

॥ सा विद्या या विमुक्तये ॥



स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

“ज्ञानतीर्थ” परिसर, विष्णुपुरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

“Dnyanteerth”, Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०-२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७-२०२०च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे खालील विषयांचे C.B.C.S. (Choice Based Credit System) Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०-२१ पासून लागू करण्यात येत आहेत.

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|---|---|
| 1. B.Sc.-II Year-Biophysics | 2. B.Sc.-II Year-Bioinformatics |
| 3. B.Sc.-II Year-Biotechnology | 4. B.Sc.-II Year-Biotechnology (Vocational) |
| 5. B.Sc.-II Year-Food Science | 6. B.Sc.-II Year-Botany |
| 7. B.Sc.-II Year-Horticulture | 8. B.Sc.-II Year-Agro Chemical Fertilizers |
| 9. B.Sc.-II Year-Analytical Chemistry | 10. B.Sc.-II Year-Biochemistry |
| 11. B.Sc.-II Year-Chemistry | 12. B.Sc.-II Year-Dyes & Drugs Chemistry |
| 13. B.Sc.-II Year-Industrial Chemistry | 14. B.C.A. (Bachelor of Computer Application)-II Year |
| 15. B.I.T. (Bachelor of Information Technology)-II Year | 16. B.Sc.-II Year-Computer Science |
| 17. B.Sc.-II Year-Network Technology | 18. B.Sc.-II Year-Computer Application (Optional) |
| 19. B.Sc.-II Year-Computer Science (Optional) | 20. B.Sc.-II Year-Information Technology (Optional) |
| 21. B.Sc.-II Year-Software Engineering | 22. B.Sc.-II Year-Dairy Science |
| 23. B.Sc.-II Year-Electronics | 24. B.Sc.-II Year-Environmental Science |
| 25. B.Sc.-II Year-Fishery Science | 26. B.Sc.-II Year-Geology |
| 27. B.Sc.-II Year-Mathematics | 28. B.Sc.-II Year-Microbiology |
| 29. B.Sc.-II year Agricultural Microbiology | 30. B.Sc.-II Year-Physics |
| 31. B.Sc.-II Year Statistics | 32. B.Sc.-II Year-Zoology |

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या www.srtmun.ac.in या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

‘ज्ञानतीर्थ’ परिसर,
विष्णुपुरी, नांदेड - ४३१ ६०६.
जा.क्र.: शैक्षणिक-१/परिपत्रक/पदवी-सीबीसीएस अभ्यासक्रम/
२०२०-२१/३३३
दिनांक : १५.०७.२०२०.



स्वाक्षरित /—
उपकुलसचिव
शैक्षणिक (१-अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- २) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
- ५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure
Faculty of Science

B. Sc. Second Year Syllabus
Semester Pattern effective from June 2020

Subject: Analytical Chemistry

Semester	Course No.	Name of the Course	Instruction Hrs / week	Total period	CA	ESE	Total Marks	Credits
III	CCAC III (Section A)	Inorganic and Organic Analysis – I	03	45	10	40	50	2
	CCAC III (Section B)	Instrumental Methods of Chemical Analysis – I	03	45	10	40	50	2
	CCAC PII [CCACIII & IV (Section A)]	Laboratory Course – II	04 04	Practicals 08 08	05 05	20 20	25 25	1 1
	SECAC I	Laboratory Safety Rules and Regulations & Water Quality Analysis	03	45	25	25	50	(02)*
IV	CCAC IV (Section A)	Inorganic and Organic Analysis – II	03	45	10	40	50	2
	CCAC IV (Section B)	Instrumental Methods of	03	45	10	40	50	2
	CCAC PIII [CCAC III & IV (Section B)]	Laboratory Course – III	04 04	Practicals 08 08	05 05	20 20	25 25	1 1
	SECAC II	Basic Concepts Food Analysis	03	45	25	25	50	(02)*
Total credits semester III and IV								12(04)*

~Note: ESE of CCACII, CCACIII & SECC I, SECAC II should be evaluated at annual

Swami Ramanand Teerth Marathwada University Nanded

Faculty of Science
B.Sc. II (Second) Year; Semester - III
Analytical Chemistry; Paper - VI
Inorganic and Organic Analysis – I
Paper Code – CHAC-201
Periods: 45 per semester; 03 per week Marks: 50

Credits: 02 (Marks: 50)

Periods: 45

Unit – I Principles of Semi micro Qualitative Analysis of Inorganic Salts 15 Periods

1.1 Chemical analysis, types of Qualitative inorganic analysis. Theoretical principles involved in separation of cations into groups – Law of mass action, solubility product, common ion effect and complex ion formation.

1.2 Spot – Test Analysis: Definition, Advantages, and spot test procedures.

Unit –II Semi–micro Determination of Elements in the Organic Compounds 12 Periods

2.1 Semi micro determination of Carbon, Hydrogen, Sulphur, Nitrogen and Halogens in the Organic Compounds.

2.2 Functional Group Analysis: Estimation of the following functional groups in the organic Compounds: Hydroxy (phenolic only), carbonyl, ester, Nitro, Amino and Carboxylic acid.

Unit – III Metallurgical Analysis

08 Periods

3.1 Estimation of main constituents in the following ores- Haematite, Pyrolusite, Bauxite and Lime stone.

Unit – IV Analysis of Metals and Alloys

10 Periods

4.1 Analysis of Copper, Silicon and Aluminum metals for their percentage purity.

4.2 Composition and analysis of following alloys- Stainless steel, Brass and Solder

Objective(s)	To understand the students basic knowledge of inorganic salt, Inorganic and Organic analysis and metallurgical analysis.
Course Outcome(s)	
CO- I	Understand the concepts of Qualitative inorganic analysis & spot test procedures.
CO-II	Aware the knowledge of Semi–micro Determination of Elements in the Organic Compounds and functional determination.
CO-III	Illustrate the main constituents in ores by Metallurgical Analysis.
CO-IV	Aware the composition of metals and alloya

Swami Ramanand Teerth Marathwada University Nanded

Faculty of Science
B.Sc. II (Second) Year; Semester - III
Analytical Chemistry; Paper - VII
Instrumental Methods of Chemical Analysis – I
Paper Code – CHAC-202
Periods: 45 per semester; 03 per week Marks: 50

Credits: 02 (Marks: 50)

Periods: 45

Unit – I Spectroscopic Methods - Visible Spectroscopy:

12 Periods

1.1 Spectroscopy-Introduction to Electromagnetic spectrum. Interaction of electromagnetic radiation with matter, process of emission, absorption and fluorescence of radiations. Visible Spectrophotometry. Theory of visible spectrophotometry and colorimetry, Lambert Beer's law, relationship between absorbance and concentration, nature of molar absorptivity and absorbance, deviations from Beer's law. Instrumentation: radiation sources, filters and monochromators, slits, cells and detection of radiation. Double beam photoelectric colorimeter-schematic diagram and working. Difference between photometer, spectrophotometer and colorimeter. Applications-Molar composition of complexes: Job's method of continuous variation. Quantitative analysis-calibration curve method, Method of Least Square.

Unit –II Spectroscopic Methods (Photometric Titrations, AS & FES):

20 Periods

Photometric Titrations: Principle, Photometric titration curves, instrumentation and applications.

04 Periods

Atomic Absorption Spectroscopy (AAS) :

10 Periods

Introduction, principle, Instrumentation : Radiation source-Hollow cathode lamp, chopper, flame atomizer, nebulization's of liquid sample, monochromators, detectors, amplifier and readout system; schematic diagram and working of single beam atomic absorption spectrophotometer, interferences, typical analysis. Quantification of analyte by Calibration Curve method, standard addition method and Internal standard addition method. Other Applications of AAS

Flame Emission Spectroscopy (FES) :

06 Periods

Introduction : Difference between Original flame photometry and the present flame emission methods. Limitations of flame photometry. General principle of flame photometry, Instrumentation: burners, mirrors, slits, monochromators, filters and detectors, schematic diagram and working of first type- simple modified flame spectrophotometer and Quantification of analyte by Calibration Curve method, standard addition method and Internal standard addition method. Other applications of flame photometry.

Unit – III Electron Microscopy:

07Periods

3.1 Transmission Electron Microscope (TEM): Instrumentation, General Design, Resolution, Electron Sources, s , TEM grids electron lenses. General Applications.

Unit – IV Atomic Force Microscope (AFM):

06Periods

4.1 Introduction, Instrumentation and General Applications .

Objective(s)	To acquire the fundamental Knowledge of Optical methods .
Course Outcome(s)	
CO-I	Understand basic fundamentals of Spectroscopic technique's.
CO-II	Learn the Photometric titrations and Atomic Spectroscopy.
CO-III	Understand the Microscopic techniques used for scanning.
CO-IV	Aware the knowledge of Atomic Force Microscope.

Swami Ramanand Teerth Marathwada University Nanded

Faculty of Science
B.Sc. II (Second) Year; Semester - IV
Analytical Chemistry; Paper - VIII
Inorganic and Organic Analysis – II
Paper Code –CHAC- 203

Periods: 45 per semester; 03 per week Marks: 50

Credits: 02 (Marks: 50)

Periods: 45

Unit – I Principles and Methods of Analysis of Saponifiable Oils and Fats 13 Periods

1.1 Definition, Classification, Nomenclature & Fatty acid composition of oils and fats. Analysis by physical and chemical methods- Density, Specific gravity, colour, smoke point, acid value, peroxide value, iodine value, Saponification value and shelf stability value. Determination and significance of these aspects in quality control.

Unit –II Analysis of Cement 10 Periods

2.1 Definition, types of cements, manufacturing processes, raw materials. Composition and analysis of Portland cement.

Unit – III Analysis of Fertilisers and Pesticides 12 Periods

3.1 Fertilisers : Definition, Classification, Characteristics of a good fertiliser. Analysis of Nitrogenous, Phosphatic and potash fertilisers.

3.2 Pesticides: Definition, Classification, Characteristics of a good pesticide. Analysis of DDT and Malathion.

Unit – IV Introduction to Quality Assurance and Quality Control 10 Periods

Quality and objectives of Analytical Chemistry:

4.1 Definitions of the terms: Quality policy, Quality Management, Quality system, Quality Control, Quality Assurance and Quality. General considerations quality assurance and quality control spiral, influencing the quality spiral.

4.2 Validatio Learning Objective :

1. Familiarise the students with industrial product analysis and clear the concept QA & QC
2. Study the analysis of oils & fats, cement, fertilisers and pesticides

Objective(s)	To enable the students acquire the fundamental knowledge in QA/QC and study the analysis of oils, fat, cement, fertilizers and pesticides.
Course Outcome(s)	
CO- I	Learn basic knowledge of Analysis of Saponifiable Oils and Fats, aspects in quality control
CO-II	General awareness about Analysis of Cement
CO-III	Understand fundamental knowledge of Analysis of Fertilisers and Pesticides
CO-IV	Understand the basic knowledge of Quality Assurance and Quality Control and its applications

Swami Ramanand Teerth Marathwada University Nanded

Faculty of Science

B.Sc. II (Second) Year; Semester - IV

Analytical Chemistry; Paper - IX

Instrumental Methods of Chemical Analysis – II

Paper Code – CHAC- 204

Periods: 45 per semester; 03 per week Marks: 50

Credits: 02 (Marks: 50)

Periods: 45

Unit – I Radiochemical Methods:

09 Periods

1.1 Introduction to nuclear radiations, detection and measurement of nuclear radiations by Gieger Muller(G.M.)Counter and scintillation counter. Tracer technique, Isotope dilution analysis and Neutron activation analysis.

Unit –II Thermal Methods of Analysis:

12 Periods

Thermal gravimetric (TG): Theory, instrumentation and applications. Thermometric titrations.

Differential Thermal Analysis (DTA): Theory, instrumentation and applications.

Unit – III Optical Methods:

08 Periods

3.1 Theory, Experimental techniques of measurement and application of each of the following properties in Chemical analysis: (i) Refractive Index (ii) Optical Activity.

Unit – IV Chromatographic Techniques -1:

16 Periods

Gas Chromatography (GC): Introduction, Types of Gas Chromatography: Gas Liquid Chromatography (GLC), Gas Solid Chromatography (GSC), Principle of Gas Solid Chromatography (GSC).

Gas liquid Chromatography (GLC): Principle, instrumentation, Qualitative and Quantitative analysis, Other Applications of GLC

High Performance Liquid Chromatography (HPLC): Introduction, Principle, Instrumentation, Solvent Delivery System, pumping systems, sample injection systems, columns, Detectors, Recorder, Mobile phases, column efficiency and Qualitative and Quantitative analysis, Other Applications of HPLC

Objective(s)	To familiarize the students with Radiochemical, thermal, Optical and Chromatographic techniques.
Course Outcome(s)	
CO-I	Understand Radiochemical Methods of Analysis.
CO-II	Learn the Thermal methods and Its Correlation with extensive and Intensive property of substance
CO-III	Know the Optical methods used to check purity of optically active compounds
CO-IV	Aware the modern methods of separation Techniques and its application for Quantification of analyte in different samples.

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Swami Ramanand Teerth Marathwada University Nanded

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science

B.Sc. II (Second) Year; Semester - IV

Analytical Chemistry; Paper - X

Laboratory Course - II

Paper Code – CHAC-P

Periods: 120 per year; 04 per week

Marks: 50

Note: Out of 30 experiments at least 16 experiments should be completed.

- 1) Estimation of Iron in haematite ore volumetrically.
- 2) Estimation of Manganese in Pyrolusite ore.
- 3) Estimation of calcium in Lime stone volumetrically.
- 4) Determination of percentage purity of aluminum metal.
- 5) Determination of percentage purity of copper metal.
- 6) Determination of Nickel in stainless steel by gravimetric method.
- 7) Determination of percentage purity of silver metal.
- 8) Determination of Copper in Brass.
- 9) Determination of Nickel in German silver.
- 10) Estimation of sulphur in the organic compound by semi-micro method.
- 11) Estimation of phenolic hydroxy group in the organic compound.
- 12) Estimation of ester group in the organic compound.
- 13) Estimation of SiO₂ in the given sample of Portland cement.
- 14) Estimation CaO in the given sample of Portland cement by gravimetric method.
- 15) Determination of total nitrogen in a fertiliser sample.
- 16) Estimation of phosphorus in a phosphate fertiliser sample.
- 17) Estimation of potassium ion in a potash fertiliser sample (solid / liquid).
- 18) Determination of acid value of an oil sample.
- 19) Determination of saponification value of an oil sample.
- 20) Preparation and standardization of acetic acid from the data of specific gravity and percentage by weight.
- 21) Determination of Iodine value of an oil sample.
- 22) Determination of volatile thinner in a paint sample.
- 23) Separation and determination of total pigment in a paint sample.
- 24) Determination of specific gravity of an oil sample.
- 25) Determination of loss on ignition of Portland cement.
- 26) Estimation of combined oxides of Fe and Al in a cement sample.
- 27) Determination of halogen in the organic compound.
- 28) Determination of density of Cu/ Al/ Zn/ Ag/ Ni metal powder using density bottle.
- 29) Determination of nitrogen in urea.
- 30) Determination of percentage of phenol in household disinfectant (e.g. black phenyl)

Objective(s)	To familiarize the students with the determination/ estimation of analyte in consumable and non-consumable materials
Course Outcome(s)	Students become aware of preparation of sample, Standardization of solution, determination / estimation of analyte in consumable and non-consumable materials

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Swami Ramanand Teerth Marathwada University Nanded

Faculty of Science

B.Sc. II (Second) Year; Semester - IV

Analytical Chemistry; Paper - XI

Laboratory Course - III

Paper Code –CHAC- P

Periods: 120 per year; 04 per week

Marks: 50

Note: Out of 24 experiments at least 16 experiments should be completed.

- 1) Analysis of permanganate and dichromate mixture.
- 2) Determination of pKa value of acid base indicator.
- 3) Determination of molar extinction coefficient of potassium permanganate Potassium dichromate.
- 4) Determination of acid neutralizing capacity of antacid tablet titrimetrically.
- 5) Determination of formula of ferric sulpho-salicylic acid complex calorimetrically by Job's method.
- 6) Photometric titration of copper by EDTA.
- 7) Colorimetric estimation of Iron by Ortho Phenanthroline.
- 8) Determination of fluoride in a given solution / tooth paste by Zirconyl-Alizarin red method colorimetrically.
- 9) Colorimetric estimation of titanium in the given solution by hydrogen peroxide.
- 10) Determination of solubility and solubility product of sparingly soluble salt by conductance measurement.
- 11) Assay of boric acid by conductometry.
- 12) Estimation of the amount of hydrochloric acid and oxalic acid in the given mixture by conductometry.
- 13) Determination of Phosphoric acid in Soft drink sample by pH meter.
- 14) Estimation of chloride and Iodide in the given mixture by Potentiometry.
- 15) Determination of the concentration of an optically active compound in the given unknown solution by Polarimetry.
- 16) Determination of sulphate present in water turbidimetrically.
- 17) Colorimetric estimation of proteins by biuret method.
- 18) Determination of Ascorbic Acid in Vitamin C Tables By redox titration.
- 19) Determination of refractive index of a given organic liquid by Abbe's Refractometer.
- 20) Titration of phosphate mixture by potentiometry.
- 21) To study the variation of viscosity with composition of the mixture of liquids.
- 22) Determination of percentage purity of an optically active compound by polarimetry.
- 23) Estimation of boric acid by potentiometry.
- 24) Estimation of amino acids by colorimetry.

Objective(s)	To familiarize the students with the determination/ estimation of analyte by different Instrumental techniques
Course Outcome(s)	
	Students become aware of Standard Operating Procedure of Instruments and its application in quantification of analyte in consumable and non-consumable materials

Recommended books for Papers VI, VII, VIII, IX, X & XI.

1. Text book of micro and semi micro qualitative inorganic analysis by A.I.Vogel.
2. Spot tests in inorganic analysis-Feigl.
3. Text book of quantitative inorganic analysis by A.I.Vogel (3rdedition).
4. Principles of Instrumental Analysis by DA Skoog 3rd Edition.
5. Principles and methods of chemical analysis of H.F. Walton.
6. Quantitative chemical analysis by Cumming and Key.
7. Text book of practical organic chemistry by A.I. Vogel.
8. Practical organic chemistry by Mann and Saunders.
9. Semi-micro quantitative organic analysis by R.Belcher and A.L. Godbert.
10. Elementary practical organic chemistry by A.I. Vogel.
11. Quantitative organic analysis by Sidney Siggia 2nd Edition.
12. Standard methods of chemical analysis by Welcher.
13. Fundamentals of analytical chemistry by D.A Skoog D.M West & FJ Holler (7th Ed.)
14. Instrumental methods of chemical analysis by Willard HH, Merritt Jr. LL, Dean JA, Settle Jr. FA.
15. Instrumental methods of chemical analysis by GW Ewing.
16. Quantitative analysis Laboratory manual by Day and Underwood.
17. Chemical separation methods by S.K. Dean.
18. Instrumental methods of analysis by S.K. Sharma.
19. Instrumental methods of analysis by Chatwal and Anand (First Edition & Reprint2008).
20. Introduction to Instrumental Analysis by R.D. Braun.
21. An introduction to Metallurgical Analysis by S.K. Jain.
22. College analytical chemistry by Baliga and Shetty.
23. Basic principles in analytical chemistry by Raghuvaran Prabhu, Prabhu and Sathe, Sheth publication.
24. Experiments in Chemistry by Dr. D.V. Jahagirdar.
25. Systematic experimental physical chemistry by Dr. Chondhekar T.K. and S.W. Rajbhoj.
26. Advanced practical inorganic chemistry by Gurdeep Raj.
27. Practical physical chemistry by J.B. Yadav.
28. Analytical chemistry by R.M. Verma.
29. Commercial methods of analysis by Foster DSnell and F.M. Biffen.
30. Scanning Electron Microscopy and X-Ray Micro Analysis-Graham Laws, Analytical Chemistry by Open Learning, Wiley India Pvt. Ltd. (2008), [For Paper VII, Unit III &IV, Electron Microscopy &STEM].
31. Methods in Modern Biophysics-Bengt Nolting, Springer InternationalEdition, Springer (India) Private Limited, New Delhi (2004) [For Paper VII, Unit III & IV, Electron Microscopy &STEM].
32. Biophysics-G.R. Chatwal, Edited by Madhu Arora, Himalaya Publishing House, New Delhi, First Edition, 2005. [For Paper VII, Unit III & IV, Electron Microscopy SETM].
33. Elements of Analytical Chemistry-R.Gopalan, P.S. Subramanian, K.Rengrajan, Sultan Chand and Sons, New Delhi , 2007.

34. Analytical Chemistry Principles, John H.Kennedy, 2nd Edition, Saunders College Publishing, New York .
35. Analytical Chemistry-Theory and Practice UN Dash, Sultan Chand and Sons, New Delhi, 2005.
36. Instrumental Methods of Chemical Analysis-H.Kaur.
37. Quantitative Analysis-R.A Day and A.L Underwood.
38. Chromatography- Dr. Brown.
39. Analytical Chemistry by R.Kellner, J.M. Mermet, M. Otto, H.M. Widmer Wiley-VCH Verlag GmbH, D-69469, Weinheim (Federal Republic of Germany) 1998. [For Paper VIII, Unit IV, Quality Assurance and Quality Control].
40. Progressive Inorganic Chemistry-Suratkar, Thatte And Pandit.
41. Quality Assurance and Quality Control in Analytical Chemical Laboratory,Piotr Konieczka ,Jacek Namiesnik, A Practical Approach, 2009 by Taylor & Francis Group, LLC.
42. FSSAI Manual
43. Modern Analytical Chemistry David Harvey; McGraw Hill Higher education publishers, (2000).

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Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- III) Semester

Pattern effective from June -2020

Analytical Chemistry

Skill Enhancement Course SECAC-I

50 Marks 2 Credits

CA 25

EAC 25

A) Unit- I: Laboratory Safety Rules and Regulations.

General rules and regulations for lab safety: Minimizing Risks of Hazards, Personal Protective Equipment (PPE) - Hair, Dressing for the Laboratory, Eye Protection, Eyewash fountain, Gloves, Laboratory Protocols, Labeling Chemicals, Careful reading of labels Prevention of Inhaling Harmful Chemicals, Guide to Chemical Hazards, Chemical Spills etc., Accidents use of fire extinguisher and first aid kit in the laboratory, safety symbols- Preparation of the charts by the students and display of charts in chemistry labs. Calibration of fractional weights, calibration of glass ware - burette, pipette, standard flask, Normality/Molarity and specific gravity of concentrated acids – Preparation of dilute solutions (Numerical problems). Precautions to be taken in the preparation of dilute acids and bases and bases. Preparation of stock solutions of salts with specific examples. Properties of primary standard salt and preparation of standard solution. Good laboratory practices-maintenance of observation book record.

B) Water Quality Analysis

Water Quality and Common Treatments for Private Drinking Water Systems: Drinking Water Standards-Primary Drinking Water Standards: Inorganic, Organics and Volatile Organic Chemicals. Secondary Drinking Water Standards- Inorganic and Physical Problems. Water Testing, Mineral Analysis, Microbiological Tests, Pesticide and Other Organic Chemical Tests. Principle involved in Water Treatment Techniques. (i) Reverse osmosis (ii) Disinfection methods such as chlorination, ultraviolet light, ozonation etc (iii) Chemical oxidation and (iv) Ion exchange (water softeners). Visit to nearby drinking water plants and interaction at sites

Course objectives:	1. To understand the experimental concepts, the procedures and safety considerations in practical laboratories 2. To inculcate knowledge about standards of drinking water
Course outcomes:	1. Able to handle hazardous chemicals with safety. 2. Able to perform tests to know the quality of drinking water and soil in surrounding areas.

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Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- IV)

Semester Pattern effective from June -2020

Analytical Chemistry

Skill Enhancement Course SECAC-II

50 Marks 2 Credits

CA 25

EAC 25

A) Basic Concepts

i) System of International Units or SI Units

Definitions of the Seven Base Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current and Luminous intensity), Derived units, Conversion between units, Significant figures.

ii) Chemical concentrations

a) Mole, molar mass

b) Calculations in grams and moles

c) Solutions and their concentrations:

d) Molar concentration, Analytical molarity, Equilibrium molarity of a particular species

e) Percent concentration e) Parts per million/billion (ppm, ppb)

f) Volume ratios for dilution procedures g) p-functions.

iii) Preparing solutions: standard solutions, primary standards, secondary standards.

iv) Description and use of common laboratory apparatus: Volumetric flasks, burettes, pipettes, meniscus readers, weighing bottles, different types of funnels chromatographic columns, chromatographic jars, desiccators, drying ovens, filter crucibles, rubber policeman. Calibration and use of volumetric glass ware.

B) Food Analysis

Objective: To carry out the physical and chemical analysis of Milk

Skill components: Learn sampling of milk, sample handling, sample preservation and determination of lactose in milk.

Objective(s)	To know the basic of units and solutions and food analysis
Course Outcome(s)	
Understand the SI units, units of concentration and standards / components of foods, adulterations in food	

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