

# VANITA VISHRAM WOMEN'S UNIVERSITY

(Managed By: Vanita Vishram, Surat)

1<sup>st</sup> Women's University of Gujarat



VANITA VISHRAM  
WOMEN'S UNIVERSITY

SURAT

## SCHOOL OF SCIENCE AND TECHNOLOGY

---

### DEPARTMENT OF CHEMISTRY

### B.Sc. CHEMISTRY (HONORS)

---

## SYLLABUS

AS PER **NEP-2020**

**W.E.F 2023-24**



## INDEX

- 1 Preamble – VVWU
- 2 Salient Features
- 3 Introduction of the Program
- 4 Programme Objectives
5. Programme Outcomes (POs)
- 6 Programme Specific Outcomes (PSOs)
- 7 Program Highlights:
- 8 Scheme of Assessment
- 9 Credit Structure
- 10 Course Structure – Paper Titles SEMESTER 1
- 11 Teaching and Evaluation Scheme for B.Sc. Chemistry academic year 2023-24
- 12 Syllabus
- 13 Teaching Methodology
- 14 Keywords



## **1 PREAMBLE – VVWU**

Vanita Vishram Women's University (VVWU) is the First-ever Women's University of Gujarat approved by the Government of Gujarat under the provisions of the Gujarat Private Universities Act, 2009. It is a University committed to achieve Women's Empowerment through Quality Education, Skill Development, and by providing employment opportunities to its girl students through its model curriculum, integration of technology in pedagogy and best-in-class infrastructure. The focus is on prioritizing practical component and experiential learning supported through academia-industry linkages, functional MoUs, skill development training, internships etc. It aims at providing opportunities to the girl students for holistic development and self-reliance.

### **VISION**

Empowerment of women through quality education and skill development, so as to make them strong pillars of stability in the society.

### **MISSION**

To provide Education & Professional Training to all women for their all-round development, so as to enable them to become economically independent and socially empowered citizens.



## 2 SALIENT FEATURES

- Based on NEP-2020 & CBCS
- Interdisciplinary as well as multidisciplinary.
- Practical-oriented, skill-based & vocation-based.
- Based on experiential learning.
- Greater exposure to internship, hands-on training, project work, field work, presentation etc.
- Mode of teaching shall be Offline.
- Qualified & Competent Faculty Members for effective teaching-learning
- Employment-Generating



### 3 INTRODUCTION OF THE PROGRAM

B.Sc. Chemistry Honors is a UG degree program designed to provide students with a comprehensive understanding of the fundamental principles and applications of chemistry. This undergraduate course offers a strong foundation in chemical theory, laboratory techniques and analytical skills necessary for a successful career in various scientific fields.

Students enrolled in this program will explore a wide range of topics, including organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry, biochemistry and environmental chemistry. Through hands-on laboratory experiments, students will gain practical experience in conducting chemical analyses, synthesizing compounds and interpreting experimental data.

The curriculum emphasizes critical thinking, problem-solving, and scientific inquiry. Students will develop a deep understanding of chemical concepts and their practical applications in areas such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, fermentation, food & dairy and forensics etc.

Upon completion of the program, students will be well-equipped to pursue careers in research and development, quality control, chemical analysis, teaching or further studies at the postgraduate level. The course opens doors to a wide range of exciting opportunities in both industry and academia, where chemists play a crucial role in advancing scientific knowledge and addressing real-world challenges.



#### 4 PROGRAMME OBJECTIVES (POs)

- PO 1. To impart knowledge of Chemical sciences and application of chemistry in day-to-day life.
- PO 2. To strengthen the in-field practical knowledge of the students by providing them hands-on experimentation, project work and field work.
- PO 3. To develop capability of thinking, understanding/analyzing and interpreting and solving problems to meet the need of industries such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, food & dairy, forensics, Academia, etc. and research.
- PO 4. To make learners understand about ethical aspects, safety aspects and their responsibilities towards mankind and the environment.
- PO 5. To make students capable of finding entrepreneurship opportunities for betterment of society, environment.
- PO 6. To make the students avail of all the basic knowledge required for various competitive examinations related to the Sciences.



## 5 PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon completion of the B.Sc. Chemistry/B.Sc. (Hons) Chemistry program, the students would:

- PSO 1. Have the knowledge of basics of Chemistry and its understanding.
- PSO 2. Be able to apply their practical skills and knowledge to identify and resolve the problems related to and serve various Chemical Industries such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, food & dairy etc.
- PSO 3. This program fosters interdisciplinary learning habits, enabling students to utilize modern analytical tools and software for industry and research analysis.
- PSO 4. Be able to cultivate professional ethics and equip students to pursue careers in various sectors as chemists, researchers, educators, managers, regulators and professionals in chemistry-related industries.
- PSO 5. Develop high-quality research encouraging scientific thinking and approach for research.
- PSO 6. Develop skills for further higher studies, competitive examinations and employment.

**6 PROGRAM HIGHLIGHTS:**

<b>Course Level</b>	UG						
<b>Program</b>	Bachelors in Science						
<b>Duration</b>	3 years (6 semesters)						
<b>Examination Type</b>	Semester system (1-6 semesters)						
<b>Intake</b>	40						
<b>Eligibility</b>	10 + 2 in Science stream with A, B or AB group						
<b>Mapping between POs and PSOs</b>		PSO 1.	PSO 2.	PSO 3.	PSO 4.	PSO 5.	PSO 6.
	PO 1.						
	PO 2.						
	PO 3.						
	PO 4.						
	PO 5.						
	PO 6.						
<b>Job Positions</b>	Scientist, Teacher, R & D Officials, QA/QC Executives in various sectors of Chemistry domain such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, forensics, Academia etc.						





## 7 SCHEME OF ASSESSMENT

Following is the scheme of assessment followed by the university –

<b>Weightage (%)</b>	<b>Continuous Comprehensive Evaluation (CCE) (50%)</b>	<b>Semester End Evaluation (SEE) (50%)</b>
100%	[Internal Exam] (20%) + [1. Assignments/ 2. Project work/ 3. Field work/ 4. Quiz/ 5. Group discussion/ 6. Role play/ 7. (Lab Record/ Lab Performance/ Lab work) / 8. (Seminar / Class Performance/ Poster Presentations) 9. Viva Voce/ 10. Book Review or Article Review/ 11. Case Studies/ 12. Class Test/ 13. Report Writing/ 14. Any Other as per the requirement of the subject] (Any Two) (Thread-01 + Thread-02) (10% + 10%) + [Attendance] (10%)	End Semester Examination (ESE) Theory/Practical Exams Whole Syllabus



## 8 CREDIT STRUCTURE

### Proposed UG Credit structure for UG -2023

#### According to Curriculum and Credit Framework for Undergraduate Programme

Semester	Major	Minor	Multi Disciplinary	Ability Enhancement Course (AEC)	Skill Enhancement Course (SEC)	Indian Knowledge System (IKS) /Value Added Courses(VAC)	RP/ OJT	Total
1	8	4	4	2	2	2	0	22
2	8	4	4	2	2	2	0	22
3	12	0	4	2	2	2	0	22
4	12	4	0	0	2	2	0	22
5	12	8	0	2	2	0	0	22
6	12	4	0	0	4	0	0	22
<b>Total</b>	<b>64</b>	<b>24</b>	<b>12</b>	<b>10</b>	<b>14</b>	<b>8</b>	<b>0</b>	<b>132</b>
7	12	4	0	0	0	0	6	22
8	12	4	0	0	0	0	6	22
<b>Total</b>	<b>24</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>44</b>
<b>Grand Total</b>	<b>88</b>	<b>32</b>	<b>12</b>	<b>10</b>	<b>14</b>	<b>8</b>	<b>12</b>	<b>176</b>

\* If anyone wants to exit after 2nd/ 4th Sem and wants a certificate/Diploma respectively, should complete an internship of 4 credits (60 hrs)

# VANITA VISHRAM WOMEN'S UNIVERSITY

(Managed By: Vanita Vishram, Surat)

1<sup>st</sup> Women's University of Gujarat



VANITA VISHRAM  
WOMEN'S UNIVERSITY  
— SURAT —

## SCHOOL OF SCIENCE AND TECHNOLOGY

---

### DEPARTMENT OF CHEMISTRY

B.Sc. CHEMISTRY

SEMESTER 1

---

### SYLLABUS

AS PER **NEP-2020**

W.E.F 2023-24

**9 COURSE STRUCTURE – PAPER TITLES SEMESTER 1**

Proposed Integrated (UG) Course structure for year – 2023									
Sem	Major	Minor	Multi-Disciplinary	Ability Enhancement Compulsory (AEC)	Skill Enhancement Course (SEC)	Indian Knowledge System / Value Added Courses (IKS/VAC)	Summer Internship/ Project/ Online Course	Dissertation	Total
1	Major-I Inorganic & Physical Chemistry-I	Minor-I Fundamentals of Chemical Science-I	Pharmaceutical Products	Functional English-I	Instrumentation	Indian Knowledge System-I	-	-	07
	Major-II Organic Chemistry-I								



## 10 TEACHING AND EVALUATION SCHEME FOR B.Sc. CHEMISTRY ACADEMIC YEAR 2023-24

S e m e s t e r	Course Code	Course Category	Course Title	Teaching Scheme			Examination Scheme													T o t a l C r e d i t	
				Contact Hours			T o t a l C r e d i t	Theory					Practical					T o t a l			
								C C E	P a s s i n g		C C E + S E E P a s s i n g	C r e d i t	C C E		S E E		C C E + S E E P a s s i n g				
				T h e o r y	P r a c t i c a l	T o t a l	M a x		P a s s i n g	M a x			P a s s i n g	M a x	P a s s i n g	T o t a l					
I	CHM201-1C	Major	Inorganic & Physical Chemistry-I (Th)	3	0	3	3	3	35	13	35	13	26	0	0	0	0	0	0	70	4
			Inorganic & Physical Chemistry-I (Pr)	0	2	2	1	0	0	0	0	0	0	0	1	15	6	15	6	12	
	CHM202-1C	Major	Organic Chemistry-I (Th)	3	0	3	3	3	35	13	35	13	26	0	0	0	0	0	0	70	4
			Organic Chemistry-I (Pr)	0	2	2	1	0	0	0	0	0	0	0	1	15	6	15	6	12	
	CHE201-1C	Minor	Fundamentals of Chemical Science-I (Th)	3	0	3	3	3	35	13	35	13	26	0	0	0	0	0	0	70	4
			Fundamentals of Chemical Science-I (Pr)	0	2	2	1	0	0	0	0	0	0	0	1	15	6	15	6	12	
	MBE201-1C	Minor	Introduction to Microbiology (Th)	3	0	3	3	3	35	13	35	13	26	0	0	0	0	0	0	70	4
			Introduction to Microbiology (Pr)	0	2	2	1	0	0	0	0	0	0	0	1	15	6	15	6	12	
	BTE201-1C	Minor	Introduction to Biotechnology (Th)	3	0	3	3	3	35	13	35	13	26	0	0	0	0	0	0	70	



		Introduction to Biotechnology (Pr)	0	2	2	1	0	0	0	0	0	0	0	0	1	15	6	15	6	12	30	
--	--	------------------------------------	---	---	---	---	---	---	---	---	---	---	---	---	---	----	---	----	---	----	----	--

I	PHE201-1C	Minor	Fundamentals of Physics-I (Th)	3	0	3	3	3	35	13	35	13	26	0	0	0	0	0	0	70		
			Fundamentals of Physics-I (Pr)	0	2	2	1	0	0	0	0	0	0	0	0	1	15	6	15	6		12
	MDC201-1C	Multi-Disciplinary	Agricultural Techniques	4	0	4	4	4	50	18	50	18	36	0	0	0	0	0	0	0	100	4
			Pharmaceutical Products	4	0	4	4	4	50	18	50	18	36	0	0	0	0	0	0	0	100	
			Food Map	4	0	4	4	4	50	18	50	18	36	0	0	0	0	0	0	0	100	
	AEC201-1C	AEC	Functional English-I	2	0	2	2	2	25	9	25	9	18	0	0	0	0	0	0	50	2	
	SEC201-1C	SEC	Instrumentation	2	0	2	2	2	25	9	25	9	18	0	0	0	0	0	0	50	2	
IKS201-1C	VAC/IKS	Indian Knowledge System	2	0	2	2	2	25	9	25	9	18	0	0	0	0	0	0	50	2		

**11 SYLLABUS OF SEMESTER-I**

**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**  
**FY B.Sc.**  
**Semester I**

**CHM201-1C: INORGANIC & PHYSICAL CHEMISTRY-I (T)****Credit 3****Contact Hour per week: 3****Outline of the Course:**

<b>Course type</b>	Theory
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Major
<b>Purpose of Course</b>	The course aims to provide a foundation for understanding the fundamental principles, properties, and reactions of elements and compounds. It equips students with essential knowledge and skills necessary for further studies and applications in chemistry.
<b>Course Objective</b>	CO 1. Learning scientific theory of atoms, concept of wave function CO 2. Physical and chemical characteristics of elements in various groups and periods according to ionic size, charge, etc. and position in the periodic table. CO 3. Learning of Basics of organic molecules, structure, bonding, hybridization and geometry of atoms reactivity and organic acid and bases with their strength. CO 4. Understanding the basics of chemical kinetics CO 5. Chemical kinetics: type of reactions, determination of order and rate of reactions.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	August 2023
<b>Pre-requisite</b>	Elementary knowledge of Chemistry
<b>Teaching Methodology</b>	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)

**Course Content:**

Units	Particulars	% Weight age of Unit	Minimum Nos. of Hours
1	<b>Atomic Structure and Periodicity:</b> Planck's quantum theory, wave particle duality, uncertainty principle, comparison between Bohr's model and quantum mechanical model of hydrogen atom, electronic configuration of atoms and ions. Hund's rule and Pauli's exclusion principle. Periodic table and periodic properties: ionization energy, electron affinity, electronegativity and atomic size.	33 %	15
2	<b>Structure and Bonding:</b> Ionic and covalent bonding, MO and VB approaches for diatomic molecules, VSEPR theory and shape of molecules, hybridization, types of Hybridization and shape of some molecules (sp, sp <sup>2</sup> , sp <sup>3</sup> , sp <sup>3</sup> d, sp <sup>3</sup> d <sup>2</sup> ), resonance, dipole moment, structure parameters such as bond length, bond angle and bond energy, hydrogen bonding and van der Waals interactions. Ionic solids, ionic radii and lattice energy (Born-Haber cycle). HSAB principle.	33 %	15
3	<b>Chemical Kinetics :</b> Chemical kinetics and its scope, Reaction rate, Average rate of reaction is a function of time, Instantaneous rate of reaction, Rate laws, Order of a reaction, Molecularity of a reaction, Molecularity of a reaction of (a) Elementary reactions and (b) Complex reactions, molecularity versus order of reaction, Pseudo-order reactions, Zero order reactions, First order reactions, Examples of first order reactions, Numericals	34 %	15
<b>REFERENCE:</b> 1. Concise inorganic Chemistry, J.D. Lee, 5th Edition, Wiley- Blackwell, New Jersey, 1999. 2. Advanced Inorganic Chemistry, F.A. Cotton, G. Wilkinson, C.A. Murillo, M. Bochman, 6th edition, John Wiley & Sons. New York, 1999 3. Concepts & Models of Inorganic Chemistry, Douglas, B.E. and Mc Daniel, D.H., Oxford, 1970 4. Essentials of physical chemistry by A. S. Bhal and G. D. Tuli, Pub: S. Chand			

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Students will have an enhanced knowledge of scientific theory of atoms and concepts of periodicity.
CO 2.	Students will be able to study the structure of atoms, molecules and chemical bonding.
CO 3.	Understanding the idea of rate of change related to chemical change and being aware of how it can be assessed. Be able to identify the reaction order for a chemical change.



**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	Atomic Structure and Periodicity			
2	Structure and Bonding			
3	Chemical Kinetics			

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**  
**FY B.Sc.**  
**Semester I**

**CHM201-1C: INORGANIC & PHYSICAL CHEMISTRY-I**

**Credit 1**

**Contact Hour per week 2**

**Outline of the Course:**

<b>Course type</b>	Practical
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Major
<b>Course Objective</b>	CO 1. To perform some basic experiments of pH-meter and Colorimeter. CO 2. To learn the accuracy and precision in volumetric titration.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	August 2023
<b>Prerequisite</b>	Elementary knowledge of Chemistry
<b>Teaching Methodology</b>	Laboratory work, Hand on Training, Discussion and Journal Writing
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)

**Course Content:**

Units	Particulars
1	<b>Physical Exercise:</b> 1) pH Metry: To determine the pH of Water samples collected from different Sources. 2) Colourimetry: To determine $\lambda_{\max}$ for a given solution.
2	<b>Volumetric Titrations of Following.</b> 1. 0.1 N succinic acid against NaOH 2. 0.1 N H <sub>2</sub> SO <sub>4</sub> against NaOH/KOH 3. 0.01 N Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> against I <sub>2</sub> solution 4. 0.1 N H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> 2H <sub>2</sub> O against KMnO <sub>4</sub> solution <b>N. B. Candidates should perform at least 2 volumetric exercises.</b>
REFERENCE:	
1. Quantitative analysis by R.A. Day and A.L. Underwood.	
2. Advanced practical physical chemistry by J B Yadav 16 <sup>th</sup> edition 16 <sup>th</sup> Goyal publication.	

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Students will be able to operate the pH-meter and Colorimeter.
CO 2.	Students will be able to perform volumetric titration

**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes	
		CO 1	CO 2
1	Physical Exercise		
2	Volumetric Titrations		

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**  
**FY B.Sc.**  
**Semester I**

**CHM202-1C: ORGANIC CHEMISTRY-I**

**Credit 3**

**Contact Hour per week: 3**

**Outline of the Course:**

<b>Course type</b>	Theory
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Major
<b>Course Objective</b>	CO 1. Learning of Basics of organic molecules, structure, bonding, hybridization and geometry of atoms reactivity and organic acid and bases with their strength. CO 2. Understanding general principles of Organic reactions mechanism, Electrophile, nucleophiles, free radicals, electronegativity, resonance, and intermediates along the reaction pathways. addition, elimination and substitution reactions. CO 3. To understand about Reactions of carbon-carbon bond formation. CO 4. To understand organic qualitative analysis there by understanding solubility behavior. CO 5. To understand organic quantitative analysis like molecular formula, element detection etc.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	August 2023
<b>Pre-requisite</b>	Elementary knowledge of Chemistry
<b>Teaching Methodology</b>	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)

**Course Content:**

Units	Particulars	% Weight age of Unit	Minimum Nos. of Hours
1	<b>Basics of Organic Chemistry:</b> a) Classification, and Systematic IUPAC Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyper conjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. b) Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and relative stabilities of reaction intermediates, Addition, Elimination and Substitution reactions.	33 %	15
2	<b>Chemistry of Aliphatic Hydrocarbons:</b> <b>Carbon-Carbon sigma bonds:</b> Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz- Fittig Reactions, Free radical substitutions: Halogenation - relative reactivity and selectivity. <b>Cycloalkanes:</b> Cycloalkanes and stability, Preparation & Properties, Baeyer strain theory <b>Carbon-Carbon pi bonds:</b> Electrophilic additions (Markovnikov / Anti Markownikoff addition), oxymercuration-demercuration, hydroboration- oxidation, 1, 2- and 1, 4- addition reactions in conjugated dienes, Diels- Alder reaction, Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene	34 %	15
3	<b>Organic Qualitative and Quantitative analysis:</b> <b>A) Organic Qualitative Analysis:</b> Elemental Analysis (Lassaigne's Test with equation), Solubility of Organic Compounds, Chemical Methods: Solubility in NaHCO <sub>3</sub> , NaOH and HCl, Acid, Base and Phenol and amphoteric compounds (Sulphanilic acid and Anthranilic acid) <b>B) Organic Quantitative Analysis:</b> Determination of Empirical Formula and its relation with Molecular Formula, Determination of Nitrogen by Kjeldahl's method and Kjeldahl's method modified with boric acid. Molecular weight of organic acid by Ag-salt method and organic base by Chloroplatinate method, Numerical based on empirical and molecular formula.	33 %	15
<b>REFERENCE:</b> 1. F. A. Carey, R. J. Sundberg, Advanced Organic Chemistry, Part A: Structure and mechanism, Kluwer Academic Publisher, (2000). 2. Organic Chemistry by Bahl & Bahl. 3. Text book of Organic Chemistry by P. S. Kalsi, 1999, MacMillan of India Pvt. Ltd. 4. Textbook of Organic chemistry by C. N. Pillai 5. Vogel's qualitative organic analysis.			

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Students will be able to study basic concepts and basic principles about organic compounds, organic reactions with mechanisms.
CO 2.	Students will be able to understand carbon-carbon bond formation reactions and its importance in organic chemistry.
CO 3.	Students will be able to learn the concepts of organic qualitative and quantitative analysis performed in the laboratory via theory.

**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	Basics of Organic Chemistry			
2	Alkanes, Cycloalkanes and Alkenes			
3	Organic Qualitative and Quantitative analysis			

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**  
**FY B.Sc.**  
**Semester I**

**CHM202-1C: ORGANIC CHEMISTRY-I**

**Credit 1**

**Contact Hour per week 2**

**Outline of the Course:**

<b>Course type</b>	Practical
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Major
<b>Course Objective</b>	CO 1. To organic spotting of single substance.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	August 2023
<b>Pre-requisite</b>	Elementary knowledge of Chemistry
<b>Teaching Methodology</b>	Laboratory work, Hand on Training, Discussion and Journal Writing
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)

**Course Content:**

Units	Particulars
1	<b>Organic Spotting:</b> Primary tests, Ignition test, Detection of Elements, Nature of the substance (solubility test), Functional group tests, C. T., Molecular formula and Structural formula of the given substance. <b>N. B. Candidates should perform the analysis of at least 6 compounds.</b>
REFERENCE: 1. Vogel's qualitative organic analysis.	

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Students will be able to identify unknown organic substances.
-------	---

**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes
		CO 1
1	<b>Organic Spotting</b>	

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						





**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**  
**FY B.Sc.**  
**Semester I**

**CHE201-1C: FUNDAMENTALS OF CHEMICAL SCIENCE-I**

**Credit 3**

**Contact Hour per week: 3**

**Outline of the Course:**

<b>Course type</b>	Theory
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Minor
<b>Course Objective</b>	CO 1. Learning scientific theory of atoms, concept of wave function CO 2. Define an explanation of the chemical bond and its origin. CO 3. Describe the various forms of bonds that the atoms create and distinguish between covalent and ionic bonding. CO 4. Use of VSEPR Theory to depict the shapes and geometries of numerous molecules. CO 5. Understand how bioinorganic systems can benefit from the fundamental principles of inorganic chemistry. CO 6. Respect the way that nature collects and deposits trace elements for use in biological processes. CO 7. Recognize the use of specialized techniques for researching bioinorganic compounds.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	August 2023
<b>Pre-requisite</b>	Basic knowledge of metals, atomic structure and type of bonds
<b>Teaching Methodology</b>	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)

**Course Content:**

Units	Particulars	% Weight age of Unit	Minimum Nos. of Hours
1	<b>Atomic Structure and Periodicity:</b> Planck's quantum theory, wave particle duality, uncertainty principle, comparison between Bohr's model and quantum mechanical model of hydrogen atom, electronic configuration of atoms and ions. Hund's rule and Pauli's exclusion principle. Periodic table and periodic properties: ionization energy, electron affinity, electronegativity and atomic size.	33 %	15
2	<b>Structure and Bonding :</b> Ionic and covalent bonding, MO and VB approaches for diatomic molecules, VSEPR theory and shape of molecules, hybridization , types of Hybridization and shape of some molecules (sp, sp <sup>2</sup> , sp <sup>3</sup> , sp <sup>3</sup> d, sp <sup>3</sup> d <sup>2</sup> ), resonance, dipole moment, structure parameters such as bond length, bond angle and bond energy, hydrogen bonding and van der Waals interactions. Ionic solids, ionic radii and lattice energy (Born-Haber cycle). HSAB principle.	34 %	15
3	<b>Bio-inorganic chemistry:</b> Metal containing enzymes and proteins, porphyrins and related complexes, metalloenzymes, oxygen transport, electron-transfer reactions; nitrogen fixation, metal complexes in medicine.	33 %	15

**Reference Books:**

1. Concise Inorganic Chemistry, J.D. Lee, 5th Edition, Wiley- Blackwell, New Jersey, 1999.
2. Advanced Inorganic Chemistry, F.A. Cotton, G. Wilkinson, C.A. Murillo, M. Bochman, 6th edition, John Wiley & Sons. New York, 1999
3. Concepts & Models of Inorganic Chemistry, Douglas, B.E. and Mc Daniel, D.H., Oxford, 1970
4. Essentials of physical chemistry by A. S. Bhal and G. D. Tuli, Pub: S. Chand
5. S. Prakash, G.D. Tuli , Advanced inorganic Chemistry , S. Chand
6. Text book of physical chemistry by P. L. Soni, O. P. Sharma; Pub. S. Chand,
7. Bioinorganic, Ajai Kumar, Aaryush Education, 2014.

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Scientific theory of atoms, atomic structure and concept of periodicity
CO 2.	Fundamentals of chemical bonding
CO 3.	Students will learn important macrocyclic and metal for life

**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	Atomic Structure and Periodicity			
2	Structure and Bonding			
3	Bio-inorganic chemistry			

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**  
**FY B.Sc.**  
**Semester I**

**CHE201-1C: - FUNDAMENTALS OF CHEMICAL SCIENCE-I**

**Credit 1**

**Contact Hour per week: 2**

---

**Outline of the Course:**

<b>Course type</b>	Practical
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Minor
<b>Course Objective</b>	CO 1. To learn the accuracy and precision in volumetric titration. CO 2. To perform Inorganic qualitative analysis of single salt with various combinations of anion and cation.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	August 2023
<b>Pre-requisite</b>	Basic knowledge of metals, atomic structure and type of bonds
<b>Teaching Methodology</b>	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)

**Course Content:**

Units	Particulars
<b>1. Volumetric Titrations of Following. (Any Two)</b>	1. 0.1 N succinic acid against NaOH 2. 0.1 N H <sub>2</sub> SO <sub>4</sub> against NaOH/KOH 3. 0.01 N Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> against I <sub>2</sub> solution 4. 0.1 N H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> 2H <sub>2</sub> O against KMnO <sub>4</sub> solution
<b>2. Inorganic Qualitative Analysis (Single Salt) (Any Four)</b>	
<b>REFERENCE:</b>	
1. Quantitative analysis by R.A. Day and A.L. Underwood. 2. Vogel's qualitative inorganic analysis. 3. Advanced practical physical chemistry by J B Yadav 16 <sup>th</sup> edition 16 <sup>th</sup> Goyal publication.	

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Students will be able to perform Volumetric titrations
CO 2.	Students will be able to identify unknown inorganic substances.

**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes	
		CO 1	CO 2
1	Volumetric Titrations of Following		
2	Inorganic qualitative analysis		

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**

**Department of Chemistry**

**B.Sc. Chemistry Program**

**FY B.Sc.**

**Semester I**

**MDC201-1C: Pharmaceutical Products**

**Credit 4**

**Contact Hour per week: 4**

---

**Outline of the Course:**

<b>Course type</b>	Theory
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Multi-Disciplinary Course
<b>Course Objective</b>	CO 1. To learn about Molecules of life. CO 2. To study the basics of pharmaceutical science. CO 3. To study the drug administration and classification CO 4. To learn about home remedies.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	August 2023
<b>Pre-requisite</b>	Elementary knowledge of Chemistry
<b>Teaching Methodology</b>	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)



Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	<b>Molecules of Life</b> Amino acids, classification of amino acids, peptides, Structure of protein, Carbohydrates, nucleic acids, lipids and fatty acids, importance of biomolecules in pharma industry.	25%	15
2	<b>Introduction:</b> Historical background of Pharmaceutical science, Definition: Drug, Prodrug, Medicine, Pharmacodynamics, Pharmacokinetics, Agonist, Antagonist	25%	15
3	<b>Classification of Pharmaceutical compounds &amp; Drug administration:</b> Classification of drug based on pharmacological action, Routes of drug administration, adsorption, distribution, metabolism, Excretion, Toxicity	25%	15
4	<b>Herbal medicine:</b> Introduction to herbal medicine, Herbal sensory gardens, herbs and plants, important herbs, caution when treating with herbs, treating tension, headaches and soreness, depression and anxiety, natural acne, wounds and blisters, cancer, body detox, lung and respiratory condition treatments.	25%	15
<b>REFERENCE:</b> 1. Medicinal Chemistry by Ashutosh Kar. 2. Traditional Home remedies for primary Health care by WHO, Regional office of South-East Asia. 3. Simple home remedies for common illness. 4. <a href="http://naturalremediesbase.com/home-remedies/simple-home-remedies-common-illnesses.html">http://naturalremediesbase.com/home-remedies/simple-home-remedies-common-illnesses.html</a> 5. <a href="http://creativehomemakers.blogspot.ca/2010/10/sore-throat-home-remedy.html">http://creativehomemakers.blogspot.ca/2010/10/sore-throat-home-remedy.html</a>			

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Students are able to know about the importance of molecules.
CO 2.	Know the history of profession of pharmacy
CO 3.	Know the classification and basic concepts of pharmaceuticals
CO 4.	Students will gain the knowledge of herbal medicine and some home remedies.

**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes			
		CO 1	CO 2	CO 3	CO 4
1	Molecules of Life				
2	Introduction				
3	Classification of Pharmaceutical compounds & Drug administration				
4	Herbal medicine				

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY****Department of Chemistry****B.Sc. Chemistry Program****FY B.Sc.****Semester I****SEC201-1C: Instrumentation****Credit: 2****Contact Hour per week: 2****Outline of the Course:**

<b>Course type</b>	Theory
<b>Level</b>	200-299 Intermediate-level
<b>Course Category</b>	Skill Enhancement Course
<b>Course Objective</b>	CO 1. Learning the principle of laboratory instruments CO 2. Learning the working mechanism of an instrument provides better accessibility to operate instruments. CO 3. Learning the basic application and uses of a variety of instruments provides a range of application knowledge. CO 4. Understanding operation, care and maintenance of laboratory techniques and instrument handling,
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	July 2023
<b>Pre-requisite</b>	Elementary knowledge of Chemistry
<b>Teaching Methodology</b>	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
<b>Evaluation Method</b>	50% Continuous Comprehensive Evaluation (CCE) 50% Semester End Evaluation (SEE)



Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	<b>Analytical Balance and Centrifugation</b> Introduction to Mass and Weight, Two-Pan Balance and Electronic Balance. Calibration of weighing balances and accuracy in measurement, Care and Use of Analytical Balance Principle, working and Components of Centrifuge, Care, maintenance, Prevention, Differentiate between various types of centrifugation methods, application of centrifugation method.	50%	15
2	<b>pH Meter and Colorimeter</b> Introduction, Structure of a pH Meter, Glass Membrane Electrode, Reference Electrode Measurement of pH, Application of pH Measurements Definition, Principle, Instrumentation, Colorimeter, Spectronic 20 Spectrocolorimeter, Choice of Instruments for Colorimetry, Applications.	50 %	15
<b>REFERENCE:</b>			
1. Introduction to Instrumentation in Life Sciences by Prakash Bisen and Anjana Sharma 2. Instrumental Methods of Chemical Analysis by B.K. Sharma 3. Principle of Instrumental Analysis by Skoog, Holler and Crouch 4. Analytical Chemistry by Gary D. Christian 5. Physical Chemistry by Bahl & Bahl			

**COURSE OUTCOMES:**

Upon successful completion of the course,

CO 1.	Analyze and operate analytical balances with precision and understand the principles and application of centrifugation methods.
CO 2.	Utilize pH meters effectively for accurate pH measurements and interpret results for various applications.
CO 3.	Demonstrate proficiency in colorimetry using appropriate instruments, gaining a solid understanding of its principles and practical applications.

**COURSE OUTCOMES MAPPING**

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	<b>Analytical Balance and Centrifugation</b>			
2	<b>pH Meter and Colorimeter</b>			

**COURSE ARTICULATION MATRIX**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>
<b>CO1</b>				
<b>CO2</b>				
<b>CO3</b>				



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**

**FY B.Sc.**  
**Semester I**  
**AEC201-1C: Functional English –I**

**Credit 4****Contact Hour per week 4****Outline of the Course**

<b>Course type</b>	Theory
<b>Level of the Course</b>	200-299 Intermediate-level
<b>Course Category</b>	Ability Enhancement Course (AEC)
<b>Purpose of Course</b>	To equip individuals with the necessary language skills and confidence to communicate effectively in English, enabling them to succeed academically, professionally, and in various social settings
<b>Course Objective</b>	CO 1. Utilize their knowledge of grammar effectively for communicative purposes. CO 2. Learn language in authentic contexts. CO 3. Use English efficiently for routine. CO 4. Sharpen receptive skills for better comprehension by providing authentic resources, explain how all the above-mentioned skills are much needed for career growth. CO 5. Make students understand how the development of these skills will lead to their holistic development.
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	June 2023
<b>Pre-requisite</b>	Elementary knowledge of English Language.
<b>Teaching Methodology</b>	Class Room Teaching, Discussion and Assignment
<b>Evaluation Method</b>	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

**Course Content**

<b>Unit No.</b>	<b>Title of the Unit</b>	<b>% Weightage of Unit</b>	<b>Minimum Nos. of Hours</b>
1	Foundational Grammar <ul style="list-style-type: none"><li>• Functional use of pronoun, adjective, adverb, preposition, and conjunction</li><li>• Narration of Past, Present and Future events</li></ul>	20	10
2	Receptive Skills <ul style="list-style-type: none"><li>• Introduction to Receptive Skills</li><li>• Techniques/strategies of Reading (Skimming and Scanning)</li><li>• Reading for Summarizing</li><li>• Comprehensive Listening: Note Taking and Note Making</li><li>• Types of Listening Skills</li></ul>	40	20
3	Productive Skills <ul style="list-style-type: none"><li>• Speech modulation and its importance</li><li>• Introduction to Phonetics for pronunciation</li><li>• Technical Writing (Leave Application/ Enquiries and Replies/ Orders and their Execution/ Complaint Letter)</li><li>• Paragraph Writing</li><li>• Report Writing</li><li>• Dialogue Writing</li></ul>	40	30

**REFERENCE**

## Reference books:

- Asha S. Kaul. Effective Business Communication. New Delhi: Prentice-Hall of India Private Ltd.
- Gupta, S.C. English Grammar & Composition. Arihant Publication. 2022.
- Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press, 2015.
- Mohan, Krishna and Banerji, Meera. Developing Communication Skills. Macmillan India Private Ltd, 2015.
- Urmila Rai and S.M. Rai. Business Communication. 1st Edition, Mumbai: Himalaya Publishing House.
- Wren and martin. English Grammar. MB publication, 2022.

**COURSE OUTCOMES**

Upon successful completion of the course, students will be able to:



CO 1	Capable themselves to express ideas clearly and accurately with fluent speaking & writing skills.
CO 2	Gain confidence in speaking & writing English in an academic and professional context.
CO 3	Analyze and improve pronunciation. Prepare themselves better for placements and beyond.

### COURSE OUTCOMES MAPPING

Unit No.	Unit Name	Course Outcomes		
		CO1	CO2	CO3
1	Foundational Grammar			
2	Receptive Skills			
3	Productive Skills			

### COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Chemistry**  
**B.Sc. Chemistry Program**

**FY B.Sc.**  
**Semester I**

**IKS201-1C: Indian Knowledge System**

**Credit 2**

**Contact Hour per week 2**

**Outline of the Course:**

<b>Course type</b>	Theory
<b>Level of the Course</b>	200-299 Intermediate-level
<b>Course Category</b>	Value Added Courses (VAC)
<b>Purpose of Course</b>	The course is intended to provide undergraduates with a foundational guide to the history, culture and philosophy of India and introduce them to the main themes and debates relating to that history.
<b>Course Objective</b>	CO 1. To provide a general introduction to Indian Knowledge System (IKS) and sensitize the students to the contributions made by ancient Indians in the field of Science, Philosophy and related applications and concepts. CO 2. Understanding the scientific value of the traditional knowledge of Bharata CO 3. Promoting the youths to do research in the various fields of Bhartiya knowledge system CO 4. Converting the Bhartiya wisdom into the applied aspect of the modern scientific paradigm
<b>Minimum weeks per Semester</b>	15
<b>Last Review / Revision</b>	June 2023
<b>Pre-requisite</b>	Eagerness to learn our ancient culture, our tradition.
<b>Teaching Methodology</b>	Class Room Teaching, Discussion and Assignment
<b>Evaluation Method</b>	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

**Course Content**

<b>Units</b>	<b>Particulars</b>	<b>% Weightage of Unit</b>	<b>Minimum Nos. of Hours</b>
<b>1</b>	<b>Indian Knowledge System</b> <ul style="list-style-type: none"><li>● Definition, Importance &amp; The IKS Corpus: classification framework</li><li>● Caturdasa vidyasthana (introductory information)<ul style="list-style-type: none"><li>○ 14 branches of learning in ancient India- Purana, Nyaya, Mimamsa, Dharma sastra</li><li>○ Six Vedanga- Siksha, Vyakarana, Nirukta, Chanda, Jyotisa, Kalpa</li><li>○ Four Vedas: Rigveda, Yajurveda, Samaveda and Atharvaveda</li></ul></li><li>● Upavedas and Upanishads: introductory information on them</li><li>● Sastras and some introductory information on them</li><li>● 18 Puranas: Their names and five general characteristics</li><li>● The Itihasas: Ramayana and Mahabharata (Learnings from them in brief)</li></ul>	<b>20</b>	<b>6</b>
<b>2</b>	<b>Indian Astronomy:</b> <ul style="list-style-type: none"><li>● Unique aspects of Indian Astronomy</li><li>● Historical development of Astronomy in India</li><li>● The Celestial coordinate system: observation of motion of celestial bodies in the Vedic corpus. Sun, Moon, Nakshatra &amp; Graha</li><li>● Elements of Indian calendar systems as followed in different regions of India</li><li>● Aryabhatiya and the Siddhantic tradition</li><li>● Panchang- The Indian calendar system</li><li>● Astronomical Instruments (Yantras)</li><li>● Jantar Mantar of Raja Jai Singh Sawai</li><li>● Prediction of monsoon rains; Parashar, Varahamithira, Pachanga, comparison with modern methods.</li></ul>	<b>20</b>	<b>6</b>





	<b>Indian Health Science</b> <ul style="list-style-type: none"><li>● Basic concept of Ayurveda- Definition of Health</li><li>● Vedic foundations of Ayurveda and its relevance with maintenance of good health and treatment of diseases</li><li>● Concepts of Three Doshas, Pancha-Mahabhuta and Sapta-dhatu and their relationship to Health</li><li>● The importance of Agni (digestion). Six Rasas and their relation to Doshas.</li><li>● Ayurvedic view of the cause of diseases.</li><li>● Daily regimen for health and wellness &amp; Ritucharya or seasonal regimen.</li><li>● Disease management<ul style="list-style-type: none"><li>○ Diagnostic techniques</li><li>○ Sleep and food – importance to health</li><li>○ Drugs and physical therapy</li></ul></li><li>● Yoga way of life – relevance to health and wellness</li></ul>	<b>20</b>	<b>6</b>
<b>4</b>	<b>Indian Agriculture</b> <ul style="list-style-type: none"><li>● Agricultural heritage – early history &amp; its importance • Ancient agricultural practices</li><li>● Indus civilization, Vedic civilization and relevance of heritage to present day agriculture</li><li>● Status of farmers in society from ancient time to till date</li><li>● Plant protection through indigenous traditional knowledge during harvesting, threshing and storage</li><li>● Indigenous &amp; introduced crops: rice, sugarcane and cotton.</li><li>● Gardening in ancient and medieval period, Vegetable farming, floriculture (perfumes), Medicinal plants and their relevance today</li></ul>	<b>20</b>	<b>6</b>
<b>5</b>	<b>Indian Metallurgy</b> <ul style="list-style-type: none"><li>● Vedic references to metals and metal working: The Indian S &amp; T heritage</li><li>● Mining and ore extraction</li><li>● Metals and metalworking technology: gold, inc, copper, mercury, lead and silver</li><li>● Extraction of Iron from Biotite by Ayurvedic method &amp; Manufacturing of steel</li><li>● Wax casting of idols and artifacts</li></ul>	<b>20</b>	<b>6</b>



<b>REFERENCE</b>			
<b>Core references:</b>			
<b>Reference books</b>			
<ul style="list-style-type: none"><li>• Mahadevan B., Bhat V. R., Nagendra P. R. N., Introduction to Indian Knowledge System: Concepts and Applications.</li><li>• Nene, Y.L. and Choudhary, S.L. 2002. Agricultural heritage of India. Asian Agri – History foundation, Secundrabad.</li><li>• A History of Hindu Chemistry. By Praphulla Chandra. Ray</li></ul>			
<b>Web references</b>			
<ul style="list-style-type: none"><li>• <a href="https://kiran.nic.in/Agri-Heritage.html">https://kiran.nic.in/Agri-Heritage.html</a></li></ul>			

### COURSE OUTCOMES

Upon successful completion of the course, students will be able to:

CO 1	Course will aware students about greatest epic historical texts which will demonstrate real meaning of life as well as students will get knowledge about religious rituals of India
CO 2	Studies will also influence students about everything present in the universe and briefly about the Indian calendar system which will be followed by various religions in India.
CO 3	Students will learn ancient techniques and treatment related to health science which is a treasure of the Indian knowledge system.
CO 4	Course will impart knowledge about agriculture and its importance in Indian history as well as in present time.
CO 5	Course will provide knowledge about the importance of metals., its mining and working technology of metals.

### COURSE OUTCOMES MAPPING

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Indian Knowledge System	■				
2	Indian Astronomy		■			
3	Indian Health Science			■		
4	Indian Agriculture				■	



Indian Metallurgy					
-------------------	--	--	--	--	--

**COURSE ARTICULATION MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							
CO4							
CO5							



## **12 TEACHING METHODOLOGY**

A teaching method comprises the principles and methods used by teachers to enable student learning. In order to achieve its objective of focused process- based learning and holistic development, the teacher/faculty may use a variety of knowledge delivery methods:

### **12.1 LECTURES/CLASS WORKS:**

Lectures should be designed to provide the learners with interesting and fresh perspectives on the subject matter. Lectures should be interactive in a way that students work with their teachers to get new insights in the subject area, on which they can build their own bridges to higher learning. Classwork has the ability to enhance relationships between teachers and students. Create goal- oriented tasks for students to prepare and enable self-learning.

### **12.2 DISCUSSIONS/ SEMINARS/PRESENTATION:**

Discussions / seminars / presentation are critical components of learning and can be used as a platform for students to be creative and critical with old and new ideas. Besides developing critiquing skills, arriving at consensus on various real-life issues and discussion groups lead to innovative problem-solving and ultimately to success.

### **12.3 CASE STUDIES/ SELF-STUDY:**

Real case studies, wherever possible, should be encouraged in order to challenge students to find creative solutions to complex problems of individual, community, society and various aspects of the knowledge domain concerned. Technology is transforming higher Education learning and teaching through various case studies to improve overall standards.



#### **12.4 PRACTICAL/PROBLEM SHEET:**

Practical ability is the essential requirement for computer science undergraduates' ability structure, and it emphasizes that computer science undergraduates should have a good grasp of theory from practice and then apply the theory to practice, improving their own software developing skills and employability.

#### **12.5 ASSIGNMENTS:**

Computer science assignments not only help students overcome their fear and stress but also help them learn more interesting facts about the subjects of computer science which are part of their syllabus and also out of curriculum.

#### **12.6 INDUSTRIAL TOURS:**

Computer Science students have to know the things practically through interaction, working methods and employment practices. Moreover, it gives exposure from an academic point of view. Main aim of the industrial visit is to provide an exposure to students about the practical working environment.

#### **12.7 TEAM WORK:**

Teamwork based projects challenge the student to apply the technical knowledge they gain in college to solve meaningful and complex problems. Positive collaboration in the form of team work is critical in the classroom environment, for which it is necessary to transcend one's prejudices and predilections so as to achieve the desired outcomes. In the process of



to... learners will acquire the skills of managing knowledge acquisition and other collaborative learners, thereby understanding how to incorporate and balance personalities.



### 13 KEYWORDS

- Bachelor of Science (B.Sc.) in Chemistry
- Periodicity
- Chemical bonding
- Basics of Organic Chemistry
- Stereochemistry
- Qualitative analysis
- Quantitative analysis
- Instrumentation
- Pharmaceutical Products