

1. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006)
2. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd. (1976)
3. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976)
4. Frank J. Welcher and Richard B. Hahn, semi micro Qualitative Analysis, New Delhi, Affiliated East-west Press Pvt.Ltd.(1969)
5. R.D.Madan, Modern Inorganic Chemistry, S.Chand and Company Ltd., New Delhi.(2002)

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		Applied Physics – II	3	0	1	4

Objective:

- Properties and Synthesis of Nanomaterials
- Properties of para, dia, ferro, Ferri and antiferro magnetism
- Preparation, properties, and applications of SMA, Metallic glasses, and Biomaterials.
- Characteristics of special purpose diodes [PIN diode, Photo diode, LCD and LCD]
- IC Fabrication and Logic gatesSynthesis

Outcome:

- Understand the properties, Synthesis of nano materials and bending of beams, analyse Physical vapour deposition method and applications of nano materials
- Experience the diverse applications of Magnetic materials and properties. Learn the basic properties of dielectric materials
- Adequate knowledge on engineering materials, metallic glasses & superconductors
- Basic knowledge on various types of optoelectronic devices and applications
- Knowledge on the principles and concepts of Integrated circuits, Classification of ICs by Structure and function, linear and digital integrated circuits, fabrication of IC components

Unit 1: Nano Physics

Introduction to Nanomaterials - Quantum confinement – Properties of nanomaterials – Synthesis of nanomaterials – Top-down and bottom-up approach – Ball milling and Physical vapour deposition method – applications of nanomaterials – CNTs

Unit 2: Magnetism & Dielectrics

Types of Magnetic Materials (Dia, Para, and Ferro)– properties – Application- Floppy Disc - Dielectrics- Basic Definitions –Dielectric Breakdown – Dielectric loss– Internal field – Classius- Mossotti relation. Application of Dielectric materials

Unit 3: Engineering Materials

Introduction and Properties of Metallic glasses – Shape memory alloys – Bio materials - Superconductors- Introduction – Meissner effect – Type I & Type II superconductors – High Tc Superconductors

Unit 4: Optoelectronic Devices

Photomultiplier Tube –Photo Conductive cells – P-N junction Photodiode – PIN Photodiode- Avalanche Photodiodes - Light Emitting Diode (LED) –Liquid Crystal Display (LCD)

Unit 5: Integrated Circuits & Logic Gates

Introduction –Scale of Integration - Classification of ICs by Structure and Function – Linear and Digital Integrated Circuits- Fabrication of IC Components – Logic Gates- Positive and Negative Logic- The OR, AND, NOT Gates – Symbols and Truth Table for Logic Operations – Universal Gates – The NAND & NOR gates – Symbols and Truth Table for Logic operations

Text Books:

[1]. R.K.Gaur&S.L.Gupta, "Modern Engineering Physics", DhanpatRai publications, 2011

[2]. A.S.Vasudeva , "Modern Engineering Physics", S.Chand & Company Ltd. 1999

[3]. Bhatacharya, Bhaskaran, "Engineering Physics", Oxford Publications, 2010

[4]. Venkatramanan, Raja, Sundarrajan, "Applied Physics for Engineers", SciTech, 2011

References:

[1]. R.Murugesan, "Modern Physics", S. Chand (Unit I), 2011

[2]. M.N.Avadhanulu, "Engineering Physics", S. Chand (Unit II&III), 1992

[3]. P.K.Palanisamy, "Engineering Physics", Scitech Publications (Unit II &III), 2009

[4]. B.L Thereja, "Basic Electronics (Solid State)", S. Chand (Unit IV & V), 2007

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		Computers for Chemists	1	0	1	2

Objectives:

- To make the students familiar with the terms used in computers.
- To understand the utility and advantages of computers
- To furnish a comprehensive introduction to computers, covering both hardware and software aspects.
- To impart practical working knowledge and skills in using basic computer applications.
- To enable the students to create, format, and present information effectively using Microsoft Office applications
- To equip students with the skills needed to leverage software tools for various aspects of chemistry, from drawing molecular structures to conducting simulations and managing chemical databases

Outcome:

After finishing the course, the students are expected to

- Have a thorough understanding of the advantages and applications of computers
- Know how to create and edit Word documents, excel sheets, and PowerPoint presentations.
- Be familiar with the software applications relevant to chemistry and their usage.

Unit-1 – Introduction to computers

Computers – types – basic components and functions- Directories, input units, Output unit - Central Processing Units, -hardware, Software. types – OS – types of OS. Windows- Windows shortcut keys Creating Folder- MS-paint.

Unit-2 – Baics of MS-Office

MS WORD- Text Basics, Text Formatting, and saving files, Working with Objects, Header, and footers, working with bullets and numbered lists, Tables, Styles and Content, Merging Documents, Sharing and Maintaining Documents, Proofing the document, Printing.

MS EXCEL Introduction to Excel, Formatting Excel workbook, performing calculations with Functions, Sort and Filter Data with Excel, Creating Effective Charts to Present Data Visually.

MS POWERPOINT- Setting Up PowerPoint Environment, creating slides and applying themes, working with bullets and numbering, Working with Objects, Hyperlinks, and Action Buttons.

Unit-3 – Software for chemistry applications

Introduction of ChemDraw and Its Application, ChemDraw software overview. Chemical file formats- Distinguishing formats- Chemical Markup Language- Protein Data Bank Format, GROMACS format, CHARMM format, SMILES, MDL number. Open source software for chemical applications- Chemcraft – Chemsketch – Avogadro – Argus lab. Introductory concepts of cheminformatics.

Textbooks:

1. Ramesh Kumari, "Computers & Their Applications to Chemistry", Narosa Publishers,2020.
2. Pundir Bansal, "Computers for Chemist", Pragati Prakasan Publishers, 2010.
3. K.V. Raman, "Computers in Chemistry", McGraw Hill Education, 2002.

References:

1. Kishore Arora, "Computer Applications in Chemistry", Anmol Publishers, 2004.
2. Peter C. Jurs, "Computer Software Applications in Chemistry", John Wiley & Sons, 1996.

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		Fundamentals of Cyber Security	1	0	1	1

COURSE OBJECTIVES

- To introduce the basic concepts of cybersecurity
- To acquire knowledge on cyber threats and attacks
- To become aware of significant security technologies and tools
- To impart knowledge on cipher methods and cryptographic algorithms
- To gain knowledge about physical security and digital forensics

COURSE OUTCOMES

- Understand the basic concepts, needs, approaches, principles, and components of security.
- Explain the various cyber threats and attacks.
- Describe the various Security Technologies and Tools.
- Explain the basic principles of cryptography and algorithms.
- Able to explain the importance of digital forensics

UNIT – I INTRODUCTION TO CYBER SECURITY

Introduction – Need for Security – Security Approaches – Principles of Security - Components – Balancing Security & Access – Software Development Life Cycle.

UNIT – II CYBER SECURITY – THREATS & ATTACKS

Threats: Intellectual Property - Software Attacks – Deviations in QoS – Theft – Hardware Failures – Software Failures Attacks: Malicious Code – Hoaxes – Back Doors – Password Crack – Brute Force – Dictionary – DoS and DDoS – Spoofing.

UNIT – III SECURITY TOOLS & TECHNOLOGIES

Firewall and VPNs – Intrusion, Detection and Prevention Systems –Access Control – Firewalls – Protecting Remote Connections.

UNIT – IV CRYPTOGRAPHY

Cryptology Terminology - Cipher methods – Cryptographic Algorithms – Cryptographic tools –Attacks on cryptosystems

UNIT – V PHYSICAL SECURITY AND DIGITAL FORENSICS

Physical Access Controls – Fire Security and Safety – Failures of Supporting Utilities and Structural Collapse – Digital Forensics.

TEXT BOOKS:

1. Michael E. Whitman, Herbert J. Mattord," Principles of Information Security", CENGAGE Learning, 4th Edition, 2012.

REFERENCE BOOKS:

1. William Stallings," Cryptography and Network Security – Principles and Practice", Pearson Education, 7th Edition.2017.
2. Atul Kahate," Cryptography and Network Security", Mc Graw Hill, 4th Edition, 2019.

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		Major Practical – II Organic and Physical Chemistry Lab	-	3	-	2

MAJOR PRACTICAL – II

1. Chemical kinetics – Clock reaction rate calculation.
2. Chemical kinetics – clock reaction effect of temperature and E_a calculation.
3. Determination of solubility of oxalic acid – Titrimetric method.
4. Determination of equivalent weight of $KMnO_4$ – Titrimetric method
5. Colorimetry - Verification of Beer- Lambert's law.
6. Colorimetry – Determination of unknown concentration
7. Colorimetry - Determination of glucose (o-toluidine method)
8. Determination of saponification value of an oil.
9. Systematic analysis of a simple salt.
10. Determination of the acid number of an oil.

Scheme of Valuation	
Record	**10 marks**
Procedure Writing	**20 marks**
Experiment	**30 marks**
Calculation	**20 marks**
Results < 2 % - 10 marks 3 % - 8 marks 4 % - 6 marks 5 % - 4 marks >5 % - 2 marks	**10 marks**
Viva	**10 marks**
Total	**100 MARKS**

Semester	Sub. Code	Title of the Paper	L	P	T	Credits
II		Applied Physics Lab - II	-	3	-	2

List of Experiments:

1. Comparison of magnetic moments – Tan A & Tan B – Equidistance method
2. Comparison of magnetic moments – Tan A & Tan B – Null deflection method
3. Dielectric constant
4. Basic Logic gates
5. NAND – Universal building block
6. NOR – Universal building block
7. Determination of Particle size – LASER
8. Determination of wavelength of LASER
9. De-Morgan's theorem
10. Study of CRO

Text Books:

[1]. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, "A Textbook of Practical Physics", Sultan Chand & Sons, 2015

References:

[1]. C.C. Ouseph, U.J. Rao and V. Vijayendran, "Practical Physics and Electronics", S. Viswanathan Publishers, Pvt. Lt.d, 2011
[2]. K. Venkatramanan, M. Sundarrajan, R. Raja,"Experimental Physics for Engineers", SciTech Publications, Chennai, 2011
[3]. Harnam Singh, "B.Sc. Practical Physics", S. Chand Publishing, 2000

Semester	Part	Sub. Code	Title of the Paper	L	P	T	Credits
I/II/IV			Principles of Environmental Science	2	0	0	2

Course Objectives:

- ✓ ***Foundational Understanding***: Introduce the fundamental components of the environment and its role in sustaining life, emphasizing the interconnectedness of natural systems.
- ✓ ***Environmental Awareness:*** Foster awareness of environmental issues, the reasons behind them, and different perspectives on the environment, including anthropocentric and ecocentric views.
- ✓ ***Multidisciplinary Approach:*** Highlight the multidisciplinary nature of environmental studies, emphasizing its scope and aims in addressing complex environmental challenges.
- ✓ ***Sustainability Principles:*** Introduce principles of sustainable development, focusing on the need to balance economic, social, and environmental factors for long-term well-being.
- ✓ ***Resource Conservation and Pollution Control:*** Define and classify natural resources and explore strategies for their conservation. Address various types of pollution, their causes, effects, and remedies to emphasize pollution control and mitigation.

Learning Outcomes:

Upon completing the Environmental Science course, students should be able to:

- ✓ ***Demonstrate Comprehensive Environmental Knowledge:*** Understand and explain the fundamental components of the environment, various types of natural resources, and the multidisciplinary nature of environmental studies.
- ✓ ***Recognize Environmental Issues***: Identify and analyze the causes and consequences of environmental problems, demonstrating an awareness of the need for environmental conservation and sustainability.
- ✓ ***Evaluate Perspectives:*** Compare and contrast anthropocentric and ecocentric views on the environment, and understand how ethical considerations play a crucial role in environmental decision-making.
- ✓ ***Apply Sustainable Principles:*** Apply principles of sustainable development to evaluate and propose solutions for environmental issues, considering economic, social, and environmental factors.
- ✓ ***Resource Conservation:*** Distinguish between different types of natural resources, assess the consequences of their depletion, and propose strategies for resource conservation.
- ✓ ***Pollution Management:*** Recognize, evaluate, and propose solutions for various forms of pollution, including air, water, soil, noise, nuclear, and thermal pollution.
- ✓ ***Engage with Global Agreements:*** Understand the significance of international environmental agreements and their role in addressing global environmental challenges.
- ✓ ***Environmental Ethics and Social Awareness:*** Apply principles of environmental ethics to make ethically informed decisions related to environmental issues and understand the social and ethical dimensions of environmental challenges.

Unit - 1: Introduction to environmental studies & Natural resources

Introduction to environment – components – nature of environment - need of awareness – reasons for environmental problems – anthropocentric and eco centric views. Environmental studies - multidisciplinary nature – scope and aim – sustainable development- principles – RRR concept-Indian environmental movements – environmental calendar.

Natural resources – definition – types – forest resources – uses –deforestation- reasons – effects. Water resources – dams – effects of dams - food resources – modern agriculture– ill effects of agrochemicals – integrated pest management- GMO- energy resources- types – hydel –nuclear – solar – wind and biomass energy.

Unit-2: Environmental Pollution

Pollution – definition – types – air pollution – causes and effects – effects of CO_2 – CO – NOx – SOx – particulates – control of air pollution – water pollution – causes – effects – remedies – soil pollution – solid waste management – e waste – ill effects of e-waste – proper recycling- Noise pollution – reasons – effects – control – nuclear pollution – cases – effects and control –thermal pollution causes – effects and remedies.

Unit – 3: Social issues and environmental ethics

Present environmental scenario – greenhouse effect – climate change – The Kyoto Protocol-ozone layer depletion-The Montreal Protocol - acid rain – causes – effects - disparity among the nations – The Copenhagen UNFCCC summit – carbon currency- virtual water- genetically modified organisms, Disaster management. Environmental ethics – introduction – people getting affected - resettlement and rehabilitation.

Text Book

- Anubha Kaushik and C.P. Kaushik," Prospects of Environmental Science", New Age International publishers, 2013.

Reference books

- Environmental Studies, N. Nandini, N. Sunitha and Sucharita Tandon, Sapna Book House, 2007.
- Text book of Environmental Science, Ragavan Nambiar, Scitech Publications, 2009.
- Text book of Environmental Chemistry and Pollution Control, S.S.Dara, S.Chand and Co., 2002.
- Environmental Chemistry, Colin Baird, W.H.Freeman and company, New York,1999.
- Environmental Chemistry, Gary W. VanLoon and Stephen J.Duffy, Oxford University Press, 2000.
- New Trends in Green Chemistry, V.K. Ahluwalia and M. Kidwai, Anamaya Publishers, 2006.

Semester	Part	Sub. Code	Title of the Paper	L	P	T	Credits
			Fundamentals of Chemistry-I	3	0	1	3

Course Objectives:

- ✓ Understand bond types (ionic, covalent) and influencing factors.
- ✓ Explain molecular orbital theory, energy diagrams, and electron filling.
- ✓ Describe metallic bonding properties and coordination chemistry principles.
- ✓ Identify organic reaction types and mechanisms, including electrophilic substitution.
- ✓ Introduce photochemistry concepts and basics of electrochemistry.
- ✓ Introduce the utility of chemistry in various fields through the various industrial materials.

Course Outcomes:

- ✓ Differentiate between ionic and covalent bonds; predict bond types.
- ✓ Construct energy level diagrams, determine bond orders, and interpret molecular orbital diagrams.
- ✓ Discuss metallic bonding, merits/demerits, ligand classification, and chelation effects.
- ✓ Recognize various organic reaction mechanisms, particularly electrophilic substitution.
- ✓ Comprehend photochemistry principles and photoluminescence; grasp electrochemistry basics.
- ✓ Appreciate the value of chemistry as an applied subject and its inevitability.

Unit-I Chemical Bonding – I **(12 hrs)**

Types of bonds – ionic bond- factors favoring ionic bond - covalent bond – orbital overlap – linear combination of orbitals - σ and π bond formation – polarity in covalent molecules – Fajan's rule – effects of polarization -coordinate bond - simple examples. Molecular Orbital Theory – linear combination of orbitals –types of molecular orbitals- energy level diagrams- e^- filling in MO – bond order – MO diagrams of H_2, He_2, Li_2, Be_2, N_2 and O_2 molecules – mixing of orbitals – MO diagrams of CO, HF and NO molecules. Metallic Bond – properties of metals – free electron theory – merits and demerits – valence theory - band theory of solids (Primitive treatment only) – H-bonding – effects H bonding.

Unit-II Co-ordination Chemistry **(12 hrs)**

Co-ordination chemistry-definition of terms- classification of ligands-Nomenclature- Chelation-Examples. Chelate effect- explanation-Coordination chemistry -nomenclature of complexes - Werner, Sidgwick and Pauling theories–Chelation – examples of complexes- Prussian Blue, Haemoglobin , Chlorophyll -applications of coordination chemistry in qualitative and quantitative analysis.

Unit-III Fundamentals of reaction mechanism **(12 hrs)**

Homolytic and heterolytic fissions – types of organic reactions – types of attacking reagents – inductive, electromeric, resonance and hyper conjugation effects. Types of substitution reactions – S_N^1 and S_N^2 reactions – aromatic electrophilic substitution mechanism – Mechanism of nitration, halogenation, alkylation, acylation, sulphonation – elimination reactions – mechanism, examples. Addition reactions – types – nucleophilic and electrophilic additions-nucleophilic additions to alkenes – Markovnikov's rule – peroxide effect.

UNIT-IV Photochemistry and Electrochemistry **(12 hrs)**

Photo chemistry – Grotthus-Drapers law and Stark-Einstein's law of photochemical

equivalence. Quantum yield. Examples for photochemical reactions-Hydrogen- Chlorine reaction, photosynthesis. Phosphorescence, Fluorescence, Chemiluminesence and photosensitization - definitions with examples.

Electrochemistry: Ionic equilibria- strong and weak electrolytes, acid-base, common ion effect, pH, buffer solutions and buffer action in biological systems and salt hydrolysis. (Definitions, examples and equations only). (No derivations)

Unit-V Industrial chemistry **(12 hrs)**

Dyes – theory of colour and constitution - chromophore, auxochrome- classification of dyes – natural dyes (Indigo) – azo dyes (Methyl Orange, Bismark brown) – triphenyl methane dyes (Malachite Green, Crystal violet). Polymers- types- addition polymerization – mechanisms- preparation, properties and uses of PE,PU, PMMA and SBR. Fertilizers - micro and macro nutrients - urea, ammonium sulphate, ammonium nitrate, potassium nitrate NPK fertilizer – eutrophication- organic manures – compost, vermiculate.

Text Books:

1. Puri & Sharma – Principles of Physical Chemistry- Vishal Publishing Co, 42nd Edition, (2007).
2. Bahl & Arun Bahl,Principles of Organic Chemistry - S. Chand & Company, 16th edition, (2004).
3. Gopalan, R., Ramalingam, V. Concise Coordination Chemistry, Vikas Publishing House Pvt. Ltd. (2007).

Reference Books:

1. Jain & Jain –Dhanpat, Engineering Chemistry –Rai Publishing, 15th edition, (2008).
2. Asim. K.Das, Fundamental concept of Inorganic Chemistry –CBS publishers and Distributors, 2nd edition, (2010).
3. B.K. Sharma – Industrial Chemistry –Krishna Prakashan media (p) Ltd., 8th edition, (1996).

Semester	Part	Sub. Code	Title of the Paper	L	P	T	Credits
III			Fundamentals of Chemistry Laboratory - I	0	3	0	2

Course Objectives:

- ✓ Develop practical laboratory skills, including chemical analysis techniques.
- ✓ Understand chemical reactions, stoichiometry, and data interpretation.
- ✓ Learn to prepare and use standard solutions for accurate chemical analysis.
- ✓ Gain proficiency in titration methods, data analysis, and error estimation.
- ✓ Emphasize laboratory safety and responsible waste management.

Course Outcomes:

- ✓ Attain proficiency in laboratory techniques and equipment handling.
- ✓ Successfully perform acid-base, redox, and complexometric titrations.
- ✓ Interpret experimental data, calculate concentrations, and report results accurately.
- ✓ Apply stoichiometry to chemical reactions and determine chemical equivalence.
- ✓ Demonstrate a strong awareness of laboratory safety practices and waste disposal procedures.

ALLIED CHEMISTRY PRACTICALS

VOLUMETRIC ANALYSIS: (any 10)

1. Estimation of hydrochloric acid using standard Oxalic acid.
2. Estimation of Sodium hydroxide using standard Sodium carbonate
3. Estimation of Na_2CO_3 in washing soda
4. Estimation of Carbonate and bicarbonate in a mixture
5. Estimation of Ferrous Sulphate- standard Mohr's salt solution.
6. Estimation of Oxalic acid- standard Mohr's salt solution
7. Estimation of H_2O_2 – using standard oxalic acid
8. Estimation of MnO_2 in Pyrolusite
9. Estimation of hardness of water using EDTA.
10. Estimation of alkalinity of a water sample.

Reference Books:

1. Advanced Inorganic Practicals- Gurudeep raj , Krishna prakashan , 2nd edition, 2002.
2. Basic Principles of Practical Chemistry - A. R. Kulandaivelu, R. Veeraswamy, V. Venkateswaran – S.Chand & Sons, 2012.

Scheme of Valuation	
Record	**05 marks**
Aim &Tables (05 marks)	**20 marks**
Procedure (05 marks)	
Calculation (05 marks)	
Result (05 marks)	
Viva	**05**
UE	**30**
CIA	**20**
Total	**50 marks**

Semester	Part	Sub. Code	Title of the Paper	L	P	T	Credits
			Fundamentals of Chemistry-II	3	0	1	3

Course Objectives:

- ✓ Understand liquid properties, solutions, and their practical implications.
- ✓ Explore chemical kinetics, reaction rates, and the role of catalysts.
- ✓ Master stereochemistry, optical activity, and organic name reactions.
- ✓ Gain insights into biomolecules and industrial materials, including lubricants, adhesives, cement, and glass.

Course Outcomes:

- ✓ Describe liquid properties, solution behavior, and the mesomorphic state.
- ✓ Analyze reaction kinetics, activation energy, and catalyst mechanisms.
- ✓ Identify and classify stereoisomers, optical isomers, and understand name reactions.
- ✓ Explain the properties of biomolecules and the role of antineoplastic agents.
- ✓ Recognize the functions of lubricants, adhesives, and understand cement and glass production and applications.

Unit-I Liquid state and solutions **(12 hrs)**

General properties of liquids – vapour pressure- definition, measurement – Trouton's rule – surface tension – effect of T on surface tension – effects of surface tension – measurement – surfactants – viscosity- measurement of viscosity – effect of temperature, pressure on viscosity.Solutions - types - Liquid in Liquid - Raoult's law. Deviation from ideal behavior - Binary liquid mixtures- theory of fractional distillation – azeotropes. Mesomorphic state – compounds forming liquid crystals – types of liquid crystals – applications of liquid crystals.

Unit-II Chemical kinetics and catalysis **(12 hrs)**

Kinetics – terminology of kinetics - rate, law of mass action, rate law, order, molecularity, pseudo first order, half-life period -Determination of order – graphical, isolation and half-life time methods. Kinetics of zero, first and second order reactions (both cases) – kinetics of hydrolysis of ester (both acid and alkaline)activation energy – importance of E_a – Arrhenius equation (derivation not expected) .

Catalysis – requirements of a catalyst – types of catalysis and catalysts –theories of catalysis – enzyme catalysis –Fischer mechanism.

Unit-III Stereoisomerism and Name reactions **(12 hrs)**

Stereoisomerism – types – geometrical isomerism – optical activity- condition for optical activity – symmetry elements –chirality -optical isomerism –R,S notation - disastereomers – optical activity of lactic and tartaric acids- racemization. Name reactions - Mechanisms of aldol,Schmidt, Perkin, Knoevenagel, Cannizaro and benzoin condensation reactions.

Unit-IV Biomolecules **(12 hrs)**

Amino Acids- Classification – preparation, properties - preparation of peptides. Classification of proteins - Primary and secondary structures of proteins – biosynthesis of proteins (basic idea only) Carbohydartes – classification, preparation and properties of glucose and fructose- open ring structuresof glucose and fructose. Antineoplastic agents – cancer – types of tumour – causes for cancer – treatment methods (concepts only)-antineoplastic agents- alkaylating agents – cisplatin -

mode of action.

Unit-V Industrial materials **(12hrs)**

Lubricants – friction and wear – functions and types of lubricants –mechanism of lubrication – solid lubricants – selection of lubricants –cutting fluids. Adhesives – adhesive action- factors affecting the adhesion- classification of adhesives.Cement – manufacture of Portland cement – hardening of cement – Glass- manufacture – types (Soda –lime and Potash – lime glasses only) and their uses.

Text Books:

1. Puri & Sharma – Principles of Physical Chemistry- Vishal Publishing Co, 42nd Edition, (2007).
2. Bahl & Arun Bahl, Principles of Organic Chemistry - S. Chand & Company, 16th edition, (2004).
3. V.K.Ahluwalia, Drugs, Ane Books Pvt. Ltd. (2010).

Reference Books:

1. Jain & Jain –Dhanpat, Engineering Chemistry –Rai Publishing, 15th edition, (2008).
2. Asim. K.Das, Fundamental concept of Inorganic Chemistry –CBS publishers and Distributors, 2nd edition, (2010).
3. B.K. Sharma – Industrial Chemistry –Krishna Prakashan media (p) Ltd., 8th edition, (1996).

Semester	Part	Sub. Code	Title of the Paper	L	P	T	Credits
IV	III	PH4LC2	Fundamentals of Chemistry Laboratory - II	0	3	0	2

Course Objectives:

- ✓ Develop skills in detecting elements (N, S, Halogens) in organic substances.
- ✓ Learn to differentiate between aliphatic and aromatic compounds based on their properties.
- ✓ Acquire the ability to distinguish between saturated and unsaturated organic compounds.
- ✓ Conduct functional group tests for various organic functional groups and apply confirmatory tests for characterization.

Course Outcomes:

- ✓ Successfully detect N, S, and Halogens in organic compounds using chemical tests.
- ✓ Accurately categorize organic compounds as aliphatic or aromatic based on their properties.
- ✓ Identify the degree of saturation in organic compounds and classify them accordingly.
- ✓ Perform functional group tests and apply confirmatory tests for characterizing specific functional groups in organic substances.

ORGANIC ANALYSIS: systematic analysis of an organic substance

1. Detection of Elements (N, S, Halogens).
2. To distinguish between Aliphatic and Aromatic.
3. To distinguish between saturated and unsaturated.
4. (a) Functional group tests for phenols, acids (mono and di), aromatic primary amine, amide, diamide, carbohydrate, carbonyl compounds.
   (b) Functional group(s) to be characterized by confirmatory tests.

Reference Books:

1. Systematic Orangic Analysis, Gnanaprakasham, B.Viswanathan publishers, 1st edition, 1979.

Scheme of Valuation	
Record	**05 marks**
Organic Analysis	**20 marks**
Procedure (05 marks)	
Elements (05 marks)	
Aromatic/ Aliphatic (03 marks)	
Sat/Unsat (02 marks)	
Functional group (05 marks)	
Viva	**05 marks**
UE	**30 marks**
CIA	**20 marks**
Total	**50 marks**