Asian Educational Institute, Patiala

(An Autonomous College)

School of Science and Mathematics

SYLLABUS

B.Sc. (Hons.) Physical Sciences

MAJOR - CHEMISTRY

(Semester- I, II)

Session: 2024-25

Navneet Kaur

Semester-I

Type of Course	Course code	Course title	Teaching hrs	Credits
Major- Chemistry	BCHEM101T	Organic Chemistry	4 hrs per week	04
Major- Chemistry Lab	BCHEM101L	Chemistry Practical-I	2 hrs per week	01

Semester-II

Type of Course	Course code	Course title	Teaching hrs	Credits
Major- Chemistry	BCHEM102T	Inorganic Chemistry	4 hrs per week	04
Major- Chemistry Lab	BCHEM102L	Chemistry Practical –II	2 hr per week	01

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Adopted In Sem-2

(Semester I)
INORGANIC CHEMISTRY
Subject Code: BCHEM101T
(Major Theory)

Max Marks: 100
End Semester Exam: 70
Internal Evaluation: 30

Credits: 04
Total Teaching Hours: 50
Pass Marks: 40%
Exam Time Duration - 3 hrs.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of 2 marks each. Use of scientific non-programmable calculator is allowed.

INSTRUCTIONS FOR THE CANDIDATES

Students have to attempt four questions in all from Section – A and B by selecting two questions from each section. Section – C will be compulsory. Use of scientific calculator is allowed.

COURSE OBJECTIVE:

The aim of the course is to enhance the basic knowledge of students on the topics of the structure of atom, periodic properties, chemical bonding and its types and molecular interactions taking place in solids.

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Students will gain knowledge about the atomic structure, Schrodinger wave equation, quantum numbers, shapes of orbitals, rules governing the filling of electrons in orbitals and electronic configuration of elements and ions.
CO2	Students will gain knowledge about positioning of elements in the periodic table, Slater's rule, periodic properties such as ionisation energy, electron affinity, electronegativity and its calculations and chemical behaviour of elements.
CO3	Students will acquire knowledge of Valence Bond Theory, Hybridisation, shapes of molecules, VSEPR theory, Molecular Orbital theory, bonding in boranes and determination of percentage ionic character.
CO4	Students will learn about close packing in solids, ionic structures, coordination number, radius ratio rules, Born Haber cycle, Solvation power and Polarising power of ions by Fajan's rule.
CO5	Students will acquire knowledge of Metallic bonding, Electron Sea model, Valence bond theory of bonding in metals, Band theories (Band Model), Hydrogen bonding and Van Der waals interactions.

(Semester I)
INORGANIC CHEMISTRY
Subject Code: BCHEM101T
(Major Theory)

Max Marks: 100
End Semester Exam: 70
Internal Evaluation: 30

Credits: 04
Total Teaching Hours: 50
Pass Marks: 40%
Exam Time Duration - 3 hrs.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of 2 marks each. Use of scientific non-programmable calculator is allowed.

INSTRUCTIONS FOR THE CANDIDATES

Students have to attempt four questions in all from Section – A and B by selecting two questions from each section. Section – C will be compulsory. Use of scientific calculator is allowed.

COURSE OBJECTIVE:

The aim of the course is to enhance the basic knowledge of students on the topics of the structure of atom, periodic properties, chemical bonding and its types and molecular interactions taking place in solids.

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Students will gain knowledge about the atomic structure, Schrodinger wave equation, quantum numbers, shapes of orbitals, rules governing the filling of electrons in orbitals and electronic configuration of elements and ions.
CO2	Students will gain knowledge about positioning of elements in the periodic table, Slater's rule, periodic properties such as ionisation energy, electron affinity, electronegativity and its calculations and chemical behaviour of elements.
CO3	Students will acquire knowledge of Valence Bond Theory, Hybridisation, shapes of molecules, VSEPR theory, Molecular Orbital theory, bonding in boranes and determination of percentage ionic character.
CO4	Students will learn about close packing in solids, ionic structures, coordination number, radius ratio rules, Born Haber cycle, Solvation power and Polarising power of ions by Fajan's rule.
CO5	Students will acquire knowledge of Metallic bonding, Electron Sea model, Valence bond theory of bonding in metals, Band theories (Band Model), Hydrogen bonding and Van Der waals interactions.

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Section-A

8 Hrs.

Atomic Structure

Bohr's Theory and its limitations, Idea of de Broglie matter waves, Heisenberg uncertainty principle and its significance, atomic orbitals, Schrodinger wave equation, significance of, Ψ and Ψ^2, quantum numbers, shapes of *s, p, d* orbitals. Normalized and orthogonal wave functions. Aufbau Principle, Pauli exclusion principle, and Hund's rule of maximum multiplicity. Electronic configurations of some elements (first 30 elements of modern periodic table). Variation of orbital energy with atomic number.

12Hrs.

Periodic Properties

Position of elements in the periodic table, effective nuclear charge and its calculations, shielding or screening effect, Slater's rules, variation of effective nuclear charge in periodic table, Atomic and ionic radii (Van Der Waals), trends in atomic and ionic radii, ionization energy, Successive ionization energies and factors affecting the ionization energy. Applications of ionization energy, electronic affinity and electronegativity. Electronegativity - Pauling's, Mulliken's, Allred-Rachow's. Sanderson's and Mulliken-Jaffe's electronegativity scales.

5 Hrs.

s-Block Elements

General electronic configurations, Comparative study, diagonal relationships, solvation and complexation tendencies including their functions in biosystems.

5 Hrs.

Chemistry of Noble gases

Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

Section-B

20Hrs.

Chemical Bonding - I

Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Born-Haber cycle and its applications, solvation energy.

Covalent Bond: Lewis structure, Valence bond theory, energetics of hybridization, Equivalent and Non-equivalent hybrid orbitals. Bent's rule, resonance and resonance energy, Molecular Orbital Theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbital interaction to be given).

Chemical Bonding - II

Valence shell electron pair repulsion (VSEPR) theory, shapes of simple molecules and ions containing lone pairs and bond pairs of electrons (NH_3, H_3O^+, SF_4, ClF_3, ICl_2, and H_2O). Covalent character in ionic compounds, polarizing power and polarizability. Fajan' s rules and consequences of polarization. Covalent Bond-Valence bond theory and its limitations, various types of hybridization and shapes of simple inorganic molecules and ions. BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7, $SnCl_2$, XeF_4, BF^-_4, PF^-_6, $SnCl^{-2}_6$.

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BOOKS PRESCRIBED:

1. Inorganic Chemistry, Weller, Overton, Rourke and Armstrong, 7th Ed. Oxford University Press,2014.
2. Concise Inorganic Chemistry, J. D. Lee, 5th Ed., Wiley India,2008.
3. Advanced inorganic Chemistry, F. Albert Cotton, Geoffrey Wilkinson 6th Ed.,Wiley,1999.
4. Inorganic Chemistry: Principles of Structure and Reactivity, James E. Huheey 4th Ed., Pearson,2006.

(Semester I)
ORGANIC CHEMISTRY
(Major Theory)
Subject Code: BCHEM101T

Max Marks: 100
End Semester Exam: 70
Internal Evaluation: 30

Credits: 04
Total Hours: 50
Pass Marks: 40%
Exam Time Duration - 3 hrs.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of 2 marks each. Use of scientific non-programmable calculator is allowed.

INSTRUCTIONS FOR THE CANDIDATES

Students have to attempt four questions in all from Section – A and B by selecting two questions from each section. Section – C will be compulsory. Use of scientific calculator is allowed.

COURSE OBJECTIVES:

1. *To expand the knowledge of basic concepts in organic chemistry.*
2. *To know the structure and formation of all the intermediates involved in chemical reaction.*
3. *An understanding of the stereochemistry of organic compounds.*

COURSE OUTCOMES:

Sr. No.	On completing the course
CO1	Students will understand the basics of Organic chemistry starting from bonding in organic compounds and notations in a reaction/ reaction mechanism.
CO2	Students will be able to identify the type of organic reaction, properties and structures of reactive intermediates involved in mechanisms.
CO3	Students will learn to understand the Stereochemistry of organic compounds.
CO4	Students will know the methods of preparation and chemical as well as physical properties of Alkanes, Alkenes, Alkynes.

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Section-A

Structure and Bonding **5 Hrs.**

Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Van der Waals interactions, resonance, Electronic displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications. Hydrogen bonding. Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternate hydrocarbons. Huckel's rule, anti-aromaticity, homo-aromaticity, non-aromatic, Quasi-aromatic, Craig's rule, Annelation effect.

Mechanism of Organic Reactions **10 Hrs.**

Homolytic and heterolytic bond fission with suitable examples. Curved arrow notation, drawing electron movements with half- headed and double headed arrows, Types of reagents of organic reaction. Nucleophilicity and Basicity. Types of reagents-electrophiles and nucleophiles. Energy considerations. Reactive intermediates - carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (intermediates & isotope effect).

Stereochemistry of Organic Compounds **10 Hrs.**

Concept of isomerism.Types of isomerism. Optical isomerism, elements of symmetry.molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diasteremers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism–determination of configuration of geometric isomers. E and Z system of nomenclature. Conformational isomerism–conformational analysis of ethane and n – butane; conformation of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

Section-B

Alkanes **5Hrs.**

Alkanes- Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Alkenes **5Hrs.**

Alkenes- Nomenclature of alkenes-methods of formation, mechanisms and dehydration of alcohols and dehydrohalogenation of alkyl halides regioselectivity in alcohol dehydration. The Saytzeff's rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions. Markownikoff's rule, hydroboration-oxidation, oxymercuration reduction. Epoxidation, ozonolysis.

Cycloalkanes **5 Hrs.**

Cycloalkanes - nomenclature, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strain less rings. The case of cyclopropane ring: banana bonds.

Dienes **5 Hrs.**

Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions - 1,2 and 1,4 additions, Diels-Alder reaction.

Alkynes **5 Hrs.**

Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions hydroboration-oxidation. metal-ammonia reductions.

BOOKS PRESCRIBED:

1. Organic Chemistry, J. Clayden, N. Greeves, S. Warren, 2nd Ed., Oxford university Press.2012.
2. Advanced Organic Chemistry, F. A. Carey, R. J. Sundberg, 2nd Ed., Springer, 2007.
3. Organic Chemistry by T. W. G. Solomons, 10th Ed., Wiley, 2024.
4. Advanced Organic Chemistry by Jerry march, 4th Ed., Wiley, 2015.

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(Semester I)

CHEMISTRY PRACTICAL - I

SUBJECT CODE: BCHEM101L

(MAJOR PRACTICAL)

Max Marks: 50 **Credits: 01**

End Semester Practical Exam: 35 marks **Exam Time Duration: 3 hrs.**

Internal Evaluation: 15marks **Total Hours: 28**

Pass Marks: 40%

INSTRUCTIONS FOR THE PAPER SETTERS EXAMINERS/CANDIDATES

The Practical Examinations will be held in morning (one day) and morning session will be of 3 hours duration. During this session students will perform the following type of experiments:

(a) semi micro analysis along with

(b) crystallization of the given sample.

Paper setter will enlist five different mixtures and the examiner will randomly distribute these mixtures amongst the students. Each candidate will analyze one mixture along with crystallization of the given sample. Students are permitted to consult the books for the scheme of tests for semi-micro analysis.

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Students will gain knowledge about semi micro analysis.
CO2	They will learn about cationic analysis, separation and identification of ions from groups I, II, III, IV, V, VI.
CO3	They will also learn about anionic analysis.
CO4	Students will learn about the technique for determination of melting points of various compounds.
CO5	They will additionally learn about the technique for determination of boiling points of various compounds.

Semi-micro analysis:

1. Cation analysis, separation and identification of ions from Groups I, II, III, IV, V and VI. Anion analysis (2 cations and 2 anions with no interference). 15 Marks
2. Crystallization:
   (i) Phthalic acid from hot water Acetanilide from boiling water
   (ii) Naphthalene from ethanol
   (iii) Benzoic acid from water. 05marks
3. Viva- Voce 10 Marks
4. Practical Note Book: 05 Marks

BOOKS PRESCRIBED:

1. Salts and Their Reactions a Class-Book of Practical Chemistry, D. Leonard, Forgotten Books,2009.
2. A Systematic Qualitative Chemical Analysis a Theoretical and Practical Study of Analytical Reactions of the More, Common Ions of Inorganic Substances, 1992, Forgotten Books.
3. Salt Analysis Chart by Sibaji Sarka, 2017.
4. Physical Chemistry Laboratory Manual - An Interdisciplinary Approach 1 Edition, A. Anand, R. Kumari, 1st Ed., 2020, Dreamtech Press.

Semester I
(Minor Theory)
BASIC INORGANIC CHEMISTRY
Paper Code: BCHEM101T

Max Marks: 100
End Semester Exam: 70
Internal Evaluation: 30

Credits: 04
Total load: 50Hours (4 hours/week)
Pass Marks: 40%
Exam Time Duration – 3hrs.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 10 marks each. Section C will consist of 10 short answer questions that will cover the entire syllabus and will be of 1 mark each. Use of scientific non-programmable calculator is allowed.

INSTRUCTIONS FOR THE CANDIDATES

Students have to attempt four questions in all from Section – A and B by selecting two questions from each section. Section – C will be compulsory. Use of scientific calculator is allowed.

COURSE OBJECTIVES:

The aim of the course is to enhance the basic knowledge of students on the topics Atomic structure, periodic properties, S-block elements, p-block elements and chemical bonding.

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Students will gain knowledge about the atomic structure, Schrodinger wave equation, quantum numbers, shapes of orbitals, rules governing the filling of electrons in orbitals and electronic configuration of elements and ions.
CO2	Students will gain knowledge about positioning of elements in the periodic table, slater's rule, periodic properties such as ionisation energy, electron affinity, Electronegativity and its calculations and chemical behaviour of elements.
CO3	Students will acquire knowledge of Valence Bond theory, Hybridisation, shapes of molecules, VSEPR theory, MO theory, bonding in boranes and determination of percentage ionic character.
CO4	Students will learn about close packing in solids, ionic structures, coordination number, radius ratio rules, Born Haber cycle, Solvating power and Polarising power of ions by Fajan's rule.
CO5	Students will acquire knowledge of Metallic bonding, Electron Sea model, Valence bond, Band theories, Hydrogen bonding and Vander wall interactions.
CO6	Students will be able to understand the physical and chemical properties of s-block, p- block and d-block elements.

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Section-A

Atomic Structure **10 Hrs.**

Bohr's Theory and its limitations, Idea of de Broglie matter waves, Heisenberg uncertainty principle and its significance, atomic orbitals, Schrodinger wave equation, significance of, Ψ and Ψ^2, quantum numbers, shapes of *s, p, d* orbitals. Normalized and orthogonal wave functions. Aufbau Principle, Pauli exclusion principle, and Hund's rule of maximum multiplicity. Electronic configurations of some elements (first 30 elements of modern periodic table). Variation of orbital energy with atomic number.

Periodic Properties **10Hrs.**

Position of elements in the periodic table, effective nuclear charge and its calculations, shielding or screening effect, Slater's rules, variation of effective nuclear charge in periodic table, Atomic and ionic radii (Van Der Waals), trends in atomic and ionic radii, ionization energy, Successive ionization energies and factors affecting the ionization energy. Applications of ionization energy, electronic affinity and electronegativity. Electronegativity - Pauling's, Mulliken's, Allred-Rachow's, Sanderson's and Mulliken-Jaffe's electronegativity scales.

s-Block Elements **5 Hrs.**

General electronic configurations, Comparative study, diagonal relationships, solvation and complexation tendencies including their functions in biosystems.

Section-B

Chemical Bonding - I **15Hrs.**

Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Born-Haber cycle and its applications, solvation energy.

Covalent Bond: Lewis structure, Valence bond theory, energetics of hybridization, Equivalent and Non-equivalent hybrid orbitals. Bent's rule, resonance and resonance energy. Molecular Orbital Theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbital interaction to be given).

p–Block Elements **10Hrs.**

Comparative study (including diagonal relationship) of groups 13-17 element , compounds like Hydrides of boron like; diborane and Higher boranes, borazine, borohydrides, fullerenes, Carbides, fluorocarbons, silicates (structural principle), tetrasulphurtetranitride, basic properties of halogens, interhalogens and polyhalide, Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

BOOKS PRESCRIBED:

1. Inorganic Chemistry, Weller, Overton, Rourke and Armstrong, 7th Ed. Oxford University Press.
2. Concise Inorganic Chemistry, J. D. Lee, 5th Ed., Wiley India, 2008.
3. Advanced inorganic Chemistry, F. Albert Cotton, Geoffrey Wilkinson 6th Ed.,Wiley.
4. Inorganic Chemistry: Principles of Structure and Reactivity, James E. Huheey 4th Ed., Pearson, 2006

(Semester-I)
(Minor Practicals)
INORGANIC PRACTICAL CHEMISTRY
SEMESTER- I
PAPER CODE: BCHEM10[illegible]L

Max Marks: 25 **Credits: 01**

End Semester Exam: 15 **Exam Time duration: 3 hrs.**

Internal Evaluation: 10 **Total Hours: 2 hours/week**

Pass Marks: 40%

INSTRUCTIONS FOR THE PAPER SETTERS EXAMINERS/CANDIDATES

The Practical Examinations will be held in morning (one day) and morning session will be of 3 hours duration. During this session students will perform the following type of experiments:

(a) Physical Chemistry Practical
(b) Organic Chemistry Practical

Paper setter will provide a list of three experiments and the examiner will allot one experiment randomly to each candidate. Each candidate will write theory, brief procedure and general calculations of the experiment in the first 10 minutes and thereafter perform the actual experiment.

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Students will gain knowledge about general parameters used in water analysis..
CO2	They will learn about Titration used in chemical analysis.
CO3	They will also learn about oxidizing and reducing agents used in analysis.
CO4	Students will learn about the techniques used chemical analysis.

Practical Description

1. To determine the pH, acidity and alkalinity of different water samples.
2. Estimation of iron (II) using standardize $KMnO_4$.
3. Estimation of oxalic acid using standardize $KMnO_4$.
4. Estimation of oxalic acid and sodium oxalate in a given mixture using standardize $KMnO_4$.
5. Estimation of iron (II) with standardize $K_2Cr_2O_7$ using internal (Diphenylamine).

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Details of Distribution of marks

1. Physical Chemistry experiments:	10 Marks
I. Initial Write up	05marks
II. Performance of Experiment	05marks
2. Viva- Voce	03 Marks
3. Practical Note Book:	02 Marks

BOOKS PRESCRIBED:

1. Salts and Their Reactions a Class-Book of Practical Chemistry, D. Leonard, Forgotten Books, 2009.
2. A Systematic Qualitative Chemical Analysis a Theoretical and Practical Study of Analytical Reactions of the More, Common Ions of Inorganic Substances, Forgotten Books, 1992.
3. Salt Analysis Chart, Sibaji Sarka, 2017.
4. Physical Chemistry Laboratory Manual - An Interdisciplinary Approach 1 Edition by A. Anand, R. Kumari, 1st Ed. Dreamtech Press, 2020.

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(Semester-I)
Interdisciplinary Course (IDC)
CHEMISTRY IN DAILY LIFE
Code: BCHEM106T

Max Marks: 50 | **Credits: 02**

End Semester Exam: 35 | **Exam Time Duration: 3 hrs.**

Internal Assessment: 15 | **Total Hours: 2 hours/week**

Pass Marks: 40% | **Total Lectures: 30hrs**

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 06 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of 1 mark each. Use of scientific non-programmable calculator is allowed.

INSTRUCTIONS FOR THE CANDIDATES

Students have to attempt four questions in all from Section – A and B by selecting two questions from each section. Section – C will be compulsory. Use of scientific calculator is allowed.

COURSE OBJECTIVES:

The aim of the course is to enhance the basic knowledge of students on the topics Chemistry in everyday life and Biomolecules.

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Students will gain knowledge about the medicines and their applications in everyday life.
CO2	Students will gain knowledge regarding designing of drugs, interaction of drugs with receptor targets and types of drugs.
CO3	Students will acquire knowledge of various chemicals used in food.
CO4	Students will be able to understand the chemistry of biomolecules in detail.

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Section-A

Chemistry in everyday life: Chemicals in Medicines, Designing a drug and classification of drugs, interaction of drug with targets, interaction of drugs with receptor targets. Types of drugs, neurologically active drugs, Antipyretics, and Analgestics, Antihistamines, Chemical in food, Chemistry of cleaning agents' soaps and detergents.

15Hrs.

Section-B

Biomolecules: Carbohydrates, Mono-saccharides- glucose and fructose, Disaccharides-sucrose, Polysaccharides-starch and cellulose, Reducing and Non-reducing sugars, Importance of carbohydrates, Proteins, ά-amino acids-classification and properties of ά-amino acids. Denaturations and Renaturation of protein, Enzymes and Vitamins (characteristics, sources and deficiency disease of some important vitamins only).

15Hrs.

BOOKS PRESCRIBED:

1. General Chemistry (XI and XII) and Engineering Chemistry, B.Tech (Part-I), 2024.
2. Medicinal Chemistry, Ashotosh Kar, New Age International Pvt. LTD.2018.

(Semester-I)
Skill Enhancement Course (SEC)
CHEMISTRY OF COSMETICS AND PERFUMES
Code: BCHEM107T

Max Marks: 50 **Credits: 02**

End Semester Exam: 35 **Exam Time Duration: 3 hrs.**

Internal Evaluation: 15 **Teaching Hours: 2 hours/week**

Pass Marks: 40% **Total Lectures: 30hrs**

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 06 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of 1 mark each. Use of scientific non-programmable calculator is allowed.

INSTRUCTIONS FOR THE CANDIDATES

Students have to attempt four questions in all from Section – A and B by selecting two questions from each section. Section – C will be compulsory. Use of scientific calculator is allowed.

COURSE OBJECTIVES:

The aim of the course is to enhance the basic knowledge of students on the topics perfumes, chemistry of cosmetics - I and II, Catalytic Processes used in cosmetic industries.

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Understanding the basics of perfumes and perfume industry.
CO2	Insight into the cosmetics and hair and nail care products.
CO3	Understanding the cosmetics for the skin care products.
CO4	Discuss the various raw materials for cosmetics and perfumes.

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Section-A

Perfumes: Introduction to perfumes, history, classification of perfumes, the concept of aroma, types and physiological effects. Composition, formulation and working mechanism of perfume. Antiperspirants and deodorants: definition, working mechanism, composition, formulation chemistry and comparison. Introduction to perfumery chemicals: Natural sources, natural identical and synthetic compounds. Extraction methods of perfumery chemicals. Examples of some important perfumery chemicals (synthesis, properties and chemistry) **08hrs.**

Chemistry of cosmetics-I: Introduction to cosmetics: Definition, history and application. Cosmetology, Introduction to cosmeceuticals. Anatomy of skin and hair with respective to cosmetology. Classification of cosmetics. Physiological effects of cosmetics. Cosmeceuticals: definition, classification, chemicals, mechanism of action. Induction to oral care products. Examples chemistry of materials used in skin, nail care products and their function. **07hrs.** Chemistry of materials used in cosmeceuticals.

Section-B

Chemistry of cosmetics-II: Introduction to skin care cosmetics: classification, chemicals, properties, physiological effects. Study chemistry of some skin care products (creams, foundation, primer, lotions). Chemistry of nail polish and paints. Hair care products: Properties, classification, working mechanism, formulation, safety and chemistry of hair products (shampoo, conditioner, gels, colouring agents etc.) **07hrs.**

Catalytic processes: Introduction to herbal cosmetics. Characterisation of cosmetics and perfumes (Chromatography, physical methods, spectroscopy). Safety and testing of cosmetics and perfumes. Regulatory and quality control of cosmetics. Modern developments in cosmetics chemistry. Cosmetic surgery and related studies. **08hrs.**

BOOKS PRESCRIBED:

1. Halida Butler (editor), Poucher's Perfumes, Cosmetics, and Soaps 10_{th} edition. Dordrecht: Kluwer Academic Publishers©2010.
2. "Chemistry and Technology of the Cosmetics and Toiletries Industries", by D.F. Williams, Springer International Edition, 2014.
3. Anthony J. O'Lenick Jr.: Thomas G. O'Lenick, Organic Chemistry for cosmetic chemists, Carol Stream, II: Allured Publishing,©2008
4. Beginning Cosmetic Chemistry by Schueller and Romanowsk, Allured Pub Corp; 3rd edition, 20089
5. Barel AO, Paye M, Maibarch HI. Handbook of cosmetic science and technology. CRC press;2014

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