Bangalore University
Department of Chemistry

Jnanabharathi Campus

Bengaluru – 560 056

Syllabus for
I & II Semester Chemistry Courses
Under-Graduate (UG) Programme
Framed according to the National Education Policy (NEP 2020)

September 2021

FOREWORD

National Education policy 2020 has been one among the intensely debated policies in the recent times. Given the long reach of Education as a social and economic transformation tool - more so for a developing nation like ours- the traction it has garnered in public domain is no surprise.

Karnataka is the first state in the country to implement NEP in higher education. But playing the role of a pioneer is not child's play. Transforming the policy into a working framework and befitting a competent curriculum and syllabus is always a challenging task. The state has come up with the NEP framework for all the UG programmes starting from the academic year 2021.

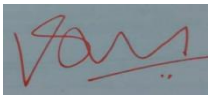
Undergraduate programmes were traditionally conceived as preparation for post graduation. Since decades its structure remained unchanged and was long due for an overhaul. The rigidity in choosing subjects through fixed combinations had to be reconsidered. The aspects of all-round development of the students, skill acquisition outside chosen subjects and research were undermined but NEP has changed all of these in one stroke.

The prominent features of the NEP framework are:

I. Flexibility in choosing subjects and even disciplines for the graduate programmes
II. Vertical and horizontal mobility across subjects throughout the programme
III. Multiple entry and exit points
IV. Main-streaming of skill based courses
V. Credit based evaluation system
VI. Integration of research into 4th year of the programme leading to Honors degree

Such radical modifications have put the learner at the center of the education system. The framework has nudged the academic faculty to work out syllabi aligned with national standards, if not global. The road map is in place. It is the implementation of NEP in its letter and spirit that would catalyze raising the bar for the quality in Higher Education.

I place on record my appreciation and regard to all those who were involved in the endeavor of the syllabus preparation for the undergraduate Chemistry programme of Bangalore University. The fact that all efforts have been made to align the syllabus with the NEP structure is further satisfying. I sincerely hope that periodical revisions will take place in coming years.



V. V. Sureshbabu, Ph.D.
CHAIRMAN
Department of Chemistry
Bangalore University
Bengaluru

Preamble

The syllabus for the B.Sc. Chemistry subject was long due for revision. It was incidental that timing of the revision overlapped with that of framing new syllabus in accordance to NEP framework to be implemented in higher educational institutions throughout the state.

Honorable Vice Chancellor of Bangalore University Dr. K. C. Venugopal provided the directions and vital inputs to undertake this uphill task of framing new syllabus for Chemistry subject of the B. Sc. programme. The model syllabus was to be provided by the state level expert committee, but this was to be modified and adopted according to our ingenious needs. The syllabus had to be compatible with the B.Sc. (Honors) programme which was to be newly introduced from the academic year 2021-22.

To accomplish the task, Department of Studies in Chemistry, Jnana Bharathi Campus, Bangalore University aligned with the Core Group of expert Teachers of the Affiliated colleges and University Department . The Core Group participated in virtual meetings on **13.09.2021, 17.09.2021, 19.09.2021 and 20.09.2021** and shaped a draft in accordance with the objectives of the NEP model curriculum. Several new elements like development of interdisciplinary skills, bridging the skill gap and knowledge-application to local problems were introduced.

Studying Chemistry subject in the B.Sc. and B,Sc.(Honors) is molded to Choice Based Credit System (CBCS) and the courses are spread over all semesters. The syllabus is intended to familiarize students with the sound basic understanding of the subject as well as expose them to advanced learning which would link to postgraduate and/or research programmes. Due importance is also given to the study of application oriented topics so as to build a foundation to acquiring skills.

The exercise of framing syllabus was a collective endeavor. Faculty of various branches of Chemistry namely Inorganic, Organic, Physical, Bio Chemistry, Analytical and Industrial had separate as well as joint brainstorm sessions and arrived at a draft syllabus for two semesters.

The Draft was brought to the attention of a wider group of teachers for further refinement and the final version incorporating the suggestions was placed before the Department Council on **22.09.2021** and then the Board of Studies in Chemistry (UG) on **23.09.2021** for approval.

V. V. Sureshbabu

Proceedings of the Syllabus Core Committee meeting held on 21-09-2021 at 10.30 am through cloud meeting platform

The Chairman welcomed the members of the Board to the meeting and placed the agendas for discussion.

The Chairman informed the members to frame syllabus for Chemistry subject of B.Sc. programme as per the directive from the Bangalore University and in accordance with the NEP- model programme structure. B.Sc. (Honors) Chemistryprogramme has been prepared with the help of the Faculty

members of the Core committee from Department of Chemistry, Bangalore University and from the affiliated Colleges of Bangalore University, Bengaluru. Proposed new syllabus is to be Introduced from 2021-22 after the approval from different bodies.

In this connection, Chairman directed the formation of four committees of expert teachers according to their specialization from various affiliated colleges of the University. Committees were instructed to hold virtual meetings too.

Chairman informed that,

- With the changing trends and voluminous development in the subject updating of the curriculum is a necessary exercise.
- The learners have to be equipped with sound subject know-how as well as skills required for their careers in teaching, industry and research.
- The rules governing the NEP - model (semester scheme) for UG programme are as per the university guidelines have to be adhered during syllabus framing.

Members of the core committee for the preparation of the Chemistry syllabus

Physical Chemistry Section

1**.** K. Ramakrishna Reddy, 2. Nagegowda P, 3. Nebula Murukesh

Analytical and Inorganic Chemistry Section

1. M. Shubha, 2. R. Nalini, 3. B. M. Savitha

Organic Chemistry Section

1. Renuka Manjunath , 2. Jisha S P, 3. Sumaiya Tabassum, 4. Meenaakshi Srinivasan

Bio Chemistry Section

1.Prasannakumar S G, 2. Kantharaju S

Proceedings of the meeting of the Board of studies in Chemistry-UG held on 23-09-2021 at 10.30 am in C_1 Lecture Hall, Department of Chemistry, Bangalore University

The Chairman welcomed the members of the Board and placed the agendas for discussion.

Agenda 1: The BOS unanimously resolved to co-opt Prasanna Kumar S G, M S Ramaiah College of Arts, Science and Commerce, Nebula Murukesh, St. Francis de Sales College and Sumaiya Tabassum, Surana College.

Agenda 2: Framing of syllabus (theory and practical) under NEP- model programme structure for the undergraduate programmes in universities and colleges scheme of examination.

Chairman informed that the tabled syllabus has been prepared as per the guidelines from the NEP.

- A core committee was formed to accomplish this task, which included the senior teachers from affiliated colleges and also the professors from the University department.
- Three meetings were held to finalize the theory and practical syllabus for I to II semester on 13.09.2021, 17.09.2021, 19.09.2021 and 20.09.2021.
- The teachers of the core committee have played a pivotal role in preparing the syllabus and their effort was duly appreciated.
- The draft syllabus was then finalized in a virtual meeting conducted on **20-09- 2021** in the presence of a wider group of teachers represented by affiliated colleges.

The draft syllabus was then placed before the Department Council for further recommendations and finally before the Board of Studies (UG) which approved the Syllabus after some modifications. The Chairman acknowledges with gratitude all the teachers involved in the preparation of this syllabus.

1. B. M. SREENIVASA
2. M. SHUBHA
3. NAGEGOWDA P. NOT PRESENT
4. JISHA S P
5. RENUKA MANJUNATH
6. MALLESH - RETIRED
7. B. VIJAYA BABU- RETIRED
8. K RAMAKRISHNA REDDY
9. K R MUDDUKRISHNA- NOT PRESENT
10. V V SURESHBABU

Co-opt members

1. Prasanna Kumar S G, M S Ramaiah College of Arts, Science and Commerce
2. Nebula Murukesh, St. Francis de Sales College
3. Sumaiya Tabassum, Surana College

Chemistry Syllabus for B.Sc. / B.Sc. (Honors) Programme

Discipline Core: Chemistry **Total Credits for the Programme: 186**

Year of implementation: 2021-22

Programme Outcomes:

By the end of the programme the students will:

1. Understand the basic principles of various branches of Chemistry
2. Demonstrate a range of practical skills to conduct and infer experiments independently and in groups
3. Apply the key concepts and standard methodologies to solve problems related to Chemistry
4. Apply methodologies to the solution of unfamiliar types of problems
5. Exhibit skills leading to employability in Chemistry and allied industries
6. Comprehend the fundamental aspects of research in Chemistry
7. Possess the level of proficiency in subject required for post graduation as well as for pursuing research in Chemistry and related interdisciplinary subjects
8. Design solutions stemming from the application of Chemistry to the local issues

Assessment: Weightage for assessments (in percentage)

Type of Course	Formative Assessment / IA	Summative Assessment/ESE
Theory	40	60
Practical	25	25
Projects	-	-
Experiential Learning (Internships etc.)	-	-

PROGRAMME STRUCTURE

Sem.	Discipline Core (DSC) (L+T+P)	Discipline Elective(DSE)/ Open Elective (OE)	Ability Enhancement Compulsory Courses (AECC), Languages (L+T+P)		Skill Enhancement Courses (SEC)		Total Credits
					Skill based (L+T+P)	Value based (L+T+P)	
I	DISCIPLINE A1 (4 + 2) DSC-1:Analytical and Organic Chemistry-I DSC lab-1:Analytical and	OE – 1 (3 CREDITS) Chemistry in	L1-1 (3), L2-1(3)		SEC-1: Digital Fluency (2) (1+0+2)	Physical education and Yoga(1) (0+0+2),	25

	Organic Practicals-I DISCIPLINE-B1(4+2)	Daily Life				Health and Hygiene(1)(0+0+2)	
II	DISCIPLINE A2(4 + 2) DSC-2:Inorganic and Physical Chemistry-I DSC Lab-2:Inorganic and Physical Practicals-I DISCIPLINE-B2(4+2)	OE – 2 (3 CREDITS) Molecules of Life	L1-2(3), L2-2 (3) (3+1+0 each)	Environmental Studies (2)		Health and Wellness/ Social & Emotional Learning (2)	25
Exit option with Certificate (50 credits)							
III	DISCIPLINE A3(4 + 2) DSC-3:Analytical and Organic Chemistry-II DSC Lab-3: Analytical and Organic Practicals-II DISCIPLINE-B3(4+2)	OE – 3 (3 CREDITS)	L1-3 (3), L2-3(3) (3+1+0 each)		SEC-2: Artificial Intelligence(2)(1+0+2)	Sports/NCC/ NSS etc(0+0+2)	25
IV	DISCIPLINE A4(4 + 2) DSC-4: Inorganic and Physical Chemistry-II DSC Lab-4: Inorganic and Physical Practicals-II DISCIPLINE-B4(4+2)	OE – 4 (3 CREDITS)	L1-4 (3), L2-4(3) (3+1+0 each)	Constitution of India (2)		Sports/NCC/ NSS etc (0+0+2)	25
Exit option with Diploma (100 credits)							
Choose any one Discipline as Major, the other as the Minor							
V	DISCIPLINE A5 (3 + 2) DSC-5: DSC Lab-5 DISCIPLINE A6 (3 + 2) DSC-6: DSC Lab-6: DISCIPLINE B5 (3 + 2)	Vocational 1 (3 CREDITS)			SEC-3: (2) SEC such as Cyber security(2) (1+0+2)	Physical Education(1) (0+0+2) NCC/NSS/R&R(S&G)/Cultural)(1) (0+0+2)	22
VI	DISCIPLINE A7 (3 + 2) DSC-7 DSC Lab-7 DISCIPLINE A8 (3 + 2) DSC-8 DSC Lab-8 DISCIPLINE B6 (3 + 2)	Vocational 2 (3 CREDITS) Internship (2 CREDITS)			SEC-4: Professional Communication(2)	Physical Education(1) (0+0+2) NCC/NSS/R&R(S&G)/Cultural)(1)(0+0+2)	24
Exit option with B. Sc. Basic Degree (146 credits)							
VII	DISCIPLINE A9 (3 + 2) DSC-9						

	DSC Lab-9 DISCIPLINE A10 (3) DSC-10 DISCIPLINE A11 (3) DSC-11	DSE A3 (3 CREDITS) DSE A4 (3 CREDITS RESEARCH METHODOLOGY (3 CREDITS)					20
VIII	DISCIPLINE A12 (3+2) DSC-12 DISCIPLINE A13 (3) DSC-13 DISCIPLINE A14 (3) DSC-14	DSE A4 (3 CREDITS) RESEARCH PROJECT (6 CREDITS)					20
Award of B.Sc. (Hons) degree (186 credits)							

***In lieu of the research Project, two additional elective papers/ Internship may be offered.**

COURSE PATTERN AND SCHEME OF EXAMINATION

Sl. No.	Semester	Title of the Paper	Teaching Hours	Hours / week		Examination Pattern Max. & Min. Marks /Paper						Duration of Exam (hours)		Total Marks / paper	Credits	
				Theory	Practical	ESE(Theory)		IA	ESE(Practical)			Theory	Practical		Theory	Practical
						Max.	Min.		Max.	Min.	IA					
1	I	**DSC-1: Analytical and Organic Chemistry-I**	**56**	**4**	**-**	**60**	**22**	**40**	**-**	**-**	**-**	**3**	**-**	**100**	**4**	**-**
		DSC LAB-1: Analytical and Organic Chemistry-I	**56**	**-**	**4**	**-**	**-**	**-**	**25**	**10**	**25**	**-**	**4**	**50**	**-**	**2**
		Chemistry-OE-1: Chemistryin Daily life	**42**	**3**	**-**	**60**	**22**	**40**	**-**	**-**	**-**	**3**	**-**	**100**	**3**	**-**

2	**II**	**DSC-2: Inorganic and Physical Chemistry-I**	**56**	**4**	**-**	**60**	**22**	**40**	**-**	**-**	**-**	**3**	**4**	**100**	**4**	**-**
		DSC LAB-2: Inorganic and Physical Chemistry-I	**56**	**-**	**4**	**-**	**-**	**-**	**25**	**10**	**25**	**-**	**4**	**50**	**-**	**2**
		Chemistry-OE-2:- Molecules of Life	**42**	**3**	**-**	**60**	**22**	**40**	**-**	**-**	**-**	**3**	**-**	**100**	**3**	**-**

Scheme of Internal Assessment Marks: Theory

Sl. No.	**Particulars**	IA Marks
1	Attendance	**05**
2	Internal Tests (Minimum of Two)	**25**
3	Assignments /Seminar	**10**
TOTAL Theory IA Marks		**40**

Scheme of Internal Assessment Marks: Practicals

Sl. No.	**Particulars**	IA Marks
1	Practical Test	**20**
2	Active participation in practical classes	**05**
TOTAL Practical IA Marks		**25**

Programme Articulation Matrix:

This matrix lists only the core courses. Core courses are essential to earn the degree in that discipline/subject. They include courses such as theory, laboratory, project, internships etc. Elective courses may be listed separately

Semester	Title /Name Of the course	Programme outcomes that the course addresses	Pre-requisite course(s)	Pedagogy	Assessment
1	**DSC-1: Analytical and Organic Chemistry-I**	● The concepts of chemical analysis, accuracy, precision and statistical data treatment ● Understand the preparation of alkanes, alkenes and alkynes, their reactions, etc. ● Understand the mechanism of nucleophilic, electrophilic reactions	P.U.C with Chemistry	Assignment Desk work	Internal Exams, Continuous Evaluation, Sem Exams
	DSC lab-1: Analytical and Organic Practicals-I	● The students will be able to learn how to handle the glassware, prepare and dilute solutions and perform the experiments with prepared reagents ● The students will be able to determine the analyte through volumetric and gravimetric analysis and understand the Chemistry involved in each method of analysis. ● The students will be able to deduce the conversion factor based on stoichiometry and in turn use this value for calculation	-	Assignment Desk work	Internal Exams, Continuous Evaluation, Sem Exams
2	**DSC-2: Inorganic and Physical Chemistry-I**	● The Bohr's theory of atomic structure and how it was developed ● Quantum numbers and their necessity in explaining the atomic structure ● The concept of unit cell, symmetry elements, Nernst distribution law.	-	Assignment Desk work	Internal Exams, Continuous Evaluation, Sem Exams
	DSC Lab -2: Inorganic and Physical Practicals-I	● Techniques like precipitation, filtration, drying and ignition ● Various titrimetric techniques and gravimetric methods		Assignment Desk work	Internal Exams, Continuous Evaluation, Sem Exams

		To determine the physical constants of organic liquids and molecular weight of non-volatile solute.			
3	**DSC-3: Analytical and Organic Chemistry-II** **DSC Lab-3: Analytical and Organic Practicals-II**		DSC-1 and DSC-2	Assignment Desk work	Internal Exams, Continuous Evaluation, Sem Exams
4	**DSC-4: Inorganic and Physical Chemistry-II** **DSC Lab-4: Inorganic and Physical Practicals-II**			Assignment Desk work	Internal Exams, Continuous Evaluation, Sem Exams
5.	**DSC-5:** **DSC Lab-5:** **DSC-6:** **DSC Lab-6:**		DSC-3 and DSC-4	MOOC, Problem solving	Internal tests, Assignments, Quiz
6.	**DSC-7:** **DSC Lab-7:** **DSC-8:** **DSC Lab-8:**			MOOC, Problem solving	Internal tests, Assignments, Quiz
7.	**DSC-9 :** **DSC Lab-9:** **DSC-10:** **DSC Lab-10 :** **DSC-11:**		DSC-5, DSC-6, DSC-7 and DSC-8	MOOC, Problem solving	Internal tests, Assignments, Seminar, Debate, Quiz
8.	**DSC-12:** **DSC Lab-12** **DSC-13:** **DSC Lab-13** **DSC-14:**			Project work, Industrial Visit	Internal tests, Assignments, Seminar, Debate, Quiz

Semester 1

Course Title: DSC-1: Analytical and Organic Chemistry-I	
Total Contact Hours: 56	Course Credits: 4
Formative Assessment (IA) Marks: 40	Duration of Summative Assessment/ ESE: 3 hrs
Syllabus Authors: Chairman	Summative Assessment Marks: 60

Course Pre-requisite(s): *PUC with Chemistry*/ Any equivalent

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Learn the concepts of chemical analysis, accuracy, precision and statistical data treatment
2. Prepare the solutions after calculating the required quantity of salts in preparing the reagents/solutions and dilution of stock solution.
3. Know the concept of volumetric and gravimetric analysis and deducing the conversion factor for determination
4. Handle toxic chemicals, concentrated acids and organic solvents and practice safety procedures.
5. Understand the concepts of Organic reactions and techniques of writing the movement of electrons, bond breaking, bond forming
6. Learn the Concept of aromaticity, resonance, hyper conjugation, etc.
7. Understand the preparation of alkanes, alkenes and alkynes, their reactions, etc.
8. Understand the mechanism of nucleophilic, electrophilic reactions

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Programme Outcomes (POs 1-8)

Course Outcomes (COs) / Programme Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Learn the concepts of chemical analysis, accuracy, precision and statistical data treatment	X							
2 Prepare the solutions after calculating the required quantity of salts in preparing the reagents/solutions and dilution of stock solution		X						
3.Know the concept of volumetric and gravimetric analysis and deducing the conversion factor for determination		X	X					
4. Handle toxic chemicals, concentrated acids and organic solvents and practice safety procedures						X		
5 Understand the concepts of Organic reactions and techniques of writing the movement of electrons, bond breaking and bond forming			X	X				
6. Learn the Concepts of aromaticity, resonance and hyper conjugation	X					X	X	
7 Understand the preparation of alkanes, alkenes, alkynes and their reactions			X			X		
8 Understand the mechanism of nucleophilic and electrophilic reactions						X	X	X

Course Articulation Matrix relates course outcomes of course with the corresponding programme outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular programme outcome.

Title of the Course: DSC-1: Analytical and Organic Chemistry – I

Number of Theory Credits	**Number of lecture hours/ semester**
4	**56**

Content of Theory Course 1	56Hrs
Unit – 1	14 Hrs
Analytical Chemistry: Definitions of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method - accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD), Limit of quantification (LOQ), linear dynamic range (working range). Errors and treatment of analytical data:Limitations of analytical methods – Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples -mean, median, range, standard deviation and variance. External standard calibration - regression equation (least squares method), correlation coefficient (R^2). Acid-base titrimetry: Titration curves for strong acid vs strong base, weak acid vs strong base and weak base vs strong acid titrations. Titration curves, Quantitative applications – selecting and standardizing a titrant, inorganic analysis - alkalinity, acidity. Complexometric titrimetry: Indicators for EDTA titrations - theory of metal ion indicators, titration methods employing EDTA - direct, back, displacement and indirect determinations, Application-determination of hardness of water. Redox titrimetry: Balancing redox equations, calculation of the equilibrium constant of redox reactions, titration curves, Theory of redox indicators, calculation of standard potentials using Nernst equation. Applications. Precipitation titrimetry: Titration curves, titrants and standards, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences. Gravimetric Analysis: Requisites of precipitation, mechanism of precipitation, Factors influencing precipitation, Co-precipitation, post-precipitation, Advantages of organic reagents over inorganic reagents, reagents used in gravimetry (8-hydroxy quinoline (oxine) and dimethyl glyoxime (DMG). Numerical problems on all the above aspects.	
Unit - 2	14 Hrs
Classification and nomenclature of organic compounds, hybridization-types, shapes of organic molecules, influence of hybridization on bond properties. **Nature of bonding in Organic molecules** Types of chemical bonding, formation of covalent bond, notations used to represent electron movements and directions of reaction- curly arrows, formal charges. Types of bond breaking- homolytic and heterolytic. Types of reagents-Electrophiles, nucleophiles, nucleophilicity and basicity. Homolytic and heterolytic fission of bonds. Carbocations, carbanions, free radicals, carbenes, nitrenes and benzyne.**Electronic displacement effects**: Inductive effects, Electromeric effect, Resonance effect, Hyperconjugation and steric effects, explanation with examples. **Types of Organic Reactions:** Substitution, addition, elimination, rearrangement and pericyclic reactions, explanation with examples. **Aliphatic Hydrocarbons:Alkanes**: Nomenclature of branched chain alkanes; *Preparation:* Corey-House synthesis, Wurtz reaction and Wurtz-Fittig reaction. Physical and chemical properties (Free radical substitution, halogenation- relative reactivity and selectivity) and commercial importance. Difference between conformation and configuration. Conformations of ethane, propane and n-butane, explanation of stability based on energy profile diagrams. Nomenclature of n-butane conformations using Klyne-Prelog terminology. Conformation and stability of 1,2-	

dichloroethane, ethylene glycol and acetaldehyde. **Cycloalkanes:** Nomenclature, method of formation. Explanation for stability based on heat of hydrogenation data. Baeyer's strain theory and stability of cyclopropane. Conformations of cyclohexane (chair, twist boat, boat, half-chair and envelop forms and their stability). Geometrical isomerism with examples, *cis* and *trans* isomerism in 1,2-dimethylcyclopropane and 1,2-dimethylcyclohexane.	
Unit - 3	14 Hrs
Carbon-carbon pi bonds **Alkenes**: Preparation by Wittig reaction-stereoselectivity, from but-2-yne to cis-alkenes – (partial catalytic hydrogenation) and trans-alkenes – (Birch reduction). Formation of alkenes by elimination reaction. Mechanism of E_1, E_2, E_1cB reaction. Saytzeff and Hofmann eliminations. Reactions: Addition of halogens to alkenes-carbocation and halonium ion mechanism. Stereospecificity of halogen addition. Addition of hydrogen halides to alkenes (Free radical addition of HBr to propene), mechanism, regioselectivity and relative rates of addition. Ozonolysis mechanism - ozonolysis of propene. Hydrogenation, hydration, hydroxylation and epoxidation of alkenes, explanation with examples. Diels-Alder reaction, allylic and benzylic bromination and mechanism in propene, 1-butene, 1-toluene and ethylbenzene. Conformation and stability of propene. Steric effect- Relative stability of trans and cis-2-butene. **Dienes:** Classification- isolated, conjugated and cumulated- one example. Structure of allene and butadiene. **Reactions:** 1, 2 addition and 1, 4 addition reactions. Diels Alder reaction: 1, 3-butadiene with maleic anhydride. **Alkynes**: Preparation*:* Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: alkylation of terminal alkynes and conversion to higher alkynes, ozonolysis and oxidation with hot alk. $KMnO_4$.	
Unit - 4	14 Hrs
Nucleophilic substitution:. Mechanism of S_N^1 and S_N^2 reactions with suitable examples. Energy profile diagrams, Stereochemistry and factors effecting S_N^1 and S_N^2 reactions **Arenes:** Nomenclature: mono, di and tri substituted benzenes, aromaticity: Huckel's rule - application to benzenoid (benzene, naphthalene, anthracene and phenanthrene) and non-benzenoid (cyclopropenyl cation, cyclopentadienyl anion, tropylium cation) compounds, anti-aromaticity, homoaromaticity. Benzene: molecular orbital picture and resonance energy. Preparation-from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Aromatic Electrophilic substitution reactions, mechanisms, σ and π complexes, Halogenation, Nitration, Sulphonation, Friedel Crafts alkylation and acylation with their mechanism. Activating and deactivating groups. Orientation influence, Ortho-para ratio. Aromatic nucleophilic substitution reaction: S_N^{Ar} and Benzyne mechanism with suitable examples, Birch reduction, side chain oxidation of toluene to benzaldehyde and benzoic acid. Polynuclear hydrocarbons: naphthalene, anthracene and phenanthrene- Preparations, resonance structures, oxidation of naphthalene, anthracene and phenanthrene. Electrophilic and nucleophilic substitution reactions of naphthalene and anthracene. Diels-Alder reaction of anthracene with 1,2-dichloroethene. Alkenyl benzenes: Styrene, *cis*- and *trans*-stilbenes and their preparations. Biphenyl: Preparation-Ullmann reaction.	

Text Books

1. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, Pearson Education Pvt.Ltd.(2007).
2. Analytical Chemistry, G.D. Christian, 6th edition, Wiley-India (2007).
3. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education)

4. Organic Reaction mechanism by V. K. AhIuwalia and K. Parashar (Narosa Publishers).
5. Organic Chemistry by S. M. Mukherji, S. P. Singh and R. K. Kapoor. (Narosa Publishers)

References

1.Finar, I. L. *Organic Chemistry (Volume I),* Dorling Kindersley (India) Pvt. Ltd. (Pearson Education)

2.McMurry, J. E. *Fundamentals of Organic Chemistry,* 7th Ed. Cengage Learning India Edition, 2013

Pedagogy :

Chalk and Talk, ICT Tools and Models

Assessment	
Assessment Occasion/ type	**Weightage in Marks**
Formative Assessment/ IA	40
Summative Assessment/ESE	60
Total	100

DCE-Lab-1 Analytical and Organic Practicals-1

Course Outcome:

After studying the course the student will be able to

1. Understand the safety practices in the Chemistry Laboratory
2. Develop awareness regarding toxicity of chemicals
3. Know the importance of calibration of glassware, pipette, burette and volumetric flask
4. Prepare standard/working solutions, standardization of solutions and determination of the respective analytes
5. Select suitablesolvent for purification of organic compounds
6. Gain an insight to the mechanism behind the reaction and the significance of catalysts
7. Learn the importance of green methods over conventional methods and proficiently handle the byproducts and disposal of waste
8. Enthuse students to conduct experiments by arousing the curiosity which would help them in learning basics and advanced concepts through simulation-based labs

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Programme Outcomes (POs 1-8)

Course Outcomes (COs) / Programme Outcomes (POs)	1	2	3	4	5	6	7	8
1.Understand the safety practices in the Chemistry Laboratory	X	X						
2.Develop awareness regarding toxicity of chemicals	X					X		
3.Know the importance of calibration of glassware, pipette, burette and volumetric flask	X	X						
4.Prepare standard/working solutions, standardization of solutions and determination of the respective analytes	X	X	X					
5.Select suitable solvent for purification of organic compounds		X	X				X	
6.Gain an insight to the mechanism behind the reaction and the significance of catalysts						X		X
7.Learn the importance of green methods over conventional methods and proficiently handle the byproducts and disposal of waste				X			X	X
8.Enthuse students to conduct experiments by arousing the curiosity which would help them in learning basics and advanced concepts through simulation-based labs				X		X		X

Course Articulation Matrix relates course outcomes of course with the corresponding programme outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular programme outcome.

Number of practical Credits	Number of practical hours/ semesters
2	**56**

Tutorials
Calibration of instruments, glasswares etc. to be performed in the beginning of the experiments
Specific arrangements to be made for proper disposal of chemicals, broken glasswares and solutions after the experiments
Green Principles to be adopted in the laboratories
Preparation of Standard solution along with calculations to be taught
Handling and dilution of mineral acids to be emphasized
Use of suitable indicators to be explained

List of Experiments to be conducted

PART-A Analytical Chemistry

1. Safety Practices in the Chemistry Laboratory, knowledge about common toxic chemicals and safety measures in their handling, cleaning and drying of glass wares.
2. Calibration of glassware, pipette, burette and volumetric flask.
3. Determination of sodium carbonate and sodium bicarbonate in a mixture.
4. Determination of alkali present in soaps/detergents
5. Determination of iron(II) using potassium dichromate
6. Determination of oxalic acid using potassium permanganate solution
7. Determination of Fe^{2+} as Fe_2O_3

   Virtual Experiments
8. Standardization of EDTA solution and determination of hardness of water
9. Gravimetric estimation of Barium
10. Gravimetric estimation of Nickel

PART-B Organic Chemistry

1. Selection of suitable solvents for Purification/Crystallization of organic compounds.
2. Preparation of acetanilide from aniline using Zn/acetic acid (Green method).
3. Synthesis of p-nitro acetanilide from acetanilide using nitrating mixture.
4. Hydrolysis of methyl m-nitrobenzoate to m-nitrobenzoic acid (Conventional method)
5. Synthesis of diazoaminobenzene from aniline (conventional method).
6. Preparation of dibenzalacetone (Green method).

7. Diels Alder reaction between furan and maleic acid (Green method).

Virtual Experiments

8. Simple Distillation
9. Separation of Compounds by Column Chromatography
10. Detection of Functional Groups

Note:

1. Questions from both sections should be given in each batch.
2. In the first 20 minutes the Teacher should discuss in detail the theory, principle, procedure and calculations
3. Instructions to be given for operating instruments, weighing chemicals and precautions while handling chemicals
4. The last 20 minutes the teacher is expected to solve related problems based on the experiments.

Title of the Course: OE-1: CHEMISTRY IN DAILY LIFE

Course Outcome:

After studying the course the student will be able to

1. Analyse the fat content and minerals in milk, butter and other dairy products
2. Know about various food preservatives, adulterants, additives and their analysis
3. Know about the Sources, role and deficiency symptoms of Vitamins
4. Learn the importance of renewable energy sources
5. Be aware of the applications of polymers as plastics in various fields and strategies for development of environment friendly polymers

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Programme Outcomes (POs 1-8)

Course Outcomes (COs) / Programme Outcomes (POs)	1	2	3	4	5	6	7	8
1.Analyse the fat content and minerals in milk, butter and other dairy products	X		X		X			
2.Know about various food preservatives, adulterants, additives and their analysis				X	X			X
3.Know about the Sources, role and deficiency symptoms of Vitamins	X					X	X	
4.Learn the importance of renewable energy sources	X	X						
5.Be aware of the applications of polymers as plastics in various fields and strategies for development of environment friendly polymers.			X			X		X

Course Articulation Matrix relates course outcomes of course with the corresponding programme outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular programme outcome.

Number of Theory Credits	Number of lecture hours/ semester
3	**42**

Content of Theory Course 1	42 Hrs
Unit – 1	14 Hrs
Dairy Products: Composition of milk and milk products. Analysis of fat content, minerals in milk and butter. Estimation of added water in milk. Beverages: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, determination of methyl alcohol in alcoholic beverages. **Food additives, adulterants, and contaminants**- Food preservatives like benzoates, propionates, sorbates, disulphites. Artificial sweeteners: Aspartame, saccharin, dulcin, sucralose, and sodium cyclamate. Flavors: Vanillin, alkyl esters (fruit flavors), and monosodium glutamate. **Artificial food colorants:** Coal tar dyes and non-permitted colors and metallic salts. Analysis of pesticide residues in food.	
Unit - 2	14 Hrs
Vitamins: Classification and Nomenclature. Sources, deficiency diseases, and structures of Vitamin A1, Vitamin B1, Vitamin C, Vitamin D, Vitamin E & Vitamin K1.	

Oils and fats: Composition of edible oils, detection of purity, rancidity of fats and oil. Tests for adulterants like argemone oil and mineral oils. Halphen test. **Soaps & Detergents**: Definition, classification, manufacturing of soaps and detergents, composition and uses	
Unit - 3	14 Hrs
Chemical and Renewable Energy Sources:	
Principles and applications of primary & secondary batteries and fuel cells. Basics of solar energy, future energy storer.	
Polymers: Basic concept of polymers, classification and characteristics of polymers. Applications of polymers as plastics in electronics, automobile components, medical fields and aerospace materials. Problems of plastic waste management. Strategies for the development of environment-friendly polymers.	

Text Books

1. B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)
2. Medicinal Chemistry- Ashtoush Kar.
3. Analysis of Foods – H.E. Cox: 13
4. Fred Billmeyer: Textbook of polymer science; Willey 3rd addition.

References

1.Foods: Facts and Principles. N. Shakuntala Many and S. Swamy, 4thed. New Age International (1998)

2.Handbook on Fertilizer Technology by Swaminathan and Goswamy, 6th ed. 2001, FAI.

Pedagogy :

Demonstration activities using live examples

Assessment	
Assessment Occasion/ type	**Weightage in Marks**
Formative Assessment/ IA	40
Summative Assessment/ESE	60
Total	100

Semester 2

Course Outcome:

After studying the course the student will be able to

1. Learn scientific theory of atoms, concept of wave functions, the fundamentals of quantum mechanics and concept of operators
2. Understand the physical and chemical characteristics of elements
3. Identify the given element, relative size, charges of proton, neutron and electron and their assembly to form different atoms
4. Learn the theory of dilute solutions, distribution law and its applications
5. Properties of liquid as solvent for various household and commercial use
6. Explain the laws governing the behaviour of ideal gases and real gases including their comparison
7. Understand the laws of crystallography, X-ray diffraction techniques, Bragg's law and its applications
8. Solve the problems related to quantum mechanics, different molecular velocities, critical constants and molar mass of non-volatile solutes

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Programme Outcomes (POs 1-8)

Course Outcomes (COs) / Programme Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1.Learn scientific theory of atoms, concept of wave functions, the fundamentals of quantum mechanics and concept of operators	X					X		X
2.Understand the physical and chemical characteristics of elements			X	X				
3.Identify the given element, relative size, charges of proton, neutron and electron and their assembly to form different atoms	X		X	X				
4.Learn the theory of dilute solutions, distribution law and its applications							X	X
5.Properties of liquid as solvent for various household and commercial use					X			X
6.Explain the laws governing the behaviour of ideal gases and real gases including their comparison	X	X	X					
7.Understand the laws of crystallography, X-ray diffraction techniques, Bragg's law and its applications			X		X			
8.Solve the problems related to quantum mechanics, different molecular velocities, critical constants and molar mass of non-volatile solutes				X	X	X	X	

Course Articulation Matrix relates course outcomes of course with the corresponding programme outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular programme outcome.

Title of the Course: DSC – 2: INORGANIC AND PHYSICAL CHEMISTRY– I

Number of Theory Credits	Number of lecture hours per semester
4	**56**

Content of Theory Course 2	56Hrs
Unit – 1	14 Hrs
Atomic structure Review of Bohr's theory and its limitations and atomic spectrum of hydrogen atom. Need of a new approach to atomic structure. Wave mechanics: de Broglie equation, Problems on calculation of wavelength of an electron Heisenberg's Uncertainty Principle and its significance What is Quantum Mechanics? Sinusoidal wave equation (Explain sinusoidal wave, Classical wave mechanics). Schrodinger's wave equation – derivation. Applications of Schrodinger's equation to the hydrogen atom. significance of ψ and $\psi 2$ Postulates of quantum mechanics. Hamiltonian operator. Eigen values and function. Concept of orbitals, Radial and angular parts of the hydrogenic wave function (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (graphical representation only). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Quantum numbers: Significance of quantum numbers. The four types of quantum numbers, shapes, s, p and d atomic orbitals, discovery of spin, spin quantum numbers (s) and magnetic spin quantum number (ms). Electronic configuration of elements. Principles (Aufbau, Pauli's exclusion principle and Hund's rule). Stability of half-filled and completely filled orbitals. Relative energies of atomic orbitals, Anomalous electronic configurations.	
Unit - 2	14 Hrs

Periodic Table & Periodic Properties The long form of periodic table. Classification of elements in to s, p, d and f-block elements. Periodic properties & trends in the periodic properties with reference to s and p-block elements: (a) Atomic radii (van der Waals) (b) Ionic and crystal radii. (c) Covalent radii (d) Ionization enthalpy, successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy. (e) Electron gain enthalpy, trends of electron gain enthalpy. (f) Electronegativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffé's electronegativity scales. Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity. Trends in the periodic properties. Applications in predicting and explaining chemical behaviour. Trends in the Chemistry of the compounds of groups 13 to 17 (hydrides, carbides, oxides and halides).	
Unit - 3	14 Hrs
Gaseous State Elementary aspects of kinetic theory of gases, Ideal and real gases. Boyle temperature (derivation not required), Molecular velocity, collision frequency, collision diameter, Collision cross section, collision number and mean free path and coefficient of viscosity, calculation of σ and η, variation of viscosity with temperature and pressure. Maxwell's Boltzmann distribution law of molecular velocities (Most probable, average and root mean square velocities). Relation between RMS, average and most probable velocity and average kinetic energies. (Mathematical derivation not required), law of equipartition of energy. Behaviour of real gases: Deviation from ideal gas behaviour. Compressibility factor (Z) and its variation with pressure for different gases. Causes of deviation from ideal behaviour, vander Waals equation of state (no derivation) and application in explaining real gas behaviour. Critical phenomena - Andrews isotherms of CO_2, critical constants and their calculation from van der Waals equation, Continuity of states, Law of corresponding states. Numerical problems. **Liquid State** **Surface Tension**: Definition and its determination using stalagmometer, effect of temperature and solute on surface tension **Viscosity**: Definition, Coefficient of viscosity. Determination of viscosity of a liquid using Oswald viscometer. Effect of temperature, size, weight, shape of molecules and intermolecular forces. **Refraction**: Specific and molar refraction- definition and advantages. Determination of refractive index by Abbes Refractometer. Additive and constitutive properties. **Parachor:** Definition, Atomic and structure parachor, Elucidation of structure of benzene and benzoquinone. Viscosity and molecular structure. Molar refraction and chemical constitution. Numerical Problems.	

Unit - 4	14 Hrs
Dilute solutions- Review of colligative properties and concentration terms Determination of molecular mass of a solute by: (i) Berkeley-Hartley's method ; (ii) Beckmann's method (ΔT^f) and (iii) Landsberger's method. Numerical problems **Distribution Law** Nernst Distribution Law – Statement. Distribution constant, factors affecting distribution constant, validity of Distribution Law, Modification of distribution law when molecules undergo a) Association b) Dissociation. Application of Distribution Law in Solvent extraction, numerical Problems **Solids** **Forms of solids:** Unit cell and space lattice, anisotropy of crystals, size and shape of crystals. Laws of Crystallography: Law of constancy of interfacial angles, Law of rational indices, Law of symmetry (Symmetry elements), Crystal systems, Bravais lattice types and identification of lattice planes. Miller indices and its calculation, X–Ray diffraction by crystals: Bragg's law and derivation of Bragg's equation, Single crystal and powder diffraction methods. Defects in crystals, glasses and liquid crystals. Numerical problems.	

Text Books

1. Concise Inorganic Chemistry: J D Lee, 4th Edn, Wiley, (2021)
2. Atkins Physical Chemistry.8th Edition. Peter Atkins & Julio De Paula Oxford University Press.
3. Principles of Physical Chemistry, Puri, Sharma & Pathania, Vishal Publishing Co.
4. Advanced Physical Chemistry, Gurdeep Raj, Goel Publishing House (2018)

References

1. Basic Inorganic Chemistry, F A Cotton, G Wilkinson and P. L. Gaus, 3rd Edition. Wiley. India
2. Physical Chemistry by Samuel Glasstone, ELBS (1982).
3. A Text Book of Physical Chemistry P.L.Soni , O.P. Dharmarhaand and U.N.Dash, Sultan Chand and Sons.

Pedagogy :

Chalk and Talk, ICT Tools and Models

Assessment	
Assessment Occasion/ type	**Weightage in Marks**
Formative Assessment/ IA	40
Summative Assessment/ESE	60
Total	100

DSC LAB-2 Inorganic and Physical Practicals

Course Outcome:

After studying the course the student will be able to

1. Inculcate the significance of physical constants organic liquids
2. Weigh accurately compounds up to fourth decimal
3. Know the importance of calibration of instruments, pipette, burette and volumetric flask
4. Understand the concept of distribution coefficient, Nernst Distribution law, and how it takes different form when solute undergo association or dissociation in one of the layer
5. Prepare standard/working solutions, standardization of solutions and determination of the respective analytes
6. Handle proficiently byproducts and disposal of waste
7. Learn the importance of green methods over conventional methods.
8. Enthuse students to conduct experiments by arousing the curiosity which would help them in learning basics and advanced concepts through simulation-based labs

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Programme Outcomes (POs 1-8)

Course Outcomes (COs) / Programme Outcomes (POs)	1	2	3	4	5	6	7	8
1.Inculcate the significance of physical constants organic liquids	X	X						
2,Weigh accurately compounds up to fourth decimal		X						X
3,Know the importance of calibration of instruments, pipette, burette and volumetric flask		X		X				
4.Understand the concept of distribution coefficient, Nernst Distribution law, and how it takes different form when solute undergo association or dissociation in one of the layer		X			X			X
5.Prepare standard/working solutions, standardization of solutions and determination of the respective analytes		X			X			
6.Handle proficiently byproducts and disposal of waste						X	X	
7.Learn the importance of green methods over conventional methods.						X	X	X
8.Enthuse students to conduct experiments by arousing the curiosity which would help them in learning basics and advanced concepts through simulation-based labs		X			X		X	

Course Articulation Matrix relates course outcomes of course with the corresponding programme outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular programme outcome.

Number of practical Credits	Number of practical hours per semester
2	**56**

Tutorials
Green Principles to be adopted in the laboratories
Specific arrangements to be made for disposal of chemicals and solutions after the experiments
Calibration of instruments, glasswares etc to be performed in the beginning of the experiments
Preparation of Standard solution along with calculations to be taught
Handling and dilution of mineral acids to be emphasized
Selection and usage of Indicators to be explained

List of Experiments to be conducted

PART-A Inorganic Chemistry

TITRIMETRY

1. Determination of carbonate and hydroxide present in a mixture.
2. Determination of oxalic acid and sodium oxalate in a given mixture using standard $KMnO_4$/NaOH solution
3. Standardization of potassium permanganate solution and determination of nitrite in a water sample
4. Determination of alkali content in antacids
5. Determination of chlorine in bleaching powder using iodometric method.

Virtual Experiments

6. Determination of concentration of Potassium Permanganate solution using Ferrous Ammonium sulphate
7. Standardization of silver nitrate and determination of chloride in a water sample
8. Soil Analysis-Determination of pH of soil.

PART-B Physical Chemistry

1. Determination of density using specific gravity bottle and viscosity of liquids using Ostwald's viscometer (ethyl acetate, toluene, chlorobenzene or any other non-hazardous liquids)
2. Study of the variation of viscosity of sucrose solution with the concentration of a solute
3. Determination of the density using specific gravity bottle and surface tension of liquids using Stalagmometer (ethyl acetate, toluene, chlorobenzene or any other non-hazardous liquids)
4. Study of variation of surface tension of detergent solution with concentration.
5. Determination of molar mass of non-electrolyte by Walker-Lumsden method
6. Determination of partition/distribution coefficient of Benzoic acid in water and toluene
7. Determination of compositionof liquid mixtures by refractometry. (toluene and alcohol, water and sucrose)
8. Determination of specific and molar refraction by Abbes refractometer (ethyl acetate, methyl acetate, ethylene dichloride)

Virtual Experiments

9. Determination of molar mass of a non-volatile solute by cryoscopic method
10. Determination of viscosity by average molecular weight of a polymer
11. Determination of partition co-efficient of Iodine between water and carbon tetrachloride

Note:

1. Questions from both sections should be given in each batch.
2. In the first 20 minutes the Teacher should discuss in detail the theory, principle, procedure and calculations
3. Instructions to be given for operating instruments, weighing chemicals and precautions while handling chemicals
4. The last 20 minutes the teacher is expected to solve related problems based on the experiments.

Title of the Course: OE – 2: Molecules of Life

Course Outcome:

After studying the course the student will be able to

1. Know about the biological importance of biomolecules
2. Learn about the structure of amino acids and proteins.
3. Understand the correlation of enzyme function with drug action
4. Learn the classification and clinical significance of lipids
5. Know about the concepts of bioenergetics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Programme Outcomes (POs 1-8)

Course Outcomes (COs) / Programme Outcomes (POs)	1	2	3	4	5	6	7	8
1.Know about the biological importance of biomolecules	X					X		
2.Learn about the structure of amino acids and proteins	X							
3.Understand the correlation of enzyme function with drug action			X				X	
4.Learn the classification and clinical significance of lipids	X			X				X
5.Know about the concepts of bioenergetics			X			X		

Course Articulation Matrix relates course outcomes of course with the corresponding programme outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular programme outcome.

Number of Theory Credits	Number of lecture hours per semester
3	**42**

Content of Theory Course 2	42 Hrs
Unit – 1	14 Hrs
Carbohydrates Classification of carbohydrates, reducing and non-reducing sugars, General properties of glucose and fructose, their open chain structures. Epimers, mutarotation and anomers. Linkage between monosaccharides, structure of disaccharides (sucrose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation. Carbohydrates as a source of energy **Amino Acids, Peptides and Proteins** Classification ofamino acids, Zwitterions structure and Isoelectric point. Peptides: structure and conformation, example and function of biologically important Peptides. Proteins: Classification based on composition, shape and function with examples. Overview of Primary, Secondary, Tertiary and Quaternary structure of proteins. Importance of primary structure by taking sickle cell anemia as example. Determination of primary structure of peptides. Denaturation of proteins:, Renaturation of proteins.	
Unit - 2	14 Hrs

Enzymes and correlation with drug action Brief introduction, Nomenclature (E.C. No. upto 2nd digit) and classification of enzymes, Effect of pH and temperature. Enzyme specificity and theories-Lock and key model, induced fit theory. Active site and its characteristics, Mechanism of enzyme action, factors affecting enzyme action, Co-enzymes and cofactors and their role in biological reactions, Specificity of enzyme action (including stereo specificity), Enzyme inhibitors and their importance, phenomenon of inhibition (Competitive and Noncompetitive inhibition including allosteric inhibition). **Drug action**-receptor theory. Structure–activity relationships of drug molecules, binding role of –OH group, -NH_2 group, double bond and aromatic ring. **Lipids** Introduction to lipids, classification. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).Oils and fats: Common fatty acids present in oils and fats, Omega fatty acids, Trans fats,Hydrogenation, Rancidity of oils. Triglycerides:: Biological importance of triglycerides. Saponification, saponification value and its significance, Unsaturation in acyl glycerols- iodine number and iodine number of different oils.Prostaglandins: definition and example, biological role of prostaglandins in general, Waxes: definition, types, biological importance. Lipoproteins: Types and functions, clinical significance.	
Unit - 3	14Hrs
Nucleic Acids Components of nucleic acids: Adenine, guanine, thymine and cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides **(nomenclature)**, Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA (**types of RNA**), Genetic Code, -(general features and about Central dogma of Molecular biology) Biological roles of DNA and RNA: Replication, Transcription and Translation. Physico- chemical properties of nucleic acids - effect of alkali, acid and heat (denaturation and renaturation), Mutation Mutagens- chemical and physical, Molecular basis of mutation: spontaneous and induced mutations. Types of mutation, **Concept of Energy in Bio systems** Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, and Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates. Introduction to bioenergetics, stages of energy transformation- Photosynthesis respiration and utilization of energy. Exergonic and endergonic reactions. standard free energy change.	

Text Books

1.Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

2.A Text Book ofBioChemistry, V. S. S. Rama Rao, UBSPD,1998.

References

1.Concise Text Book ofBioChemistry,T. N. Pattabhiraman, All India Publishers, 2000.
2.W. H. Freeman. Berg, J.M., Tymoczko, J.L. & Stryer, L. *BioChemistry*, , 2002.

Pedagogy :

Chalk and Talk, ICT Tools and Models

Assessment	
Assessment Occasion/ type	**Weightage in Marks**
Formative Assessment/ IA	40
Summative Assessment/ESE	60
Total	100