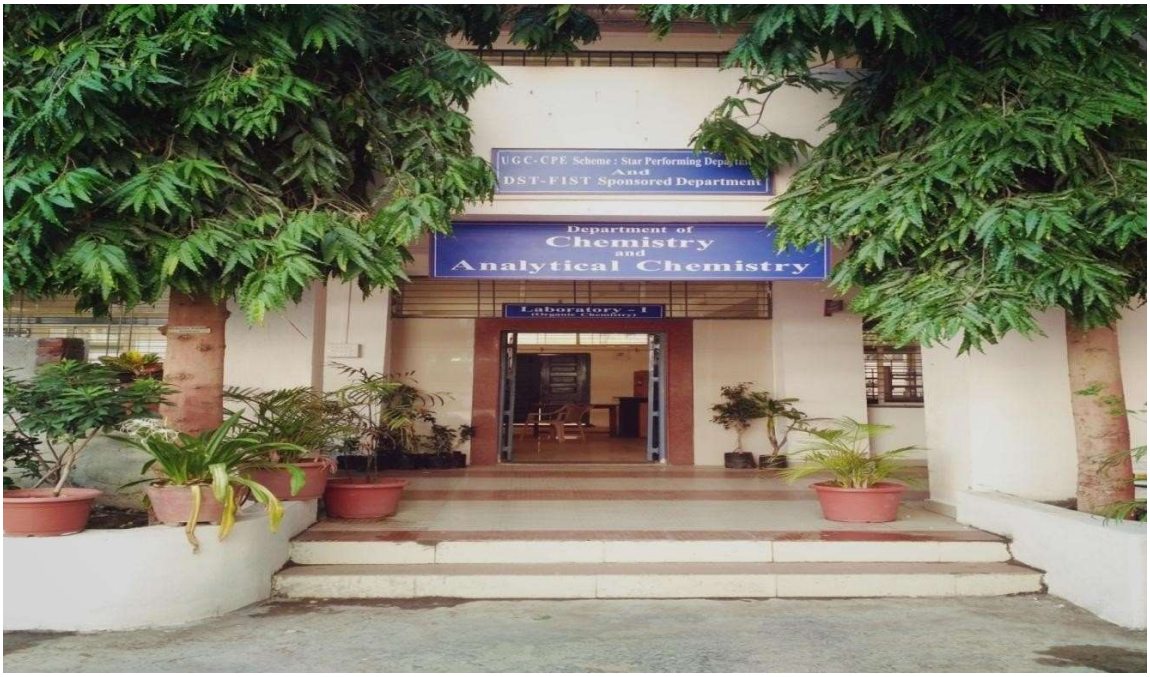
Rajarshi Shahu Mahavidyalaya, (Autonomous) Latur – 413512

DEPARTMENT OF ANALYTICAL CHEMISTRY

[Faculty of Science]



Revised Syllabus as approved by
Board of Studies, Dated: 02.07.2019
Academic Council, Dated: 16.07.2020

B.Sc. (Third Year) Analytical Chemistry

(V & VI Semester)

(With Effect from 2022-2023)

B.Sc. (Third Year) Analytical Chemistry

STRUCTURE OF SYLLABUS OF ANALYTICAL CHEMISTRY PROGRAM

Semester – V

Paper	Course Code	Course	Periods/ Week	Total Periods	Marks	Credits
IX	U-ANC-571	Modern Techniques Of Chemical Analysis-IX **OR** Concepts in Analytical Chemistry-IX (Elective)	03	45	50	02
X	U-ANC-572	Environmental & Food Analysis-X	03	45	50	02
VII	U-ANC-573	Analytical Chemistry Laboratory Course – VII **OR** Practical's based on 'Elective' [DSEAC-P]	03	45	50	01
VIII	U-ANC-574	Analytical Chemistry Laboratory Course – VIII	03	45	50	01
--	U-ADC-540- P SECAC-III	Pharmaceutical Chemistry (Theory+Practical)	03 (1+2)	45	50 (20+30)	02*
			Total		**250**	**06(02*)=08**

B.Sc. (Third Year) Analytical Chemistry

STRUCTURE OF SYLLABUS OF ANALYTICAL CHEMISTRY PROGRAM

Semester – VI

Paper	Course Code	Course	Periods/ Week	Total Periods	Marks	Credits
XI	U-ANC-671	Electroanalytical Techniques & Chromatography-XI	03	45	50	02
XII	U-ANC-672	Applied Analytical Chemistry-XII **OR** Forensic Science- XII (Elective)	03	45	50	02
IX	U-ANC-673	Analytical Chemistry Laboratory Course – IX	03	45	50	01
X	U-ANC-674	Analytical Chemistry Laboratory Course – X OR Practical's based on 'Elective' [DSEAC-P]	03	45	50	01
--	U-ADC-640 SECAC-IV	Blood and Urine Analysis (Theory+Practical)	03 (1+2)	45	50 (20+30)	02*
--	U-PRW-164	Project Work	03	45	50	02†
			Total		**250**	**06(02*+02†) =10**

Semester- V

ANALYTICAL CHEMISTRY (Theory)

Course Title: Modern Techniques of Chemical Analysis- IX

Course Code: U-ANC-571

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. The Modern Techniques of chemical analysis.
2. Interpretation of spectral data for research.

Course Learning Outcome:

. By the end of the course, the students will be able to:

1. Explain principles and mechanisms involved in spectroscopy and spectrometry
2. Interprete spectral data.

Unit – I Infrared Spectrophotometry : [12 Periods]

Range of IR-radiation, Theory- Requirements for IR radiation absorption, Different normal modes of vibrations of atoms in polyatomic molecules, Hook's Law, Instrumentation and Experimental Technique, Applications of IR spectroscopy.

Unit – II ^{1}H NMR Spectroscopy : [13 Periods]

Theory of ^{1}H NMR Spectroscopy, Instrumentation, Experimental technique, NMR spectra, Number of signals- equivalent and nonequivalent protons, Chemical Shift, Measurement of Chemical Shift, Factors affecting chemical shift, Spin-spin coupling, Interpretation of ^{1}H NMR spectra in structure determination and identification.

Unit – III Mass Spectrometry : [12 Periods]

Theory, Instrumentation, components of mass spectrometer, Recording of mass spectrum, Resolution of mass spectrometer, McLafferty Rearrangement Reaction, Types of ions produced in a mass spectrometer, Interpretation of Mass Spectra,

Applications of mass spectrometry.

Unit – IV Fluorescence Spectroscopy : [08 Periods]

Theory, Relation between fluorescence intensity and concentration, Single and Double beam filter fluorometers, Applications.

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Semester- V

ANALYTICAL CHEMISTRY (Theory)

Discipline Selective Elective Analytical Chemistry (DSEAC)

Course Title: Concepts in Analytical Chemistry-IX

Course Code: U-ANC-571

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. The requisite concepts in analytical chemistry.

Course Learning Outcome:

. By the end of the course, the students will be able to:

1. Understand the requisite concepts in analytical chemistry.

Unit I Reference Materials (RMs): **[06 Lectures]**

Analytical standards, primary and secondary standards, high purity substances, reference materials, use of RMs in statistical control schemes and in inter- comparisons, role of certified reference materials (CRMs), production and requirements, obtaining reference value and certified value.

Unit II Modern Spectroscopic Techniques: **[16 Lectures]**

a) Electron Spin Resonance Spectroscopy (ESR):

NMR and ESR, Theory of ESR, ESR: Principle, Instrumentation, ESR spectra, densities and factors affecting 'g' values, Spin labeling ESR spectroscopy, FT-ESR, Applications, numerical.

b) Mossbauer Spectroscopy:

Introduction to Mossbauer effect, recoilless emission & absorption of X–rays, Instrumentation, Spectral parameters of Mossbauer spectra such as Isomer shift, Quadruple splitting and Hyperfine interactions, application of Mossbauer effect to the investigations of compounds of iron and tin.

Unit III Automated Methods of Analysis: **[15 Lectures]**

Specification and performance of automated methods, Automation strategy, IR process analysers, Selection of online analysers, Online potentiometric analsers,

Optodes and microsensors, Process chromatography systems, Automatic Chemical Analysers, Continuous flow methods, Flow injection analysis, Centrifugal analysers, automatic elemental analysers, Laboratory Robots.

Unit IV Sampling and Calibration: [08 Lectures]

Important terms involved in sampling and microanalysis, Methods of sampling, Construction of calibration curves, comparison with single standard, matrix matching, bracketing of std, standard addition and internal standard methods, calibration of Glassware, buoyancy errors, numerical.

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Semester- V

ANALYTICAL CHEMISTRY (Theory)

Discipline Selective Elective Analytical Chemistry (DSEAC)

Course Title: Environmental and Food Analysis-X

Course Code: U-ANC-572

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Environmental pollution
2. The level ofpollutants
3. The analysis of food

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Understand issues regarding the environmental pollution
2. Learn procedures for analysis of pollutants and food samples.

Unit – I Environmental Analysis-I (Air and water) : [12 Periods]

Analysis of Air : Composition of natural atmospheric air, pollution, pollutants in air, causes of pollution, sampling of air, Determination of i) particulate matter suspended and settled ii) Sulphur dioxide iii) Nitrogen dioxide iv) Carbon mono and dioxide aspollutants.

Analysis of Water : Introduction to potable water quality standards, objectives of water analysis. Methods of measurement of water quality parameters: Physical parameters - pH, conductivity, total dissolved solids. Determination of chemical parameters – Temporary and Permanent Hardness, Dissolved oxygen, Chemical Oxygen Demand and Bio chemical Oxygen Demand.

Unit – II Environmental Analysis-II (Industrial Effluent)

Analysis of Industrial Effluent : [05 Periods]

Definition of industrial effluent, Estimation of toxic metals like Hg & Zn in industrial effluent.

Unit – III Environmental Analysis-III (Analysis of Soil) : [12 Periods]

Methods of soil sampling, Determination of : i) Bulk density (ii) specific gravity (iii) water holding capacity (iv) moisture content (v) Loss on ignition (vi) soil pH. Chemical Analysis of Soil: Determination of i) Total nitrogen, (ii) Nitrate Nitrogen (iii) organic matter. Determination of potassium and sodium.

Unit – IV Analysis of Food and Food Products: [12 Periods]

i) Milk Analysis: Determination of specific gravity , Total solids, Fat, Protein, Lactose and Acidity. Wheat flour : Determination of moisture, ash, fat, protein, fiber, acidity, pH & starch.

ii) Fish Analysis: Assessment of raw fish for its spoilage, Chemical methods for assessment of spoilage. Determination of moisture, total fat, ash, chloride, Nitrogen and total phosphorus.

iii) Honey Analysis: Determination of total solids, moisture , ash , free acid pH and glucose.

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Semester- V

ANALYTICAL CHEMISTRY (Practical)

Discipline Selective Elective Analytical Chemistry (DSEAC)

Course Title: Analytical Chemistry Laboratory Course – VII

Course Code: U-ANC-573

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Experimental skills for the environmental & food analysis

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Analyse environmental and food samples practically

Note : Out of 15 experiments, at least 08 experiments should be completed.

A. Environmental Analysis :

1. Colorimetric estimation of traces of nitrogen in the sample of water using Nessler's reagent.
2. Determination of dissolved oxygen in water by Winkler's method.
3. Determination of nitrate nitrogen/ nitrite nitrogen/ phosphate in a sample of water by colorimetry.
4. Determination of total hardness, calcium hardness and magnesium hardness of a water sample.
5. Determination of chemical oxygen demand (COD) of a waste water sample.
6. Estimation of carbon/ organic matter in a soil sample by chromic acid digestion.
7. Determination of Silica in soil.
8. Determination of magnesium in soil.
9. Determination of soil pH.

B. Food & Food product analysis :

10. Determination of nitrogen in wheat flour.
11. Estimation of lipids in egg yolk.
12. Estimation of protein in milk by formal titration/ casein nitrogen.
13. Analysis of milk for its lactose/ total solid.
14. Determination of ascorbic acid in fruit juices/ citrus fruits.
15. Determination of total acidity, fixed acidity and volatile acidity in pickeles / titratable acidity in fruits/ fruits juices.

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Semester- V

ANALYTICAL CHEMISTRY (Practical)

Discipline Selective Elective Analytical Chemistry Practical (DSEAC-P)

Course Title: Analytical Chemistry Laboratory Course - VII

Course Code: U-ANC-573(DSEAC-P –VII)

[Practical's based on 'Elective']

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Various analytical methods.

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Analyse samples with various analytical methods.

Note: Out of 12 experiments, at least 08 experiments should be completed.

1. Determination of phosphate in detergents by spectrophotometry.
2. Photometric Titration of Fe Vs EDTA using salicylic acid.
3. Determination of chloride/sulfate with an adsorption indicator.
4. Determination of calcium in egg shell by flame photometric method.
5. Determination of potassium in soil by flame photometric method (Lithium internal standard method).
6. Determination of chloride nephelometrically.
7. Potentiometric titrations: (a) FAS Vs $K_2Cr_2O_7$ (b) FAS Vs $KMnO_4$.
8. Table work for IR-spectra, NMR, UV–Visible spectra.
9. Spectrophotometric determination of pH of a buffer mixture.
10. Determination of iron in food sample by spectrophotometry
11. Determination of fluoride in given sample solution by zirconyl-Alizarin red method colorimetrically
12. Determination of acid value of rosin

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Semester- V

ANALYTICAL CHEMISTRY (Practical)

Discipline Selective Elective Analytical Chemistry Practical (DSEAC-P)

Course Title: Analytical Chemistry Laboratory Course – VIII

Course Code: U-ANC-574

[Practical's based on 'Elective']

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Practical knowledge of chromatographic separation
2. Analysis of water and metals

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Handle chromatographic techniques
2. Analyse water and metal samples

Note : Out of 13 experiments, at least 08 experiments should be completed.

1. **Chromatographic Techniques** :
   1. Paper/Thin layer chromatography separation of metals/ amino acids / Sugars from a mixture.
   2. Chromatographic separation of plant leaf pigments.
   3. Separation of inorganic ions by TLC.
2. **Analysis of water**:
   4. Potentiometeric determination of fluoride in drinking water/ river water using Fluoride- ion selective electrode.
   5. Determination of available chlorine in bleaching powder volumetrically using an external Indicator.
   6. Microscale quantitative Analysis of Hard water samples using an indirect

potassium permanganate Redox titration.

3. **Elemental Analysis**:

7. Determination of concentration of ferrous ion by potentiometric titration.
8. Determination of antimony by titration with iodine.
9. Iodometric determination of copper.
10. Estimation of ferrous and ferric iron in a mixture.
11. Determination of copper and nickel in a mixture.

4. **Spectroscopic Analysis**:

12. Determination of functional groups of given compounds by IR spectrophotometry.
13. Study of complexes by IR spectrophotometry.

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Semester- V

ANALYTICAL CHEMISTRY (Theory)

Skill Enhancement Course in Analytical Chemistry

Course Title: Pharmaceutical Chemistry

Course Code: SECAC–III

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Basic knowledge of synthetic methods, advantages & disadvantages of drugs and vitamins

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Understand the preparations methods of different drugs
2. Apply acquired knowledge for drug analysis

Unit–I Drugs & Pharmaceuticals, Drug discovery, design and development, Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, antiinflammatory agents (Aspirin, paracetamol, ibuprofen), antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryltrinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine). Fermentation Aerobic and anaerobic fermentation.

Unit–II Medicinal values of curcumin (haldi), azadirachtin (neem), vitamin C and antacid (ranitidine).

Practicals (any three)

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).

3. Preparation of paracetamol.

4. Analysis of vitamin-C colorimetrically.

5. Estimation of sulpha drug by TLC

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Semester- VI

ANALYTICAL CHEMISTRY (Theory)

Course Title: Electroanalytical Techniques and Chromatography-XI

Course Code: U-ANC-671

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Electroanalytical techniques
2. New chromatographic techniques in analysis

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Apply their knowledge regarding electroanalytical techniques and chromatographic techniques for requisite analysis

Unit-I Electroanalytical Techniques-1: **[12 Periods]**

Conductometry: Conductance, specific conductance, Equivalent conductance, molecular conductance, Effect of dilution, measurement of conductance-conductivity cell, wheat stone bridge apparatus. Conductometric Titrations, apparatus for conductometric titrations, Types of conductometric titrations - Acid base, Precipitation and Redox titrations.

Potentiometry : Electrode Potential, Standard electrode potential, Nernst equation, EMF of an electrolytic cell, reference, indicator and ion selective electrodes. Theory of potentiometric titrations, Types of potentiometric titrations- Acid base, Redox and precipitation titrations.

Unit - II Electro analytical Techniques-2: **[13 Periods]**

Polarography :

Principle of DC polarography, polarogram, Limiting current, Residual current, Migration current, Diffusion Current, IlKovic equation, Kinetic Current,

Decomposition potential, Half wave potential, Oxygen wave and its removal, Current maxima. Instrumentation, Dropping mercury electrode, Dissolved oxygen electrode, analytical applications.

Amperometry: Theory of amperometric titrations, Typical titration curves, Apparatus with rotating Platinum microelectrode and applications.

Unit - III Chromatographic Techniques -2 : [05 Periods]

Ion Exchange Chromatography: Principle, ion exchange resins & their types- cation exchange resins, anion exchange resins, ion exchange reactions, ion exchange equilibria, properties of ion exchange resins, ion exchange capacity, Techniques- Batch & Column method and applications.

Unit – IV Chromatographic Techniques–3: [15 Periods]

a) **Size Exclusion chromatography :** Principle, Gel-materials, Technique, instrumentation and applications.
b) **Super Critical Fluid Chromatography:** Principle, instrumentation and applications
c) **Hyphanated Techniques:** GC-MS, LC-MS

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Semester- VI

ANALYTICAL CHEMISTRY (Theory)

Discipline Selective Elective Analytical Chemistry (DSEAC-XII)

Course Title: Applied Analytical Chemistry-XII

Course Code: U-ANC-671(DSEAC-XII)

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Forensic Science and relevant analysis techniques.

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Acquaint the basic knowledge of forensic analysis and relevant analysis techniques.

Unit-I **[08 Lectures]**

a) Forensic Science Overview

Overview, Destructive and Nondestructive techniques, Data interpretation.

b) Blood Analysis: Blood preservation and ageing effects, Analysis of blood components and exogenic substances, blood stain analysis.

Unit-II **[15 Lectures]**

DNA Profiling : DNA and its polymorphism, DNA typing procedures-RFLP, PCR, MVR-PCR, AMP-FLP, STR, other methods, paternity testing, applications, interpretation and practical use, Hybridisation, Dot-blot, Southern blotting, Northern blotting, Western blotting, Radioimmunoassay (RIA), Enzyme linked immune sorbent assay (ELISA)

Unit-III **[15 Lectures]**

a) Fingerprint analysis: Latent fingerprints; optical, physical, physico-chemical & chemical detection methods; fingerprints in blood, fingerprint detection sequences.

b) Hair analysis: Structure and composition of hair, morphological examination, Chemical analysis of hair components and components remaining on or in hair.

c) Determination of alcohol in body fluids: Legal background, Sampling and sample preservation, analysis-GC, IR, enzymatic and other methods

Unit IV **[07 Lectures]**

Systematic Drug Identification: Classification and categories of compounds involved, analytical strategy-EMIT, FPIA, TLC, LC, GC-MS, etc., requirements for identification, possibilities & limitations of selected techniques, isotope detection method with numericals, new drug groups.

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Semester- VI

ANALYTICAL CHEMISTRY (Theory)

Course Title: Applied Analytical Chemistry-XII

Course Code: U-ANC-672

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. The pharmaceutical, Clinical & cosmetic Analysis.
2. The separation by solvent extraction
3. The cosmetic fuel analysis techniques

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Analyse pharmaceutical, clinical, cosmetic and fuel samples
2. Separate components of samples by solvent extraction techniques.

Unit – I Pharmaceutical Analysis : **[11 Periods]**

Definition, classification of drugs on the basis of their therapeutic action and structure. Definition and analysis of followings classes of drugs with one specific example of each : (i) Antiseptics and Disinfectants (ii) Analgesics (iii)Antipyretics (iv)Antibiotics

Unit – II Clinical & Cosmetic Analysis : **[12 Periods]**

Clinical Analysis: Composition of Blood, Non cellular/ plasma and cellular components, Normal range of concentration of important constituents, collection and preservation of blood for plasma, serum, glucose and CO_2 analysis. Estimation of sodium, potassium, calcium, bicarbonate, blood glucose, and blood urea.

Analysis of Cosmetics: Introduction to cosmetics, definition, General characteristics, composition and analysis in outline of the following (i) Face Powders (ii) Hair dyes

Unit–III Separation by Solvent Extraction: [10 Periods]

Theoretical Principles – Nernst distribution law, Distribution constant, Distribution ratio, Efficiency of extraction, Percentage extraction, Amount of solute extracted and left unextracted, Sequence of extraction process, Extraction equilibria, Factors favouring extraction, Techniques of extraction, Analytical applications.

Unit –IV Analysis of Fuels : [12 Periods] Definition and classification of fuels, solid fuels, liquid fuels and gaseous fuels. Calorific value of fuels, Gross and Net calorific value, Determination of calorific value by Bomb Calorimeter, Proximate analysis of coal- moisture, volatile matter, Ash, fixed carbon & their significance. Flash, fire and aniline points of liquid fuels, their determination and significance.

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Semester- VI

ANALYTICAL CHEMISTRY (Practical)

Course Title: Analytical Chemistry Laboratory Course – IX

Course Code: U-ANC-673

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. The instrument and chromatographic techniques handling skill

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Analyse samples with instrumental and chromatographic techniques

Note : Out of 13 experiments, at least 08 experiments should be completed.

A. Conductometry:

1. Assay of aspirin by conductometry.
2. Determination of velocity constant of hydrolysis of ethyl acetate by base (NaOH) conductometrically.
3. Determination of strength of acetic acid in commercial sample of vinegar by conductometry.

B. Potentiometry:

4. Determination of iron in pharmaceutical preparation by potentiometry.
5. Determination of percentage purity of commercial washing soda by potentiometry.
6. Determination of pH of Hair shampoos.

C. Autotitration:

7. Determination of moisture content in the sample by Karl-Fischer method.

D. Chromatography:

8. Determination of Capacity of cation exchange resin.
9. Determination of Capacity of anion exchange resin.

10. Determination of magnesium and Zinc in a mixture/ Zinc in pharmaceutical preparations by ion exchange separation and complexometric titration.

11. Seperation of cadmium and zinc on an anion exchanger and their subsequent determination by EDTA titration.

12. Separation of cobalt and nickel on an anion exchange resin and their subsequent determination by direct back EDTA titration.

13. Estimation of sodium by ion exchange method

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Semester- VI

ANALYTICAL CHEMISTRY (Practical)

Course Title: Analytical Chemistry Laboratory Course – X

Course Code: U-ANC-674

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Experimental skills in pharmaceutical, clinical, cosmetic & fuel analysis.

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Acquaint experimental skill for pharmaceutical, clinical, cosmetic and fuel analysis.

Note : Out of 14 experiments, at least 08 experiments should be completed.

A. Pharmaceuitical Analysis:

1. Determination of milk of magnesia in given antacid sample.

2. Assay of aspirin (acetyl salicylic acid).

3. Assay of Isoniazide

4. Analysis of Sulpha drugs i.e. Sulphadiazine, Sulphadimethoxine, Sulphathiazole/ Sulphaxole, Sulphaacetamide sodium.

B. Clinical analysis & Cosmetic Analysis:

5. Estimation of blood glucose.

6. Estimation of serum bicarbonate.

7. Estimation of blood urea.

8. Determination of zinc in talcum powder sample.

9. Determination of magnesium in talcum powder sample.

C. Solvent Extraction

10. Ultraviolet spectrophotometric determination of Asprin, Phenacetin, and caffeine in APC tablets using solvent extraction.
11. Determination of ether extractives and caffeine in tea/coffee samples.
12. Spectrophotometric estimation of lead on leaves using solvent extraction.

D. Fuel Analysis:

13. Determination of moisture in coal
14. Determination of Ash in coal.

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Semester- VI

ANALYTICAL CHEMISTRY (Practical)

Discipline Selective Elective Analytical Chemistry Practical (DSEAC-P)

Course Title: Analytical Chemistry Laboratory Course – X

Course Code: (DSEAC-P –X)

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. To understand various analytical methods.

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Handle various analytical methods of analysis.

Note: Out of 10 experiments, at least 08 experiments should be completed.

1. Determination of glucose in honey by Wilstatter's method
2. Estimation of micro nutrients Zinc/Copper/ Maganese in a soil sample.
3. Determination of sodium bicarbonate in carbonated drinks/ soda water/ soft drinks and determination of caffeine in cola drinks/ carbonated beverages.
4. Determination of iron content in foods by spectrophotometry
5. Isolation of piperine from black pepper and its determination as crude piperine.
6. Determination of phosphoric acid in beverges.
7. Determination of dissociation constant of malonic acid by titrating against NaOH pH metrically.
8. To determine isobestic point of methyl orange indicator.
9. Analysis of fertilizer for N, P, K content.
10. Determination of chloride in Ringer Lactate solution by titrimetry.

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Semester- VI

ANALYTICAL CHEMISTRY (Practical)

Skill Enhancement Course in Analytical Chemistry

Course Title: Blood and Urine Analysis

Course Code: (SECAC–IV)

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Learning Objective:

The objective of this course is to make students aware about:

1. Collection of Clinical Specimen
2. Analysis of Clinical Specimen

Course Learning Outcome:

By the end of the course, the students will be able to:

1. Collect Clinical Specimen and Analyse them

Unit I: Collection of Specimens and Analysis of Blood and urine Blood: Collection of Blood specimens, storage and preservation, Urine: Collection of Urine, physical characteristics of urea, preservation and storage, Faeces: Collection and preservation. **Unit II: Blood and Urine Analysis**: Determination of blood and plasma glucose by glucose oxidase method, Determination of urine for glucose, Determination of ketone bodies in blood, Oral Glucose tolerance test, Determination of serum creatinin, estimation of serum bilirubin, Estimation of serum cholesterol, determination of blood hemoglobin, Urate: determination of serum urate, determination of urea in urine by urease method and by direct colorimetry, Estimation of Na, K, Ca by flame photometry, inorganic phosphate by colorimetry.

Practicals (any three)

1. Spectrophotometric determination of inorganic phosphorous in human serum or urine
2. Determination of Blood Group
3. Estimation of blood glucose by Folin-Wu Method
4. Determination of urea in urine by urease method/by direct colorimetry/Crocker's

method

5. Determination of calcium in blood serum

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Recommended Books for Theory Papers IX, X, XI & XII,
Laboratory Courses – VII, VIII, IX & X, DSE and SEC

1. Fundamentals of Analytical Chemistry : 7th Edition – Douglas A. Skoog, Donald M. West and Holler, Harcourt College Pub
2. Principles of instrumental analysis: D.A Skoog and D. M. West saunder's college publishers.
3. Standard methods of chemical analysis: Part A & B – Editor: Welcher, Van Nostrand Reinhold Co.
4. Text Book of Microbiology: Freeman Burrows, WB saunders.
5. Text Book of Biochemistry: West and Tood/ Lehninger.
6. Practical physiological chemistry : Hawn, Oser and summerson, Tata- Mograw Hill book Co
7. A Text book of quantitative Inorganic Analysis : A. I Vogel
8. Quantitative Analysis : Cumming and Key
9. Quantitative Chemical Analysis : Kolthoff, sandell and others 4th Edition
10. Analytical Chemistry : Gary D. Christain, 4th Edition, John Wiley and Sons, New York
11. Environmental analysis : G. R. Chatawal, MC Mehra, M. satake and others – Amol Publications, New Delhi
12. Analytical Agricultural Chemistry : SL Chopra and J. S. Kanwar Kalyani Publishers, Ludhiana
13. Chemistry of the Soil: Edited by Firman E. Bear 2nd Edition, Americal Chem. Soc. Monograph Series Oxford & IBH Publishers.
14. A text Book of Experiments & Calculations in Engineering Chemistry S. S. Dara S. Chand and Co.
15. Elements of Environmental Chemistry: H . V. Jadhav , Himalaya Publishing House, New Delhi.
16. Methodology for water Analysis: IAAB Editional Board M. S. Kodarkar, AD Diwan and others, IAAB Publication, V.V. College, Hyderabad .

17. Experiments in general Chemistry : C. N. R. Rao and U. C. Agrawala, 4th Edition Affiliated East – West Press
18. Chemistry of air and air pollution: S.A. Iquabal and Y. Mido, Discovery Publishing house, New Delhi.
19. A Text Book of Environmental Chemistry and Pollution Control : S. S. Dara
20. Environmental Chemistry: A.K. De, Wiley Estern Pub.
21. Pearsons Chemical Analysis of Foods: Harold Egan, Ronald S. Kirk and Ronald Sawyer, 8th Edition, Churchill Livingstone.
22. Hand Book of Analysis & Quality Control for fruit and vegetable products: S. Ranganna, Tata Mc Graw Hill Pub. Co.
23. Chemical analysis of food and food products : M.B. Jacob
24. Food analysis – Lab Experiments : Melon and Pomerazu
25. Introduction to Chromatography: V. K. Srivastava and K Krishna, S. Chand and Co.
26. Polarographic methods in Analytical Chemistry : M.G. Arora, Anmol Publications, New Delhi
27. Quantitative Pharmaceutical Chemistry : Jenkins and others
28. Bentley and Drivers T. B. of Pharmaceutical Chemistry : Revised By L. M. Atherden, 8th Edition Oxford University Press, New Delhi
29. Air Pollution : Henry C. Perkins
30. Chemical Analysis of Water : Dickinson
31. Applied Inorganic Analysis: Hoffmann, Lundell & others.
32. Commercial Method of Analysis : Foster D Snell and Frank M. Biffen
33. Quantitative Analysis : Day & Underwood
34. Instrumental methods Chemical analysis : Willard, Dean and Merit
35. Instrumental methods of Analysis : Chatwal and Anand
36. Spectrometric Identification of Organic Compounds : Silverstein, Bessler and others
37. Spectroscopic Methods in Organic Chemistry : D. H. Williams and Ian Flaming
38. Spectroscopy : William Kemp
39. Biochemical Laboratory Technique : Chey kin

40. ISI Standard methods of Water and Air analysis : Blackie , USA
41. Experiments in modern Analytical Chemistry: D.Kealey, Chapman & Hall.
42. Analytical Chemistry -H, Kaur, Pragati Prakashan, Meerut (for Fuel & Soil Analysis)
43. Analytical Chemistry - Dr. Alka K. Gupta , Pragati Prakashan, Meerut (for Fuel & Soil Analysis)
44. Analytical Chemistry - Gary D. Christian Wiley students Old & 6th edition (for automation)
45. Principles and practice of Analytical Chemistry – F. W. Fi Field & D. Kealey (for automation)
46. Chromatography – D. R. Brown, Ivy publishers, New Delhi .
47. Chemical Analysis, 2nd Edition, 2007 Franc's Rouessac & Annick Rouessac John Wiley & Sons. (for chromatography)
48. Practical Clinical Biochemistry, Gowenlock, CBS published, 6th Ed.
49. Practical Clinical Biochemistry – Harold Warely.
50. Mossbauer Spectroscopy, Greenwood N.N., Gibbs T.C., Chapmann Hall, 1971.
51. Chemical Application of Mossbaur Spectroscopy, Goldanski V.I & Harber H., Academic Press 1968.
52. Spectroscopy in Inorganic Compounds CNR Rao & Ferraro G.R., Academic Press, 1970.
53. Basic Principles of Spectroscopy Cheney R.Mac Grows Hill, 1971.
54. "Introduction to instrumental analysis" R. D. Braun (1987).
55. "Instrumental methods of chemical analysis", H. H. Willard, L. L. Merrit Jr., J. A. Dean and F. A. Settle, 6th Ed (1986).
56. 'Forensic Chemistry' by Suzanne Bell, Pearson Prentice Hall Publishers, 2006
57. Encyclopedia of Analytical Chemistry, Volume 3, Academic Press, 1995

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Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Seat No. ☐

SEE-2020

Faculty of Science

B.Sc. Third Year (Semester-VI)
SEE WINTER/SUMMER-2020

Subject : Analytical Chemistry
Course Title :
Course Code:

Date: **Time:**

Time: 1:30 hrs **Maximum Marks: 30**

Q1. Answer the following: **[2×5=10]**

a)
b)
c)
d)
e)

Q2. Answer any Two of the following: **[5×2=10]**

a)
b)
c)
d)

Q3. Answer any One of the following: **[10×1=10]**

a)
b)

Prepared by,
BoS in Analytical Chemistry (UG)
E-mail ID: rsmldeptchemistry@gmail.com
Contact No.: 9890499290
Date: 02.07.2020

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Semester- VI

Semester- VI

ANALYTICAL CHEMISTRY (Project)

Course Title: Project Work

Course Code: U-PRW-164

Marks: 50 **Credits: 02**

Periods: 45 **3 per week**

Project Work – 50 Marks

(20 Marks Viva-Voce and 30 Marks Dissertation)

To,
The Principal,
Rajarshi Shahu Mahavidyalaya (Autonomous),
Latur – 413 512

Sub :- New syllabus of B.Sc III (CBCS), Analytical chemistry (Semester V & VI) to be implemented from the academic Year 2020-21 under autonomous status.

Respected Sir,

As per the requirement, we are submitting herewith the new syllabi of B.Sc. III Analytical Chemistry, comprising two theory papers (Paper No. IX, X, XI & XII) including Skill Enhancement Courses (SECAC-III & IV) and Discipline Selective Elective Analytical Chemistry (DSEAC, Paper No. IX & XII) of semester V & VI and four practical papers (Laboratory Course – VII, VIII, IX & X) including Discipline Selective Elective Analytical Chemistry-Practical (DSEAC-P, Paper No. VII & X), under autonomous status as an attachment to this e-mail.

Accept the same for implementation from the academic year 2020-21. Thanking you.

Yours Faithfully,

Chairman
(Mr. D. G. Palke)
BoS in Analytical Chemistry (UG)

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