Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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–: પરિપત્ર :–

યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૫–૨૬ થી અમલમાં આવનાર T.Y.B.Sc. Chemistry Sem.-5 & 6 Major, Minor અને SEC નો પેટાસમિતિ દ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ સંદર્ભે રસાયણશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૨૮/૦૩/૨૦૨૫ ની સભાના ઠરાવ ક્રમાંકઃ૦૨ થી કરેલ ભલામણ સ્વીકારી વિજ્ઞાન વિદ્યાશાખાની તા.૩૦/૦૪/૨૦૨૫ની સભાનાં ઠરાવ ક્રમાંકઃ૧૭ થી કરેલ ભલામણ સ્વીકારી એકેડેમિક કાઉન્સિલની તા.૫/૫/૨૦૨૫ ની સભાનાં ઠરાવ ક્રમાંકઃ ૮૪ થી મંજુર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંકઃઓથો./પરિપત્ર/સિલેબસ/૧૧૯૯૨/૨૦૨૫
તા.૨૬–૦૫–૨૦૨૫

કુલસચિવ

પ્રતિ,
૧) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.
.....આપશ્રીની કોલેજના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.
૨) ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

UNDER GRADUATE PROGRAMME
IN
CHEMISTRY
UNDER FACULTY OF SCIENCE
3 (YEARS DEGREE) AND 4 (YEARS HONOURS)

T. Y. B. Sc. Sem. – V and Sem. – VI

[Subject Code-2603000506012001]

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY (MAJOR)

PAPER - CH-MJ-601

Inorganic Chemistry (Major) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CH-MJ-601
Subject Title	Inorganic Chemistry (Theory)
Credits	02
Teaching per week	02 Hours
Effective from	2025-2026
Purpose of Course	This course introduces molecular symmetry, inorganic reaction mechanisms, and organometallic compounds, emphasizing their structural and bonding aspects.
Objective of Course	Students will learn to classify molecules into point groups, understand ligand substitution mechanisms in metal complexes, and explore the bonding in key organometallic compounds.
Course Outcomes	**CO1-Remembering:** Students will recall the fundamental concepts of molecular symmetry, point groups, and organometallic compounds, including their classification and bonding. **CO2-Understanding:** Students will explain symmetry elements, symmetry operations, ligand substitution mechanisms, and bonding in organometallic compounds. **CO3-Application:** Students will classify molecules into point groups, apply symmetry rules to chemical structures, and determine reaction mechanisms in metal complexes. **CO4-Analysis:** Students will analyse molecular structures using symmetry principles, construct multiplication tables, and evaluate the stability of organometallic compounds. **CO5-Evaluation:** Students will compare different ligand substitution mechanisms, predict reaction pathways in inorganic complexes, and assess the bonding nature in organometallic compounds. **CO6-Creation:** Students will construct symmetry multiplication tables, predict the behavior of organometallic compounds, and propose mechanisms for substitution reactions.

Mapping Between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓		✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓		✓
CO4	✓	✓	✓	✓	✓		✓	
CO5	✓	✓	✓		✓	✓	✓	✓
CO6	✓		✓	✓	✓	✓	✓	

CH-MJ-601 (Inorganic Chemistry)

Program Name: T. Y. B. Sc. Sem. – VI

Syllabus effective from June 2025

Unit – 1		
	Molecular Symmetry Introduction and importance of symmetry, Symmetry elements and Symmetry operations, Classification of molecules in to point groups. Point group of simple molecules like CO_2, HCl, H_2O, NH_3, BF_3, $[PtCl_4]^{-2}$, PF_5, C_6H_6, $C_5H_5^-$, Bromo benzene (C_6H_5Br), Cyclobutane, Boric acid (H_3BO_3), Cis and Trans Dichoro ethylene ($C_2H_2Cl_2$), Staggered and Eclipsed Ethane (C_2H_6). Law of multiplications, Construction of multiplication table for C_2v, C_3v, C_2h.	**15 h**
Unit – 2		
	[A] Metal Complexes (Inorganic Reaction Mechanism) Reaction mechanisms of ligand substitution in octahedral complexes (i) SN^1(ii) SN^2, Acid hydrolysis & Base Hydrolysis-Redox (Single Electron Transfer) reactions, Substitution reaction without breaking M-L bond. **[B] Organo-metallic compounds** Definition, classification, Structure and bonding in ferrocene, dibenzene chromium, Zeise ion and gaseous dimethyl beryllium, Tetramethyl lead.	**08 h** **07 h**

Reference books:

1) Theoretical Inorganic chemistry by Day & Selbin, Affiliated East West
2) Advanced Inorganic Chemistry by Cotton and Wilkinson, John Wiley
3) Uni. Chemistry by B. H. Mahan
4) Structural Inorganic chemistry by A. F. Wells.
5) Chemical Bonding- an introduction By Rawal, Patel & Patel. Sugumar.
6) Basic Inorganic Chemistry by Cotton and Wilkinson
7) A Text book of Inorganic Chemistry by P.L. Soni
8) Introduction to Inorganic Chemistry by Durrant and Durrant
9) Modern Co-ordination Chemistry by R. Lewis and R.G. Wilkinson.
10) Inorganic Chemistry- Principles of structure and reactivity by J.E. Huhhey and E.A. Keiter.
11) Application of Group Theory to Chemistry by P. K. Bhattacharya., Himalaya Pub. House, Mumbai.

[Subject Code-2603000506012002]

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY Practical (MAJOR)

PAPER - CHP-MJ-601

Inorganic Chemistry (Major) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CHP-MJ-601
Subject Title	Inorganic Chemistry (Practical)
Credits	02
Teaching per week	04 Hours
Effective from	2025-2026
Purpose of Course	This course provides hands-on experience in gravimetric and volumetric analysis, focusing on the estimation of metal ions and alloys using classical analytical techniques.
Objective of Course	Students will develop skills in gravimetric and volumetric methods for quantitative analysis, including metal ion precipitation, complexometric titrations, and purity determination of compounds.
Course Outcomes	**CO1-Remembering:** Students will recall the principles and procedures involved in gravimetric and volumetric estimation methods for metal ions and alloys. **CO2-Understanding:** Students will explain the theoretical concepts of precipitation reactions, complexometric titrations, and the role of indicators in volumetric analysis. **CO3-Application:** Students will perform gravimetric and volumetric estimations, apply stoichiometric principles, and analyse alloy compositions. **CO4-Analysis:** Students will interpret experimental results, assess reaction completion, and determine sources of errors in gravimetric and volumetric methods. **CO5-Evaluation:** Students will compare different titrimetric and gravimetric techniques, assess sample purity, and evaluate the accuracy and precision of their experimental findings. **CO6-Creation:** Students will design experimental procedures for alloy and metal ion estimation, optimize reaction conditions, and propose modifications to improve accuracy.

Mapping Between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓	✓		✓	✓	✓
CO2	✓	✓	✓	✓	✓		✓	
CO3	✓	✓	✓	✓	✓	✓		✓
CO4	✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓		✓	✓	✓	✓
CO6	✓	✓	✓	✓	✓	✓		

CHP-MJ-601 (Inorganic Chemistry)

Third Year B. Sc. Semester - VI

Syllabus effective from June 2025

GRAVIMETRIC ESTIMATION OF (ANY TWO)

1. Fe^{+2} as Fe_2O_3 from $Fe(NH_4)_2SO_4 + CuSO_4$
2. Ba^{+2} as $BaSO_4$ from $BaCl_2 + FeCl_3$
3. Al^{+3} as Al_2O_3 from $Al_2(SO_4)_3 + CuSO_4$

ESTIMATION OF ALLOY (ANY ONE)

1. **Brass-**
   Zinc as $Zn_2P_2O_7$ (gravimetrically) & Copper by iodometrically (volumetric)
2. **German silver –**
   Nickel as $Ni(DMG)_2$ (gravimetrically) & Copper by iodometrically (volumetric)

VOLUMETRIC EXERCISE (ANY FOUR)

1. To determine the percentage purity of potassium acid phthalate.
2. To determine the amount of Ammonium sulphate in the given solution
3. To determine the amount of Ferric by EDTA.
4. To determine the amount of Chromium by EDTA.
5. To determine the amount of Nickel with Magnesium by EDTA.
6. To determine the amount of Chloride by Mohr's method OR Absorption indicator.
7. To determine the amount of Bromide by Vohlard's method OR Absorption indicator.
8. To determine the percentage purity of $NaNO_2$ / KNO_2.

[Subject Code-2005000506022001]

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY (MAJOR)

PAPER - CH-MJ-602

Organic Chemistry (Major) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CH-MJ-602
Subject Title	Organic Chemistry (Theory)
Credits	02
Teaching per week	02 Hours
Effective from	2025-2026
Purpose of Course	This course explores the intersection of Ayurveda and organic chemistry, emphasizing the chemical composition of Ayurvedic herbs and molecular transformations in organic compounds.
Objective of Course	Students will understand the scientific basis of Ayurvedic principles, learn key molecular rearrangements, and study the structure and synthesis of important terpenoids.
Course Outcomes	**CO1-Remembering:** Students will recall the fundamental concepts of Ayurveda, organic chemistry, and the chemical composition of Ayurvedic herbs. **CO2-Understanding:** Students will explain the scientific validation of Ayurvedic principles and their applications in organic chemistry. **CO3-Application:** Students will analyse the mechanisms of molecular rearrangements, including Wagner-Meerwein, Pinacol-Pinacolone, Hoffmann, Curtius, and Beckmann rearrangements. **CO4-Analysis:** Students will classify terpenoids, apply the isoprene rule, and determine structural aspects of α-pinene and citral using analytical and synthetic evidence. **CO5-Evaluation:** Students will compare molecular rearrangements, assess the significance of isoprenoids in natural product chemistry, and validate Ayurvedic chemical principles. **CO6-Creation:** Students will propose future directions for integrating Ayurveda and organic chemistry, design synthesis strategies for terpenoids, and develop research-based applications.

Mapping Between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓		✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓		✓	✓	✓	✓
CO6	✓	✓	✓	✓	✓	✓		

CH-MJ-602 (Organic Chemistry)

Program Name: T. Y. B. Sc. Sem. – VI

Syllabus effective from June 2025

Unit – 1		
	Panchmahabhuta and organic compounds Introduction to Ayurveda & Organic Chemistry. Chemical composition of Ayurvedic herbs. Scientific validation of Ayurvedic Principles. Applications & Future directions.	**15 h**
Unit – 2		
	(A) Molecular Rearrangements Mechanism of rearrangements involving C to C migrations as illustrated by Wagner-Meerwein and Pinocol-Pinacolone rearrangements. Mechanism of rearrangements involving C to N migrations as illustrated by Hoffmann, Curtius, and Beckmann rearrangements. **(B) Terpenoids (Isoprenoids)** Their occurrence, classification, isoprene, and special isoprene rule, general methods to determine their structure, analytical and synthetic evidences for the structure of α-pinene & Citral.	**8 h** **7 h**

Reference Books:

- Baldev Upadhya, Samskrta Sastrom ka Itihas, Chowkhambha, Varansi, 2010.
- D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds. A Concise History of Science of India, 2nd edition, University press, Hydrabad, 2010.
- Astangahrdaya Vol. 1 Sutrasthana and Sarirasthana, Translated by K. R. Srikantha Murthy, Vol 1 Krishnadas Academy, Varansi, 1991.
- Dharampal, Some aspects of earlier Indian Society and polity and their relevance today, New quest Publications, Pune, 1987.
- Dharampal, Indian science and technoilogy in the eighteenth century; Some contemporary European accounts, Dharampal classic series, Rashtrotthana Sahitya, Bengaluru, 2021
- Mechanism and Structure in organic chemistry-GouldeS.
- Reaction mechanism in organic chemistry by Mukhejee &Singh
- Principles of reaction mechanism in organic chemistry by Dharmaraha & Chawla
- Organic reaction mechanism by Bansal Tata Mac.Hill
- Organic Chemistry by Hendrickson, Cram &Hammond
- Organic Chemistry by Brown R.F.
- Organic Chemistry by Solomon W. Graham
- Principles of Organic Synthesis- R. O. C. Norman
- Basic Principles of Organic chemistry, by R. Y. Caserio, W. A.Benjamin
- May's Chemistry of synthetic Drugs by Dyson
- Synthetic Organic Chemistry by O. P. Agarwal
- Organic Chemistry by Morrison and Boyd
- Chemistry of organic Natural Product Vol. I & II by O. P.Agarwal
- Organic reactions & their mechanism by P. S. Kalsi, New age international publishers.

[Subject Code-2603000506022002]

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY Practical (MAJOR)

PAPER - CHP-MJ-602

Organic Chemistry (Major) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CHP-MJ-602
Subject Title	Organic Chemistry (Practical)
Credits	02
Teaching per week	04 Hours
Effective from	2025-2026
Purpose of Course	This course focuses on the systematic separation, identification, and purification of organic compounds to enhance students' practical skills in organic analysis.
Objective of Course	Students will learn techniques for separating binary mixtures, identifying components, and performing crystallization and derivative preparation for purification.
Course Outcomes	**CO1-Remembering:** Students will recall the principles of organic separation techniques, including crystallization and derivative preparation. **CO2-Understanding:** Students will explain the methods used for separating binary mixtures containing acids, bases, phenols, and neutral compounds. **CO3-Application:** Students will analyse and identify individual components of binary organic mixtures using suitable separation techniques. **CO4-Analysis:** Students will classify organic compounds into different functional groups and determine their derivatives through purification techniques. **CO5-Evaluation:** Students will compare separation techniques, assess the efficiency of different purification processes, and validate separation results. **CO6-Creation:** Students will design and develop improved methods for organic separation, optimizing techniques for purification and characterization.
Mapping Between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓	✓		✓	✓	
CO2	✓	✓	✓		✓	✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓		✓	✓	✓	✓
CO6	✓	✓	✓	✓	✓	✓		

CHP-MJ-602 (Organic Chemistry)

Third Year B. Sc. Semester - VI

Syllabus effective from June 2025

ORGANIC SEPARATION

Separation of binary mixture, identification of the components and its crystallization & preparation of one derivative and its purification:

ACID : Benzoic acid, Salicylic acid, Phthalic acid, Cinnamic acid, Phenyl aceticacid

BASE : *o* - Nitroaniline, *m* - Nitroaniline, *p* - Nitroaniline, Aniline, *p* - Toluidine, *p* - Chloroaniline, Dimethylaniline, Diethylaniline, Diphenylamine (Not with Neutral)

PHENOL : α - naphthol, β - naphthol, *o* - Nitro Phenol

NEUTRAL : **Aldehyde**: Benzaldehyde
Ketone: Acetone, Methyl Ethyl ketone, Acetophenone
Ester: Methyl acetate, Ethyl acetate,
Alcohol: Methanol, Ethanol
Hydrocarbon: Toluene, Anthracene, Naphthalene, Diphenyl
Nitro Hydrocarbon: Nitrobenzene, *m* - Dinitro benzene
Halogenated hydrocarbon: Chloroform, Carbon tetrachloride, Chlorobenzene, Bromobenzene, *p* – Dichlorobenzene
Amide: Benzamide
Anilide: Acetanilide

NOTE: Candidate should perform the analysis of at least 08 mixtures.

[Subject Code-2603000506032001]

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY (MAJOR)

PAPER - CH-MJ-603

Analytical Chemistry (Major) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CH-MJ-603
Subject Title	Analytical Chemistry (Theory)
Credits	02
Teaching per week	02 Hours
Effective from	2025-2026
Purpose of Course	This course introduces the principles and instrumentation of spectroscopic and chromatographic techniques essential for chemical analysis and identification.
Objective of Course	Students will learn the fundamentals of Raman spectroscopy, UV-Vis spectrophotometry, gas chromatography, and high-performance liquid chromatography for qualitative and quantitative analysis.
Course Outcomes	**CO1-Remembering:** Students will recall fundamental principles of spectroscopy, Raman spectroscopy, and chromatography techniques. **CO2-Understanding:** Students will explain the theories, instrumentation, and applications of Raman spectroscopy, spectrophotometry, gas chromatography, and liquid chromatography. **CO3-Application:** Students will apply spectrophotometric and chromatographic techniques for quantitative analysis of different ions such as Cu^{2+}, Fe^{3+}, and NO_2^-. **CO4-Analysis:** Students will analyse chromatographic data to differentiate between packed and capillary columns, detector selection, and sample introduction techniques. **CO5-Evaluation:** Students will evaluate the efficiency of single-beam and double-beam spectrophotometers and compare qualitative and quantitative analysis methods in GC and HPLC. **CO6-Creation:** Students will design experiments using spectrophotometry and chromatography to optimize analytical methods for chemical analysis.

Mapping Between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓	✓		✓	✓	✓
CO2	✓	✓	✓		✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓	✓	
CO4	✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	
CO6	✓	✓	✓		✓	✓		

CH-MJ-603 (Analytical Chemistry)

Program Name: T. Y. B. Sc. Sem. – VI
Syllabus effective from June 2025

Unit – 1		
	Spectroscopy Introduction of Raman spectroscopy (Indian Knowledge System), Basic principle, Theory of Raman spectroscopy, Instrumentation; Source, Sample handling (solid, liquid and gas samples). Different types of spectrum, Process involved in interaction with matter (Fluorescence, Phosphorescence), Components of Spectrophotometer-Sources, Grating and Prism as dispersing device, Sample handling, Detectors- Photo tube, Photomultiplier tube. Block diagram and working of single beam and double beam spectrophotometer. Terms involved in Beer's law (no derivation). Lambert-Beer's law and its derivation, Analysis of unknown by calibration curves method. Determination of Cu^{+2}, Fe^{+3}, NO_2^{-1}, using spectrophotometer. (Only principles), Problems based on quantitative analysis.	**15 h**
Unit – 2		
	Gas Chromatography Classification of chromatography, Principles of GC separation. Components of GC, Sample introduction system, Columns: Packed column Capillary Column (WCOT, SCOT), Carrier gas and its selection-stationary phases: Solid adsorbents, Inert supports (Selection criteria, Diatomaceous earths) and liquid stationary phases, Detectors: FID, TCD, Qualitative and quantitative analysis using GC. **Liquid Chromatography** Limitation of conventional liquid chromatography (no detail method), technique of HPLC, elementary idea about technique and layout diagrams of instrument, components of instrument of HPLC technique, Elementary idea of TLC.	**10 h** **05 h**

Reference Books:

- Molecular diffraction of light by Sir C. V. Raman, Calcutta University Press, 1922.
- The Raman Effect: A unified treatment of the theory of Raman scattering by molecules by Derek A. Long
- Quantitative Analysis by R. A. Day & A. L. Underwood, 6th ed. Pub. Prentice Hall of India ltd.
- Vogel's Text Book Inorganic Quantitative Analysis, 6th ed.
- Analytical Chemistry (Principles & Technique) by Lary G. Hargis
- Fundamental of Analytical Chemistry by Skoog D. A. & West D. M.
- Instrumental Methods of Analysis by B. K. Sharma
- Instrumental analysis by R. D. Braun Mc Graw Hill
- Analytical Chemistry by Gary Christian
- Modern Analytical Chemistry by David Harvey, McGraw Hill Higher Education
- College Analytical Chemistry, Mangaonkar, Teckchandani, Sathe, Ghalsasi, Jain, Himalaya Publishing House
- Analytical Chemistry by Alka L. Gupta, Pragati Prakashan
- Instrumental Methods of Chemical Analysis by H. Kaur, Pragati Prakashan

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY Practical (MAJOR)

PAPER - CHP-MJ-603

Analytical Chemistry (Major) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CHP-MJ-603
Subject Title	Analytical Chemistry (Practical)
Credits	02
Teaching per week	04 Hours
Effective from	2025-2026
Purpose of Course	This course provides hands-on experience in analysing reaction kinetics, surface tension, pH metry, conductometry, colorimetry, and refractometry to develop practical skills in chemical analysis.
Objective of Course	Students will learn to determine reaction rates, dissociation constants, and concentrations of various compounds using instrumental techniques while understanding their applications in chemical research.
Course Outcomes	**CO1-Remembering:** Students will recall fundamental concepts of reaction kinetics, surface tension, pH metry, conductometry, colorimetry, and refractometry. **CO2-Understanding:** Students will explain reaction rate dependencies, dissociation constants, and the principles behind instrumental techniques like conductometry, pH metry, and colorimetry. **CO3-Application:** Students will apply experimental techniques to determine reaction rates, dissociation constants, vanillin content, and the cleansing power of detergents. **CO4-Analysis:** Students will analyse experimental data related to acid dissociation, Lambert-Beer's law, and refractometry for binary liquid mixtures. **CO5-Evaluation:** Students will evaluate the accuracy of experimental methods for determining reaction rates, weak acid constants, and specific refractivity. **CO6-Creation:** Students will design and optimize experiments for titrations, conductometric analysis, and colorimetric verification of theoretical laws.

Mapping Between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓		
CO3	✓		✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓		✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	
CO6	✓	✓	✓		✓	✓	✓	

CHP-MJ-603 (Analytical Chemistry)

Third Year B. Sc. Semester - VI

Syllabus effective from June 2025

1. To investigate the rate of reaction between $KBrO_3$ and KI, [a=b]
2. To investigate the rate of reaction between $KBrO_3$ and KI, [a≠b]
3. **Surface tension:** To compare the cleansing power of two detergents by measuring surface tension of their solutions.
4. **pH metry:** To determine the dissociation constant of weak acid [CH_3COOH] by titration of weak acid and strong base [NaOH] .
5. **Conductometry:** To determine the amount of vaniline in the given sample of vanilla solution.
6. **pH metry:** To determine the amount of Na_2CO_3 and $NaHCO_3$ in the given mixture by using standard HCl solution.
7. **Colorimetry:** To determine the indicator constant of phenolphthalein.
8. **Colorimetry:** To verify Lambert-Beer's law for $KMnO_4$ solution.
9. **Refractometry:** To determine the specific refractivity of the given liquids A, B and their mixtures containing 20%, 40%, 60% and unknown liquid by volume. [Benzene + Chloroform] OR [Benzene + Carbon tetra chloride]

Note: Any seven practicals including TWO chemical kinetics should be performed by the students.

[Subject Code-2603000506042001]

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY (MINOR)

PAPER - CH-ME-601

General Chemistry (Minor) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CH-ME-601
Subject Title	General Chemistry (Theory)
Credits	02
Teaching per week	02 Hours
Effective from	2025-2026
Purpose of Course	This course introduces students to detergents, environmental pollution, solution preparation, and industrial chemical processes, emphasizing their practical applications and impact.
Objective of Course	Students will understand detergent classification, pollution control methods, solution preparation techniques, and key industrial processes with flow diagrams to develop applied chemical knowledge.
Course Outcomes	**CO1-Remembering:** Students will recall fundamental concepts of detergents, pollution types, solution preparation, and industrial processes. **CO2-Understanding:** Students will explain the principles of detergency, pollution control measures, and the theoretical basis of solution preparation and industrial synthesis. **CO3-Application:** Students will apply their knowledge to classify detergents, analyse pollution effects, and prepare standard solutions. **CO4-Analysis:** Students will analyse the interconversion of concentration units, evaluate industrial manufacturing processes, and study pollution control techniques. **CO5-Evaluation:** Students will evaluate the environmental impact of pollutants, industrial chemical synthesis methods, and detergent properties. **CO6-Creation:** Students will design flow diagrams for industrial processes and formulate solutions for pollution control and detergent formulation.

Mapping Between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓		
CO3	✓		✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓		✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	
CO6	✓	✓	✓		✓	✓	✓	

Third Year B. Sc. Sem. – VI

CH-ME-601 (General Chemistry)

Syllabus effective from June 2025

Unit – 1		
	(A) Detergents Introduction, Principles detergency, classification of surface-active agents, Anionic detergents, Cationic detergents, Nonionic detergents, Amphoteric detergents, Suds regulators, Builders and Additives. **(B) Environmental pollution** Introduction, types of Pollutions (1) Gaseous pollution in air, Acid rain, Green house Effect and ozone depletion (2) Radiation pollution cause, effect and control, (3) Noise Pollution and their effect and control (4) Oil pollution and their control.	**08 h** **07 h**
Unit – 2		
	(A) Preparation of solutions and standard solutions Definitions of terms: Solute, Solvent, and Solution Composition of solution-normal solution, molar solution, molal solution, mole fraction, % solution, saturated, unsaturated and supersaturated solution and solubility. Effect of temp. on various units of concentration. Inter conversion of one unit into another unit. Preparation of solutions of some primary standard substances (e.g. Oxalic acid, succinic acid, KHP, $K_2Cr_2O_7$, As_2O_3) **(B) Industrial manufacturing process with flow diagram & their uses** • Preparation of methanol from synthesis gas. • Preparation of Isopropanol from propylene. • Preparation of acetone from Isopropanol. • Preparation of formaldehyde from methanol by oxidation dehydration process. • Acetylene from natural gas.	**10 h** **05 h**

Reference Books:

(1) Shreve Chemical Process Industries, 5ed., George. T. Austin. MacGraw Hill, Book Agency
(2) Reigel's Industrial Chemistry, Ed. By James A. Kent
(3) Unit Process in Organic Synthesis by D.H. Groggins
(4) An Introduction to Industrial Chemistry, by Peter Wiseman, Applied Science Pub. Ltd. London.
(5) Industrial Chemistry by B. K. Sharma, Goel Pub.
(6) Quantitative Analysis by R. A. Day & A. L. Underwood, 6th ed. Pub. Prentice Hall of India ltd.
(7) Vogel's Text Book Inorganic Quantitative Analysis, 6th ed.
(8) Quantitative analysis by R.A. Day and A. L. Underwood
(9) Elements of Analytical Chemistry by R. Gopalan; P.S. Subramanian and K. Rengarajan
(10) Elementary Organic Spectroscopy by Y. L. Sharma
(11) Organic Spectroscopy by B. K. Sharma
(12) Environmental Chemistry by H. Kaur

VEER NARMAD SOUTH GUJARAT UNIVERSITY

T. Y. B. Sc. – SEM – VI CHEMISTRY Practical (MINOR)

PAPER - CHP-ME-601

General Chemistry (Minor) (2 Credits Theory + 2 Credits Practical)

As per NEP 2020

To be implemented from the Academic year 2025-26

Course Subject Code	CHP-ME-601
Subject Title	General Chemistry (Practical)
Credits	02
Teaching per week	04 Hours
Effective from	2025-2026
Purpose of Course	This course provides hands-on experience in titrimetric and instrumental analytical techniques for quantitative chemical analysis, essential for accurate determination of chemical substances.
Objective of Course	Students will develop skills in titrimetric methods and instrumental techniques like pH metry, conductometry, colorimetry, and surface tension measurement to analyse chemical compounds effectively.
Course Outcomes	**CO1-Remembering:** Students will recall fundamental principles of titrimetric analysis, EDTA titrations, Mohr's method, and instrumental techniques. **CO2-Understanding:** Students will explain the underlying principles behind titrimetric methods and instrumental techniques like pH metry, conductometry, colorimetry, and surface tension measurement. **CO3-Application:** Students will apply their knowledge to determine the purity of various compounds and analyse solutions using different analytical techniques. **CO4-Analysis:** Students will analyse data obtained from titrations and instrumental methods to evaluate unknown concentrations and validate experimental results. **CO5-Evaluation:** Students will evaluate different analytical techniques based on accuracy, precision, and applicability for various chemical analyses. **CO6-Creation:** Students will develop experimental strategies for titrimetric and instrumental methods to solve analytical chemistry problems.
Mapping Between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓		
CO3	✓		✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓		✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	
CO6	✓	✓	✓		✓	✓	✓	

Third Year B. Sc. Semester - VI

CHP-ME-601

Syllabus effective from June 2025

TITRIMETRIC METHODS (Any Four)

1. To determination the amount of Bismuth by EDTA
2. To determination the amount of Nickel by EDTA (Back titration)
3. To determination the amount of Chloride by Mohr's method.
4. To determine the percentage purity of $NaNO_2/KNO_2$
5. To determine the percentage purity of potassium acid phthalate.
6. To ddetermine of amount of glucose in the given solution.

INSTRUMENTAL EXERCISE (Any three)

1. **pH Metry**: To determine the amount of HCl in given by Std. NaOH.
2. **Conductometry**: Solubility of $PbSO_4$ by Conductometry.
3. **Colourimetry**: To verify Lambert – Beer's law for $KMnO_4$ solution.
4. **Surface Tension**: To compare the cleansing power of two detergents by measuring surface tension of their solutions.