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(Bachelor of Science) (Undergraduate)

B. Sc. (UG) Semester -VI

Course Code	US06MACHE01	Title of the Course	INORGANIC CHEMISTRY
Total Credits of the Course	04	Hours per Week	04
Course Objectives:	To make students familiar with: 1. Inorganic Chemistry as a subject. 2. Advanced topics of inorganic chemistry. 3. Understanding of symmetry, CFT, trans effect, coordination chemistry, term symbol and electronic spectra of metal complexes.		

Course Content		
Unit	Description	Weightage* (%)
1.	SYMMETRY Introduction, Various types of symmetry elements, Point groups, Properties of point groups, To determine the point group of a molecule, Representations of groups, multiplication table for point groups C_{2v} , C_{3v} and C_{2h} . Rules of Group theory.	25%
2.	[A] CRYSTAL FIELD THEORY Importance of CFT, Grouping of 5d orbitals, CFT applied for octahedral complexes, Distribution of d^n electrons (strong field and weak field), Factor influencing magnitude of Δ_0 , Spectrochemical series, Mean pairing energy and calculations, Calculation based on CFSE, CFT for tetrahedral complexes, Distribution of d^n electrons, Limitation of CFT, Energy Level Diagram for $[CoF_6]^{3-}$ and $[Co(NH_3)_6]^{3+}$. [B] TRANS EFFECT Introduction of trans effect, uses of trans effect, theories of trans effect, electrostatic polarisation theory and π -bonding theory.	25%
3.	WAVE MECHANICS Wave equation, Interpretation of ψ and Heisenberg's uncertainty principle, Properties of ψ , Operators, Second postulate of quantum mechanics, Setting up operators for different observable, Third postulate of quantum mechanics, Fourth postulate of quantum	25%

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	mechanics, Particle in one dimensional box, Three dimensional box, Characteristics of the wave functions, Normalization and orthogonality, Numericals.	
4.	(A) TERM SYMBOL: Russel Saunders coupling and determination of Term symbols of the ground state. Calculation of number of microstates. Pigeon hole diagram of p^2 and d^2 configurations. Hund's rule. Hole formulation. (B) ELECTRONIC SPECTRA OF METAL COMPLEXES Electronic spectra of transition metal complexes, Laporte orbital and spin selection rules. Orgel energy level diagram of d^5 and combined diagrams of $d^1 - d^9$, $d^2 - d^8$, $d^3 - d^7$, $d^4 - d^6$ and their spectra. Jahn Teller distortion. Spectrochemical series.	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 (Power Point presentations, audio visual resources, e-resources, seminars, workshops, models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Internal Continuous Assessment in the form of Class test/Internal 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%)].	50
2.	Semester End Examination [Total 50 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will learn about basic concept of symmetry, crystal field theory, geometry of the molecule, electronic spectra of metal complexes and term symbol.

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2.	Understand applications of inorganic chemistry in further studies and in industries.
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References books	
Sr. No.	References
1.	Advanced Inorganic Chemistry Volume I- 18 th Edition By SatyaPrakash, G. D. Tuli, S. K. Basu, R. D.Madan
2.	Basic Inorganic Chemistry -3 rd Edition By F. Albert Cotton, Geoffrey, Wilkinson & Paul L. Gaus
3.	Selected Topic in Inorganic Chemistry, 8 th Edition, By Wahid U. Malik, G. D. Tuli And R. D. Madan
4.	Introductory Quantum Chemistry- 4 th Edition By A K Chandra
5.	Selected Topic in Inorganic Chemistry, 8 th Edition, By Wahid U. Malik, G. D. Tuli And R. D. Madan

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

B. Sc. Chemistry

Semester – VI

(Effective from JUNE - 2026)

Course Code (Minor)	US06MICHE06	Title of the Course	Business Management& Economics – II – Project work
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	This course aims to develop students' leadership and management skills in industrial settings by equipping them with practical knowledge of business organization and management. The objective is to enhance their decision-making abilities, strategic thinking, and problem-solving skills relevant to the chemical industry.
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Course Content
➤ Book Review Report Writing: Selection and critical analysis of books related to business and management, Structured report writing and submission, Presentation and discussion of key insights. ➤ Case Study Analysis: Identification of key management issues in the chemical industry, conducting an in-depth case study based on an industrial visit, Preparing a comprehensive report with findings and recommendations. ➤ Project Work: Research and documentation on various business topics, including: Forms of legal ownership and their implications. Financial management: budgeting, financial planning, and cost control. Marketing management: market analysis, pricing strategies, and sales forecasting. Project cost estimation techniques and financial feasibility analysis. Plant location and design: factors affecting site selection and layout planning. Inventory management: stock control, supply chain strategies, and optimization.

Teaching- Learning Methodology	Courses for B. Sc. Industrial Chemistry program is 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).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal (Practical Examination, Viva – Voce) (As per NEP – 2020)	50%
2.	University Examination	50%

Course Outcomes: Upon successful completion of this course, students will:
1. Develop analytical and critical thinking skills through book reviews and case study evaluations.

2. Gain hands-on experience in business management through practical project work.
3. Acquire fundamental knowledge of financial, marketing, and project management concepts applicable to the chemical industry.
4. Understand the application of inventory management, plant location selection, and project cost estimation techniques in industrial settings.
5. Enhance their leadership, teamwork, and decision-making abilities essential for industrial roles.

Suggested References:

Sr. No.	References
1.	C.B. Gupta, "Business Organization and Management" – Sultan Chand & Sons.
2.	M.C. Shukla, "Business Organization and Management" – S. Chand Publishing.
3.	Donald F. Kuratko, "Entrepreneurship: Theory, Process, and Practice" – Cengage Learning.
4.	Poornima M. Charantimath, "Entrepreneurship Development and Small Business Enterprises" – Pearson Education.
5.	T. Ramasamy, "Principles of Management" – Himalaya Publishing House.
6.	Prasanna Chandra, "Financial Management: Theory and Practice" – McGraw-Hill Education.
7.	Philip Kotler & Kevin Lane Keller, "Marketing Management" – Pearson Education.
8.	Charles T. Horngren, Srikant M. Datar & Madhav V. Rajan, "Cost Accounting: A Managerial Emphasis" – Pearson.

On-line resources to be used if available as reference material

Online Resources: Google Books, INFLIBNET, Google Web



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Bachelor of Science

Undergraduate

B. Sc. Chemistry

Semester – VI

(Effective from JUNE - 2026)

Course Code (Minor)	US06MICHE05	Title of the Course	Industrial Management & Economics – II
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with: 1. A comprehensive understanding of business ownership structures, entrepreneurship skills, and financial acumen. 2. Insight into marketing strategies, decision-making processes, and practical applications in business environments. 3. Knowledge of industrial management principles, including project planning, cost estimation, plant location, and inventory control
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Course Content		
Unit	Description	Weightage*(%)
1.	Functions of Management – Covers key managerial functions, including planning, decision-making, directing, staffing, control, and organizational structures, with a focus on effective business operations and leadership.	50%
2.	Project Planning & Management – Focuses on industrial project planning, cost estimation, plant location strategies, inventory management techniques, employee welfare, safety regulations, and plant design considerations.	50%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry programs are delivered through classroom, and 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, and models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal (Written Examination, Practical Examination, Continuous Evaluation, Quizzes, Seminars, Assignments, Attendance) (As per NEP – 2020)	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand key managerial functions and their application in business decision-making.
2.	Analyze and evaluate entrepreneurship principles to develop and manage new business ventures.
3.	Gain practical knowledge of financial management, including sources of finance, working capital, interest, depreciation, taxes, and insurance.
4.	Effectively manage industrial projects, including plant setup, equipment selection, and production planning.

Suggested References:	
Sr. No.	References
1.	Gupta, C.B. "Business Organization and Management" – Sultan Chand & Sons
2.	Shukla, M.C. "Business Organization and Management" – S. Chand Publishing
3.	Kuratko, Donald F. "Entrepreneurship: Theory, Process, and Practice" – Cengage Learning
4.	Charantimath, Poornima M. "Entrepreneurship Development and Small Business Enterprises" – Pearson Education
5.	Ramasamy, T. "Principles of Management" – Himalaya Publishing House
6.	Chandra, Prasanna "Financial Management: Theory and Practice" – McGraw-Hill Education
7.	Kotler, Philip & Keller, Kevin Lane "Marketing Management" – Pearson Education
8.	Horngren, Charles T., Datar, Srikant M., & Rajan, Madhav V. "Cost Accounting: A Managerial Emphasis" – Pearson

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Bachelor of Science

Undergraduate

B. Sc. Chemistry

Semester – VI

(Effective from JUNE - 2026)

Course Code (Minor Practical)	US06MICHE04	Title of the Course	Polymer Science – Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	This course will develop the skill of learners towards synthesis and analysis of various polymers and monomers.
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Course Content
Synthesis of Polymers and resins like Novalak Phenol Formaldehyde, Resol Phenol formaldehyde, Urea Formaldehyde, Malamine formaldehyde, Glyptal Resin, Saturated and Unsaturated Polyester, Cellulose acetate, Cellulose Nitrate, Polysulfone Rubber, determination of % Purity of formaline, Benzoyl Peroxide and Hydrogen peroxide, Determination of acid value and Hydroxyl value.

Teaching-Learning Methodology	Courses for B. Sc. Industrial Chemistry program are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (Power Point presentations, audio visual resources, e-resources, seminars, workshops, models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal (Practical Examination, Viva – Voce) (As per NEP – 2020)	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to Acquire practical knowledge of basic polymer laboratory tools and analytical concept for polymer chemistry for the subject of industrial chemistry.
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Bachelor of Science

Undergraduate

B. Sc. Chemistry

Semester – VI

(Effective from JUNE - 2026)

Course Code (Minor)	US06MICHE03	Title of the Course	Polymer Science
Total Credits of the Course	2	Hours per Week	2
Course Objectives:	To make students familiar with: 1. Industrial Polymers and Resins. 2. Fibres – natural and synthetic. Rubbers and speciality Polymers.		

Course Content

Unit	Description	Weightage*(%)
1.	Introduction of polymer Technology, Classification of polymers, Mechanism of polymerization and Polymerization methods. Determination of Molecular weight and molecular weight distribution number, Determination of weight average and viscosity average molecular weight of polymers. Methods of determining molecular weight.	50%
2.	Raw material, manufacture, properties and application of PF, UF, MF, PU, Epoxy resins. Fiber – Natural and synthetic Fiber, nylon, polyester and Rayon. Rubber – Natural and synthetic rubbers, Polyisoprene, Butadiene, Neoprene, SBR and Thiokol. Example of Specialty Polymers.	50%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry programs are delivered through classroom, and 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, and models).
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Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage
1.	Internal (Written Examination, Practical Examination, Continuous Evaluation, Quizzes, Seminars, Assignments, Attendance) (As per NEP – 2020)	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	This paper will inculcate knowledge of polymer industry.
2.	The students will study the concepts of polymerization, types of polymers and the chemistry of polymerization process.
3.	Also, they will learn about types of polymers, their characteristics and synthesis at laboratory level and industrial level as well.
4.	Additionally, students will learn the manufacturing of various synthetic polymers and their application in day-to-day life.

Suggested References:	
Sr. No.	References
1.	Shreve's Chemical Process Industries by Austin (Mac Grow- Hill Publication, New Delhi)
2.	Riegel's Hand Book of Industrial Chemistry by James A Kent (CBS Publishers & Distributors – New Delhi)
3.	Polymer Science by V. R Gowariker, N. V. Viswanathan, Jayadev Sreedhar, Wiley Eastern. (New Age International (P) Ltd., New Delhi)
4.	Polymer Science and Technology of Plastics and Rubbers by Premamoy Ghosh (Tata McGraw-Hill Publishing Co. Ltd., New Delhi)
5.	Polymer Science and Technology, by Joel R Fried, PHI.

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Online Resources: Google Books, INFLIBNET, Google Web

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(Bachelor of Science) (Undergraduate)

B. Sc. (UG) Semester - VI

Course Code	US06MICHE02	Title of the Course	ORGANIC CHEMISTRY PRACTICAL
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	To make students familiar about: 1. Organic Chemistry practical as a subject. 2. Basic concepts and applications related to organic synthesis. 3. Hands on training of laboratory practices.
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Practical	Description
I	Organic Preparations [Synthesis of organic compounds and writing of its spectral data (IR, NMR and Mass)]: (i) Preparation of p-Bromoacetanilide from Acetanilide. (Bromination) (ii) Preparation of p-Nitroacetanilide from Acetanilide (Nitration). (iii) Preparation of m-Nitroaniline from m-Dinitrobenzene. (Reduction) (iv) Preparation of Benzoic acid from Benzaldehyde (Oxidation). (v) Preparation of Iodoform. (haloform reaction) (vi) Preparation of Dyes: Mordent Yellow dye. (Diazotization reaction) (vii) Preparation of coumarin derivative. (coumarin synthesis) (viii) Preparation of dihydropyridine derivative (DHP) (Hantzsch dihydropyridine synthesis) (ix) Separation of various mixture using Paper chromatography. VIVA-VOCE EXAMINATION

Teaching-Learning Methodology	Hands on training to Practical Courses are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)



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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 hands on training of organic synthesis.
2.	Improve practical skills of students.

Suggested References Books:

Sr. No.	References Books:
1.	Comprehensive practical organic chemistry Preparation and qualitative analysis by V. K. Ahuwalia and Renu Agarwal.
2.	Organic Preparation by A. I. Vogel

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)

B. Sc. (UG) Semester - VI

Course Code	US06MICHE01	Title of the Course	ORGANIC CHEMISTRY
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	To make students familiar with: 1. Organic Chemistry as a subject. 2. Understanding chemistry of Amino Acids and Proteins, Organic photo chemistry.
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Course Content		
Unit	Description	Weightage* (%)
1.	AMINO ACIDS AND PROTEINS : Proteins, Structure of amino acids, Amino acids as dipolar ions, Isoelectric point of amino acids, Configuration of natural amino acids, Preparation of amino acids, Peptides. Geometry of the peptide linkage, Determination of structure of peptide. Terminal residue analysis. Partial hydrolysis. Synthesis of peptides, Proteins. Classification and function. Denaturation, Structure of proteins, Peptide chain, Side chain. Isoelectric point. Electrophoresis, Conjugated proteins. Prosthetic group. Enzyme (definition), Coenzymes, Secondary structure of protein, Mechanism of enzyme action. Chymotrypsin, Nucleoproteins and nucleic acids. Synthesis of Purines, Pyrimidine and Uracil.	50%
2.	[A] HORMONES Hormones Introduction, including difference between Hormones and Vitamins, Sex hormones. Introduction, constitution and synthesis of Oestrone, Introduction, constitution and synthesis of Testosterone. Adrenocortical hormones. [B] VITAMIN Introduction, history and nomenclature, classification, synthesis of vitamins by intestinal bacteria, Fat and water soluble vitamins. Vitamin-A and its chemistry, absorption, transport and metabolism, colour vision, other biological functions and deficiency of Vitamin-A. Vitamin-D: chemistry and biochemical functions of Vitamin-D,	50%

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	Vitamin-D is a hormone and not a vitamin, dietary sources and deficiency symptoms. Vitamin-E: chemistry and biochemical functions of Vitamin-E, dietary sources and deficiency symptoms. Vitamin-C: chemistry and biochemical functions of Vitamin-C, dietary sources and deficiency symptoms, biomedical/clinical concepts.	
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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 (Power Point presentations, audio visual resources, e-resources, seminars, workshops, models).
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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.	From the study of this paper, student will learn about basic concepts of amino acids, proteins and organic photochemistry.
2.	This study will helpful them in further higher studies and in industries.

Suggested References Books:	
Sr. No.	References Books:
1.	Organic chemistry of natural products by Gurdeep Chatwal, Vol.II.
2.	Organic chemistry by Morrison and Boyd, 6 th Ed.

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3.	Organic reaction mechanism by R. K. Bansal, 3 rd ed.
4.	Organic chemistry by S. M. Mukherji, S. P. Singh and R. P. Kapoor. Vol. II.
5	Synthetic organic chemistry by Gurdeep R. Chatwal
6	Biochemistry by U. Satyanarayan and U. Chakrapani.
7	Fundamentals of biochemistry by Dr. A.C. Deb.

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

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(Bachelor of Science) (Undergraduate)

B. Sc. (UG) Semester -VI

Course Code	US06MACHE03	Title of the Course	PHYSICAL AND INORGANIC CHEMISTRY PRACTICAL
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	To make students familiar with: 1. Practical chemistry as a subject 2. Practical aspects of physical and inorganic chemistry. 3. Advanced practical aspects of Instrumentals techniques and separation of inorganic mixture.
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Course Content	Total Marks : 100
Unit	Description
Practical –I	PHYSICAL CHEMISTRY PRACTICAL: Applications of pH metry 1. To determine Molarity of strong acid by titrating against 0.1 M NaOH solution. 2. To determine molarity and dissociation Constant of weak monobasic acids like HAC by titrating against 0.1 M NaOH solution. 3. To determine Molarity of each acid present in a Mixture of strong acid and weak acid. Applications of Conductometry 4. To determine Molarity of strong acid by titrating against 0.1 M NaOH solution. 5. To determine Molarity of weak acid by titrating against 0.1 M NaOH solution. 6. To determine Molarity of each acid present in a Mixture of strong acid and weak acid. Applications of Potentiometry : To determine Molarity of strong acid by titrating against 0.1 M NaOH solution. 7. To determine molarity and dissociation Constant of weak monobasic acids like HAC titrating against 0.1 M NaOH solution. 8. To determine Molarity of each acid present in a Mixture of strong acid and weak acid. Applications of Colourimetry : 9. To determine concentration of $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ by colourimetry.

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Practical -II	INORGANIC MIXTURES : Semi-micro Inorganic Qualitative Analysis of Mixture Containing Three Positive & Three Negative Radicals. Cd^{+2} , Cu^{+2} , Bi^{+3} , Fe^{+2} , Fe^{+3} , Zn^{+2} , Al^{+3} , Co^{+2} , Ni^{+2} , Mn^{+2} , Ba^{+2} , Sr^{+2} , Ca^{+2} , Mg^{+2} , NH_4^+ , K^+ , Cl^- , Br^- , I^- , NO_3^- , CO_3^{-2} , S^{-2} , PO_4^{-3} , BO_3^{-3} , SO_4^{-2} , CrO_4^{-2} , $\text{Cr}_2\text{O}_7^{-2}$ etc. VIVA VOCE EXAMINATION
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Teaching-Learning Methodology	Hands on training of Practicals and Instruments. 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).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Internal Continuous Assessment in the form of Labwork assessment 20 Marks (40%), lab quiz/viva voce 20 Marks (40%) and attendance 10 Marks (20%). [Total 50 Marks (100%)].	50
2.	Semester End Examination Labwork assessment 40 Marks (80%), lab quiz/viva voce 10 Marks (20%) . [Total 50 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understanding of instrumental methods used in chemical analysis, as well as Separation and identification of six radicals of inorganic mixture.
2.	Above studies will be useful in further higher studies and in industries.

References Books	
Sr. No.	References Books:

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1.	Experimental Physical Chemistry by R. C. Das & B. Behera
2.	Advanced Physical Chemistry by J. B. Yadav
3.	Comprehensive practical organic chemistry Preparation and qualitative analysis by V. K. Ahuwalia and Renu Agarwal.
4.	Vogel's Text book of Quantitative Chemical Analysis, 5 th Edition By G. H. Jeffery, J. Basset, J. Mendham, R. C. Denney.
5.	Vogel's Textbook Of Qualitative Inorganic Analysis By G. Svehla
6.	Practical Chemistry By O. P. Pandey, D. N. Bajpai & S. Giri
7.	An Advanced Course In Practical Chemistry By Ghoshal, Mahapatra & Nad

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

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(Bachelor of Science) (Undergraduate)

B. Sc. (UG) Semester -VI

Course Code	US06MACHE02	Title of the Course	PHYSICAL CHEMISTRY
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	To make students familiar with: 1. Physical Chemistry as a subject. 2. Advanced topics of physical chemistry. 3. Understanding of entropy, thermodynamics, chemical kinetics, Phase rule and electrochemistry.
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Course Content		
Unit	Description	Weightage %
1.	ENTROPY AND SECOND LAW OF THERMODYNAMICS: Limitation of first law, spontaneous or irreversible process, cyclic process. Carnot cycle, Carnot theorem, entropy the new state function, the concept of entropy, entropy change in isothermal expansion of an ideal gas. Entropy change in reversible and irreversible change, the entropy change accompanying phase change, calculation of entropy of an ideal gas with change in P, V and T. Entropy of mixing of an ideal gas. Physical significance of entropy. Work and free energy function, variation of free energy change with T and P. Numericals.	25%
2.	CHEMICAL KINETICS: Kinetics of Third order reaction ($a = b = c$), Mechanism of complex reaction. The equilibrium approximation, Steady state approximation, Effect of temperature on reaction rate, Effect of Catalyst, Activated Complex Theory (ACT) of Bimolecular reaction. The Arrhenius Equation, The theories of reaction rate: The Lindemann theory of unimolecular reaction, Eyring equation, Numerical.	25%
3.	PHASE EQUILLIBRIA: Introduction to Phase rule, Phase component and degree of freedom, Phase reactions, condition for equilibrium between phases, derivation of phase rule, advantage and limitations of phase rule, one component system, water system, the sulfur system, experimental determination of transition point, two component system, simple eutectic system, lead silver system.	25%
4.	ELECTROMOTIVE FORCE OF ELECTROCHEMICAL CELLS: Electrodes, cell emf, emf and free energy. Types of reversible electrodes. Standard electrode potentials, reference electrode, Nernst's	25%

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	equation. Applications of emf measurement (equilibrium constant, Solubility product for sparingly soluble salts, activities, activity coefficients, pH measurement), electrode concentration cells, electrolyte concentration cells. Numericals.	
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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 (Power Point presentations, audio visual resources, e-resources, seminars, workshops, models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Internal Continuous Assessment in the form of Class test/Internal 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%)].	50
2.	Semester End Examination [Total 50 Marks (100%)].	50

Course Outcomes: Having completed this course,	
1.	From the study of this paper, student will be able learn about basic principles of thermodynamics and chemical kinetics. Also understands basics of Phase equilibrium rule and electro chemistry.
2.	This study will helpful them in further studies and in industries.

References books	
Sr. No.	References
1.	Advanced Physical Chemistry by Gurdeep Raj.

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2.	Text book of physical chemistry by Samuel Glasstone.
3.	Principles of Physical Chemistry by Puri, Sharma and Pathania. 38 th Ed.
4.	Essential of physical chemistry by Bahl, Bahl and Tuli. 25 th Edition.
5.	Physical Chemistry by G. M. Barrow, 5 th ed.
6.	Textbook of physical chemistry by P. L. Soni, O. P. Dharmarha, U. N. Dash
7.	University chemistry by Bruce H. Mahan
8.	Principles of Physical chemistry, S. H. Marron, Karl F. Prutton.
9.	Physical Chemistry, Ira Levine.
10.	Physical Chemistry, Atkins

On-line resources to be used if available as reference material
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