VEER NARMAD SOUTH GUJARAT UNIVERSITY M.Sc.-I (CHEMISTRY)

PROPOSED SYLLABUS TO EFFECTIVE FROM JUNE-2018

PAPER-IV (Instrumental and chemical analysis)

Max. Marks: 100(External –70 + Internal – 30) **Total Periods: 45**

SEMESTER-I

UNIT-I: UV-VisibleSpectrophotometry **12 Periods**

Types of electronic transition, auxochrome, chromophore, Bathochromic effect, Hypso chromic effect, Hyper chromic effect, Hypo chromic effect, Factor affecting λ_{max} like resonance, hyper conjugation, hydrogen bonding, steric effect , Woodward's rules for α,β-unsaturatedketones, Diene systems, aromatic system, Effect of solvent on absorption bands, law of absorption with derivation, Elementary idea of double beam automatic recording, Spectrophotometer, Application.

UNIT-II: CHROMATOGRAPHY **11 Periods**

Thin-Layer Chromatography: Selection of stationary and mobile phase, Detection techniques –Elementary idea of HPTLC

Gas Chromatography: Selection of mobile phase – Selection of stationary phase in GLC and GSC – Detectors: FID (with modifications), TCD and ECD, Their comparison, Packed column, WCOT,SCOT(advantagesanddisadvantages)–Temperatureprogramming– Derivatisation in GC – Quantitative Analysis.

UNIT-III: CHEMICAL MATHEMATICS **11 Periods**

Errors in Chemical analysis, classification of errors, nature and origin of errors, Propagation of error, Accuracy and precision, Average deviation and standard deviation and its physical significance, Normal Distribution curve and its properties. Confidence limit and probability, Statisticaltreatmentforerroranalysis,student't'test,rejectioncriteriaand Q-test, method of least square

UNIT-IV: THERMAL METHODS OF ANALYSIS **11 Periods**

(A) THERMOGRAVIMETRY:

Thermogravimetry, Instruments for TGA- thermobalace and furnace, Calibration of temperature scale, Factorsaffecting TGA results instrumental and experimental, Applications.

(B) THERMOMETRIC TITRATION:

Thermometric Titration (TT), Advantages, Instrument, Applications of TT in Neutralization Titration, Precipitation Titration, Complexometry Titration and Redox titration.

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SEMESTER-II

UNIT-I: IR SPECTROPHOTOMETRY 12 Periods

IR Spectroscopy*:* Introduction: Theory, Instrumentation: single beam, double beam spectrophotometers, radiation sources, sample cells, monochromators, detectors, sample handling, Resolution, wave number measurement,Useful terms: IR region, types of vibrations: fundamental and overtones, linear and nonlinear molecule, equation for vibrational frequency, selection rule, coupling interactions, hydrogen bonding information, Fermi resonance. IR spectra: group frequency, group frequency region, finger print region, spectra interpretations (Amino, carboxyls, hydroxyl, ethers groups containing compounds) and structure elucidation. FTIR: principle, instrument design, and function of beam splitter, Advantages of FTIR vs. IR.

UNIT-II: LIQUID CHROMATOGRAPHY 11 Periods

Principle of Liquid – Solid chromatography, Comparison with GC, Column chromatography,Gradient elution, Displacement chromatography, Principle of HPLC, Instrument andsignificance of each component, Pumps, Guard column Criteria in selection of mobilephase, Stationary phases (solid, liquid), Bonded phase supports, Detectors: UVabsorption, RI detectors – Normal phase and Reversed phase. Method of introducing sample.

UNIT-III GREEN CHEMISTRY AND WATER ANALYSIS 11 Periods

(A) Green Chemistry (04 Periods)

Twelve principles, Green solvents and their applications*:* Ionic liquids, types, properties and applications, ILs as solvents, Supercritical fluids, Supercritical CO_2, its properties and applications in dry cleaning and decaffeination of coffee.

(B) Water analysis (07Periods)

Sources of water pollution, Sewage and industrial effluents, Analysis of waterpollutants, Sampling, Preservation, Measurement of parameters such as COD, BOD, DO,TDS,suspended solids, TCC, phenols, fluoride.

UNIT-IV TITRIMETRIC METHODS AND ELEMENTAL ANALYSIS 11 Periods

(A) Solution and Their Concentration: (03 Periods)

Molarity, Molality, Normality, ppm, ppb, ppt, %w/v, %w/w, %v/v, Formality, Primary and Secondary standard, Acid Value, Density and Specific Gravity, Numerical.

(B) Non Aqueous Titration: (04 Periods)

Protic and Aprotic Solvent, Solvent system, Dielectric constant, Titrant, Titration Curve, Determination of Equivalence point, Karl Fisher Titration, Numerical.

(C) Elemental Analysis: (04 Periods)

Step on Analysis, C and H Analysis, N Analysis, Halogen Analysis and Sulpher Analysis, Numerical.

Reference book:

1. Fundamental of molecular spectroscopy, C.N. Banwell, Tata McGraw Hill Pub. Camp.
2. Spectrometric Identification of Organic Compounds (4^{th}edition/5^{th}edition), Silverstein,Bassler&Morril,JohnWiley&Sons.
3. IntroductiontoMolecularSpectroscopy,G.M.Barrow, McGraw – Hill.
4. Modern Spectroscopy, J.M.Hollas, John Wiley.
5. Basic Principles of Spectroscopy, R.Chang, McGraw-Hill.
6. ModernMethodsofChemicalAnalysis(2^{nd}ed.),Pecsok,Shields,Cairns&McWilliom, JohnWiley&Sons.
7. Instrumental Analysis byR. D. Braun, McGraw-Hill.
8. Mathematics for Chemistry, Doggett and Sucliffe, Longman.
9. Mathematical preparation for Physical Chemistry, F. Daniels, McGrawHill.
10. Introductionto Instrumental Analysis by R. D. Brawn, McGraw-Hill Book.
11. FundamentalsofAnalyticalChemistry:SkoogD.R.andWestD.M.(Holt,Rinehart&Winston, New York).
12. Chemical Analysis in Industry(in Gujarati) by M. N. Desai.
13. Instrumental Methods of Analysis by G. W. Ewing.
14. ModernMethodofChemicalAnalysisbyPecsok,Shield,Cairns,McWilliam,John Wiley and Sons.
15. Quantitative Analysis, 6^{th}Ed.,R.A.DayandA.L.Underwood, Prentice– Hall of India, 1993.
16. Instrumental Analysis: G. D. Caristian and J. E. O'Reilly (Allyn& Bacon Inc., NewYork, 2^{nd}edition.
17. Instrumental Methods of Chemical Analysis: G. W. Ewing (McGraw-Hill, NewYork), 5^{th}edition.
18. Instrumental Methods of Analysis: H. R. Willard, L. L. Merrit, J. A. Dean, F. A. Settle (Van Nostrand Reinhold Co., New York), 6^{th}edition.
19. Modern Methods of Chemical Analysis: Pecsok, Shield & Cairns (John Wiley), 2^{nd}edition.
20. Introduction to Instrumental Analysis (1987), R. D. Braun (McGraw-Hill Book Company), New Delhi.
21. Analytical Chemistry: Principles and Techniques: Larry G. Hargis (Prentice-Hall International edition).
22. Introduction to Modern Liquid Chromatography: L. R. Shyder& J. J. Kirkland (John Wiley & Sons, New York).
23. Treatise on Analytical Chemistry: I. M. Kohthoff& P. J. Elving (John Wiley & Sons, New York).
24. Handbook of Analytical Chemistry: L. Meites (McGraw-Hill, New York).
25. Environmental Chemistry: B. R. Sharma, H. Kaur (Goel Publishing House, Meerut).
26. Environmental Chemistry by A.K.de
27. Spectrometric Identification of Organic Compounds; By Robert M. Silverstein, Francis X. Webster, David J. Kiemle, David L. Bryce, Eight edition, Published by Wiley

28.Introduction to Spectroscopy; By Donald L. Pavia, Gary M. Lampman, George S. Kriz, James A. Vyvyan,Fourth edition, Published by Brooks cole.
29.Spectroscopic Methods in Organic Chemistry; By D.H Williams, I. Fleming, Sixth edition, Published by Tata Mcgraw Hill Education.
30.Spectroscopy of Organic Compounds; By P S Kalsi, Sixth edition, Ne Age International Publisher.
31.Organic Spectroscopy: Principles and Applications; By Jag Mohan, Second edition, Published by Alpha Science International Ltd.
32.Organic Spectroscopy (NMR, IR, Mass and UV); By Dewan S.K.,First edition, CBS Publisher & Distributors Pvt Ltd.
33.Basic Principles of Spectroscopy; By Raymond Chang, Published by McGraw-Hill Inc.
34.Elementary Organic Spectroscopy; By Y R Sharma, S. Chand & Company Pvt. Ltd.
35.Organic Spectroscopy; By William Kemp, Published by Palgrave Macmillan.

36. Green chemistry by V. K. Ahluwalia, Narosa Pub New Delhi
37. Green Chemistry, Theory and Practice, P. T. Anastas and John C. Warner, Oxford University Press, 2000, New York, USA.
38. Green Chemistry: An Introductory Text, Mike Lancaster, Green Chemistry Network, University of York, RSC, 2002.