B.Sc., CHEMISTRY

Syllabus

Program Code: UCH

2023-2024 onwards

MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with "A" Grade by NAAC

PASUMALAI, MADURAI – 625 004

GUIDLINESS FOR OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(FOR UG PROGRAM FROM 2023 -2024 ONWARDS)

ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the UG Degree program must have passed the Higher Secondary Education (respective groups – Arts / Science) of the Government of Tamil Nadu or any other state or its equivalent qualification.

DURATION OF THE COURSE

The duration of the course shall be three academic years comprising six semesters with two semesters in each academic year.

Subjects of Study

Part I   : Tamil / Hindi /

Part II : English

Part III :

       1.Core Subjects

       2.Allied Subjects

       3.Electives

 Part IV:

       1.Non Major Electives (I Year)

       2.Skill Based Subjects

       3.Environmental Studies - Mandatory Subject

       4.Value Education - Mandatory Subject

Part V :

       Extension Activities

ARTS & SCIENCE

CBCS COURSE STRUCTURE FOR UG PROGRAMS

Sem I	Credit	Sem II	Credit	Sem III	Credit	Sem IV	Credit	Sem V	Credit	Sem VI	Credit
1.1. Language - Tamil	3	2.1. Language - Tamil	3	3.1. Language - Tamil	3	4.1. Language - Tamil	3	5.1 Core Course – \CC IX	4	6.1 Core Course – CC XIII	4
1.2 English	3	2.2 English	3	3.2 English	3	4.2 English	3	5.2 Core Course – CC X	4	6.2 Core Course – CC XIV	4
1.3 Core Course – CC I	4	2.3 Core Course – CC III	4	3.3 Core Course – CC V	4	4.3 Core Course – CC VII Core Industry Module	4	5.3.Core Course CC -XI	4	6.3 Core Course – CC XV	4
1.4 Core Course – CC II	4	2.4 Core Course – CC IV	4	3.4 Core Course – CC VI	4	4.4 Core Course – CC VIII	4	5.3.Core Course –/ Project with viva-voce CC -XII	4	6.4 Elective -VII Generic/ Discipline Specific	3
1.5 Elective I Generic/ Discipline Specific	3	2.5 Elective II Generic/ Discipline Specific	3	3.5 Elective III Generic/ Discipline Specific	3	4.5 Elective IV Generic/ Discipline Specific	3	5.4 Elective V Generic/ Discipline Specific	3	6.5 Elective VIII Generic/ Discipline Specific	3
1.6 Skill Enhancement Course SEC-1 (NME)	2	2.6 Skill Enhancement Course SEC-2 (NME)	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	4.6 Skill Enhancement Course SEC-6	2	5.5 Elective VI Generic/ Discipline Specific	3	6.6 Extension Activity	1
1.7 Ability Enhancement Compulsory Course (AECC) Soft Skill-1	2	2.7 Skill Enhancement Course – SEC-3(NME)	2	3.7 Skill Enhancement Course SEC-5	2	4.7 Skill Enhancement Course SEC-7	2	5.6 Value Education	2	6.7 Professional Competency Skill	2
1.8 Skill Enhancement - (Foundation Course)	2	2.8 Ability Enhancement Compulsory Course (AECC) Soft Skill-2	2	3.7 Ability Enhancement Compulsory Course (AECC) Soft Skill-3	2	4.7 7Ability Enhancement Compulsory Course (AECC) Soft Skill-4	2	5.5 Summer Internship /Industrial Training	2		
				3.8 E.V.S	-	4.8 E.V.S	2				
	23		23		22		25		26		21
Total Credit Points											140

QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL ASSESSMENT

Note: Duration – 1 hour

(FOR PART I, PART II & PART III)

The components for continuous internal assessment are:

Part –A

Four multiple choice questions (answer all)   4 x01= 04 Marks

Part –B

Two questions ('either …. or 'type)   2 x05= 10 Marks

Part –C

Two questions ('either …. or 'type)   2 x 08=16 Marks

                              Total   30 Marks

THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two   tests and their average   --15 marks

Seminar /Group discussion / Quiz Test   --5 marks

Assignment   --5 marks

              Total   25 Marks

QUESTION PAPER PATTERN FOR THE SUMMATIVE EXAMINATIONS:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions   10 x01   = 10 Marks

No Unit shall be omitted: not more than two questions from each unit.)

Part –B

Five Paragraph questions ('either …. or 'type)   5 x 05   = 25 Marks

(One question from each Unit)

Part –C

Five Paragraph questions ('either …. or 'type)   5 x 08   = 40 Marks

(One question from each Unit)

                              Total   75 Marks

PART-IV- SKILL BASED PAPERS / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)

QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL ASSESSMENT (SKILL BASED AND NME COURSES) DURATION – 1 HOUR

❖ 50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and converted for 15 marks

THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:

Two   tests and their average   --15 marks

Seminar /Group discussion / Quiz Test   -- 5 marks

Assignment   -- 5 marks

                  Total   25 Marks

SUMMATIVE EXAMINATION PATTERN (SKILL BASED AND NME COURSES) DURATION – 3 HOURS

Pattern of the Question Paper for Skill Based and Non-Major Elective courses (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

PART-IV- ENVIRONMENTAL STUDIES AND VALUE EDUCATION

QUESTION PAPER PATTERN (INTERNAL ASSESSMENT)

Pattern of the Question Paper for Environmental Studies & Value Education (Internal)

50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and converted for 15 marks

Two tests and their average	--	15 marks
Project	--	10 marks

Total		25 Marks
		--------------

* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

SUMMATIVE EXAMINATION PATTERN

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

PART V EXTENSION ACTIVITIES: (MAXIMUM MARKS: 100)

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

Internal Examinations   - - 25 Marks

Summative Examinations - - 75 Marks
_____
100
_____

OUTCOME BASED EDUCATION:

OBE starts with the identification and articulation of clear and measurable learning outcomes for each course or program. These outcomes describe the skills, knowledge, and abilities that students are expected to acquire. The curriculum, instructional methods, and assessments are aligned with the defined learning outcomes. This ensures that everything taught and evaluated is directly related to what students are expected to learn.

The Learning Outcomes-Based Approach to curriculum planning and transaction in our institution ensures whether the teaching-learning processes are oriented towards enabling students to attain the defined learning outcomes relating to the courses within a programme. The outcome based approach, particularly in the context of undergraduate studies, requires a significant shift from teacher-centric to learner-centric pedagogies and from passive to active/participatory pedagogies.

Assessment Method: The students are assessed with 2 internal examination and the summative examination which includes problem based assignments; practical assignment laboratory reports; observation of practical skills; individual project reports ,case-study reports; team project reports; oral presentations, including seminar presentation; viva voce interviews; computerized adaptive testing; etc. and any other pedagogic approaches as per the context.
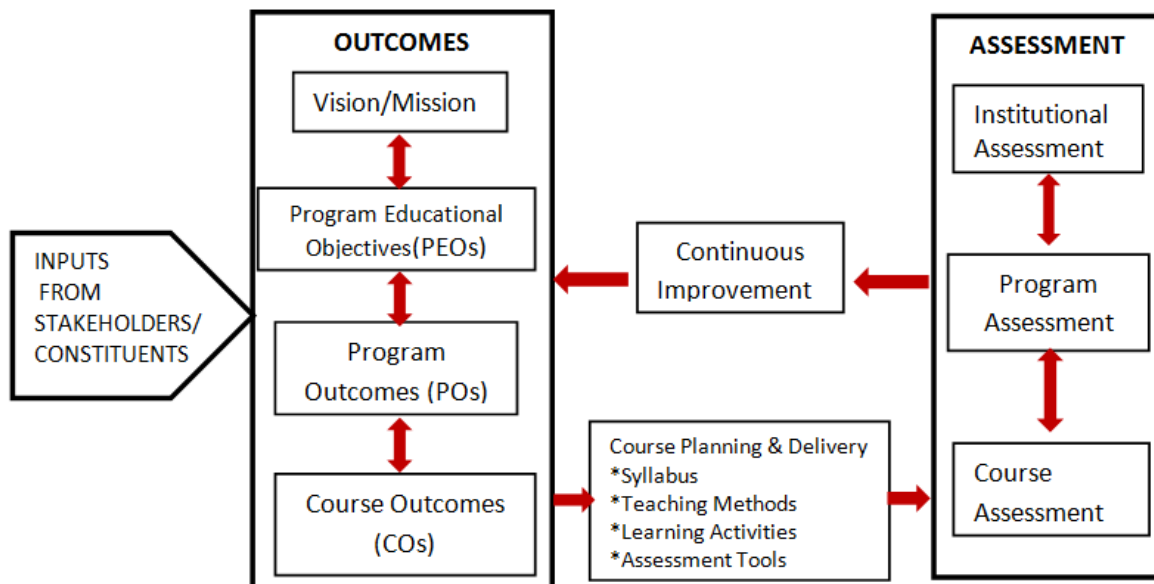
INSTITUTIONAL VISION

To Mould the learners into accomplished individuals by providing them with a stimulus for social change through character, confidence and competence.

INSTITUTIONAL MISSION

1. Enlightening the learners on the ethical and environmental issues.

2. Extending holistic training to shape the learners in to committed and competent citizens.

3. Equipping them with soft skills for facing the competitive world.

4. Enriching their employability through career oriented courses.

5. Ensuring accessibility and opportunity to make education affordable to the underprivileged.

Highlights of the Revamped Curriculum:

➢ Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.

➢ The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.

➢ The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.

➢ The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

- ➢ The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- ➢ The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- ➢ Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- ➢ State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS), MADURAI – 625 004
B.SC CHEMISTRY CURRICULUM
(For the student admitted during the academic year 2023-2024 onwards)

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
FIRST SEMESTER						
Part – I	**Tamil / Alternative Course**					
23UTAGT11	தமிழ் இலக்கிய வரலாறு - I	6	3	25	75	100
Part – II	**English**					
23UENGE11	GENERAL ENGLISH - I	6	3	25	75	100
Part - III	**Core Courses**					
23UCHCC11	GENERAL CHEMISTRY - I	5	5	25	75	100
23UCHCP11	QUANTITATIVE INORGANIC ESTIMATION AND INORGANIC PREPARATIONS - PRACTICAL	4	4	25	75	100
Part - III	**Elective Courses**					
23UMTEA11 / 23UMBEA12	ALLIED MATHEMATICS - I / ALLIED BOTANY- I	5	4	25	75	100
Part IV	**Non Major Elective**					
23UCHNM11	ROLE OF CHEMISTRY IN DAILY LIFE	2	2	25	75	100
Part IV	**Foundation Course**					
23UCHFC11	FUNDAMENTALS OF CHEMISTRY	2	2	25	75	100
	Total	**30**	**23**	**175**	**525**	**700**
SECOND SEMESTER						
Part – I	**Tamil / Alternative Course**					
23UTAGT21	தமிழ் இலக்கிய வரலாறு – II	6	3	25	75	100
Part – II	**English**					
23UENGE21	GENERAL ENGLISH - II	6	3	25	75	100
Part - III	**Core Courses**					
23UCHCC21	GENERAL CHEMISTRY - II	5	5	25	75	100
23UCHCP21	QUANTITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS - PRACTICAL	4	4	25	75	100
Part - III	**Elective Courses**					
23UMTEA21 / 23UMBEA22	ALLIED MATHEMATICS - II / ALLIED BOTANY- II	5	4	25	75	100
Part IV	**Non Major Elective**					
23UCHNM21	DAIRY CHEMISTRY	2	2	25	75	100
Part IV	**Skill Enhancement course**					
23UCHSC21	COSMETICS AND PERSONAL CARE PRODUCTS	2	2	25	75	100
	Total	**30**	**23**	**175**	**525**	**700**

FIRST SEMESTER

Course Name	GENERAL CHEMISTRY - I			
Course Code	23UCHCC11	L+T	P	C
Category	CORE	4+1	-	5

COURSE OBJECTIVES: The course aims at giving an overall view of the

- ➢ various atomic models and atomic structure
- ➢ wave particle duality of matter
- ➢ periodic table, periodicity in properties and its application in explaining the chemical behavior
- ➢ nature of chemical bonding, and
- ➢ fundamental concepts of organic chemistry

UNIT - I	ATOMIC STRUCTURE AND PERIODIC TRENDS	12+3

History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom;The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli's exclusion principle and Aufbau principle; Numerical problems involving the core concepts.

UNIT - II	INTRODUCTION TO QUANTUM MECHANICS & MODERN PERIODIC TABLE	12+3

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2.

Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.

UNIT - III STRUCTURE AND BONDING - I   12+3

Ionic bond

     Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.

Covalent bond

     Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7. Partial ionic character of covalent bond-dipole moment, application to molecules of the type A_2, AB, AB_2, AB_3, AB_4; percentage ionic character- numerical problems based on calculation of percentage ionic character.

UNIT - IV   STRUCTURE AND BONDING - II   12+3

     VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, CO_3^{2-}, NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O_2^{2-}, O N_2, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties.

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors.

Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT - V	BASIC CONCEPTS IN ORGANIC CHEMISTRY AND ELECTRONIC EFFECTS	12+3

Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes.

Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects.

Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.

Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane.

Types of organic reactions- addition, substitution, elimination and rearrangements

Total Lecture & Tutorial Hours	**75**

BOOKS FOR STUDY:

- Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry,* 2nd ed.; S. Chand and Company: New Delhi, 2003.
- Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000.
- Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry,* 38thed.;Vishal Publishing Company: Jalandhar, 2002.
- Bruce, P. Y. and PrasadK. J. R. *Essential Organic Chemistry*, Pearson Education: New Delhi, 2008.
- Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi,2016

BOOKS FOR REFERENCES:

- Maron, S. H. and Prutton C. P. Principles of Physical Chemistry,4thed.; The Macmillan Company: Newyork,1972.
- Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William Heinemann: London,1991.
- Gurudeep Raj, Advanced Inorganic Chemistry, 26thed.; Goel Publishing House: Meerut, 2001.
- Atkins, P.W. & Paula, J. Physical Chemistry, 10th ed.; Oxford University Press:New York, 2014.
- Huheey, J. E. Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed .; Addison, Wesley Publishing Company: India,1993.

WEB RESOURCES:

- ❖ **https://onlinecourses.nptel.ac.in**
- ❖ **http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm**
- ❖ **http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html**
- ❖ **https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding**
- ❖ **https://www.chemtube3d.com**

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	✓	GLOBAL
Changes Made in the Course	Percentage of Change		No Changes Made		New Course		✓

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.	K1 to K4
CO2	classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.	K1 to K4
CO3	apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx, Δp electronegativity, percentage ionic character and bond order.	K1 to K4
CO4	evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects	K1 to K4
CO5	construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M

S- STRONG   M – MEDIUM   L – LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3

CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	15	15	15	15	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3.0	3.0	3.0	3.0	3.0

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum;	6	Chalk & talk, ppt
	Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli's exclusion principle and Aufbau principle;	5	Chalk & talk
	Numerical problems involving the core concepts.	1	Practicing problems
	Discussion on Questions related to the above topics, from various competitive examinations	3	Group discussion & inquiry
II	Introduction to Quantum mechanics Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals - Probability density and significance of Ψ and Ψ^2.	6	Chalk & talk
	Modern Periodic Table Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.	5	Chalk & talk, animation videos
	Discussion on Questions related to the above topics, from various competitive examinations	3	Group discussion
III	Ionic bond: Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation– polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.	5	Chalk & talk, ppt
	Covalent bond: Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of	6	Chalk & talk, ppt

	the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7		
	Discussion on Questions related to the above topics, from various competitive examinations	3	**Group discussion & inquiry**
IV	VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, $CO_3{2-}$, NO_3-; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O_2-, O_2^{2-},N_2, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories	4	**Chalk & talk**
	Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors	4	**Chalk & talk, ppt**
	Weak Chemical Forces-Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding–Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.	4	**Chalk & talk, animation videos**
	Discussion on Questions related to the above topics, from various competitive examinations	3	**Group discussion & inquiry**
V	Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes.	4	**Chalk & talk**
	Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects. Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.	4	**Chalk & talk**
	Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane Types of organic reactions- addition, substitution, elimination and rearrangements	4	**Chalk & talk, ppt**
	Discussion on Questions related to the above topics, from various competitive examinations	3	**Group discussion & inquiry**

<table>
<tr><td colspan="8" align="center">Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)</td></tr>
<tr><td rowspan="3">Internal</td><td rowspan="3">Cos</td><td rowspan="3">K Level</td><td colspan="2">Section A</td><td rowspan="3">Section B
Either or
Choice</td><td rowspan="3">Section C
Either
or Choice</td></tr>
<tr><td colspan="2">MCQs</td></tr>
<tr><td>No. of.
Questions</td><td>K -
Level</td></tr>
<tr><td rowspan="2">CI
AI</td><td>CO1</td><td>K1 – K4</td><td>2</td><td>K1</td><td>2 (K2,K2)</td><td>2(K3,K3)</td></tr>
<tr><td>CO2</td><td>K1 – K4</td><td>2</td><td>K2</td><td>2(K3,K3)</td><td>2(K4,K4)</td></tr>
<tr><td rowspan="2">CI
AII</td><td>CO3</td><td>K1 – K4</td><td>2</td><td>K1</td><td>2(K2,K2)</td><td>2(K3,K3)</td></tr>
<tr><td>CO4</td><td>K1 – K4</td><td>2</td><td>K2</td><td>2(K3,K3)</td><td>2(K4,K4)</td></tr>
<tr><td rowspan="4">Question
Pattern
CIA I & II</td><td colspan="2">No. of Questions to
be asked</td><td>4</td><td></td><td>4</td><td>4</td></tr>
<tr><td colspan="2">No. of Questions to
be answered</td><td>4</td><td></td><td>2</td><td>2</td></tr>
<tr><td colspan="2">Marks for each
question</td><td>1</td><td></td><td>5</td><td>8</td></tr>
<tr><td colspan="2">Total Marks for
each section</td><td>4</td><td></td><td>10</td><td>16</td></tr>
</table>

<table>
<tr><td colspan="8" align="center">Distribution of Marks with K Level CIA I & CIA II</td></tr>
<tr><td></td><td>K
Level</td><td>Section A
(Multiple
Choice
Questions)</td><td>Section B
(Either /
Or Choice)</td><td>Section C
(Either /
Or Choice)</td><td>Total
Marks</td><td>% of (Marks
without choice)</td><td>Consolidate of %</td></tr>
<tr><td rowspan="5">CIA
I</td><td>K1</td><td>2</td><td>-</td><td>-</td><td>2</td><td>3.57</td><td rowspan="2">25</td></tr>
<tr><td>K2</td><td>2</td><td>10</td><td>-</td><td>12</td><td>21.43</td></tr>
<tr><td>K3</td><td>-</td><td>10</td><td>16</td><td>26</td><td>46.43</td><td>46.43</td></tr>
<tr><td>K4</td><td>-</td><td>-</td><td>16</td><td>16</td><td>28.57</td><td>28.57</td></tr>
<tr><td>Marks</td><td>4</td><td>20</td><td>32</td><td>56</td><td>100</td><td>100</td></tr>
<tr><td rowspan="5">CIA
II</td><td>K1</td><td>2</td><td>-</td><td>-</td><td>2</td><td>3.57</td><td rowspan="2">25</td></tr>
<tr><td>K2</td><td>2</td><td>10</td><td>-</td><td>12</td><td>21.43</td></tr>
<tr><td>K3</td><td>-</td><td>10</td><td>16</td><td>26</td><td>46.43</td><td>46.43</td></tr>
<tr><td>K4</td><td>-</td><td>-</td><td>16</td><td>16</td><td>28.57</td><td>28.57</td></tr>
<tr><td>Marks</td><td>4</td><td>20</td><td>32</td><td>56</td><td>100</td><td>100</td></tr>
</table>

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1&K2	2 (K2)	2 (K3)
2	CO2	K1-K4	2	K1&K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1&K2	2 (K2)	2 (K3)
4	CO4	K1-K4	2	K1&K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1&K2	2 (K4)	2 (K3)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	5	3.57	21.43
K2	5	20	-	25	17.86	
K3	-	20	48	68	48.57	48.57
K4	-	10	32	42	30	30
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer **ALL** the questions			**PART – A**		**(10 x 1 = 10 Marks)**
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer **ALL** the questions		**PART – B**			**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**		
		OR			
11. b)	**Unit - I**	**CO1**	**K2**		
12. a)	**Unit - II**	**CO2**	**K3**		
		OR			
12. b)	**Unit - II**	**CO2**	**K3**		
13. a)	**Unit - III**	**CO3**	**K2**		
		OR			
13. b)	**Unit - III**	**CO3**	**K2**		
14. a)	**Unit - IV**	**CO4**	**K3**		
		OR			
14. b)	**Unit - IV**	**CO4**	**K3**		
15. a)	**Unit - V**	**CO5**	**K4**		
		OR			
15. b)	**Unit - V**	**CO5**	**K4**		

Answer **ALL** the questions		**PART – C**			**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**		
		OR			
16. b)	**Unit - I**	**CO1**	**K3**		
17. a)	**Unit - II**	**CO2**	**K4**		
		OR			
17. b)	**Unit - II**	**CO2**	**K4**		
18. a)	**Unit - III**	**CO3**	**K3**		
		OR			
18. b)	**Unit - III**	**CO3**	**K3**		
19. a)	**Unit - IV**	**CO4**	**K4**		
		OR			
19. b)	**Unit - IV**	**CO4**	**K4**		
20. a)	**Unit - V**	**CO5**	**K3**		
		OR			
20. b)	**Unit - V**	**CO5**	**K3**		

Course Name	QUANTITATIVE INORGANIC ESTIMATION AND INORGANIC PREPARATIONS - PRACTICAL			
Course Code	23UCHCP11	L	P	C
Category	CORE	-	4	4

COURSE OBJECTIVES:

This course aims at providing knowledge on

- ➤ laboratory safety
- ➤ handling glasswares
- ➤ Quantitative estimation
- ➤ preparation of inorganic compounds

UNIT - I   CHEMICAL LABORATORY SAFETY IN ACADEMIC INSTITUTIONS   5

Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.

Common Apparatus Used in Quantitative Estimation (Volumetric)

Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.

Principle of Quantitative Estimation (Volumetric)

Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.

UNIT - II Experiments - I	35

Quantitative Estimation(Volumetric)

Preparation of standard solution, dilution from stock solution

Permanganometry

Estimation of sodium oxalate using standard ferrous ammonium sulphate.

Dichrometry

Estimation of ferric alum using standard dichromate (external indicator)

Estimation of ferric alum using standard dichromate (internal indicator)

Iodometry

Estimation of copper in copper sulphate using standard dichromate .

Argentimetry

Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)

UNIT - III Experiments - II	20

Complexometry

Estimation of hardness of water using EDTA.

Estimations

Estimation of iron in iron tablets Estimation of ascorbic acid.

Preparation of Inorganic compounds

Potash alum

Tetraammine copper (II) sulphate

Hexamminecobalt (III) chloride

Mohr's Salt

Total Lecture Hours	**60**

BOOKS FOR STUDY:

- Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. Basic Principles of Practical Chemistry,2nd ed.; Sultan Chand &Sons: New Delhi, 1997.
- Nad, A. K.; Mahapatra, B.; Ghoshal, A.; An advanced course in Practical Chemistry, 3rd ed.; New Central Book Agency: Kolkata, 2007.

BOOKS FOR REFERENCES:

- Vogel's Textbook of Quantitative Chemical Analysis, 6th ed.; Pearson Education Ltd: New Delhi, 2000.

WEB RESOURCES:

- ❖ http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis
- ❖ https://chemdictionary.org/titration-indicator/

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	✓	GLOBAL	
Changes Made in the Course	Percentage of Change		No Changes Made		New Course		✓

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Explain the basic principles involved in titrimetric analysis and inorganic preparations.	K1 to K4
CO2	Compare the methodologies of different titrimetric analysis.	K1 to K4
CO3	calculate the concentrations of unknown solutions in different ways	K1 to K4
CO4	Develop the skill to estimate the amount of a substance present in a given solution.	K1 to K4
CO5	Assess the yield of different inorganic preparations and identify the end point of various titrations.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M

S- STRONG	M – MEDIUM	L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	15	15	15	15	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3.0	3.0	3.0	3.0	3.0

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers- types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal. **Common Apparatus Used in Quantitative Estimation (Volumetric)** Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand. **Principle of Quantitative Estimation (Volumetric)** Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.	5	Explanation with models, chalk & talk

II	**Quantitative Estimation(Volumetric)** Preparation of standard solution, dilution from stock solution **Permanganometry** Estimation of sodium oxalate using standard ferrous ammonium sulphate **Dichrometry** Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator) **Iodometry** Estimation of copper in copper sulphate using standard dichromate **Argentimetry** Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)	**35**	**Practical experiments**
III	**Complexometry** Estimation of hardness of water using EDTA **Estimations** Estimation of iron in iron tablets Estimation of ascorbic acid **Preparation of Inorganic compounds** Potash alum Tetraammine copper (II) sulphate Hexamminecobalt (III) chloride Mohr's Salt	**20**	**Practical experiments**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	**Cos**	**K Level**	**Section A**		**Section B**	**Section C**
			MCQs			
			No. of. Questions	**K - Level**		
Model Exam	**CO1**	**K1 – K4**	5	K1		
	CO2	**K1 – K4**	5	K2		
	CO3	**K1 – K4**				1(K4)
	CO4	**K1 – K4**				1 (K3)
	CO5	**K1- K4**			1 (K3)	
Question Pattern Model exam	**No. of Questions to be asked**		10		1	2
	No. of Questions to be answered		10		1	2
	Marks for each question		1		10	10
	Total Marks for each section		10		10	20

Overall CIA marks (25) = (Model exam conducted for 40 marks is converted to 15 marks + regular class observation 10 marks)

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	**COs**	**K - Level**	**Section A (MCQs)**		**Section B K - LEVEL**	**Section C K - LEVEL**
			No. of Questions	**K – Level**		
1	**CO1**	**K1 – K4**	5	K1		
2	**CO2**	**K1 – K4**	5	K2		
3	**CO3**	**K1 – K4**				1(K4)
4	**CO4**	**K1 – K4**				1(K3)
5	**CO5**	**K1 – K4**			1 (K3)	
No. of Questions to be Asked			10		1	2
No. of Questions to be answered			10		1	2
Marks for each question			1		10	15
Total Marks for each section			10		10	30
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Overall Summative Exam marks (75) = Exam marks (60) + Record marks (15)

Course Name	ALLIED MATHEMATICS - I			
Course Code	23UMTEA11	**L**	**P**	**C**
Category	ELECTIVE	5	-	4

COURSE OBJECTIVES:

➢ To explore the fundamental concepts of Mathematics.
➢ To acquire knowledge about finding approximate roots of the polynomial equations.
➢ To improve students' ability in applications of matrices and calculus.
➢ Students are exposed to understanding the concept of derivatives and their applications.
➢ To expose double and triple integrals and their applications

UNIT – I SOLUTIONS OF TRANSCENDENTAL AND ALGEBRAIC EQUATIONS	15

Iteration method, Bisection method, Newton's method – Regula Falsi method, Horner's method(without proof) (Simple problems only

UNIT – II SOLUTIONS OF SIMULTANEOUS EQUATIONS	15

Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method - Gauss Jacobi method (Restricted to three variables only) (Simple problems only)

UNIT - III MATRICES	15

Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of inverse matrix

UNIT – IV DIFFERENTIAL CALCULUS	15

n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians– Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates

UNIT - V APPLICATION OF INTEGRATION	15

Evaluation of double, triple integrals – Simple applications to area, volume, and centroid.

Total Lecture Hours	**75**

BOOKS FOR STUDY:

- ➢ P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences
- ➢ Numerical Analysis, S. Chand & Company Ltd., New Delhi-55
  Unit I : Chapter 1

  Unit II: Chapter 2
- ➢ P. Duraipandian and Dr. S. Udayabaskaran (1997), "Allied Mathematics" , Vol I

  Chennai: Muhil Publishers.
  Unit III: Chapter 1 - Sec – 1.1.1, 1.1.2, 1.2, 1.4.3

- ➢ P. Duraipandian and Dr. S. Udayabaskaran (1997), "Allied Mathematics" , Vol II. Chennai: Muhil Publishers.

  Unit IV : Chapter 1 - Sec – 1.1.1,1.1.2,1.2,1.4.3

  Unit V: Chapter 3 – Sec - 3.4, 3.4.1, 3.5.1, 3.5.2, 3.6

BOOKS FOR REFERENCES:

- ➢ S.J.Venkatesan, "Allied Mathematics - I", Sri Krishna Publications, Chennai.
- ➢ P. R. Vittal (2003), "Allied Mathematics", Margham Publication, Chennai
- ➢ A.Singaravelu "Numerical Methods"Meenakshi Publications

WEB RESOURCES:

- ❖ **https;//www.mathwarehous.com/**
- ❖ **https;//www.mathhelp.com/**
- ❖ **https;//www.mathsisfun.com/**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✔	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL	✔	NATIONAL		GLOBAL
Changes Made in the Course	Percentage of Change		No Changes Made			New Course	✔

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Find out the approximate roots of polynomial equations.	K1 to K4
CO2	Develop the skills of finding roots of simultaneous equations	K1 to K4
CO3	Demonstrate knowledge about matrices and their applications	K1 to K4
CO4	Carry out calculations of problems related to curvature and radius of curvature.	K1 to K4
CO5	Evaluate double and triple integrals, and enabled to understand the applications of integration in real-life situation	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	3	3				
CO2	2	1	2	2	2	2				
CO3	3	2	2	3	1	2				
CO4	2	2	2	2	2	2				
CO5	2	1	2	2	3	2				

S- STRONG   **M – MEDIUM**   **L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	1		
CO 2	3	2	1		
CO 3	3	2	1		
CO 4	3	2	1		
CO 5	3	2	1		
WEIGHTAGE	15	10	5		
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3	2	1		

LESSON PLAN:

UNIT	ALLIED MATHEMATICS – I	HRS	PEDAGOGY
I	Iteration method, Bisection method, Newton's method – Regula Falsi method, Horner's method(without proof) (Simple problems only	15	Chalk & Talk
II	Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method - Gauss Jacobi method (Restricted to three variables only) (Simple problems only)	15	Chalk & Talk
III	Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of inverse matrix	15	Chalk & Talk

IV	n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians-Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates	15	**Chalk & Talk**
V	Evaluation of double, triple integrals – Simple applications to area, volume, and centroid.	15	**Chalk & Talk**

Learning Outcome Based Education & Assessment (LOBE) **Formative Examination - Blue Print** **Articulation Mapping – K Levels with Course Outcomes (COs)**						
Internal	**Cos**	**K Level**	**Section A** **MCQs**		**Section B** **Either or Choice**	**Section C** **Either or Choice**
			No. of. Questions	**K - Level**		
CI AI	**CO1**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO2	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
CI AII	**CO3**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO4	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		**No. of Questions to be asked**	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Either / Or Choice)**	**Section C (Either / Or Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2			2	**3.6**	**25**
	K2	2	10		12	**21.4**	
	K3		10	16	26	**46.4**	46.4
	K4			16	16	**28.6**	28.6
	Marks	**4**	**20**	**32**	**56**	**100**	**100**
CIA II	**K1**	2			2	**3.6**	**7.2**
	K2	2	10		2	**3.6**	
	K3		10	16	26	**46.4**	46.4
	K4			16	26	**46.4**	46.4
	Marks	**4**	**20**	**32**	**56**	**100**	**100**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	Cos	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
2	CO2	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
3	CO3	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
4	CO4	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
5	CO5	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.6	4
K2	5	20		25	17.8	18
K3		30	32	62	44.3	44
K4			48	48	34.3	34
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer **ALL** the questions			**PART – A**		**(10 x 1 = 10 Marks)**
1.	**Unit - I**	**CO1**	**K1**		
				a)	b)
				c)	d)
2.	**Unit - I**	**CO1**	**K2**		
				a)	b)
				c)	d)
3.	**Unit - II**	**CO2**	**K1**		
				a)	b)
				c)	d)
4.	**Unit - II**	**CO2**	**K2**		
				a)	b)
				c)	d)
5.	**Unit - III**	**CO3**	**K1**		
				a)	b)
				c)	d)
6.	**Unit - III**	**CO3**	**K2**		
				a)	b)
				c)	d)
7.	**Unit - IV**	**CO4**	**K1**		
				a)	b)
				c)	d)
8.	**Unit - IV**	**CO4**	**K2**		
				a)	b)
				c)	d)
9.	**Unit - V**	**CO5**	**K1**		
				a)	b)
				c)	d)
10.	**Unit - V**	**CO5**	**K2**		
				a)	b)
				c)	d)

Answer **ALL** the questions			**PART – B**	**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**	
			OR	
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
			OR	
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
			OR	
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
			OR	
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
			OR	
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions			**PART – C**	**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**	
			OR	
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
			OR	
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
			OR	
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
			OR	
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
			OR	
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	ALLIED BOTANY - I			
Course Code	23UMBEA12	**L**	**P**	**C**
Category	ALLIED	5	-	4

COURSE OBJECTIVES:

➢ To study morphological and anatomical adaptations of plants of various habitats.
➢ To demonstrate techniques of plant tissue culture.
➢ To familiarize with the structure of DNA, RNA.
➢ To carryout experiments related with plant physiology.
➢ To perform biochemistry experiments.

UNIT - I Algae	12

General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.

UNIT - II Fungi, Bacteria and Virus	12

General characters of fungi, structure, reproduction and life cycle of the following genera - *Penicillium* and *Agaricus* and economic importance of fungi.
Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria.
Virus - general characters, structure of TMV, structure of bacteriophage.

UNIT - III Bryophytes, Pteridophytes and Gymnosperms	12

General characters of Bryophytes, Structure and life cycle of *Funaria*.
General characters of Pteridophytes, Structure and life cycle of *Lycopodium*.
General characters of Gymnosperms, Structure and life cycle of *Cycas*.

UNIT - IV Cell Biology	12

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.

UNIT - V Genetics and Plant Biotechnology	12

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods. Plant tissue culture and its application in biotechnology.

	Total Lecture Hours	**60**

BOOKS FOR STUDY:

➢ Singh,V.,Pande,P.C andJain,D.K. 2021. ATextBookofBotany.RastogiPublications,Meerut.
➢ Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
➢ Sharma,O.P.2017. Bryophyta, MacMillanIndiaLtd.Delhi.
➢ Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
➢ Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany,S.
  Viswanathan Pvt. Ltd., Madras.

BOOKS FOR REFERENCES:

➢ Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.
➢ Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
➢ Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
➢ Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
➢ Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
➢ Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.
➢ Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.

WEB RESOURCES:

❖ **https://www.kobo.com/us/en/ebook/the-algae-world**
❖ **http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html**
❖ **http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm**
❖ **https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/**
❖ **https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf**
❖ **https://www.us.elsevierhealth.com/medicine/cell-biology**
❖ **https://www.us.elsevierhealth.com/medicine/genetics**
❖ **https://www.kobo.com/us/en/ebook/plant-biotechnology-1**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Increase the awareness and appreciation of human friendly algae and their economic importance.	**K1 to K4**
CO2	Develop an understanding of microbes and fungi and appreciate their adaptive strategies.	**K1 to K4**
CO3	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	**K1 to K4**
CO4	Compare the structure and function of cells and explain the development of cells.	**K1 to K4**
CO5	Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.	**K1 to K4**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3					
CO2	3	3	3	3	3					
CO3	2	3	3	3	3					
CO4	3	3	2	3	3					
CO5	3	2	2	2	2					

S- STRONG　　　　　　　**M – MEDIUM**　　　　　　　**L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	1	3	3	3	3
CO 4	3	2	3	2	3
CO 5	2	2	1	2	1
WEITAGE	12	13	13	13	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	**Algae:** General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.	12	**PPT/CHALK AND TALK**
II	**Fungi, Bacteria and Virus:** General characters of fungi, structure, reproduction and life cycle of the following genera - *Penicillium* and *Agaricus* and economic importance of fungi. Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.	12	**PPT/CHALK AND TALK**
III	**Bryophytes, Pteridophytes and Gymnosperms:** General characters of Bryophytes, Structure and life cycle of *Funaria*. General characters of Pteridophytes, Structure and life cycle of *Lycopodium*. General characters of Gymnosperms, Structure and life cycle of *Cycas*	12	**PPT/CHALK AND TALK**
IV	**Cell Biology:** Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles	12	**PPT/CHALK AND TALK**

	- ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.			
V	**Genetics and Plant Biotechnology:** Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law ofindependent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods. Plant tissue culture and its application in biotechnology.	**12**	**PPT/CHALK AND TALK**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	**Cos**	**K Level**	**Section A**		**Section B Either or Choice**	**Section C Either or Choice**
			MCQs			
			No. of. Questions	**K - Level**		
CI AI	CO1	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO2	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
CI AII	CO3	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO4	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		**No. of Questions to be asked**	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Either / Or Choice)**	**Section C (Either / Or Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2	10		2	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	26	46.4	46.4
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

			Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
S. No	**Cos**	**K - Level**	**No. of Questions**	**K – Level**		
1	**CO1**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
2	**CO2**	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
3	**CO3**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
4	**CO4**	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
5	**CO5**	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Title row: **Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)**

Distribution of Marks with K Level						
K Level	**Section A (Multiple Choice Questions)**	**Section B (Either or Choice**	**Section C (Either/ or Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	5			5	**3.6**	**4**
K2	5	20		25	**17.8**	**18**
K3		30	32	62	**44.3**	**44**
K4			48	48	**34.3**	**34**
Marks	**10**	**50**	**80**	**140**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer **ALL** the questions				**PART – A**	**(10 x 1 = 10 Marks)**
	Unit - I	**CO1**	**K1**		
1.				a)	b)
				c)	d)
	Unit - I	**CO1**	**K2**		
2.				a)	b)
				c)	d)
	Unit - II	**CO2**	**K1**		
3.				a)	b)
				c)	d)
	Unit - II	**CO2**	**K2**		
4.				a)	b)
				c)	d)
	Unit - III	**CO3**	**K1**		
5.				a)	b)
				c)	d)
	Unit - III	**CO3**	**K2**		
6.				a)	b)
				c)	d)
	Unit - IV	**CO4**	**K1**		
7.				a)	b)
				c)	d)
	Unit - IV	**CO4**	**K2**		
8.				a)	b)
				c)	d)
	Unit - V	**CO5**	**K1**		
9.				a)	b)
				c)	d)
	Unit - V	**CO5**	**K2**		
10.				a)	b)
				c)	d)

Answer **ALL** the questions			**PART – B**	**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**	
		OR		
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
		OR		
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
		OR		
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
		OR		
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
		OR		
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions			**PART – C**	**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**	
		OR		
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
		OR		
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
		OR		
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
		OR		
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
		OR		
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	ROLE OF CHEMISTRY IN DAILY LIFE			
Course Code	23UCHNM11	**L**	**P**	**C**
Category	NON-MAJOR ELECTIVE	2	-	2

COURSE OBJECTIVES: This course aims at providing knowledge on

➢ importance of Chemistry in everyday life

➢ chemistry of building materials and food

➢ chemistry of Drugs and pharmaceuticals

UNIT - I CHEMICALS IN NATURE	06

General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution

UNIT - II BUILDING MATERIALS & PLASTICS	06

Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.

UNIT - III FOOD & NUTRITION , COSMETICS	06

Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance).

Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.

UNIT - IV CHEMICALS IN FOOD PRODUCTION & FUELS	06

Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate.

Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.

UNIT - V PHARMACEUTICALS, DYES & EXPLOSIVES	06

Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications.

Explosives - classification and examples.

	Total Lecture Hours	30

BOOKS FOR STUDY:

- Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
- A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012.
- S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
- B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
- Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019.
- Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co.Publishers, second edition, 2006

BOOKS FOR REFERENCES:

- Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourthedition, 1977.
- W.A.Poucher, JosephA.Brink, Jr.Perfumes, Cosmetics and Soaps, Springer, 2000.
- A.K.De, Environmental Chemistry, NewAge International PublicCo., 1990.

WEB RESOURCES:

- ❖ **https://www.science.org.au/curious/chemistry**
- ❖ **https://www.nsf.gov/news/classroom/chemistry.jsp**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		ENTREPRENEURSHIP		✓
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	✓	GLOBAL	
Changes Made in the Course	Percentage of Change		No Changes Made		New Course		✓

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Identify the chemicals used in everyday life as well as air pollution and water pollution.	**K1 to K2**
CO2	Describe on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,	**K1 to K2**
CO3	Summarize on Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.	**K1 to K2**
CO4	Discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses	**K1 to K2**
CO5	illustrate the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.	**K1 to K2**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M

| CO4 | S | S | S | S | S | S | S | M |
| CO5 | S | M | S | S | S | S | S | M |

S- STRONG		**M – MEDIUM**		**L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	15	15	15	15	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3.0	3.0	3.0	3.0	3.0

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style.	3	Chalk & talk, ppt
	Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution	3	Chalk & talk
II	Building materials - cement, ceramics, glass and refractories - definition, composition and application only.	3	Chalk & talk
	Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.	3	Chalk & talk,ppt
III	Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance).	3	Chalk & talk

	Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.	**3**	**Chalk & talk, ppt**
IV	Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate.	**3**	**Chalk & talk, ppt**
	Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.	**3**	**Chalk & talk, ppt**
V	Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin.	**3**	**Chalk & talk, ppt**
	Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.	**3**	**Chalk & talk, ppt**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A	
			MCQs	
			No. of. Questions	**K - Level**
CI AI	**CO1**	**K1 – K2**	25	**K1,K2**
	CO2	**K1 – K2**	25	**K1,K2**
CI AII	**CO3**	**K1 – K2**	25	**K1,K2**
	CO4	**K1 – K2**	25	**K1,K2**
Question Pattern CIA I & II	**No. of Questions to be asked**		50	
	No. of Questions to be answered		50	
	Marks for each question		1	
	Total Marks for each section		50	

* Two Formative examinations will be conducted as a part of Continuous Internal

Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist

Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

Course Name	FUNDAMENTALS OF CHEMISTRY			
Course Code	23UCHFC11	**L**	**P**	**C**
Category	SKILL ENHANCEMENT COURSE	2	-	2

COURSE OBJECTIVES: This course aims

➢ To help students to get an overview of chemistry before learning their core courses.
➢ To serve as a bridge between the school curriculum and the degree programme.

UNIT - I   Chemicals in nature   06

General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution.

UNIT - II   Basic concepts in Chemistry   06

Importance of Chemistry- Nature of Matter- Properties of matter- Uncertainty in measurement- laws of chemical combinations – Dalton's atomic theory – atomic and molecular masses- mole concept and molar masses- percentage composition- stoichiometry and stoichiometric calculations.

Structure of atom – sub atomic particles – atomic models – Bohr's atomic model of hydrogen atom- Quantum mechanical model of atom.

UNIT - III State of Matter and Thermodynamics   06

Intermolecular forces- thermal energy- the gaseous state – the gas laws- ideal gas equation – kinetic molecular theory of gases – deviation of real gases from ideal gas behaviour – liquefaction of gases – liquid state.

Thermodynamic state- applications – measurement of ΔU and ΔH: calorimetry- enthalpy change ΔH of a reaction – enthalpies for different types of reactions – spontaneity – Gibbs energy change and equilibrium.

UNIT - IV Organic chemistry – Basic principles and techniques   06

Tetravalence of Carbon: Shapes of Organic compounds – structural representation- classification – nomenclature – isomerism- fundamental concepts in organic mechanism- methods of purification of organic compounds – qualitative analysis of organic compounds – quantitative analysis

Hydrocarbons- Classification – alkanes – alkenes- alkynes – aromatic hydrocarbon- carcinogenicity and toxicity.

UNIT - V	Elementary ideas on Biomolecules	06
	Carbohydrates- classification- monosaccharides – glucose and fructose – structure – disaccharides – polysaccharides- importance Aminoacids – classification – structure of proteins- denaturation. Vitamins – classification. Nucleic acids – chemical composition- structure – biological function	
	Total Lecture Hours	**30**

BOOKS FOR STUDY:

➢ NCERT Class XI and class XII Chemistry books

BOOKS FOR REFERENCES:

➢ TN school text book class XI and XII

WEB RESOURCES:

❖ **https://ncert.nic.in/textbook.php**

❖ **https://tntextbooks.online/**

❖ **https://www.youtube.com/c/ncertofficial/videos**

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL	NATIONAL	GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.						

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Identify the chemicals used in everyday life as well as air pollution and water pollution.	**K1 to K2**
CO2	Summarize Basic concepts of chemistry	**K1 to K2**
CO3	Describe state of matter and thermodynamics	**K1 to K2**
CO4	Illustrate basic principles and techniques Organic chemistry	**K1 to K2**
CO5	Explain elementary ideas on Biomolecules	**K1 to K2**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M

S- STRONG   **M – MEDIUM**   **L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	**15**	**15**	**15**	**15**	**15**
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3.0	3.0	3.0	3.0	3.0

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style.	**3**	**Chalk & talk, ppt**
	Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution.	**3**	**Chalk & talk**

II	Importance of Chemistry- Nature of Matter- Properties of matter- Uncertainty in measurement- laws of chemical combinations – Dalton's atomic theory – atomic and molecular masses- mole concept and molar masses- percentage composition- stoichiometry and stoichiometric calculations.	4	**Chalk & talk, problem solving**
	Structure of atom – sub atomic particles – atomic models – Bohr's atomic model of hydrogen atom- Quantum mechanical model of atom.	2	**Chalk & talk**
III	Intermolecular forces- thermal energy- the gaseous state – the gas laws- ideal gas equation – kinetic molecular theory of gases – deviation of real gases from ideal gas behaviour – liquefaction of gases – liquid state.	3	**Chalk & talk**
	Thermodynamic state- applications – measurement of ΔU and ΔH: calorimetry- enthalpy change ΔH of a reaction – enthalpies for different types of reactions – spontaneity – Gibbs energy change and equilibrium	3	**Chalk & talk**
IV	Tetravalence of Carbon: Shapes of Organic compounds – structural representation- classification – nomenclature – isomerism- fundamental concepts in organic mechanism- methods of purification of organic compounds – qualitative analysis of organic compounds – quantitative analysis	4	**Chalk & talk, animation videos**
	Hydrocarbons- Classification – alkanes – alkenes- alkynes – aromatic hydrocarbon- carcinogenicity and toxicity.	2	**Chalk & talk**
V	Carbohydrates- classification- monosaccharides – glucose and fructose – structure – disaccharides – polysaccharides- importance.	3	**Chalk & talk**
	Aminoacids – classification – structure of proteins- denaturation. Vitamins – classification. Nucleic acids – chemical composition- structure – biological function	3	**Chalk & talk, ppt**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	**Cos**	**K Level**	**Section A**	
			MCQs	
			No. of. Questions	**K - Level**
CI AI	**CO1**	**K1 – K2**	25	**K1,K2**
	CO2	**K1 – K2**	25	**K1,K2**
CI AII	**CO3**	**K1 – K2**	25	**K1,K2**
	CO4	**K1 – K2**	25	**K1,K2**
Question Pattern CIA I & II		**No. of Questions to be asked**	50	
		No. of Questions to be answered	50	
		Marks for each question	1	
		Total Marks for each section	50	

* Two Formative examinations will be conducted as a part of Continuous Internal

Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist

Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	**K1**	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

SECOND SEMESTER

Course Name	GENERAL CHEMISTRY - II			
Course Code	23UCHCC21	**L+T**	**P**	**C**
Category	CORE	4+1	-	5

COURSE OBJECTIVES:

This course aims to provide a comprehensive knowledge on

➤ chemistry of acids, bases and ionic equilibrium

➤ properties of s and p-block elements

➤ chemistry of hydrocarbons

➤ applications of acids and bases

➤ compounds of main block elements and hydrocarbons

UNIT - I ACIDS, BASES AND IONIC EQUILIBRIA	12+3

Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves (4 types) - use of acid base indicators.

UNIT - II   CHEMISTRY OF s - BLOCK & p- BLOCK ELEMENTS (13-14)   12+3

Chemistry of s - Block Elements

Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, $KClO_3$ alkaline earth metals – general properties alone. Anomalous behaviour of Be.

Chemistry of p- Block Elements (Group 13 & 14)

Preparation and structure and bonding of diborane and borazine. Extraction of Al and its uses. Alloys of Al.

Comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Silane- Silicone polymers- synthesis and applications.

UNIT - III   CHEMISTRY OF p- BLOCK ELEMENTS (GROUP 15-18)   12+3

General characteristics of elements of Group 15; chemistry of H_2N-NH_2, NH_3 and urea. Chemistry of P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4), DAP and Super phosphate- preparation and uses.

General properties of elements of group16 - Classification and properties of oxides - chemistry of ozone- allotropes of Sulphur- - oxides of sulphur (SO_2 & SO_3) – Oxy acids of sulphur (Sulphuric acid ,Caro's and Marshall's acids).

Chemistry of Halogens: General characteristics of halogen with reference to electronegativity, electron affinity, oxidation states and oxidizing power. Preparation of Fluorine and difficulties in preparation of Fluorine, Peculiarities of fluorine. Bleaching powder – preparation, properties and uses. Inter-halogen compounds (Types and structure alone), pseudo halogens [$(CN)_2$ and $(SCN)_2$].

UNIT - IV	HYDROCARBON CHEMISTRY-I	12+3

Alkenes-Nomenclature, general methods of preparation – Mechanism of β- elimination reactions – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis, polymerisation.

Alkynes

Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.

Cycloalkanes: Nomenclature, Conformational analysis of cyclohexane, Bayer's strain theory and its limitations

UNIT - V	HYDROCARBON CHEMISTRY - II	12+3

Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.

Polynuclear Aromatic hydrocarbons: Naphthalene and Anthracene -structure, preferential substitution position and uses.

	Total Lecture Hours	**75**

BOOKS FOR STUDY:

➢ B.R. Puri, L.R. Sharma, M.S. Pathania; *Principles of Physical Chemistry*, 46th edition, Vishal Publishing, 2020.

➢ B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009.

➢ P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & amp; Sons, twentieth edition, 2006.

- ➤ M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, Vishal Publishing, fourth reprint, 2003.
- ➤ S.M. Mukherji, and S.P. Singh, *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., third edition, 1994.

BOOKS FOR REFERENCES:

- ➤ T. W. Graham Solomons, Organic Chemistry, John Wiley & Sons, fifth edition, 1992.
- ➤ A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt., Ltd.,New Delhi, seventh edition, 2009.
- ➤ I. L. Finar, Organic Chemistry, Wesley Longman Ltd, England, sixth edition, 1996.
- ➤ P. L. Soni, and H. M.Chawla - Text Book of Organic Chemistry, New Delhi, Sultan Chand & Sons, twenty ninth edition, 2007.
- ➤ J.D. Lee, Concise Inorganic Chemistry, Blackwell Science, fifth edition, 2005.

WEB RESOURCES:

MOOC components

- ❖ **https://nptel.ac.in/courses/104104101**
- ❖ **Solid state chemistry https://nptel.ac.in/courses/103106071**
- ❖ **Nuclear industries and safety https://nptel.ac.in/courses/104106119s**

   Introduction to organic chemistry

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED			ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change			No Changes Made			New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.									

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Explain the kinetic properties of gases by using mathematical concepts.	**K1 to K4**
CO2	Describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.	**K1 to K4**
CO3	Investigate the radioactivity, nuclear energy and its production, also the nuclear waste management.	**K1 to K4**
CO4	Write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols.	**K1 to K4**
CO5	Investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including Thiel.	**K1 to K4**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M

S- STRONG   M – MEDIUM   L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	**15**	**15**	**15**	**15**	**15**
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of	**6**	**Chalk & talk, ppt**

	dissociation;		
	Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves (4 types) - use of acid base indicators.	**6**	**Chalk & talk, animation videos**
	Discussion on Questions related to the above topics, from various competitive examinations	**3**	**Group discussion & inquiry**
II	**Chemistry of s - Block Elements** Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, $KClO_3$ alkaline earth metals – general properties alone. Anomalous behaviour of Be.	**6**	**Chalk & talk**
	Chemistry of p- Block Elements (Group 13 & 14) Preparation and structure and bonding of diborane and borazine. Extraction of Al and its uses. Alloys of Al. Comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Silane- Silicone polymers- synthesis and applications.	**6**	**Chalk & talk, ppt**
	Discussion on Questions related to the above topics, from various competitive examinations	**3**	**Group discussion & inquiry**
III	General characteristics of elements of Group 15; chemistry of H_2N-NH_2, NH_3 and urea. Chemistry of P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4), DAP and Super phosphate- preparation and uses.	**6**	**Chalk & talk**
	General properties of elements of group16 - Classification and properties of oxides - chemistry of ozone- allotropes of Sulphur- - oxides of sulphur (SO_2 & SO_3) – Oxy acids of sulphur (Sulphuric acid ,Caro's and Marshall's acids).		
	Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Preparation of Fluorine and difficulties in preparation of Fluorine, Peculiarities of fluorine. Bleaching powder – preparation, properties and uses. Inter-halogen compounds (Types and structure alone), pseudo halogens [$(CN)_2$ and $(SCN)_2$].	**6**	**Chalk & talk, ppt**
	Discussion on Questions related to the above topics, from various competitive examinations	**3**	**Group discussion**

			& inquiry
IV	**Alkenes**-Nomenclature, general methods of preparation – Mechanism of β- elimination reactions – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis, polymerisation.	6	Chalk & talk, model making
	Alkynes Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation. **Cycloalkanes:** Nomenclature, Conformational analysis of cyclohexane, Bayer's strain theory and its limitations	6	Chalk & talk, model making
	Discussion on Questions related to the above topics, from various competitive examinations	3	Group discussion & inquiry
V	**Benzene:** Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation,	6	Chalk & talk, model making
	Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity. **Polynuclear Aromatic hydrocarbons**: Naphthalene and Anthracene -structure, preferential substitution position and uses.	6	Chalk & talk
	Discussion on Questions related to the above topics, from various competitive examinations	3	Group discussion & inquiry

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1	2 (K2,K2)	2(K3,K3)
	CO2	K1 – K4	2	K2	2(K3,K3)	2(K4,K4)
CI AII	CO3	K1 – K4	2	K1	2(K2,K2)	2(K3,K3)
	CO4	K1 – K4	2	K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II	No. of Questions to be asked		4		4	4
	No. of Questions to be answered		4		2	2
	Marks for each question		1		5	8
	Total Marks for each section		4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	2	3.57	25
	K2	2	10	-	12	21.43	
	K3	-	10	16	26	46.43	46.43
	K4	-	-	16	16	28.57	28.57
	Marks	4	20	32	56	100	100
CIA II	K1	2	-	-	2	3.57	25
	K2	2	10	-	12	21.43	
	K3	-	10	16	26	46.43	46.43
	K4	-	-	16	16	28.57	28.57
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

			Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
S. No	COs	K - Level	No. of Questions	K – Level		
1	CO1	K1-K4	2	K1&K2	2 (K2)	2 (K3)
2	CO2	K1-K4	2	K1&K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1&K2	2 (K2)	2 (K3)
4	CO4	K1-K4	2	K1&K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1&K2	2 (K4)	2 (K3)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

(Figures in parenthesis denotes, questions should be asked with the given K level)

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	5	3.57	21.43
K2	5	20	-	25	17.86	
K3	-	20	48	68	48.57	48.57
K4	-	10	32	42	30	30
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer **ALL** the questions			**PART – A**		**(10 x 1 = 10 Marks)**
1.	**Unit - I**	**CO1**	**K1**		
				a)	b)
				c)	d)
2.	**Unit - I**	**CO1**	**K2**		
				a)	b)
				c)	d)
3.	**Unit - II**	**CO2**	**K1**		
				a)	b)
				c)	d)
4.	**Unit - II**	**CO2**	**K2**		
				a)	b)
				c)	d)
5.	**Unit - III**	**CO3**	**K1**		
				a)	b)
				c)	d)
6.	**Unit - III**	**CO3**	**K2**		
				a)	b)
				c)	d)
7.	**Unit - IV**	**CO4**	**K1**		
				a)	b)
				c)	d)
8.	**Unit - IV**	**CO4**	**K2**		
				a)	b)
				c)	d)
9.	**Unit - V**	**CO5**	**K1**		
				a)	b)
				c)	d)
10.	**Unit - V**	**CO5**	**K2**		
				a)	b)
				c)	d)

Answer **ALL** the questions		**PART – B**			**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**		
				OR	
11. b)	**Unit - I**	**CO1**	**K2**		
12. a)	**Unit - II**	**CO2**	**K3**		
				OR	
12. b)	**Unit - II**	**CO2**	**K3**		
13. a)	**Unit - III**	**CO3**	**K2**		
				OR	
13. b)	**Unit - III**	**CO3**	**K2**		
14. a)	**Unit - IV**	**CO4**	**K3**		
				OR	
14. b)	**Unit - IV**	**CO4**	**K3**		
15. a)	**Unit - V**	**CO5**	**K4**		
				OR	
15. b)	**Unit - V**	**CO5**	**K4**		

Answer **ALL** the questions		**PART – C**			**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**		
				OR	
16. b)	**Unit - I**	**CO1**	**K3**		
17. a)	**Unit - II**	**CO2**	**K4**		
				OR	
17. b)	**Unit - II**	**CO2**	**K4**		
18. a)	**Unit - III**	**CO3**	**K3**		
				OR	
18. b)	**Unit - III**	**CO3**	**K3**		
19. a)	**Unit - IV**	**CO4**	**K4**		
				OR	
19. b)	**Unit - IV**	**CO4**	**K4**		
20. a)	**Unit - V**	**CO5**	**K3**		
				OR	
20. b)	**Unit - V**	**CO5**	**K3**		

Course Name	QUANTITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS - PRACTICAL			
Course Code	23UCHCP21	L	P	C
Category	CORE	-	4	4

COURSE OBJECTIVES:

This course aims at providing knowledge on

➢ laboratory safety

➢ handling glass wares

➢ analysis of organic compounds

➢ preparation of organic compounds

UNIT - I	**02**

Safety rules, symbols and first-aid in chemistry laboratory -Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses

UNIT - II	**29**

Qualitative Organic Analysis

Preliminary examination, detection of special elements - nitrogen, sulphur and halogens

Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests

Confirmation of functional groups

➢ monocarboxylic acid, dicarboxylic acid

➢ monohydric phenol, polyhydric phenol

➢ aldehyde, ketone, ester

➢ carbohydrate (reducing and non-reducing sugars)

➢ primary, secondary, tertiary amine

➢ monoamide, diamide, thioamide

➢ anilide, nitro compound

➢ Preparation of derivatives for functional groups

Preparation of Organic Compounds

- Nitration - picric acid from Phenol
- Halogenation - p-bromo acetanilide from acetanilide
- Oxidation - benzoic acid from Benzaldehyde
- Microwave assisted reactions in water:
- Methyl benzoate to Benzoic acid
- Salicylic acid from Methyl Salicylate
- Rearrangement - Benzil to Benzilic Acid

Hydrolysis of benzamide to Benzoic Acid

Separation and Purification Techniques (Not for Examination)

- Purification of organic compounds by crystallization (from water / alcohol) and distillation
- Determination of melting and boiling points of organic compounds.

Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves.

Chromatography (any one) (Group experiment)

Separation of amino acids by Paper Chromatography

Thin Layer Chromatography - mixture of sugars / plant pigments /permanganate dichromate.

Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.

Electrophoresis – Separation of amino acids and proteins. **(Demonstration)**

Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE)

	Total Lecture Hours	60

BOOKS FOR REFERENCES:

- Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand: New Delhi, 2012.
- Manna, A.K. Practical Organic Chemistry, Books and Allied: India, 2018.
- Gurtu, J. N; Kapoor, R. Advanced Experimental Chemistry (Organic), Sultan Chand: New Delhi, 1987.
- Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. Vogel's Textbook

WEB RESOURCES:

- ❖ **https://www.vlab.co.in/broad-area-chemical-sciences**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Observe the physical state, odour, colour and solubility of the given organic compound.	**K1 to K4**
CO2	Identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.	**K1 to K4**
CO3	compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides,	**K1 to K4**
CO4	Differentiate mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it.	**K1 to K4**
CO5	exhibit a solid derivative with respect to the identified functional group.	**K1 to K4**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M

S- STRONG	**M – MEDIUM**	**L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	**15**	**15**	**15**	**15**	**15**
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3.0	3.0	3.0	3.0	3.0

LESSON PLAN:			
UNIT	**Qualitative Organic Analysis and Preparation of Organic Compounds**	**HRS**	**PEDAGOGY**
I	Safety rules, symbols and first-aid in chemistry laboratory Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses	**02**	**Explanation with models**
II	**Qualitative Organic Analysis** Preliminary examination, detection of special elements - nitrogen, sulphur and halogens Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests Confirmation of functional groups ➤ monocarboxylic acid, dicarboxylic acid ➤ monohydric phenol, polyhydric phenol ➤ aldehyde, ketone, ester ➤ carbohydrate (reducing and non-reducing sugars) ➤ primary, secondary, tertiary amine ➤ monoamide, diamide, thioamide ➤ anilide, nitro compound ➤ Preparation of derivatives for functional groups	**29**	**Experiments**
III	**Preparation of Organic Compounds** ➤ Nitration - picric acid from Phenol ➤ Halogenation - p-bromo acetanilide from acetanilide ➤ Oxidation - benzoic acid from Benzaldehyde ➤ Microwave assisted reactions in water: ➤ Methyl benzoate to Benzoic acid ➤ Salicylic acid from Methyl Salicylate ➤ Rearrangement - Benzil to Benzilic Acid ➤ Hydrolysis of benzamide to Benzoic Acid **Separation and Purification Techniques (Not for Examination)** ➤ Purificationof organic compounds by crystallization (from water / alcohol) and distillation ➤ Determination of melting and boiling points of organic	**29**	**Experiments**

compounds.

Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves.

Chromatography (any one) (Group experiment)

Separation of amino acids by Paper Chromatography

Thin Layer Chromatography - mixture of sugars / plant pigments /permanganate dichromate.

Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.

Electrophoresis – Separation of amino acids and proteins.

(Demonstration)

Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE)

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)						
			Section A		Section B	Section C
			MCQs			
Internal	**Cos**	**K Level**	**No. of. Questions**	**K - Level**		
Model Exam	**CO1**	**K1 – K4**	5	**K1**		
	CO2	**K1 – K4**	5	**K2**		
	CO3	**K1 – K4**				1(K4)
	CO4	**K1 – K4**				1 (K3)
	CO5	**K1- K4**			1 (K3)	
Question Pattern Model exam		No. of Questions to be asked	10		1	2
		No. of Questions to be answered	10		1	2
		Marks for each question	1		10	10
		Total Marks for each section	10		10	20

Overall CIA marks (25) = (Model exam conducted for 40 marks is converted to 15 marks + regular class observation 10 marks)

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B K - LEVEL	Section C K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	5	K1		
2	CO2	K1 – K4	5	K2		
3	CO3	K1 – K4				1(K4)
4	CO4	K1 – K4				1(K3)
5	CO5	K1 – K4			1 (K3)	
No. of Questions to be Asked			10		1	2
No. of Questions to be answered			10		1	2
Marks for each question			1		10	15
Total Marks for each section			10		10	30
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Overall Summative Exam marks (75) = Exam marks (60) + Record marks (15)

Course Name	ALLIED MATHEMATICS - II			
Course Code	23UMTEA21	**L**	**P**	**C**
Category	ELECTIVE	5	-	4

COURSE OBJECTIVES:

➢ This course is designed for the students to expose the topics such as expansions of trigonometric functions, partial differential equations, and integration.
➢ To gain knowledge of expansions of trigonometric functions.
➢ To acquire the knowledge of solving partial differential equations.
➢ Basic knowledge of vector calculus.
➢ To understand and carry out the calculations of a given set of data

UNIT – I TRIGONOMETRY	15

Expansions of $\sin n\theta$, $\cos n\theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ – Expansions of $\sin\theta$, $\cos\theta$, $\tan\theta$ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers.

UNIT – II PARTIAL DIFFERENTIAL EQUATION	15

Formation-complete integrals and general integrals-Four standard types-Lagrange's equation.

UNIT - III VECTOR DIFFRENTIATION	15

Vector functions- Derivative of a vector function- Scalar and vector point functions- Gradient of a scalar point function-Gradient- Directional derivatives –Unit vector normal to a surface– angle between the surfaces-divergence, curl.

UNIT – IV VECTOR INTEGRATION	15

Green's theorem in the plane- Gauss divergence theorem- Stoke's theorem [without proofs].

UNIT - V FINITE DIFFERENCE	15

Operator E, Relation between Δ, ∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation- Lagrange's interpolation formula for unequal intervals(without proof) .

	Total Lecture Hours	75

BOOKS FOR STUDY:

➢ P. Duraipandian and S. Udayabaskaran(1997), "Allied Mathematics", Vol I & II. Chennai: Muhil Publishers.

Unit-I: Chapter 6 (6.1,6.1.1-6.1.3,6.2,6.2.1-6.2.3,6.3,6.4), Vol I,

Unit-II: Chapter :6 (6.1,6.1.1,6.2,6.3,6.4), Vol II,

Unit-III Chapter 8 - (8.1,8.1.1,8.2,8.3,8.3.1,8.3.2,8.4,8.4.1,8.4.2,8.4.3,8.4.4),Vol I,

Unit-IV: Chapter 8 - (8.6.1 - 8.6.3), Vol I,

Unit-V: Chapter 5 - (5.1,5.2) Vol II

BOOKS FOR REFERENCES:

➢ S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
➢ S.J.Venkatesan, "Allied Mathematics - II", Sri Krishna Publications, Chennai.
➢ P. R. Vittal (2003), "Allied Mathematics", Margham Publications, Chennai.
➢ P.Kandhasamy, K. Thilagavathy (2003), "Allied Mathematics" Vol I & II, New Delhi: Tata McGraw Hill.
➢ P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences & Numerical Analysis,S. Chand & Company Ltd., New Delhi-55.

WEB RESOURCES:

❖ **https;//www.mathwarehous.com/**
❖ **https;//www.mathhelp.com/**
❖ **https;//www.mathsisfun.com/**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✔	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL	REGIONAL	✔	NATIONAL	GLOBAL	
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✔

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Find out the expansions of trigonometric functions and carry out problems related to hyperbolic and inverse hyperbolic functions.	**K1 to K4**
CO2	Provide a basic knowledge of partial differential equations and develops knowledge on handling practical problems. Develop the skills of finding roots of simultaneous equations	**K1 to K4**
CO3	Demonstrate knowledge of solving problems involving vector and scalar functions.	**K1 to K4**
CO4	Carry out calculations of problems related to vector integration	**K1 to K4**
CO5	Evaluate finite differences using various interpolation methods	**K1 to K4**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	1	3	3	2	3				
CO2	2	2	2	3	2	3				
CO3	3	2	2	3	1	1				
CO4	1	2	2	1	2	3				
CO5	3	2	2	1	2	3				

S- STRONG	**M – MEDIUM**	**L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	1		
CO 2	3	2	1		
CO 3	3	2	1		
CO 4	3	2	1		
CO 5	3	2	1		
WEIGHTAGE	**15**	**10**	**5**		
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3	2	1		

LESSON PLAN:

UNIT	ALLIED MATHEMATICS – II	HRS	PEDAGOGY
I	Expansions of sin n θ, cos n θ, sinnθ, cosnθ, tannθ – Expansions of sinθ, cosθ, tanθ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers.	15	**Chalk & Talk**
II	Formation-complete integrals and general integrals-Four standard types-Lagrange's equation	15	**Chalk & Talk**

		Vector functions- Derivative of a vector function- Scalar and vector point functions- Gradient of a scalar point function-Gradient- Directional derivatives –Unit vector normal to a surface– angle between the surfaces-divergence, curl..		
III		Vector functions- Derivative of a vector function- Scalar and vector point functions- Gradient of a scalar point function-Gradient- Directional derivatives –Unit vector normal to a surface– angle between the surfaces-divergence, curl..	**15**	**Chalk & Talk**
IV		Green's theorem in the plane- Gauss divergence theorem- Stoke's theorem [without proofs].	**15**	**Chalk & Talk**
V		Operator E, Relation between Δ ,∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation- Lagrange's interpolation formula for unequal intervals(without proof) .	**15**	**Chalk & Talk**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	**CO1**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO2	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
CI AII	**CO3**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO4	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		**No. of Questions to be asked**	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	**4**	**20**	**32**	**56**	**100**	**100**
CIA II	K1	2			2	3.6	7.2
	K2	2	10		2	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	26	46.4	46.4
	Marks	**4**	**20**	**32**	**56**	**100**	**100**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	Cos	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
2	CO2	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
3	CO3	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
4	CO4	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
5	CO5	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.6	4
K2	5	20		25	17.8	18
K3		30	32	62	44.3	44
K4			48	48	34.3	34
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer **ALL** the questions			PART – A		(10 x 1 = 10 Marks)
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer **ALL** the questions		**PART – B**		(5 x 5 = 25 Marks)
11. a)	**Unit - I**	**CO1**	**K2**	
		OR		
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
		OR		
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
		OR		
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
		OR		
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
		OR		
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions		**PART – C**		(5 x 8 = 40 Marks)
16. a)	**Unit - I**	**CO1**	**K3**	
		OR		
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
		OR		
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
		OR		
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
		OR		
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
		OR		
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	ALLIED BOTANY - II			
Course Code	23UMBEA22	**L**	**P**	**C**
Category	ALLIED	5	-	4

COURSE OBJECTIVES:

➢ To understand the fundamental concepts of plant parts and their morphology.
➢ To analyze and recognize the main taxonomic ranks in plants.
➢ To understand the concepts in the types and mechanisms involved in disease establishment.
➢ To classify the different agents that can cause infection in plants and their methods of spread.
➢ To classify the methods of managing plant diseases to prevent or minimize loss.

UNIT - I	MORPHOLOGY OF PLANTS	12

Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types – Brief descriptions only.

UNIT - II	PLANT TAXONOMY	12

Introduction to Taxonomy and Systematics – Identification, Classification and Nomenclature – Binomial system of naming plants, Brief descriptions of the major groups in plant taxonomy – Plant Kingdom, Division, Class, Order, Family, Genus and species.

UNIT - III	ANATOMY	12

Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

UNIT - IV	EMBRYOLOGY	12

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds.

UNIT - V	PLANT PHYSIOLOGY	12

Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC– CSIR/GATE/TNPSC/others to be solved/ (To be discussed during the Tutorial hour)

	Total Lecture Hours	**60**

BOOKS FOR STUDY:

- Agrios George N. 2005. Plant Pathology. 5th Edition, Elsevier Press, London, NY, Tokyo.

- Narayanasamy P. 2011. Microbial Plant Pathogens – Detection and Disease Diagnosis. Fungal Pathogens – Vol. 1, Springer Dordrecht Heidelberg. London and New York.

- Narayanasamy P. 2011. Microbial Plant Pathogens – Detection and Disease Diagnosis. Bacterial and Phytoplasmal Pathogens – Vol. 2, Springer Dordrecht Heidelberg. London and New York.

- Narayanasamy P. 2011. Microbial Plant Pathogens – Detection and Disease Diagnosis. Viral and viroid Pathogens – Vol. 3, Springer Dordrecht Heidelberg. London and New York.

- Ting, I.P. 1982. Plant Physiology.Addison Wesley Pb. Philippines.

BOOKS FOR REFERENCES:

- Gillings Michael and Andrew Holmes, Editors. 2005. Plant Microbiology, BIOS Scientific Publishers, Taylor and Francis Group, London and NY.

- Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.

- Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.

- Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.

- Balaji Aglave, 2018. Handbook of Plant Disease Identification and Management. 1st Kindle edition. CRC Press. Florida.

WEB RESOURCES:

- https://portal.ct.gov/CAES/Fact-Sheets/Plant-Pathology/Plant-Health-Problems#:~:text= COMMON%20SYMPTOMS%20OF%20PLANT%20DISEASE,flowers%2C%20or%20the%20entire%20plant.

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7604890/

- https://byjus.com/neet/anatomy-of-root-stem-and-leaf/

- https://www.apsnet.org/edcenter/disimpactmngmnt/topc/EpidemiologyTemporal/Pages/ManagementStrategies.aspx

- https://www.botanyyworld.com/inflorescence/

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL	REGIONAL		NATIONAL	GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.						

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Understand the fundamental concepts of plant anatomy.	**K1 to K4**
CO2	Analyze and recognize the different ranks in plant taxonomy	**K1 to K4**
CO3	Understand the types and various factors of plant diseases.	**K1 to K4**
CO4	Classify the different biological agents causing plant infections, symptoms and their transmission.	**K1 to K4**
CO5	Classify the methods of plant protection to avoid or minimize loss.	**K1 to K4**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3					
CO2	3	3	3	3	3					
CO3	2	3	3	3	3					
CO4	3	3	2	3	3					
CO5	3	2	2	2	2					

S- STRONG　　　　**M – MEDIUM**　　　　**L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	1	3	3	3	3
CO 4	3	3	2	3	2
CO 5	2	2	1	2	2
WEIGHTAGE	12	14	12	14	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3	3	3	3	3

LESSON PLAN:

UNIT		HRS	PEDAGOGY
I	Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types – Brief descriptions only	12	**PPT/CHALK AND TALK**
II	Introduction to Taxonomy and Systematics – Identification, Classification and Nomenclature – Binomial system of naming plants, Brief descriptions of the major groups in plant taxonomy – Plant Kingdom, Division, Class, Order, Family, Genus and species.	12	**PPT/CHALK AND TALK**

			Section A		Section B	Section C

III	Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.	**12**	**PPT/CHALK AND TALK**
IV	Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds.	**12**	**PPT/CHALK AND TALK**
V	Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.	**12**	**PPT/CHALK AND TALK**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	**Cos**	**K Level**	**Section A**		**Section B Either or Choice**	**Section C Either or Choice**
			MCQs			
			No. of. Questions	**K - Level**		
CI AI	**CO1**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO2	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
CI AII	**CO3**	**K1 – K4**	2	K1,K2	2(K2,K2)	2(K3,K3)
	CO4	**K1 – K4**	2	K1,K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		**No. of Questions to be asked**	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	**4**	**20**	**32**	**56**	**100**	**100**
CIA II	K1	2			2	3.6	7.2
	K2	2	10		2	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	26	46.4	46.4
	Marks	**4**	**20**	**32**	**56**	**100**	**100**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	Cos	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
2	CO2	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
3	CO3	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
4	CO4	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
5	CO5	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.6	4
K2	5	20		25	17.8	18
K3		30	32	62	44.3	44
K4			48	48	34.3	34
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer **ALL** the questions			**PART – A**		**(10 x 1 = 10 Marks)**
	Unit - I	CO1	K1		
1.				a)	b)
				c)	d)
	Unit - I	CO1	K2		
2.				a)	b)
				c)	d)
	Unit - II	CO2	K1		
3.				a)	b)
				c)	d)
	Unit - II	CO2	K2		
4.				a)	b)
				c)	d)
	Unit - III	CO3	K1		
5.				a)	b)
				c)	d)
	Unit - III	CO3	K2		
6.				a)	b)
				c)	d)
	Unit - IV	CO4	K1		
7.				a)	b)
				c)	d)
	Unit - IV	CO4	K2		
8.				a)	b)
				c)	d)
	Unit - V	CO5	K1		
9.				a)	b)
				c)	d)
	Unit - V	CO5	K2		
10.				a)	b)
				c)	d)

Answer **ALL** the questions			**PART – B**	**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**	
		OR		
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
		OR		
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
		OR		
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
		OR		
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
		OR		
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions			**PART – C**	**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**	
		OR		
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
		OR		
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
		OR		
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
		OR		
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
		OR		
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	DAIRY CHEMISTRY			
Course Code	23UCHNM21	**L**	**P**	**C**
Category	NON - MAJOR ELECTIVE	2	-	2

COURSE OBJECTIVES:

This course aims at providing an overall view of the
➢ chemistry of milk and milk products
➢ processing of milk
➢ Preservation and formation of milk products.

UNIT - I	COMPOSITION OF MILK	06

Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.

UNIT - II	PROCESSING OF MILK	06

Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.

UNIT - III	MAJOR MILK PRODUCTS	06

Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fat in cream. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity - definition - prevention - antioxidants and synergists - natural and synthetic.

UNIT - IV	SPECIAL MILK	06

Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk - condensed milk - definition, composition and nutritive value.

UNIT - V FERMENTED AND OTHER MILK PRODUCTS	06

Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers – emulsifiers and their role-milk powder-definition-need for making milk powder- drying process-types of drying.

	Total Lecture Hours	30

BOOKS FOR STUDY:

- ➢ K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition, 2006.
- ➢ K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia Publishing House New Delhi, 1974.
- ➢ Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, Indian Council of Agricultural Research, 1 st edition, 2008.
- ➢ A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 st edition,2013.
- ➢ Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers, 2021.

BOOKS FOR REFERENCES:

- ➢ Robert Jenness and S. Patom, Principles of Dairy Chemistry, S.Wiley, New York, 2005.
- ➢ F.P.Wond, Fundamentals of Dairy Chemistry, Springer, Singapore, 2006.
- ➢ Sukumar De, Outlines of Dairy Technology, Oxford University Press, New Delhi, 1980.
- ➢ P.F.Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry, Springer, Second edition, 2016. Dairy chemistry and biochemistry, P. F. Fox, T. Uniacke-Lowe, P.L.H. McSweeney, J.A. OMahony, Springer, Second edition, 2015.

WEB RESOURCES:

- ❖ https://archive.nptel.ac.in/courses/126/105/126105013/
- ❖ http://ecoursesonline.iasri.res.in/course/index.php?categoryid=10

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED			ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL	✓	GLOBAL	
Changes Made in the Course	Percentage of Change			No Changes Made			New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.									

		K LEVEL
COURSE OUTCOMES:		
After studying this course, the students will be able to:		
CO1	Understand about general composition of milk – constituents and its physical properties.	**K1 to K2**
CO2	Acquire knowledge about pasteurization of Milk and various types of pasteurization - Bottle, Batch and HTST Ultra High Temperature Pasteurization.	**K1 to K2**
CO3	learn about Cream and Butter their composition and how to estimate fat in cream and Ghee	**K1 to K2**
CO4	Explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.	**K1 to K2**
CO5	have an idea about how to make milk powder and its drying process - types of drying process	**K1 to K2**

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M

S- STRONG	**M – MEDIUM**	**L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	**15**	**15**	**15**	**15**	**15**
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3.0	3.0	3.0	3.0	3.0

LESSON PLAN:

UNIT	Dairy Chemistry	HRS	PEDAGOGY
I	Composition of Milk Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.	6	**Chalk & talk**

II	Processing of Milk Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.	**6**	**Chalk & talk, videos**
III	Major Milk Products Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fat in cream. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity - definition - prevention - antioxidants and synergists - natural and synthetic.	**6**	**Ppt , Chalk & talk, videos**
IV	Special Milk Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk - condensed milk - definition, composition and nutritive value.	**6**	**Chalk & talk, ppt**
V	Fermented and other Milk Products Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – Yoheer Indigenous products-khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers – emulsifiers and their role-milk powder-definition-need for making milk powder- drying process-types of drying.	**6**	**Chalk & talk, ppt**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
			Section A	
Internal	**Cos**	**K Level**	**MCQs**	
			No. of. Questions	**K - Level**
CI **AI**	CO1	K1 – K2	25	K1,K2
	CO2	K1 – K2	25	K1,K2
CI **AII**	CO3	K1 – K2	25	K1,K2
	CO4	K1 – K2	25	K1,K2
Question Pattern **CIA I & II**	**No. of Questions to be asked**		50	
	No. of Questions to be answered		50	
	Marks for each question		1	
	Total Marks for each section		50	

Distribution of Marks with K Level CIA I & CIA II					
	K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	**50**	**50**	**100**	**100**
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	**50**	**50**	**100**	**100**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	**COs**	**K - Level**	**Section A (MCQs)**	
			No. of Questions	**K – Level**
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

Course Name	COSMETICS AND PERSONAL CARE PRODUCTS			
Course Code	23UCHSC21	L	P	C
Category	SKILL ENHANCEMENT COURSE	2	-	2

COURSE OBJECTIVES:

This course aims at familiarizing the students with

- ➢ formulations of various types of cosmetics and their significance
- ➢ hair, skin and dental care makeup preparations and personal grooming

UNIT - I SKIN CARE	06

Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.

UNIT - II HAIR CARE & DENTAL CARE	06

Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types – ingredients;Tooth pastes – ingredients – mouth wash.

UNIT - III MAKE UP	06

Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge.

UNIT - IV PERFUMES	06

Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones.

UNIT - V BEAUTY TREATMENTS	06

Facials - types – advantages – disadvantages; face masks – types; bleach - types – advantages– disadvantages; shaping the brows; eyelash tinting; perming types; hair colouring and dyeing ; permanent waving – hair straightening; wax types – waxing; pedicure, manicure - advantages – disadvantages

	Total Lecture Hours	30

BOOKS FOR STUDY:

➢ Thankamma Jacob, (1997) Foods, drugs and cosmetics – A consumer guide, Macmillan publication, London.

BOOKS FOR REFERENCES:

➢ Wilkinson J B E and Moore R J, (1997) Harry's cosmeticology, 7th ed., Chemical Publishers, London.

➢ George Howard, (1987) Principles and practice of perfumes and cosmetics, Stanley Therones, Chettenham

WEB RESOURCES:

❖ **http://www.khake.com/page75.html**
❖ **Net. foxsm/list/284**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		ENTREPRENEURSHIP		✓
Curriculum Relevance	LOCAL	REGIONAL		NATIONAL	✓	GLOBAL	
Changes Made in the Course	Percentage of Change		No Changes Made		New Course		✓

* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	know about the composition of various cosmetic products	K1 to K2
CO2	Understand chemical aspects and applications of hair care and dental care and skin care products.	K1 to K2
CO3	Understand chemical aspects and applications of perfumes and skin care products.	K1 to K2
CO4	to understand the methods of beauty treatments their advantages and disadvantage.	K1 to K2
CO5	Understand the hazards of cosmetic products.	K1 to K2

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M

S- STRONG   M – MEDIUM   L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
WEIGHTAGE	15	15	15	15	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3.0	3.0	3.0	3.0	3.0

LESSON PLAN:

UNIT	Cosmetics and Personal Care Products	HRS	PEDAGOGY
I	Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.	6	Chalk & talk, ppt
II	Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types – ingredients Tooth pastes – ingredients – mouth wash	6	Chalk & talk, ppt
III	Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge	6	Chalk & talk, ppt
IV	Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones	6	Chalk & talk, ppt
V	Facials - types – advantages – disadvantages; face masks – types;bleach -types– advantages– disadvantages; shaping the brows; eyelash tinting; perming types; hair colouring and dyeing ;permanent waving– hair straightening; wax types – waxing; pedicure,manicure - advantages – disadvantages	6	Chalk & talk, ppt

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	**Cos**	**K Level**	**Section A**	
			MCQs	
			No. of. Questions	**K - Level**
CI AI	CO1	K1 – K2	25	K1,K2
	CO2	K1 – K2	25	K1,K2
CI AII	CO3	K1 – K2	25	K1,K2
	CO4	K1 – K2	25	K1,K2
Question Pattern CIA I & II		No. of Questions to be asked	50	
		No. of Questions to be answered	50	
		Marks for each question	1	
		Total Marks for each section	50	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.