



**DEPARTMENT OF CHEMISTRY**  
**EVALUATION SCHEME OF UG & PG PROGRAM AS PER NEP-2024-25**

w.e.f. July, 2024-25

**Certificate in Bioorganic and Chemical Analysis**

**1<sup>st</sup> Year / 1<sup>st</sup> Semester**



S. No.	Course Code	Course Title	(T)Theory (P) Practical	Course Type	Periods per Week			Evaluation Scheme			End Semester	Subject Total	Total Credit	Attributes						United Nations Sustainable Development Goals (SDGs)			
					Lecture	Tutorial	Practical	Class Test	Teacher Assessment	Total				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Values		Professional Ethics		
1.	B020101T/CH151	Fundamentals of Chemistry-I	T	Core Major	3	1	-	15	10	25	75	100	04	√	√						-		
2.	B020102T/CH152	Fundamentals of Chemistry-II	T		3	1	-	15	10	25	75	100	04	√	√							-	
3.	B020103P/CH153	Quantitative Measurement	P		-	-	4	15	10	25	75	100	02	√	√	√							
4.	B020104P/CH154	Analytical Testing	P		-	-	4	15	10	25	75	100	02	√	√	√							
5.	B000101V/CH137	Plastic Waste Management	T + P	Vocational	1	-	2	-	-	-	100	100	03	√	√	√			√				
6.	Z010101T/BE105	Food Nutrition and Hygiene	T	Co-curricular	2	-	-	15	10	25	75	100	02	√	√			√					
7.	A050101T/HM101	Rashtra Gaurav*	T	Audit Course	2	-	-	-	-	-	100	100	00					√	√	√			
<b>TOTAL</b>					<b>11</b>	<b>02</b>	<b>10</b>	<b>75</b>	<b>50</b>	<b>125</b>	<b>575</b>	<b>700</b>	<b>17</b>										

\*Qualifying (Non-Credit Course)



<b>Effective from Session:</b> 2024-2025							
<b>Course Code</b>	B020101T/CH151	<b>Title of the Course</b>	Fundamentals of Chemistry-I	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	First	<b>Semester</b>	First	3	1	0	4
<b>Pre-Requisite</b>	10+2	<b>Co-requisite</b>	-				
<b>Course Objectives</b>	The main aim of this course is to impart fundamental knowledge of chemical bonding, and periodic properties and their trends, across the periodic table. The course would enable the learner to predict and element's properties by comprehension of the properties of different periods and groups. The learner would also understand the concepts of stereochemistry, organic reaction mechanisms, and other fundamentals of organic chemistry.						

<b>Course Outcomes</b>	
<b>CO1</b>	The students would perceive a sound knowledge of molecular polarity and weak chemical forces such as van der Waals forces, ion-dipole forces, and dipole-dipole interactions and induced dipole interaction. They would also be acquainted with current bonding models taking examples of simple inorganic and organic molecules to predict their structures and important bonding parameters.
<b>CO2</b>	The students would get an acumen related to the periodic as an invaluable tool for properties prediction. A detailed insight of the periodic table will be imparted.
<b>CO3</b>	The students would be able to evaluate the fundamentals of chemical reaction, reactive intermediates, transition states and other elements related to bond formation. The student would be able understand the reactants, catalysts, stereochemistry, and the formation of major and minor products in organic reactions.
<b>CO4</b>	The students would perceive a sound knowledge of stereochemistry and two-dimensional and three-dimensional structure of the molecules, and their role in reaction mechanism.
<b>CO5</b>	The students would learn about solutions, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination, and osmosis and their principles and applications.

<b>Unit No.</b>	<b>Title of the Unit</b>	<b>Content of Unit</b>	<b>Contact Hrs.</b>	<b>Mapped CO</b>
1	Molecular polarity	van der Waals forces, ion-dipole forces, dipole dipole interactions, induced dipole interaction, dipole moment and molecular Structure (Diatomic and polyatomic molecules), Percentage ionic character from dipole moment, polarizing power and polarizability. Fajan's rules and consequences of polarization.	8	1
2	General Periodic Properties	Electronic configurations of elements, types of radii (covalent, crystal and Vander Waal's radii), electron affinity, electronegativity, and ionization potential. Pauling scale, Mulliken electronegativity scale, Slater rules, Allred and Rochow scale, diagonal relationship.	8	2
3	Periodic properties of Atoms (with reference to s & p-block)	Brief discussion, factors affecting and variation trends of following properties in groups and periods (with reference to s & p-block) such as effective nuclear charge, shielding or screening effect, Atomic and ionic radii, Electronegativity, Ionization enthalpy, Electron gain enthalpy.	8	2
4	Mechanism of Organic Reactions	Curved arrow notation, drawing electron movements with allows, half-headed and double-headed arrows, homolytic and heterolytic bond fission, Types of reagents electrophiles and nucleophiles.	6	3
5	Essentials of Isomerism	Concept of isomerism, Different types of isomerism, their nomenclature and associated physico chemical properties. Structural isomerism: chain isomerism, positional isomerism, functional isomerism and metamerism, keto-enol tautomerism.	6	3
6	Stereochemistry-I	Optical isomerism: elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomer, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.	8	4
7	Stereochemistry-II	Geometric isomerism: determination of configuration of geometric isomers, E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism: conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives, Newman projection and Sawhorse formulae, Fischer and flying wedge formulae, Difference between configuration and conformation.	8	4
8	Solutions and Colligative Properties	Dilute Solutions, Colligative Properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.	8	5

<b>Reference Books:</b>	
Lee, J.D. Concise Inorganic Chemistry, Pearson Education 2010	
Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K. Inorganic Chemistry, Principles of Structure and Reactivity, Pearson Education 2006.	
Carey, F. A., Giuliano, R. M. Organic Chemistry, Eighth edition, McGraw Hill Education, 2012.	
Clayden, J., Greeves, N. & Warren, S. Organic Chemistry, 2nd edition, Oxford University Press, 2012.	
Mukeyherji, Singh, Kapoor, Organic Chemistry, Vol 1, New Age International 2014	
<b>e-Learning Source:</b>	
<a href="http://heecontent.upsdc.gov.in/Home.aspx">http://heecontent.upsdc.gov.in/Home.aspx</a>	
<a href="https://nptel.ac.in/courses/104/106/104106096/">https://nptel.ac.in/courses/104/106/104106096/</a>	
<a href="http://heecontent.upsdc.gov.in/Home.aspx">http://heecontent.upsdc.gov.in/Home.aspx</a>	
<a href="https://nptel.ac.in/courses/104/106/104106096/">https://nptel.ac.in/courses/104/106/104106096/</a>	
<a href="https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm">https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm</a>	

<b>Course Articulation Matrix: (Mapping of COs with POs and PSOs)</b>	
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<b>PO-PSO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	2	-	-	-	-	-	3	-	-	2	3
<b>CO2</b>	2	1	-	-	-	-	-	2	-	-	2	2
<b>CO3</b>	1	3	-	-	-	-	-	3	-	-	3	3
<b>CO4</b>	3	2	-	-	-	-	-	2	-	-	2	3
<b>CO5</b>	2	3	-	-	-	-	-	2	-	-	3	2

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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Effective from Session: 2024-2025

<b>Course Code</b>	B020103T/CH152	<b>Title of the Course</b>	Fundamentals of Chemistry-II	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	First	<b>Semester</b>	First	3	1	0	4
<b>Pre-Requisite</b>	10+2	<b>Co-requisite</b>	-				
<b>Course Objectives</b>	The objective of this course is to provide fundamental and essential knowledge on the origin of chemistry, ancient Indian chemistry, principles of chemical calculations, weak chemical forces, classical and contemporary atomic structure theories, as well as thermodynamics, chemical equilibrium, and acids, and bases. Upon completion of this course, students would gain a thorough understanding of chemical forces, molecular polarity, periodic properties, and trends which will assist in the prediction of chemical forces, classical and modern atomic structure theories, as well as thermodynamics and the principles of chemical equilibrium for acids and bases.						

Course Outcomes	
<b>CO1</b>	The students would perceive a sound knowledge of fundamental and essential knowledge on the origins of chemistry, ancient Indian chemistry, principles of chemical calculations, and weak chemical forces.
<b>CO2</b>	The students would understand the concept of matter waves and de-Broglie equation, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, $\Psi$ and $\Psi^2$ significance, quantum numbers, radial and angular wave functions, probability distribution curves, shapes of s, p, d orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rule, electronic configurations of the elements, and effective nuclear charge.
<b>CO3</b>	The students would understand the fundamentals of valence bond theory, valence shell electron pair repulsion (VSEPR) theory, molecular orbital theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy
<b>CO4</b>	The students would analyze the ionic structures, radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rules and their applications.
<b>CO5</b>	The students would know about the different concepts of acids and bases and theories of indicators like acid-base, redox, metal ion, adsorption, and choice of indicators. They would also evaluate types of systems, intensive and extensive properties, thermodynamic processes, and laws.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	The beginnings of chemistry	The history of chemistry, quantitative experiments by Lavoisier, Proust, and Dalton, the law of conservation of mass, and the law of multiple proportions. Avogadro's hypothesis. Introduction of ancient Indian chemistry, contribution of Indian chemists in context to the holistic development of modern science and technology.	8	1
2	Fundamentals of Chemical Calculations and Weak Chemical Forces	Atomic weight, molecular weight, equivalent weight, mole concept, percentage yield, composition of liquid mixtures and gaseous mixtures, molarity, molality, normality. Hydrogen bonding, van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interaction.	8	1
3	Structure and Bonding	Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of $\Psi$ and $\Psi^2$ , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d, orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rule, electronic configurations of the elements, effective nuclear charge.	8	2
4	Chemical Bonding-I	Covalent Bond: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, valence shell electron pair repulsion (VSEPR) theory to $\text{NH}_3$ , $\text{H}_3\text{O}^+$ , $\text{SF}_4$ , $\text{ClF}_3$ , $\text{ICl}_2^-$ and $\text{H}_2\text{O}$ , MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy, Percentage ionic character from dipole moment and electro-negativity difference.	6	3
5	Chemical Bonding-II	Ionic Solids: Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule, Metallic bond-free electron, valence bond and band theories.	8	3
6	Recapitulation of Basics of Organic Chemistry	Bond lengths and bond angles, bond energy, localized and delocalized chemical bonding, Van der Waals interactions, inclusion compounds, Clathrates, Charge transfer complexes, hyperconjugation, Dipole moment; Electronic Displacements: Inductive, electromeric, resonance mesomeric effects and their applications. Types of organic reactions, Energy considerations. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples).	8	4
7	Acids and Bases	Lowery - Bronsted concept, Lewis's concept, hard and soft acids and bases, Lux-Flood acids and bases, theories of indicators, acid-base, redox, metal ion and adsorption indicators and choice of indicators.	6	4
8	Thermodynamics and Chemical Equilibrium	System, surroundings etc. Types of systems, intensive and extensive properties, State and path functions and their differentials, Thermodynamic processes, concept of heat and work. Thermodynamic laws, enthalpy changes, entropy, processes and functions, free energy, partial molar quantities, activity, activity co-efficient, and fugacity, effect of temperature and pressure on equilibrium constants in gaseous system.	8	5

**Reference Books:**

Lee, J.D. Concise Inorganic Chemistry, Pearson Education 2010

Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K. Inorganic Chemistry, Principles of Structure and Reactivity, Pearson Education 2006.

Carey, F. A., Giuliano, R. M. Organic Chemistry, Eighth edition, McGraw Hill Education, 2012.

Clayden, J., Greeves, N. & Warren, S. Organic Chemistry, 2nd edition, Oxford University Press, 2012.

**e-Learning Source:**<http://heecontent.upsdc.gov.in/Home.aspx><https://nptel.ac.in/courses/104/106/104106096/><http://heecontent.upsdc.gov.in/Home.aspx><https://nptel.ac.in/courses/104/106/104106096/><https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>

<b>Course Articulation Matrix: (Mapping of COs with POs and PSOs)</b>												
<b>PO-PSO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	2	-	-	-	-	-	3	-	-	2	3
<b>CO2</b>	2	1	-	-	-	-	-	2	-	-	2	2
<b>CO3</b>	1	3	-	-	-	-	-	3	-	-	3	3
<b>CO4</b>	3	2	-	-	-	-	-	2	-	-	2	3
<b>CO5</b>	2	3	-	-	-	-	-	2	-	-	3	2

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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**Effective from Session: 2024-2025**

<b>Course Code</b>	B020103P/CH153	<b>Title of the Course</b>	Quantitative Measurement	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	First	<b>Semester</b>	First	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>Pre-Requisite</b>	10+2	<b>Co-requisite</b>	-				
<b>Course Objectives</b>	The chemistry lab program for this course is designed to with an objective to impart the essential knowledge about different laboratory techniques and tests for the estimation of metal ions, concentrations of acids and alkalis in commercial products, and estimation of the potability of water sample.						

**Course Outcomes**

<b>CO1</b>	The students would be able to prepare standard solutions of different concentrations.
<b>CO2</b>	The students would understand and be able to perform the potability tests of water samples.
<b>CO3</b>	The students would be able to estimate different metals ions.
<b>CO4</b>	The students would be able to estimate alkali and acid contents in an unknown sample.
<b>CO5</b>	The students would develop skills to understand the laboratory methods and tests related to the estimation of metals ions, acids and alkali contents in commercial products.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Preparation of Standard Solutions	Preparation of standard solution of $K_2Cr_2O_7$ . To find out the concentration of unknown $K_2Cr_2O_7$ solution using $Na_2S_2O_3$ solution as an intermediate. Preparation of standard solution of copper sulphate. To find out the concentration of unknown copper sulphate solution using $Na_2S_2O_3$ solution as an intermediate.	15	5
2	Estimation of Metals Ions	Estimation of ferrous and ferric by dichromate method. Estimation of copper using thiosulphate.	15	2,3
3	Estimation of Acids and Alkali Contents	Determination of acetic acid in commercial vinegar using NaOH. Determination of alkali content – antacid tablet using HCl. Estimation of oxalic acid by titrating it with $KMnO_4$ .	15	2,4
4	Estimation of one Anion and Cation	Estimation of one anion and cation in each salt: Anion: $CO_3^{2-}$ , $S^{2-}$ , $SO_3^{2-}$ , $SO_4^{2-}$ , $NO_3^-$ , $NO_2^-$ , $Cl^-$ , $Br^-$ , $I^-$ , $PO_4^{3-}$ , $CO_2$ , $CH_3COO^-$ Cation: $Pb^{2+}$ , $Cu^{2+}$ , $As^{3+}$ , $Al^{3+}$ , $Fe^{3+}$ , $Mn^{2+}$ , $Ni^{2+}$ , $Zn^{2+}$ , $Co^{2+}$ , $Ca^{2+}$ , $Sr^{2+}$ , $Ba^{2+}$ , $Mg^{2+}$ , $NH_4^+$	15	1,2

**Reference Books:**

- Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.  
Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman (2007) Chapters 3-5.  
Harris, D.C.Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.  
Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher, 2009.  
Skoog, D.A. Holler F.J. and Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning, India

**e-Learning Source:**

- <https://www.labster.com/chemistry-virtual-labs/>  
<https://www.vlab.co.in/broad-area-chemical-sciences>  
<http://chemcollective.org/vlabs>

**Course Articulation Matrix: (Mapping of COs with POs and PSOs)**

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	1	2	-	-	-	-	-	-	2	1	-	-
<b>CO2</b>	2	1	-	-	-	-	-	-	3	2	-	-
<b>CO3</b>	2	2	-	-	-	-	-	-	2	1	-	-
<b>CO4</b>	1	3	-	-	-	-	-	-	1	2	-	-
<b>CO5</b>	3	1	-	-	-	-	-	-	3	2	-	-

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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**Effective from Session: 2024-2025**

<b>Course Code</b>	B1020104P/CH154	<b>Title of the Course</b>	Analytical Testing	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	First	<b>Semester</b>	First	0	0	4	2
<b>Pre-Requisite</b>	10+2	<b>Co-requisite</b>	-				
<b>Course Objectives</b>	The objective of the chemistry lab program in this course is to provide essential knowledge of good laboratory practice (GLP), calibration of apparatuses, preparation of standard solutions of various concentrations, determination of viscosity, surface tension of liquids, and simple laboratory techniques.						

**Course Outcomes**

<b>CO1</b>	The students would be able to understand and follow good laboratory practice (GLP).
<b>CO2</b>	The students would be able to understand the basic analytical and technical skills in different fields of chemistry.
<b>CO3</b>	The students would know the record keeping and maintenance of lab record.
<b>CO4</b>	The students would be able to estimate the composition and constituents of inorganic salts and hydrated water in samples.
<b>CO5</b>	The students would be able to determine the viscosity and surface tension of liquids.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Good Laboratory Practices (GLP)	Good laboratory practices, Calibration of thermometer and burette	15	1,2,3
2	Simple Laboratory Techniques	Crystallization, fractional crystallization, distillation, fractional distillation, melting point and boiling point determination.	15	2,3
3	Inorganic Salts and Hydrated Water	Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. Estimation of calcium content in chalk as calcium oxalate by permanganometry. Estimation of water of crystallization in Mohr's salt by titrating with KMnO <sub>4</sub> .	15	2,5
4	Viscosity and Surface Tension of Liquids	Determination of relative viscosity of a liquid with water and determination of % composition of an unknown solution. Determination of the surface tension of an organic liquid and determination of % composition of an unknown mixture.	15	4

**Reference Books:**

Saxena Ruchi, Srivastava Alok Kumar, "Read & Do Practical Chemistry", Kitab Mahal, New Delhi, India (2016).  
 Skoog D. A., West.D.M and Holler .F.J., "Analytical Chemistry: An Introduction", 7th edition, Saunders college publishing, Philadelphia (2010).  
 G. Larry Hargis, "Analytical Chemistry: Principles and Techniques" Pearson© (1988)  
 B.Sc. Physics Practical Book By CI Arora

**e-Learning Source:**

<https://www.labster.com/chemistry-virtual-labs/>  
<https://www.vlab.co.in/broad-area-chemical-sciences>  
<http://chemcollective.org/vlabs>

**Course Articulation Matrix: (Mapping of COs with POs and PSOs)**

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	2	1	-	-	-	-	-	-	3	2	-	-
<b>CO2</b>	1	2	-	-	-	-	-	-	2	1	-	-
<b>CO3</b>	3	3	-	-	-	-	-	-	3	2	-	-
<b>CO4</b>	3	1	-	-	-	-	-	-	2	3	-	-
<b>CO5</b>	2	2	-	-	-	-	-	-	3	2	-	-

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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<b>Effective from Session:</b> 2024-2025							
<b>Course Code</b>	B000101V/CH137	<b>Title of the Course</b>	Plastic Waste Management	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	First	<b>Semester</b>	First	1	0	2	3
<b>Pre-Requisite</b>	10+2	<b>Co-requisite</b>	-				
<b>Course Objectives</b>	This course's primary goal is to equip students with the fundamental knowledge of how laboratories operate; how to calibrate equipment, how to prepare standard solutions, solutions in a range of concentrations, and how to solve qualitative and quantitative problems both independently and collaboratively associated with the treatment of waste like plastic, pharmaceuticals, agrochemicals, households etc.						

<b>Course Outcomes</b>	
<b>CO1</b>	After completing this course, students will be able to analyses qualitatively, comprehend the fundamentals of treating plastic and industrial waste, and analyses physical parameters of wastes.
<b>CO2</b>	Students would be capable of handling and sampling plastic and industrial waste.
<b>CO3</b>	Understand the handling of radioactive waste and its disposal, conductivity, and its measurements
<b>CO4</b>	Able to conduct and analyses electro-analytical procedures and potentiometric measurements.
<b>CO5</b>	Learning about garbage recycling and sustainability.

<b>Unit No.</b>	<b>Title of the Unit</b>	<b>Content of Unit</b>	<b>Contact Hrs.</b>	<b>Mapped CO</b>
1	Managerial Skill on Waste Treatment/Water Treatment	Theory: Introduction of plastic and its classification; waste focusing on metal deduction. Practical: Qualitative Analysis	10	1,2
2	Supervisory and Technician Skill For Pharma/Chemical Industries	Theory: Sampling and handling of Industrial waste/ plastic waste. Practical: Sampling and digestion	10	1,2
3	Managerial (QA/QC) Skill For Cement/Plastic/Textile Industries /Waste Treatment Plant Industries	Theory: Principles of industrial waste treatment/ plastic waste treatment. Practical: Physical parameters of waste	10	1,2
4	Technician Skill/Radioactive Waste Handling Expertise For Nuclear Power Plant	Theory: Radioactive waste and its disposal, conductivity and its measurements. Practical: Conductivity measurement of different samples	10	1,3
5	Technician Skill For Sugar, Cement, Pharma Steel/Iron Foundries	Theory: Potentiometric measurements, electro analytical methods. Practical: pH measurement & Electrochemical measurements	10	1,4
6	QC Managerial Skill For Cosmetic/Pharma/ Steel/Polymer/ Textile/ Food And Dairy Products	Theory: Sustainability and the chemical industry. Practical: Recycle of wastes	10	1,5

<b>Reference Books:</b>
Industrial Chemistry by B.K Sharma, By Krishna Publications, GOEL Publishing House
Environmental Chemistry by H. Kaur, Pragati Prakashan, Meerut.
Environmental Chemistry by A. K.De , New Age International Publishers, (9th edition)
Water Pollution by V.P. Kudesia, 4th edition, (latest) Pragati Prakashan, Meerut.
Vogel's Textbook of Quantitative Chemical Analysis, Pearson Education, sixth edition
<b>e-Learning Source:</b>
<a href="https://www.researchgate.net/publication/320360474_Metal_Recovery_from_Industrial_and_Mining_Wastewaters">https://www.researchgate.net/publication/320360474_Metal_Recovery_from_Industrial_and_Mining_Wastewaters</a>
<a href="https://www.routledge.com/Metal-Recovery-from-Industrial-Waste/Brooks/p/book/9781315895352">https://www.routledge.com/Metal-Recovery-from-Industrial-Waste/Brooks/p/book/9781315895352</a>
<a href="https://rajyasabha.nic.in/rsnew/publication_electronic/E-Waste_in_india.pdf">https://rajyasabha.nic.in/rsnew/publication_electronic/E-Waste_in_india.pdf</a>

<b>Course Articulation Matrix: (Mapping of COs with POs and PSOs)</b>												
<b>PO-PSO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	-	-	-	-	-	-	3	2	1	1
<b>CO2</b>	3	3	-	-	-	-	-	-	2	2	2	1
<b>CO3</b>	2	3	-	-	-	-	-	-	3	2	1	1
<b>CO4</b>	3	1	-	-	-	-	-	-	3	2	1	2
<b>CO5</b>	3	3	-	-	-	-	-	-	3	3	1	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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<b>Effective from Session: 2024-2025</b>							
<b>Course Code</b>	Z010101T/BE105	<b>Title of the Course</b>	Food, Nutrition and Hygiene	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	First	<b>Semester</b>	First	2	0	0	2
<b>Pre-Requisite</b>	-	<b>Co-requisite</b>	-				
<b>Course Objectives</b>	To learn the basic concept of food, nutrition, hygiene, common diseases prevalent in society along with 1000 days nutrition concept.						

Course Outcomes	
<b>CO1</b>	To learn the basic concept of the Food and Nutrition, and meal planning.
<b>CO2</b>	To learn about macro and micronutrients and its RDA, sources, functions, deficiency, and excess.
<b>CO3</b>	To learn 1000 days Nutrition Concept and study the nutritive requirement during special conditions like pregnancy and lactation.
<b>CO4</b>	To study common health issues in the society and to learn the special requirement of food during common illness.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Concept of Food and Nutrition	(a) Definition of Food, Nutrients, Nutrition, Health, balanced Diet (b) Types of Nutrition- Optimum Nutrition, under Nutrition, Over Nutrition (c) Meal planning- Concept and factors affecting Meal Planning (d) Food groups and functions of food	8	1
2	Nutrients: Macro and Micro RDA, Sources, Functions, Deficiency and excess of	(a) Carbohydrate (b) Fats (c) Protein (d) Minerals Major: Calcium, Phosphorus, Sodium, Potassium Trace: Iron, Iodine, Fluorine, Zinc (e) Vitamins Water soluble vitamins: Vitamin B, C Fat soluble vitamins: Vitamin A, D, E, K (f) Water (g) Dietary Fiber	7	2
3	1000 days Nutrition	(a) Concept, Requirement, Factors affecting growth of child. (b) Prenatal Nutrition (0 - 280 days): Additional Nutrients' Requirement and risk factors during pregnancy (c) Breast / Formula Feeding (Birth – 6 months of age) Complementary and Early Diet (6 months – 2 years of age)	8	3
4	Community Health Concept	(a) Causes of common diseases prevalent in the society and Nutrition requirement in the following: Diabetes Hypertension (High Blood Pressure) Obesity Constipation Diarrhea Typhoid (b) National and International Program and Policies for improving Dietary Nutrition. (c) Immunity Boosting Food	7	4

<b>Reference Books:</b>	
Singh, Anita, "Food and Nutrition", Star Publication, Agra, India, 2018.	
Sheel Sharma, Nutrition and Diet Therapy, Peepee Publishers Delhi, 2014, First Edition.	
1000Days-Nutrition_Brief_Brain-Think_Babies_FINAL.pdf	
<a href="https://pediatrics.aappublications.org/content/141/2/e20173716">https://pediatrics.aappublications.org/content/141/2/e20173716</a>	
<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750909/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750909/</a>	
<b>e-Learning Source:</b>	
<a href="https://www.udemy.com/course/internationally-accredited-diploma-certificate-in-nutrition">https://www.udemy.com/course/internationally-accredited-diploma-certificate-in-nutrition</a>	
Diploma in Human Nutrition-Revised Offered by Alison	

Course Articulation Matrix: (Mapping of COs with POs and PSOs)												
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	-	-	-	2	2	3	2	3	3	2	2	-
<b>CO2</b>	-	-	-	3	2	3	2	3	3	2	2	-
<b>CO3</b>	-	-	-	3	3	2	3	3	-	-	2	-
<b>CO4</b>	-	-	3	3	3	3	3	3	3	2	3	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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<b>Effective from Session: 2024-25</b>							
<b>Course Code</b>	A050101T/ HM101	<b>Title of the Course</b>	RASHTRA GAURAV	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	First	<b>Semester</b>	Second	2	0	0	2
<b>Pre-Requisite</b>	10+2	<b>Co-requisite</b>	None				
<b>Course Objectives</b>	The objective of the course on "Rashtra Gaurav" is to explore and critically analyze the multifaceted dimensions of national pride and glory, as depicted in the paper. Participants will delve into the historical, cultural, social, and political aspects that contribute to the concept of "Rashtra Gaurav" (National Pride) in the context of the specific themes and perspectives presented in the paper. Through in-depth discussions, readings, and interactive sessions, participants will gain a comprehensive understanding of the factors that shape and define a nation's sense of pride, and how these factors influence individual and collective identities. The course aims to foster a nuanced appreciation for the significance of "Rashtra Gaurav" in contemporary society, encouraging participants to critically evaluate its implications and applications within diverse global contexts.						

<b>Course Outcomes</b>	
<b>CO1</b>	To understand the basics of Indian Society and culture.
<b>CO2</b>	To analyze the fundamental issues in India.
<b>CO3</b>	To understand Indian Heritage.
<b>CO4</b>	To examine the philosophical and spiritual developments in India.
<b>CO5</b>	To evaluate the contributions of Major National Characters and Personalities.

<b>Unit No.</b>	<b>Title of the Unit</b>	<b>Content of Unit</b>	<b>Contact Hrs.</b>	<b>Mapped CO</b>
1	INDIAN SOCIETY & CULTURE	<ul style="list-style-type: none"> <li>Unity in Diversity</li> <li>Art forms, Literature, Culture from Ancient to Modern time.</li> <li>National and International Awards &amp; Awardees</li> </ul>	05	01
2	ISSUES IN INDIA	<ul style="list-style-type: none"> <li>Issues of Gender Equality and role of Women Organisations</li> <li>Issues of Poverty and Development</li> <li>Social Empowerment through Social Movements in India</li> </ul>	05	02
3	INDIAN HERITAGE	<ul style="list-style-type: none"> <li>Cultural Heritage in India: Buddhist Monuments at Sanchi, Ajanta &amp; Ellora Caves, Khajuraho, Taj Mahal</li> <li>Tourist Places in India: Red Fort, Ambar Palace, Kaziranga National Park, Ram Mandir (Ayodhya)</li> </ul>	04	03
4	PHILOSOPHICAL AND SPIRITUAL DEVELOPMENTS	<ul style="list-style-type: none"> <li>Sufism &amp; Bhakti Movement: Bulleh Shah, Data Ganj Baksh, Khwaja Moinuddin Chishti, and Nizamuddin Auliya. Tulsidas, Surdas, Meera, Nank &amp; Kabir</li> <li>Jainism: Mahavir's biography and education</li> <li>Buddhism: The life of Buddha, Contributions of Buddhism to India's Culture</li> </ul>	05	04
5	MAJOR NATIONAL CHARACTERS AND PERSONALITIES	<ul style="list-style-type: none"> <li>Ashoka the Great and His Dhamma</li> <li>Raja Ram Mohan Roy &amp; Brahma Samaj</li> <li>Savitribai Phule: A Social Reformer and contribution in Women Education</li> <li>Swami Vivekanand and his philosophies</li> <li>Mahatma Gandhi: Role of Gandhi in Indian National Movement</li> <li>Dr. Bhimrao Ambedkar: A Chief architect of the Indian Constitution</li> </ul>	06	05

<b>Reference Books:</b>
Jawaharlal Nehru - "The Discovery of India"
B.R. Ambedkar - "Annihilation of Caste"
Ramachandra Guha - "India After Gandhi: The History of the World's Largest Democracy"
Mahatma Gandhi - "My Experiment with Truth"
S C Dubey- "Indian Society"
Nadeem Hasnain - "Indian Society and Culture"
G Shah- "Social Movements in India"

<b>Course Articulation Matrix: (Mapping of COs with POs and PSOs)</b>										
<b>PO-PSO</b>	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	2	1	3	3	2	2	3	2	1	2
<b>CO2</b>	3	2	2	3	1	2	3	1	2	1
<b>CO3</b>	1	2	2	2	2	3	2	3	3	2
<b>CO4</b>	1	3	2	3	2	3	2	3	1	3
<b>CO5</b>	2	3	1	2	2	3	1	3	2	1

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign and seal of HoD</b>
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