॥ मा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

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E-mail: bos@srtmun.ac.

विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, या विद्यापीठा अंतर्गत येणा–या सर्व संलग्नित महाविद्यालयामध्ये शैक्षणिक वर्ष २०२४–२५ पासून पदवीस्तरावर राष्ट्रीय शैक्षणिक धोरण –२०२० लागू करण्याच्या दृष्टीकोनातून विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत येणा–या अभ्यासमंडळांनी तयार केलेल्या पदवी प्रथम वर्षाचे अभ्यासक्रमांना मा. विद्यापरिषदेने दिनांक १५ मे २०२४ रोजी संपन्न झालेल्या बैठकीतील विषय क्रमांक १५/५९–२०२४ च्या ठरावाअन्वये मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील खालील बी. एस्सी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) लागू करण्यात येत आहेत.

01 B. Sc. I year - Biotechnolgy
02 B. Sc. I year – Bio-informatics
03 B. Sc. I year – Biotechnology (Vocational)
04 B. Sc. I year- Dyes and Druge
05 B. Sc. I year – Industrial Chemistry
06 B. Sc. I year – Agrochemical and Fertilizers
07 B. Sc. I year – Chemistry (General)
08 B. Sc. I year – Analytical Chemisrty
09 B. Sc. I year – Biochemistry
10 B. Sc. I year – Statistics
11 B. Sc. I year – Zoology
12 B. Sc. I year – Biotechnolgy (NMD College Hingoli)

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

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२४–२५/123
दिनांक २०.०६.२०२४

डॉ. सरिता लोसरवार
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) मा. प्राचार्य, न्यू मॉडल डिग्री कॉलेज हिंगोली.
५) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

SwamiRamanandTeerthMarathwadaUniversity,Nanded

FacultyofScience

B.Sc.I(First)Year; Semester-I(w.e.f.2024-25)
AnalyticalChemistry;Paper- I
GeneralConceptsofAnalyticalChemistry-I
PaperCode–SACHCT1101

Periods: 30 per semester; 02 per week **Credit-2**

Unit-I

ScopeandImportanceofAnalyticalChemistry: 8Periods

Introduction to analytical chemistry, Role of analytical chemistry in sciences, Qualitative analysis, Quantitative analysis; major, minor and trace constituents. Quantitative methods of analysis- classification of analytical methods according to property, parameter measured, size of the sample with explanation. Steps in typical quantitative analysis. Typesof analysis complete analysis, partial analysis and assay of ingredients, the analytical chemist and analyst.

Unit-II

Preliminary Operations in Quantitative Analysis: 7 Periods

Introduction, sampling: definitions, purpose of sampling, theory of sampling, types ofsampling, samplingofsolids,liquidsandgases.Preparationoflaboratorysamples: crushingand grinding of laboratorysamples andpreparationofsolutionofsample.

Unit-III

Mole Concept and Concentration Units: 10Periods

MoleConcept,molecularweight,formulaweight,andequivalentweight.compounds forConcentration units: Molarity, Formality, Normality, Molality, Mole fraction, Percentbyweight,Percentbyvolume,Partsperthousand,Partspermillion,Partsper billion, pX, pH,pOH, pM, milliequivalents, Milli moles and Titer, Numerical.

Unit-IV

Introductionto Chromatographic Techniques: 05 Periods

Introduction,generalprincipleofchromatography,classificationofchromatographic techniques.Principle,techniqueandapplicationsofpaper

Objective(s)	Tounderstandthescopeandimportanceofanalytical chemistry, acquire the knowledge about preliminary operationinquantitativeanalysis,moleconcept, concentration units, and Chromatography

	compoundinchemicalanalysis.
CourseOutcome(s)	
CO1	Understandthescopeandimportanceofanalytical chemistry
CO2	Learnaboutthepreliminaryoperationcarriedoutin quantitativeanalysis.
CO3	Learnaboutmoleconceptandconcentrationunit.
CO4	Learnabouttheaspectandusesofchromatographyin chemical analysis

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SwamiRamanandTeerthMarathwadaUniversity,Nanded

FacultyofScience

B.Sc.I(First)Year;Semester-I(w.e.f.2024-25) Paper Code – SACHCP1102
AnalyticalChemistry;Paper-II
LaboratoryCourse-I

Periods:60perSemester;04perweek **Credit-2**
Note:Outof12experiments16experimentshouldbecompleted.

1. Calibration of volumetric apparatus: Pipette
2. Calibration of volumetric apparatus: Standard flask.
3. Preparation of standard solution of potassium hydrogen phthalate and standardization of sodium hydroxide solution.
4. Preparation of standard solution of $K_2Cr_2O_7$ and standardization of given $FeSO_4$ solution.
5. Preparation of standard solution of $(COONa)_2$ and standardization of given $KMnO_4$ solution.
6. Preparation of $Na_2S_2O_3$ solution and its standardization using standard $K_2Cr_2O_7$/ KIO_3 solution.
7. Preparation of standard solution of NaCl and standardization of given $AgNO_3$ solution.
8. Separation of metal ions (Cu^{2+}, Pb^{2+} and Cd^{2+}) by paper chromatography.
9. Assay of commercial sodium hydroxide.
10. Assay of formaldehyde.
11. Determination of alkalinity of water sample.
12. Determination of free chloride in a sample of water.
13. Estimation of ester by hydrolysis.
14. Determination of Carbon Dioxide in polluted water sample.
15. Determination of Calcium in Calcium Gluconate.
16. Estimation of calcium in the given sample of Lime stone or Dolomite using standard EDTA solution

Objective(s)	Tomakestudentawareaboutthecalibrationof glasswareaswellashandlethelaboratory instruments.Totrainedthestudentcarrying outvarious titrations and estimations.
CourseOutcome(s)	
	Learn basic ideas about the calibration of glassware and handling of glassware and laboratoryinstruments.Studentsaregettrained incarryoutdifferenttitrationandestimations.

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SwamiRamanandTeerthMarathwadaUniversity,Nanded

FacultyofScience

B.Sc. I(First)Year; Semester- II (w.e.f.2024-25)

Analytical Chemistry; Paper - III
BasicAnalyticalChemistry-I

PaperCode–SACHCT1151

Periods: 30 per semester; 02 per week **Credi-2**

Unit-I

MeasurementofVolume: **5 Periods**

Unitsofvolume,effectoftemperatureonvolumemeasurement.Apparatusfor precisemeasurementofvolume;pipette,burette andvolumetricflask&theircalibration.

Unit-II

SolventsandReagents: **8 Periods**

Solvents:Solute,Solvent&Solution,classificationofsolvents(i)Proticandaprotic (ii) Acidic, basic amphiprotic and neutral. Each type to be explained with at least one example.

Reagents: Classification of reagents according to their action; (i) acids (ii) bases (iii)salts (iv) complexingagents(v)oxidizingandreducingagents(vi)precipitatingagents(vii)chelating agents. Each type to be explained with at least one suitable example.

Unit– III

Principles of Volumetric Analysis-I:

10Periods

PeriodsDefinition of terms: Titrant, titrand, analyte, end point and equivalence point, indicator, standard titrant, titration. Acid-base titration: Theory of acid base indicators, Theory of acid-basetitration,titrationofstrongacid-strongbase,strongacid-weakbasewith titration curve .

Unit-IV

Principles of Volumetric Analysis-II: **07Periods**

Redox Titration: Theoretical basis of volumetric analysis involving Potassium Permanganate and (ii) Potassium dichromate.

Precipitationtitratio: Titrationcurveforprecipitationreaction,endpointdetection, Mohr's method.

ComplexometricTitration: Theoryofcomplexometrictitration,indicatorsforEDTA titration.

Objective(s)	Toacquirethebasic knowledgeabout,volume measurement, types of solvents and reagents,principles ofvolumetric analysis and types of titrations.
CourseOutcome(s)	
CO1	Learn about the measurement of volume.
CO2	Learn about the different types of solvent and reagent used in gravimetric analysis.
CO3	Gettheknowledgeabouttheprinciplesofvolumetric analysis.
CO4	Learnaboutthedifferenttypesoftitrations.

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SwamiRamanandTeerthMarathwadaUniversity,Nanded

FacultyofScience

B.Sc. I(First)Year;Semester–II(w.e.f.2024-25)

Paper Code – SACHCP1152

AnalyticalChemistry;Paper-IV

Laboratory Course-II

Periods:60perSemester;04perweek **Credit-2**

Note:Outof16experiments12experimentshouldbecompleted.

1. Determination of acetic acid content in a commercial sample of vinegar.
2. Separation of metal ions (Zn^{2+}, Co^{2+}& Ni^{2+}) by paper chromatography.
3. Assay of commercial barium hydroxide.
4. Assay of H_2O_2 solution.
5. Assay of formaldehyde.
6. Determination of alkalinity of water sample.
7. Determination of free chloride in a sample of water.
8. Determination of moisture content in a soil/ coal sample.
9. Estimation of HCl and CH_3COOH in mixture using acid base indicators.
10. Estimation of iodine in the given solution using standard $Na_2S_2O_3$solution.
11. Preparation of EDTA solution and its standardization using standard Zn^{++} solution.
12. Estimation of Al^{3+} in the given solution using standard EDTA solution (Back Titration).
13. Estimation of calcium in the given sample of Calcite using standard EDTA solution.
14. Analyse the given sample of face powder for its magnesium content by complexometric method
15. Determination of Carbon Dioxide in polluted water sample.
16. Study the variation of surface tension of detergent solutions withvarious concentration.

Objective(s)	To make student aware about the calibration of glassware as well as handle the laboratory Instruments. Totrainedthestudentcarryingoutvarioustitrationsand estimations.
CourseOutcome(s)	
	Learnbasicideas about the calibration ofglassware and handling of glassware and laboratory instruments. Studentsaregettrainedincarryoutdifferenttitrationand estimations.

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SwamiRamanandTeerthMarathwadaUniversity,Nanded

Facultyof Science

B.Sc.I(First)Year;Semester- I(w.e.f.2024-25)
AnalyticalChemistry (Generic Elective)-I

BASIC ANALYTICAL CHEMISTRY-I

PaperCode–SACHGE1101

Periods: 30 per semester; 02 per week **Credits:2**

Unit-I

GeneralIntroductionofAnalyticalChemistry 10 Periods

Introductiontoanalyticalchemistry,needofanalyticalchemistry,chemicalanalysisandtypes ofAnalysisultratrace.Competeanalysis,partialanalysis.Applicationofanalyticalchemistry in various filed.

Unit-II 07 Periods

Descriptionanduseofcommonlaboratoryapparatus.

Volumetric flasks, burettes, pipettes, meniscus readers, weighing bottles, different types of funnels chromatographic columns, chromatographic jars, drying ovens, filter crucibles, rubber policeman. Calibration and use of volumetric glass ware.

Unit-III 08 Periods

LaboratoryOperationsandPractices

Fastening and anchoring, weighing of solids and liquids, volume measuring for liquids or solutions, Techniques used in chemical reactions, Agitation, mixing and grinding, Reflux, Filtration, Centrifugation, Recrystallization of organic compounds, Liquid-liquid extraction (with and without chemical reaction), Drying of liquids, Solid-liquid extraction .

Unit-IV 05 Periods

Workingin AnalyticsLaboratory

Good laboratory practice, basic laboratory operations, requirements for the suitability of the reactions for use in chemical analysis, rules of work in a analytical laboratory.

Objective(s)	To familiar student about the general concepts of analytical chemistry and its scope and importance, Use of common laboratoryequipment'sandapparatus,Laboratory OperationsandPracticesandworkinginAnalytical

	Laboratories.
CourseOutcome(s)	
CO1	Learngeneralconcepts,scopeandimportanceof Analytical Chemistry.
CO2	Learnaboutdescriptionandusesofcommonlaboratory equipment's and apparatus.
CO3	Gettheknowledgelaboratoryoperationsand practices.
CO4	LearnabouthowtoworkinAnalyticalLaboratories.

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SwamiRamanandTeerthMarathwadaUniversity,Nanded

Facultyof Science

B.Sc.I(First)Year;Semester- II(w.e.f.2024-25)
AnalyticalChemistry (Generic Elective)-II

BASIC ANALYTICAL CHEMISTRY-II
PaperCode–SACHGE1151

Periods:30persemester;02perweek **Credits:2**

Unit–I 10Periods

ChemicalandLaboratory Notebook forAnalytical Chemistry

Classification of chemical reagents, grade (LR grade, AR grade, CP grade, spectroscopic grade) primary standard grade and special purpose reagent and chemicals. Rules for handling reagents, apparatus, cleaning and marking of lab-wares, handling of volumetric flask, Calibration of burette, pipette, volumetric flask.

Unit-II 8 Periods

Basic Units

DefinitionsoftheSevenBasicUnits(Mass,Length,Time,Temperature,Amountofsubstance, Concentration of solutions) Derived units, Conversion between units, Significant figures. B. Chemicalconcentrationsi)Mole Concept, molecular weight, formula weight, and equivalent weight. compounds) for Concentration units: Molarity, Formality, Normality, Molality, Mole fraction, Percent by weight, Percent by volume, Parts per thousand, Parts per million.

Units III 7 Periods

IntroductiontoEnvironmental Analysis

Sampling method, Environmental pollution from industrial effluents Pollution due to some typical industries like Textile, Pulp and Cane sugar.

Unit IV 5 Periods

Conceptandscopeofenvironmental chemistry

Introduction to water Classification of water pollutants, Dissolved Oxygen, BOD, COD, Waste water treatment.

Objective(s)	To acquire basic knowledge about chemical and laboratory notebook for analytical chemistry, Basic units, Environmental Analysis, Concept and Scope of environmental Chemistry.
CourseOutcome(s)	

CO1	Togetknowledgeaboutvariouschemicalsandreagents used in laboratory, as well as handling of reagent and apparatus.
CO2	LearnaboutbasicunitsusedintheAnalyticalchemistryfor measurement and determination of analyte concentration.
CO3	Gettheknowledgeabouttheenvironmentalanalysis such as air and water analysis for pollution control.
CO4	LearnaboutconceptsandscopeofenvironmentalChemistrysuch as BOD, COD, DO etc.

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SwamiRamanandTeerthMarathwadaUniversity,Nanded

Facultyof Science

B.Sc.I(First) Year;Semester- I(w.e.f.2024-25)
AnalyticalChemistry (V&SEC)-I
PaperCode–SACHSC1101

Periods:30 **Credits:2**

Unit 112 periods

Safety symbols

SafetySymbolsandTheirMeanings,TypesofSafetySymbols,Prohibition,Warning, Mandatory, Emergency their information, feature and examples.

Safety Practices in the Chemistry Laboratory, washing of different types of glassware using different types of cleaning reagents.

Unit II

Preparation of different types of concentration solutions. **18periods**

Fastening and anchoring, weighing of solids and liquids, volume measuring for liquids or solutions

Definitions of the Seven Basic Units (Mass, Length, Time, Temperature, Amount of substance, Concentration of solutions) Mole Concept, molecular weight, formula weight, and equivalent weight. compounds) for Concentration units: Molarity, Formality, Normality, Molality, Mole fraction, Percent by weight, Percent by volume, Parts per thousand, Parts per million. Preparation of each type of concentration solution

Objective(s)	ToacquirebasicknowledgeSafety symbols, handling of glassware and reagents.
CourseOutcome(s)	
CO1	Learnaboutsafetysymbols and handling of glassware.
CO2	Learn about basics Practicesi.e preparations of different solutions.

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SwamiRamanandTeerthMarathwadaUniversity,Nanded

Facultyof Science

B.Sc.I(First)Year;Semester- II(w.e.f.2024-25)
AnalyticalChemistry (V&SEC)-II
PaperCode–SACHSC1151

Periods:30persemester;02perweek

Credits:2

Units 1

Meaning of science Laboratory **15 Periods**

Planning

Space, ample physical and material facility, ambulance storage facility for chemical and equipment, good lightening and ventilation, regular supply of water and gas, availability of shelves, cupboard and notice board, seating arrangement and furniture in laboratory.

Maintenance

storage of scientific material, maintenance of lab registers, maintenance of electrical parts, maintenance of glassware, care and maintenance of lab equipment apparatus and repair of electrical parts and equipment.

Units 2 **15 Periods**

LaboratoryOperationsandPractices

Techniques used in chemical reactions, Agitation, mixing and grinding, Reflux, Filtration, Centrifugation, Recrystallization of organic compounds, Liquid-liquid extraction (with and without chemical reaction), Drying of liquids, Solid-liquid extraction

Objective(s)	ToacquirebasicknowledgeChemistry laboratory and their maintenance
CourseOutcome(s)	
CO1	LearnaboutAnalytical laboratory and maintenance
CO2	Learn about Laboratory Operations and Practices

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ReferenceBooks:

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2. Anintroductiontoanalyticalchemistry,S.A.Iqbal,M.Satake,Y.MidoandM.S.Shethi.
3. Collegeanalyticalchemistry:Joshi,BaligaandShetty,HimalayaPublishinghouse.
4. Qualitativeanalysis:DayandUnderwood.
5. Qualitativeinorganicanalysis:A.I.Vogel.
6. Principlesofanalyticalchemistry:PanditandSoman.
7. Anaylticalchemistry,G.D.Christian,J.WileyeasternpressLtd.
8. Analyticalchemistry:AlkaGupta.
9. Basicconceptsofanalyticalchemistry:S.M.Khopkar.
10. Advancedpracticalorganicchemistry:Vishnoi.
11. Qualitativeanalysis:Alaboratorymanual:DayandUnderwood.
12. Fandamentalsofanalyticalchemistry:D.A.Skoog,D.M.WestandH.J.Holler,7th edition.
13. Analyticalchemistryprinciples:J.H.Kennedy,W.B.S.Saunderspub. Ltd.
14. Analyticalchemistry:PrinciplesandTechniques:L.G.Hargis,PrenticeHall.
15. Principlesinsemi-microqualitativeanalysis:G.R.ChatwaleditedbyM.Arora.
16. Experimentsinchemistry: D.V.Jahagirdar.
17. Atextbookofexperimentalandcalculationinengineeringchemistry:S. S.Dara.
18. Analyticalchemistry:PitrzykandFrank,secondedition.
19. Modernanalyticalchemistry:W.F.Pickering,MarcelDeckerINC.NewYork.
20. Introductiontochromatography:SrivastavaandSrivastava.
21. UniversityPracticalChemistrybyPCKamboj,VishalPublishingCompany,Jalandhar.
22. FoodChemistrybyL.W.AurandandA.E.woodstheAVIPublising Inc.
23. FoodChemistrybyL.H.Meyer,AffliatedEast-WestpressLtd,NewDelhi.
24. Foods-FactsandprinciplesbyN.ShakuntalaManay,M.ShdaksharaSwamy.
25. PrinciplesofFoodChemistrybyJohnM.deMan.

26. Principles of Food Science, Part I,Food Chemistry edited by Owen R. Fennama, Mareal Dekker, Inc., New York.

27. HandbookofFoodandNutritionbyM.Swaminathan

28. PracticalChemistry(forB.Sc.I,II&IIIYearStudentsofAllIndianUniversities)Dr.O.P.Panday, D.N. Bajpai& Dr. S. Giri, S.Chand& Company, New Delhi.

29. Vogel,A.I.ATextbookofQuantitativeInorganicAnalysis,ELBS.

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31. Garland,C.W.;Nibler,J.W.&Shoemaker,D.P.ExperimentsinPhysicalChemistry8th Ed.; McGraw-Hill: New York (2003).

32. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman& Co.: New York (2003)

33. Mann,F.G.&Saunders,B.C.PracticalOrganicChemistry,PearsonEducation(2009)

34. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)

35. Khosla,B.D.;Garg,V.C.&Gulati,A.,SeniorPracticalPhysicalChemistry,R.Chand& Co.: New Delhi (2011).

36. Athawale, V. D. & Mathur, P. Experimental Physical ChemistryNew Age International: New Delhi (2001).

37. ManualofBiochemistryWorkshop,2012,DepartmentofChemistry,UniversityofDelhi.

38. Arthur,I.V.QuantitativeOrganicAnalysis,Pearson.

39. Garland,C.W.;Nibler,J.W.&Shoemaker,D.P.ExperimentsinPhysicalChemistry8th Ed.; McGraw-Hill: New York (2003).

Program Outcomes (PO's)	ThestudentgraduatingwithdegreehavingAnalytical ChemistryasaMojororminorshouldbeabletoacquire/have : 1. Student will acquire core competency in subject Analytical Chemistry. 2. Student are expected to have sound understanding of fundamental principles, recent trends and future opportunities in the subject area. 3. Studentwillbeabletoknowthebasicprinciplesusedin the modern instrumental techniques in laboratory. 4. Studentswillenabletoanalyze,characterize,identifyand separate components of unknown compounds using modern instrumental methods.

	5. Competency in critical thinking after identifying assumptionsthatframeourthinkingandaction,checking out their degree of accuracy and validity and finally our response from different perspectives. 6. Skill to adopt role of Analytical Chemistry in a state handling of chemical environmental issues and other societal concerns. 7. Awarenessofdifferentvaluesystemsincludingourown, understanding of the moral dimensions of our decisions and accepting responsibility for them. 8. The ability to engage in lifelong learning in broadest content of socio-technological Change. 9. Abilitytoelicitviewsofothers,mediatedisagreements andcopeupwith richconclusionin group discussion.
Program Specific Outcomes (PSO's)	After successful completion of degree in Analytical Chemistry the learner would be able to: 1. Understand Scope, importance, techniques, methodologiesandapplicationsofAnalyticalchemistry. 2. Enablelearnertouseappropriateprinciplesandskillsof analytical chemistry to deal with the problems. 3. Enablelearnertoapplypracticalrelevancetothetheory courses studied and will come up with fruitful experimental results. 4. Learners are able to solve most of the environmental, social and economic problems of the society related to medicinalandhealththroughanalyticalChemistrypoint of view. 5. Learnersdealswithsafetyofchemicals,preparationsof solution, chemical reactions and safety disposal of hazardous chemicals. 6. Learnerswillhelptoresolveenvironmentalissuesby applyinganalyticalchemistryknowledge.

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