Vitthalbhai Patel & Rajratna P. T. Patel Science College
(Autonomous)
(Reaccredited with 'A' Grade by NAAC (CGPA 3.13)
Affiliated to SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
Syllabus effective from the Academic Year 2024-2025

(Bachelor of Science) (Undergraduate) (NEP-2020)
B. Sc. (UG) Semester-II

Course Code	**US02MACHE01**	Title of the Course	**GENERAL CHEMISTRY- II**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Some advanced topics of basic chemistry. 2. Historic development and scope of various branches of chemistry. 3. Basic concepts related to alkyl and aryl halides, bonding in inorganic compounds and fundamental aspects of chemical aspects.

Course Content		
Unit	Description	Weightage* (%)
1.	**ALKYL AND ARYL HALIDES** Homolytic and Heterolytic chemistry, Classification, Preparation, Reaction: Nucleophilic aliphatic substitution, SN^2 Reaction: Mechanism, kinetics and stereochemistry, Reactivity and steric hindrance, SN^1 Reaction: Mechanism, kinetics, stereochemistry, Carbocation, Structure of carbocation, Relative stability of carbocations, Stability of carbocation: polar effect, Rearrangement of carbocation, Reaction, Low reactivity of aryl and vinyl halides, Structure of aryl and vinyl halides, Nucleophilic aromatic substitution, Bimolecular displacement for nucleophilic aromatic substitution, Reactivity in nucleophilic aromatic substitution, Orientation in nucleophilic aromatic substitution, Electron withdrawal by resonance, Elimination-Addition mechanism, Benzynes.	**25**
2.	**CHEMICAL BONDING** Valence bond theory and its limitation, The Lewis Theory and exceptions to the octet rule, Sidgwick-Powell Theory, Valance shell Electron pair Repulsion Theory (VSEPR), Effect of Lone Pair, Effect of electron negativity, Isoelectronic molecules and principle, shape and hybridization of some molecules based on VSEPR theory like BeF_2, BF_3 (or BH_3), $[BF_4]^-$ ion, NH_3, H_2O, PCl_5, ClF_3, SF_4, SF_6, I^-_3 and IF_7. Hybridization, Types of hybridisation (SP, SP^2, SP^3). Molecular orbital method LCAO method, s-s combination of orbitals,	**25**

	s-p combination of orbitals, p-p combination of orbitals, Rules of linear combination of atomic orbitals, Examples of molecular orbital treatment for HOMO Nuclear Diatomic Molecules (H_2^+, He_2, B_2, C_2, N_2, O_2, O^-_2, O^{-2}_2 , F_2). Treatment for Hetero Nuclear Diatomic Molecules (CO, CO^+, NO).	
3.	**[A] FUNDAMENTAL CONCEPT OF COORDINATION CHEMISTRY** Definition of some terms, Classification of ligands, Chelate, chelating ligand and Chelation, Classification of chelates, Uses of Chelates, Co-ordination number and Stereochemistry including distortion of complexes having coordination number 7, Nomenclature of co-ordination compounds, Stability of complexes, Detail factors affecting the stability of complexes. **[B] BENZENE AND THEIR DERIVATIVES** Classification of substituent group, Mechanism of nitration, Sulphonation, Friedal-Craft alkylation, Friedal-Craft acylation and Halogenation of benzene, Limitations of Friedal-Craft alkylation, Halogenation of alkyl benzene: ring Vs side chain, Side-chain halogenations of alkyl benzene.	**25**
4.	**CHEMICAL KINETICS** Introduction, Concentration Effects, Differential Rate Laws, The Integrated Rate Laws, Experimental Determination of rate laws, Reaction Mechanisms, Elementary Processes, Mechanism and rate laws, Collision Theory of Gaseous Reactions, Temperature effects, Numerical Problems based on above topics.	**25**

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Internal Continuous Assessment in the form of Class test/Internal	50

	Written test 15 Marks (30%), Quiz 15 Marks (30%) Active learning 05 Marks (10%), Home Assignments 05 Marks (10%), Class Assignments 05 Marks (10%), Attendance 05 Marks (10%), (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 50 Marks (100%)].	
2.	Semester End Examination [Total 50 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Gain the knowledge of Chemistry using various fundamental aspects of all four major branches of chemical sciences.
2.	Explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the several chemical reactions.
3.	To have knowledge of basic aspects of inorganic chemistry comprising of various aspects of periodic table.
4	Gain knowledge about various acid base theory and their applications.
5	Know about use of various theoretical analytical methods and their applications.

Suggested References:	
Sr. No.	References
1.	Morrison, R. T. & Boyd, R. N., *Organic chemistry* (6^{th} edition). (unit- 1 & 3)
2.	Clayden, J., Greeves, N., Warren, S., *Organic Chemistry* 2^{nd} Edition, Oxford University Press. (unit- 1)
3.	Prakash S., Tuli, G. D., Basu, S. K., Madan R. D., *Advance inorganic chemistry* (Vol. - I). (unit- 2 & 3)
4.	Lee J. D., *Concise Inorganic Chemistry* (4^{th} Edition). (unit-2 & 3)
5.	Cotton, F.A. & Wilkinson, G. *Basic Inorganic Chemistry*, Wiley. (unit- 2 & 3)
6.	Selected Topics in Inorganic Chemistry, Wahid U. Malik, G. D. Tuli, R. D. Madan. (unit- 2 & 3)

7.	Mahan, B.H. *University Chemistry*, 3rd Edition Narosa. (unit- 4)
8.	Sharma K. K and Sharma L. K. *A Text Book of Physical chemistry*, (5th Edition), Vikas Publishing House. (unit- 4)
9.	Bahl, B.S., Tuli J. D., and Bahl, A, *Essentials of Physical Chemistry*. 25th Edition, S. Chand and Co. (unit- 4)
10.	Barrow, G. M., *Physical chemistry* (6th Edition). (unit- 4)

On-line resources to be used if available as reference material
On-line Resources : Google books, INFLIBNET, Google Web.

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(Bachelor of Science) (Undergraduate) (NEP-2020)

B. Sc. (UG) Semester- II

Course Code	**US02MACHE02**	Title of the Course	**CHEMISTRY PRACTICAL - I**
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	To make students familiar about: 1. Chemistry as a subject 2.Practical aspects of chemistry 3. Basic concepts related to qualitative analysis of organic substances. 4. Hands on training of laboratory practices.

Course Content	
Unit	Description
1.	**Identification of Organic substance**: Like organic spotting, detection of elements, Type of compound like aliphatic/aromatic, Nature (acidic/basic/neutral), Functional group(s) analysis, and m.pt. /b.pt. Benzoic acid, Salicylic acid, α-Naphthol, β-Naphthol, p-nitroaniline/m-nitroaniline, Acetanilide, Urea, Naphthalene, p-dichlorobenzene, m-dinitrobenzene, Dextrose, Acetamide, Acetone, Methanol, Methyl acetate/Ethyl acetate, Carbon tetrachloride, Benzaldehyde, Aniline.
2.	**TITRIMETRIC ANALYSIS** For the following exercise student has to prepare solution of titrant, where ever required. (i) To determine the amount of NH_3 volumetrically from the given solution of $(NH_4)_2SO_4$ or NH_4Cl. (ii) To determine the amount and percentage of $CaCO_3$ in the given sample (i.e. in chalk). (iii) To determine the amount of Mg^{+2} by EDTA using Eriochrom Black-T indicator. (iv) To determine the amount of Ni^{+2} by EDTA using Muroxide indicator. (v) To determine the amount of Cu^{+2} by EDTA using Fast Sulphon Black-F indicator. (vi) To determine the amount of Cd^{+2} by EDTA using Xylenol Orange indicator. (vii) To determine the amount of Ca^{+2} by EDTA using EBT indicator.

	(viii) To determine the amount of Zn^{+2} by EDTA using Eriochrom Black-T. indicator. (ix) To determine the molarity and gm/lit of H_2O_2 solution by using 0.02 M $KMnO_4$ solution. (x) To determine the amount of Nitrite solution by using 0.01 M $KMnO_4$ solution by direct titration method.

Teaching-Learning Methodology	Hands on training, Practical Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Laboratory work Assessment 20 (40 %), Viva Voce/Lab Quiz 20 (40 %), Attendance 10 (20 %). [Total 50 Marks (100%)].	50
2.	Semester End Examination : Laboratory work Assessment 40 (80 %), Viva Voce/Lab Quiz 10 (20 %). (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 50 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to learn	
1.	About hands on training of Volumetric analysis and Analysis of Inorganic substances.
2.	About improvement in practical skills of students.

Suggested References:	
Sr.	References

No.	
1.	Mendham, J., Denney, R. C., Barnes, J. D., Thomas, M. J. K., *Vogel's textbook of quantitative chemical analysis*, 6th Edition.
2.	Pandey, O. P., Bajpai, D. N.,Giri, S., *Practical Chemistry*.
3	Ghoshal, Mahapatra,Nad , *An Advanced course in Practical Chemistry.*

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On-line Resources : Google books, INFLIBNET, Google Web

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Course Code (Minor)	**US02MICHE01**	Title of the Course	**BASIC CHEMISTRY- II**
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with: 1. Some advanced topics of basic chemistry. 2. Historic development and scope of various branches of chemistry. 3. Basic concepts related to alkyl and aryl halides, and bonding in inorganic compounds.

Course Content		
Unit	Description	Weightage* (%)
1.	**ALKYL AND ARYL HALIDES** Homolytic and Heterolytic chemistry, Classification, Preparation, Reaction: Nucleophilic aliphatic substitution, SN^2 Reaction: Mechanism, kinetics and stereochemistry, Reactivity and steric hindrance, SN^1 Reaction: Mechanism, kinetics, stereochemistry, Carbocation, Structure of carbocation, Relative stability of carbocations, Stability of carbocation: polar effect, Rearrangement of carbocation, Reaction, Low reactivity of aryl and vinyl halides, Structure of aryl and vinyl halides, Nucleophilic aromatic substitution, Bimolecular displacement for nucleophilic aromatic substitution, Reactivity in nucleophilic aromatic substitution, Orientation in nucleophilic aromatic substitution, Electron withdrawal by resonance, Elimination-Addition mechanism, Benzynes.	**50**
2.	**CHEMICAL BONDING** Valence bond theory and its limitation, The Lewis Theory and exceptions to the octet rule, Sidgwick-Powell Theory, Valance shell Electron pair Repulsion Theory (VSEPR), Effect of Lone Pair, Effect of electron negativity, Isoelectronic molecules and principle, shape and hybridization	**50**

	of some molecules based on VSEPR theory like BeF_2, BF_3 (or BH_3), $[BF_4]^-$ ion, NH_3, H_2O, PCl_5, ClF_3, SF_4, SF_6, I^-_3 and IF_7. Hybridization, Types of hybridisation (SP, SP^2, SP^3). Molecular orbital method LCAO method, s-s combination of orbitals, s-p combination of orbitals, p-p combination of orbitals, Rules of linear combination of atomic orbitals, Examples of molecular orbital treatment for HOMO Nuclear Diatomic Molecules (H_2^+, He_2, B_2, C_2, N_2, O_2, O^-_2, O^{-2}_2 , F_2). Treatment for Hetero Nuclear Diatomic Molecules (CO, CO^+, NO).	

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Class test/Internal written test 10 Marks (40%), Quiz 05 Marks (20%), Home Assignments 05 Marks (20%), Attendance 05 Marks (20%), (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50
2.	Semester End Examination [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about basic concepts of alkyl and aryl halides, and chemical bonding. This learning will be helpful in understanding second and third year B.Sc. chemistry course.
2.	Gain knowledge of various electrophilic and nucleophilic reactions of aromatic compounds.

Suggested References:

Sr. No.	References
1.	Morrison, R. T. & Boyd, R. N., *Organic chemistry* (6^{th} edition).
2.	Lee J. D., *Concise Inorganic Chemistry* (4^{th} Edition).
3	Prakash S., Tuli, G. D., Basu, S. K., Madan R. D., *Advance inorganic chemistry* (Vol. - II).
4	Cotton, F.A. & Wilkinson, G. *Basic Inorganic Chemistry*, Wiley.
5	Selected Topics in Inorganic Chemistry, Wahid U. Malik, G. D. Tuli, R. D. Madan.

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Course Code (Minor)	**US02MICHE02**	Title of the Course	**CHEMISTRY PRACTICAL-2**
Total Credits of the Course	2	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Chemistry as a subject. 2. Practical aspects of chemistry. 3. Basic concepts related to qualitative analysis of organic substances. 4. Hands on training on laboratory practices.

Course Content	
Practical	Description
1	**Identification of Organic substance**: Like organic spotting, detection of elements, Type of compound like aliphatic/aromatic, Nature (acidic/basic/neutral), Functional group(s) analysis, and m.pt. /b.pt. Benzoic acid, Salicylic acid, α-Naphthol, β-Naphthol, p-nitroaniline/m-nitroaniline, Acetanilide, Urea, Naphthalene, p-dichlorobenzene, m-dinitrobenzene, Dextrose, Acetamide, Acetone, Methanol, Methyl acetate/Ethyl acetate, Carbon tetrachloride, Benzaldehyde, Aniline.

Teaching-Learning Methodology	Hands on training, Practical Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Laboratory work Assessment 10 (40%), Viva Voce/Lab Quiz 10 (40%), Attendance 05 (20%). [Total 25 Marks (100%)]	50
2.	Semester End Examination : Laboratory work Assessment 20 (80%), Viva Voce/Lab Quiz 5 (20%). (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about hands on training of Analysis of organic substances.
2.	Improve practical skills of students.

Suggested References:	
Sr. No.	References
1.	Mendham, J., Denney, R. C., Barnes, J. D., Thomas, M. J. K., *Vogel's textbook of quantitative chemical analysis*, 6th Edition.
2.	Pandey, O. P., Bajpai, D. N., Giri, S., *Practical Chemistry*.
3	Ghoshal, Mahapatra, Nad , *An Advanced course in Practical Chemistry*.

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Course Code (Inter Disciplinary)	**US02IDCHE01**	Title of the Course	**FUNDAMENTALS OF CHEMISTRY-II**
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with: 1. Some advanced topics of basic chemistry. 2. Historic development and scope of various branches of chemistry. 3. Basic concepts related to d-Block elements, coordination chemistry and fundamental aspects of chemical kinetics.

Course Content		
Unit	Description	Weightage* (%)
1.	**[A] FUNDAMENTAL CONCEPT OF COORDINATION CHEMISTRY** Definition of some terms, Classification of ligands, Chelate, chelating ligand and Chelation, Classification of chelates, Uses of Chelates, Co-ordination number and Stereochemistry including distortion of complexes having coordination number 7, Nomenclature of co-ordination compounds, Stability of complexes, Detail factors affecting the stability of complexes. **[B] BENZENE AND THEIR DERIVATIVES** Classification of substituent group, Mechanism of nitration, Sulphonation, Friedal-Craft alkylation, Friedal-Craft acylation and Halogenation of benzene, Limitations of Friedal-Craft alkylation, Halogenation of alkyl benzene: ring Vs side chain, Side-chain halogenations of alkyl benzene.	**50**
2.	**CHEMICAL KINETICS** Introduction, Concentration Effects, Differential Rate Laws, The Integrated Rate Laws, Experimental Determination of rate laws, Reaction Mechanisms, Elementary Processes, Mechanism and rate laws, Collision	**50**

	Theory of Gaseous Reactions, Temperature effects, Numerical Problems based on above topics.	

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Class test/Internal written test 10 Marks (40%), Quiz 05 Marks (20%), Home Assignments 05 Marks (20%), Attendance 05 Marks (20%), (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50
2.	Semester End Examination [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about basic concepts of co-ordination chemistry, chemical kinetics, d-block elements. This learning will be helpful in understanding second and third year B.Sc. chemistry course.
2.	Have knowledge of nomenclature of complexes and ligands.
3.	To gain knowledge of d-block elements and various bonds in inorganic complexes.

Suggested References:	
Sr. No.	References

1.	Barrow, G. M., *Physical chemistry* (6^{th} Edition).
2.	Bahl, B.S., Tuli J. D., and Bahl, A, *Essentials of Physical Chemistry*.
3	Prakash S., Tuli, G. D., Basu, S. K., Madan R. D., *Advance inorganic chemistry* (Vol. - II).
4	Mahan, B.H. *University Chemistry*, 3^{rd} Edition Narosa.
5	Selected Topics in Inorganic Chemistry, Wahid U. Malik, G. D. Tuli, R. D. Madan.
6	Cotton, F.A. & Wilkinson, G. *Basic Inorganic Chemistry*, Wiley.
7	Lee J. D., *Concise Inorganic Chemistry* (4^{th} Edition).
8	Sharma K. K and Sharma L. K. *A Text Book of Physical chemistry*, (5^{th} Edition), Vikas Publishing House.

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On-line Resources : Google books, INFLIBNET, Google Web.

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Course Code (Inter Disciplinary)	**US02IDCHE02**	Title of the Course	**CHEMISTRY PRACTICAL-3**
Total Credits of the Course	2	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Chemistry as a subject. 2. Practical aspects of chemistry. 3. Basic concepts related to qualitative analysis of organic substances. 4. Hands on training on laboratory practices.

Course Content	
Practical	Description
1.	**Identification of Organic substance**: Like organic spotting, detection of elements, Type of compound like aliphatic/aromatic, Nature (acidic/basic/neutral), Functional group(s) analysis, and m.pt. /b.pt. Benzoic acid, Salicylic acid, α-Naphthol, β-Naphthol, p-nitroaniline/m-nitroaniline, Acetanilide, Urea, Naphthalene, p-dichlorobenzene, m-dinitrobenzene, Dextrose, Acetamide, Acetone, Methanol, Methyl acetate/Ethyl acetate, Carbon tetrachloride, Benzaldehyde, Aniline.

Teaching-Learning Methodology	Hands on training, Practical Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Laboratory work Assessment 10 (40%), Viva Voce/Lab Quiz 10 (40%), Attendance 05 (20%). [Total 25 Marks (100%)]	50
2.	Semester End Examination : Laboratory work Assessment 20 (80%), Viva Voce/Lab Quiz 5 (20%). (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about hands on training of Analysis of organic substances.
2.	Improve practical skills of students.

Suggested References:	
Sr. No.	References
1.	Mendham, J., Denney, R. C., Barnes, J. D., Thomas, M. J. K., *Vogel's textbook of quantitative chemical analysis*, 6th Edition.
2.	Pandey, O. P., Bajpai, D. N., Giri, S., *Practical Chemistry*.
3	Ghoshal, Mahapatra, Nad , *An Advanced course in Practical Chemistry*.

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On-line Resources: Google books, INFLIBNET, Google Web

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Course Code (Multidisciplinary)	**US02MDCHE01**	Title of the Course	**ENVIRONMENTAL POLLUTION - II**
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with: 1. Chemistry as a subject. 2. Basic concepts related to pollution and its effect on environment.

Course Content		
Unit	Description	Weightage (%)
1.	**Soil Pollution** Introduction, Importance and formation of soil, Composition of soil, Salt affected to soil, Sources of soil pollution, Soil erosion and its types, Agents of soil erosion, Mechanism of soil erosion, Factors affecting to soil erosion, Detrimental effects of soil erosion, Measures of soil erosion, Preventing soil erosion, Chemical method of SEWAGE Treatment, Control of soil pollution, Sources using wastes.	**50**
2.	**Radioactive Pollution** Introduction, How radioactive pollution differs from other pollution. Types and unit of radiation, Radiation chemistry, Interaction of ionizing radiation with matter, Principal Types of radiation, Chemical change, Effect of ionizing radiation on water and aqueous solution, Effect of radiation on organic compound, Auto radiolysis, Natural sources of radiation, Anthropogenic sources of radiation, Classification and effects of radiation, Effect of ionizing & non-ionizing radiation.	**50**

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that

	accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Class test/Internal written test 10 Marks (40%), Quiz 05 Marks (20%), Home Assignments 05 Marks (20%), Attendance 05 Marks (20%), (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50
2.	Semester End Examination [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Gain the knowledge of pollution chemistry using various fundamental aspects of chemical sciences.
2.	Understand types of pollutions and its effect on surrounding environment.
3.	To have knowledge of basic aspects of pollution chemistry.

Suggested References:	
Sr. No.	References
1.	Environmental studies by S.V.S. Rana Second reprint (F. Edi) : 2007.
2.	Environmental Chemistry by B. K. Sharma, H.KAUR, Third revised and enlarged edition -1996-97.

On-line resources to be used if available as reference material.
On-line Resources : Google books, INFLIBNET, Google Web

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Course Code (Multi Disciplinary)	**US2MDCHE02**	Title of the Course	**CHEMISTRY PRACTICAL-4**
Total Credits of the Course	2	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Chemistry as a subject. 2. Practical aspects of chemistry. 3. Basic concepts related to qualitative analysis of organic substances. 4. Hands on training on laboratory practices.

Course Content	
Practical	Description
1	**Identification of Organic substance**: Like organic spotting, detection of elements, Type of compound like aliphatic/aromatic, Nature (acidic/basic/neutral), Functional group(s) analysis, and m.pt. /b.pt. Benzoic acid, Salicylic acid, α-Naphthol, β-Naphthol, p-nitroaniline/m-nitroaniline, Acetanilide, Urea, Naphthalene, p-dichlorobenzene, m-dinitrobenzene, Dextrose, Acetamide, Acetone, Methanol, Methyl acetate/Ethyl acetate, Carbon tetrachloride, Benzaldehyde, Aniline

Teaching-Learning Methodology	Hands on training, Practical Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Continuous and compression evaluation : Laboratory work Assessment 10 (40%), Viva Voce/Lab Quiz 10 (40%), Attendance 05 (20%). [Total 25 Marks (100%)]	50
2.	Semester End Examination : Laboratory work Assessment 20 (80%), Viva Voce/Lab Quiz 5 (20%). (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about hands on training of Analysis of organic substances.
2.	Improve practical skills of students.

Suggested References:	
Sr. No.	References
1.	Mendham, J., Denney, R. C., Barnes, J. D., Thomas, M. J. K., *Vogel's textbook of quantitative chemical analysis*, 6th Edition.
2.	Pandey, O. P., Bajpai, D. N., Giri, S., *Practical Chemistry*.
3	Ghoshal, Mahapatra, Nad , *An Advanced course in Practical Chemistry*.

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Syllabus effective from the Academic Year 2024-2025

Course Code (Skill Enhancement Courses)	**US02SECHE01**	Title of the Course	**FUNDAMENTALS OF SOIL CHEMISTRY**
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with: 1. Chemistry as a subject. 2. Fundamentals of soil chemistry.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction to Soil Chemistry** Importance of soil, soil formation, composition of soil, the soil profile, types of soil, micro and macro plant nutrients. Soil fertility and productivity, techniques for the analysis of soil, soil reaction, determination of total nitrogen in soil, determination of phosphorus in soil, determination of potassium in soil by flame photometry.	**50**
2.	**Analysis of Nutrients** Determination of total sulphur in soil, determination of calcium in soil determination of magnesium in soil, determination of lime and liming material in soil. Mechanical analysis of soil. Determination of total manganese in soil, determination of Fe (II) and Fe (III) in soil, determination of silica in soil, determination of soluble salts in soil, determination of sodium in soil by flame photometry.	**50**

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that

	accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Class test/Internal written test 10 Marks (40%), Quiz 05 Marks (20%), Home Assignments 05 Marks (20%), Attendance 05 Marks (20%), (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50
2.	Semester End Examination [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Gain the knowledge of soil Chemistry.
2.	Learn about analysis of micronutrients.

Suggested References:	
Sr. No.	References
1.	Environmental Chemistry: H. Kaur, Pragati Prakashan, 2nd Edition.
2.	Soils in our Environment: Raymond W. Miller, Duane T. Gardiner, Prentice Hall, 8th Edition.

On-line resources to be used if available as reference material
On-line Resources : Google books, INFLIBNET, Google Web

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