



LOKNETE DR. BALASAHEB VIKHE PATIL (PADMABHUSHAN AWARDEE)
PRAVARA RURAL EDUCATION SOCIETY'S

Establishment 4 August 2004

ARTS, COMMERCE & SCIENCE COLLEGE, ALKUTI

ID. No. PU/AN/ACS/78/2004

College code No.757

A/p.Alkuti, Tal.Parner, Dist.Ahmednagar.Pin-414305



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Department of Chemistry

Programs offered: B.Sc. Chemistry (Credit Pattern)

Sr. No.	Program	Program Objective	Program Specific Objectives
01	B.Sc. Chemistry	<ol style="list-style-type: none">1.To understand the fundamentals, principles , mathematical concepts included in chemistry and recent research development in Chemistry.2. Students are well prepared for a detailed study and understanding the knowledge with chemistry experiments.3. To understand the different types of chemical reactions.4. To understand the fundamentals, principles, mathematical concepts and recent developments in the subject area	<p>PSO-1.Introducehistoricalconcepts, study techniques in thestudy of history of Marathas to makeit value based, conceptual andthoughtprovocative.</p> <p>PSO-2.Tounderstand Socio-economic, cultural and politicalbackground of 17th centuryMaharashtra.</p> <p>PSO-3.To increase the spirit ofhealthy Nationalism and Secularismamongthestudent.</p>

Courses offered (CBCS 2019 Pattern)

Sr. No.	Course	Course Outcomes
01	F.Y.B.Sc. Chemistry I (CH-101) Physical Chemistry	a) To understand the fundamentals, principles, mathematical and theoretical concepts and recent developments as well as basic knowledge in the subject area.
	F.Y.B.Sc. Chemistry II (CH-201) Inorganic Chemistry	a) To Understand Hybridization concepts in inorganic chemistry. b) To learn periodic table and chemical bonding. c) To learn basic knowledge of sigma, pi, delta bonding in inorganic.
	F.Y.B.Sc. Chemistry I(CH-102) Organic Chemistry	a) To learn general organic reactions b) Basic hint of the pathway of reaction mechanism c) To learn basic knowledge of stereochemistry.
	F.Y.B.Sc. Chemistry II (CH-202) Analytical Chemistry	a)To introduce basics of analytical chemistry b)To understand errors and its interpretation c) To disseminate knowledge of qualitative & quantitative analysis.
	F.Y.B.Sc. Chemistry I(CH-103) Chemistry Practical	a)To understand MSDS data sheet. b) Well known about Instrument Handling.
	F.Y.B.Sc. Chemistry I(CH-203) Chemistry Practical	a) To understand Experiments related to Chemical kinetics b) Calculation regarding Experimental and Theoretical yield.
02	S.Y.B.Sc. Chemistry I(CH301)Physical and Analytical Chemistry	a) To conceptualize phenomenon of free energy and equilibrium. b) To distinguish behavior of liquid phase solutions. c) To provide basic knowledge essential for volumetric analysis.
	S.Y.B.Sc. Chemistry II(CH-302) Inorganic and Organic Chemistry	a) To understand different type of Name reactions Rearrangements and rule. b) Knowledge regarding Molecular Orbital Theory. c) General Metallurgy Concepts.
	S.Y.B.Sc. Chemistry III (CH-303) Chemistry Practical	a) To correlate theoretical and experimental knowledge b) Acquired skills of handling various tools, instrumentation techniques for chemical analysis c) Graphical knowledge about performed experiments.
	S.Y.B.Sc. Chemistry I(CH401)Physical and Analytical Chemistry	a) To learn the basic concepts related to kinetics and chemical and Electrochemistry. b) To understand the Meaning and Types of equilibrium such as true or static, metastable and Unstable equilibrium.
	S.Y.B.Sc. Chemistry II(CH-402) Inorganic and Organic Chemistry	a) To know the Molecular Orbital Theory, VBT, CFT etc. b) Knowledge regarding reaction mechanism. c) Know the meaning of various terms involved in coordination chemistry. d) Knowledge Of Structural isomers, functional isomers, Positional Isomers.

		e)) To learn the stereochemistry of substituted cyclohexane
	S.Y.B.Sc. Chemistry III (CH-403) Chemistry Practical	a) Complete Qualitative and Quantitative analysis of organic and inorganic Compounds. b) To learn various tests regarding Some specific chemical groups.
03	T.Y.B.Sc. (CH-501) Physical Chemistry-I	a) Principles of Spectrophotometric analysis and properties of electromagnetic radiations. b) To know the basics Electrochemical cell with specific examples. c) To know the basics crystal structure of Solid state and quantum chemistry.
	T.Y.B.Sc. (CH-502) Analytical Chemistry-I	a) To know Solvent Extraction b) Separation mechanism involved in GSC and GLC c) Separation mechanism involved in adsorption and partition HPLC
	T.Y.B.Sc. (CH-503) Physical Chemistry Practical -I	a) To understand Experiments related to Chemical kinetics and instrument Calibration method. b) Calculation regarding Experimental and Theoretical yield
	T.Y.B.Sc. (CH-504) Inorganic Chemistry -I	a) Students should know the meaning of terms f-block elements, Inner transition elements, lanthanides, actinides. b) The meaning of metal & semiconductor.
	T.Y.B.Sc. (CH-505) Industrial Chemistry	a) Industrial Visit can be arranged. b) The students are expected to learn Importance of sugar industry and Fermentation Industry. c) Students should know about different types of soap detergents and Cosmetics products.
	T.Y.B.Sc. (CH-506) Inorganic Chemistry practical -I	a) Complete Qualitative and Quantitative analysis of organic and inorganic Compounds. b) To learn various tests regarding Some specific chemical groups.
	T.Y.B.Sc. (CH-507) Organic Chemistry - I	a) Student should know the homogeneous catalyst and heterogeneous catalysis. b) To know the Retro synthetic analysis and applications. c) To study the intermediates.
	T.Y.B.Sc. (CH-508) Chemistry of Biomolecules	a) Structures of Carbohydrates, Glucose, Nucleic acids. b) Study of Killani Fischer Synthesis.
	T.Y.B.Sc. (CH-509) Organic chemistry practical -I	a) Complete Qualitative and Quantitative analysis of organic Compounds. b) To learn various tests regarding Some specific chemical groups. c) Roles of Reagents can be known.
	T.Y.B.Sc. (CH-510) SEC-I Polymer Chemistry	a) Students should know Polymer chemistry. b) Long chain and short chain polymers knowledge c) Isotactic, Syndiotactic polymers knowledge.
	T.Y.B.Sc. (CH-511) SEC-II Environmental Chemistry	a) Various Factors that effect on environment that can be known. b) Types of pollutions that effects on the environment can be studied.

	T.Y.B.Sc. (CH-601) Physical Chemistry-II	a) Principles of Thermodynamics can be known. b) To know the basic Electrochemical cell with specific examples. c) To know the basics crystal structure of Solid state and quantum chemistry.
	T.Y.B.Sc. (CH-602) Physical chemistry-III	a) Principles and properties of electromagnetic radiations. b) To know the basics Electrochemical cell with specific examples. c) To know the basic crystal structure of Solid state and quantum chemistry.
	T.Y.B.Sc. (CH-603) Physical chemistry Practical -II	a) Acquired skills of handling various tools, instrumentation techniques for chemical analysis. b) Well known about electrodes used for instruments.
	T.Y.B.Sc. (CH-604) Inorganic chemistry-II	a) Various types of Organometallic compounds can be known , b) Acid and Bases Chemistry can be studied
	T.Y.B.Sc. (CH-605) Inorganic chemistry-III	a) knowledge of Bioinorganic Chemistry b) Whole Periodic table can be known. c) Coupling Reactions can be studied.
	T.Y.B.Sc. (CH-606) Inorganic chemistry Practical-II	a) Complete Qualitative and Quantitative analysis of inorganic Compounds. b) To learn various tests regarding Some specific chemical groups. c) Groups like Phosphate, sulphate can be detected with tests.
	T.Y.B.Sc. (CH-607) Organic chemistry-II	a) Well known about Spectroscopy b) UV , IR , NMR instruments can be known c) Problems related to Spectroscopic data can be solved and known about Doublet, triplet , quartet,...
	T.Y.B.Sc. (CH-608) Organic chemistry-III	a) Organic Reaction mechanism can be known. b) Electrophilicity and Nucleophilicity known c) Roles of Electron donating and Electron withdrawing groups , Types of Effects in chemistry known. d) Rearrangements Reactions known.
	T.Y.B.Sc. (CH-609) Organic chemistry Practical- III	a) Complete Qualitative and Quantitative analysis of inorganic Compounds. b) Thin Layer Chromatography (TLC) whole study. c) To learn various tests regarding Some specific chemical groups. d) Chemical Properties of Toxic chemicals can be learned.
	T.Y.B.Sc. (CH-610) SEC III Chemistry of Soil and Agrochemicals	a) To Know the role of agriculture chemistry and its potential b) Understand basic concept of soil, properties of soil & its classification on the basis of pH. c) Know the different plant nutrients, their functions and deficiency symptoms.
	T.Y.B.Sc. (CH-611) SEC IV Analytical Chemistry -II	a) Colorimetric and polarography as an analytical tool b) Knowledge about types of Errors, Deviations.
04	Msc-I (CHP-110)Physical Chemistry- I(Fundamentals of Physical Chemistry)	a) Represent of the rate law of the elementary and chain reaction b) Understand of the theories for the determination of the rate of the reactions c) Understand of the kinetics of the explosive photochemical and unimolecular reactions

		<ul style="list-style-type: none"> d) Understand of the laws of thermodynamics and their applications e) know the phase diagram of single component systems and binary mixtures f) Understand of the applications statistical thermodynamics g) Understand of the quantum chemistry of free electron and H- atom
	<p>Msc-I (CHI-130)Inorganic Chemistry-I (Molecular Symmetry and Chemistry of Main Group Elements)</p>	<ul style="list-style-type: none"> a) Able to visualize molecule in 3-D, understand the concept of symmetry elements and symmetry operations. b) know the point groups of molecules and understand symmetry considerations for optical activity and dipole moment. c) Understand the group multiplication table, character table and representations of group. d) Apply the projection operator for constructing SALCs. e) correlate application of symmetry to spectroscopy and find IR active modes of vibration. f) Understand the detail chemistry of s- and p- block elements w.r.t. their compounds, reactions and applications. g) learn the advance chemistry of boranes, fullerenes, zeolites, carbon nanotubes, Polymers, etc. h) Understand the organometallic chemistry of some important elements of s- and p- block. i) understand how to derive the SALCs for molecules using the Projection Operators and also how to construct molecular orbitals using various symmetry operations and their representations
	<p>Msc-I (CHO-150)Organic Chemistry-I (Basic Organic Chemistry)</p>	<ul style="list-style-type: none"> a) To understand some fundamental aspects of organic chemistry, to learn the concept aromaticity, to understand the various types of aromaticity b) To study heterocyclic compound containing one and two hetero atoms with their structure, synthesis and reactions. c) To know stereochemistry of organic compounds; able to do interconversion of Fischer to Newmann, Newmann to Sawhorse and vice versa, Able to assign R and S to given molecules; understand stereoselective and stereospecific reactions; acquire knowledge on topicity. d) To study structure, formation, stability and related name reaction of intermediates like Carbocation, Carbanion, Free Radical, Carbenes and nitrenes; Recognize neighboring group participation e) To study rearrangement reaction with specific mechanism and migratory aptitude of different groups. f) To study Ylides and their reaction. g) To understands the basis of redox reaction; acquire knowledge about the reagents which causes selective oxidation / reduction in various compounds; learn the basic mechanism of oxidation / reduction in organic compounds
	<p>Msc-I (CHG-190) Introduction to Chemical Biology-I</p>	<ul style="list-style-type: none"> a) Students will be able to explore new areas of research in both chemistry and allied fields of science and technology. b) Students will be able to function as a member of an interdisciplinary problem solving team. c) To impart the students thorough idea in the chemistry of

		<p>carbohydrates, amino acids, proteins and nucleic acids etc.</p> <p>d) Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter.</p> <p>e) Develop skills to critically read the literature and effectively communicate research in a peer setting.</p>
	Msc-I (CHG-190) Inorganic Chemistry-Material Analysis, Synthesis and Applications Practical	<p>a) prepare the exact solutions for quantitative analysis.</p> <p>b) Apply the knowledge of quantitative analysis for the determination of metals from ores/alloys.</p> <p>c) synthesize Inorganic complexes and also find their purity.</p> <p>d) Understand Ion-exchange chromatography for separation of metal ions.</p> <p>e) Understand the principle and working of different instruments like colourimeter, conductometer, spectrophotometer, etc</p>
	Msc-I (CHP-107) Basic Practical Chemistry-I	<p>a) understand chemical bonding and reactivity, various effects in organic molecules.</p> <p>b) understand Acidity and Basicity as well as aromaticity.</p> <p>c) understand concepts of stereochemistry and will be able to stereochemical aspects in organic chemistry.</p> <p>d) develop knowledge of substitution (electrophilic, nucleophilic), addition and elimination reactions</p>
	Msc-I (CHP-210) Physical Chemistry - II (Molecular Spectroscopy and Nuclear Chemistry)	<p>a) Able to visualize molecule in 3-D, understand the concept of symmetry elements and symmetry operations.</p> <p>b) know the point groups of molecules and understand symmetry considerations for optical activity and dipole moment.</p> <p>c) Understand the group multiplication table, character table and representations of group.</p> <p>d) Apply the projection operator for constructing SALCs.</p> <p>e) correlate application of symmetry to spectroscopy and find IR active modes of vibration.</p> <p>f) Understand the detail chemistry of s- and p- block elements w.r.t. their compounds, reactions and applications.</p> <p>g) learn the advance chemistry of boranes, fullerenes, zeolites, carbon nanotubes, Polymers, etc.</p> <p>h) Understand the organometallic chemistry of some important elements of s- and p- block.</p> <p>i) understand how to derive the SALCs for molecules using the Projection Operators and also how to construct molecular orbitals using various symmetry operations and their representations</p>
	Msc-I (CHI-230) Inorganic Chemistry -II (Coordination and Bioinorganic Chemistry)	<p>a) Student should able to find out the no of microstates and meaningful term symbols, construction of microstate table for various configuration</p> <p>b) Hund's rules for arranging the terms according to energy.</p> <p>c) Student should understand interelectronic repulsion.</p> <p>d) Student should know the concept of weak and strong ligand field.</p> <p>e) Student able to find out splitting of the free ion terms in weak ligand field and strong ligand field.</p> <p>f) To draw correlations diagram for various configurations in Td and Oh ligand field.</p>

		<ul style="list-style-type: none"> g) Student should know basic instrumentation and selection rules and relaxation in rules. h) Student should know basic d-d transition, d-p mixing, charge transfer spectra. i) Interpretation of electronic spectra for spin allowed oh and td complexes using Orgel diagram. j) Understand the concept of spectro chemical series and Nephelauxeticserie k) Importance of bioinorganic chemistry. l) Role of metals in Metalloprotein and metalloenzymes. m) Similarities in coordination theory for metal complexes and metal ions complexed with biological ligands. n) Importance and transport of metal ions. o) Passive transport metal ions by ionophores and gramicidin. p) Mechanism for active transport of Na⁺ and K⁺ 7) Nerve impulse generation in rod cell of retina. q) Importance and function of Ca, Fe and Mg in metalloprotein r) Catalytic role of Mn in photosynthesis
	<p style="text-align: center;">Msc-I (CHO-250) Organic Chemistry-II (Photochemistry, Pericyclic and Organic spectroscopy)</p>	<ul style="list-style-type: none"> a) Students should able to understand free radicals' formation, stability and reactivity and should also be able to use the basic understanding in writing probable reaction mechanisms. b) Students should able to write MO diagram for various olefinic compounds and should able to predict the products, the stereochemistry as well as should able to understand the preferred reaction pathways. c) Students should able to calculate λ_{max} of organic compounds containing more than one and less than four conjugated systems. Students should able to correlate IR bands with functional groups using numerical data as well as spectral data. d) Students should able to solve ¹H-NMR problems and should also able to draw the ¹H-NMR spectrum for simple organic compounds mentioning multiplicity pattern and coupling constant with the help of "Tree Diagram" Should able to predict and analyze the multiplicity patterns with more than one coupling constants. e) Students should able to use ¹³C-NMR data to interpret the structure NMR problems and should also able to draw the ¹H-NMR spectrum for simple organic compounds mentioning multiplicity pattern and coupling constant with the help of "Tree Diagram" Should be able to predict and analyze the multiplicity patterns with more than one coupling constants. f) Students should know various key factors responsible for the spectroscopic data acquisition and should able to solve Problems based on UV, IR, MS, ¹H-NMR, ¹³CNMR. g) MOT and will be able to extend this in predicting reaction mechanism and stereochemistry of electrocyclic reactions. h) The concepts in free radical reactions, mechanism and the stereo chemical outcomes. i) The basic principle of spectroscopic methods and their applications in structure elucidation of organic compounds

		using given spectroscopic data or spectra.
	Msc-I (CHG-290) Introduction to Chemical Biology-II	<ul style="list-style-type: none"> a) Students will be able to explore new areas of research in both chemistry and allied fields of science and technology. b) Students will be able to function as a member of an interdisciplinary problem solving team. c) To impart the students thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc. d) Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter. e) Develop skills to critically read the literature and effectively communicate research in a peer setting. f) Describe the importance of chemical biology research and interdisciplinary work.
	Msc-I (CHG-290) Electroanalytical Techniques of Analysis Practical	<ul style="list-style-type: none"> a) This course is designed to make students aware of how to perform organic compounds in laboratory. b) The course includes synthesis of some derivatives and organic compounds, which will help them while working in research laboratory in future.
	Msc-I (CHP-227) Basic Practical Chemistry-II	<ul style="list-style-type: none"> c) This course is designed to make students aware of how to perform organic compounds in laboratory. d) The course includes synthesis of some derivatives and organic compounds, which will help them while working in research laboratory in future. e) Making derivatives of organic compounds will help them in industry or while doing research in medicinal chemistry for Drug development. f) This practical course is also designed to make student aware of green chemistry and role of green chemistry in pollution reduction. g) The students learn how to avoid solvents and do solvent free reaction. h) Students are trained to different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction. i) Students are made aware of safety techniques and handling of chemicals. j) Students are made aware of carrying out different types of reactions and their workup methods. k) This practical course is designed to make student aware of green chemistry and role of green chemistry in pollution reduction.
5.	Msc-II (CHO-350) Organic Reaction Mechanism and Biogenesis	<ul style="list-style-type: none"> a) Students should able to understand free radicals' formation, stability and reactivity and should also be able to use the basic understanding in writing probable reaction mechanisms. b) Students should able to write MO diagram for various olefinic compounds and should able to predict the

		products, the stereochemistry as well as should able to understand the preferred reaction pathways.
Msc-II (CHO-351) Structure Determination of Organic Compounds by Spectroscopic Methods		<ul style="list-style-type: none"> a. understand how to interpret nuclear magnetic resonance spectrum. b. know how to solve problems based on H1 and C13 NMR c. know applications of mass spectroscopy in determination of structures. d. understand methods of solving combines problems on all spectroscopic techniques
Msc-II (CHO-352) Stereochemistry and Asymmetric Synthesis of Organic Compound		<ul style="list-style-type: none"> a. understand various ways of attack on electrophilic species by a nucleophile to predictenantioselective product. b. understand mechanisms in asymmetric reaction. c. visualise3D structure of molecules. d. develop interest in Asymmetric synthesis of naturally occurring essential compounds.
Msc-II CHO-353-A) Protection - De-protection, Chiron approach and Carbohydrate Chemistry		<ul style="list-style-type: none"> a. understand various Pericyclic and photochemical reactions and rearrangements. b. understand and write mechanism of reactions and their applications. c. understand how to synthesize five, six and seven-membered heterocycles. d. utilize their knowledge in practicals for various heterocyclic and photochemical conversions.
Msc-II CHO-354 Practical I: Solvent Free Organic Synthesis		<ul style="list-style-type: none"> a. understand different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction. b. get awareness of safety techniques and handling of chemicals. c. understand how to carry out different types of reactions and their workup methods. d. become aware of green chemistry and role of green chemistry in pollution reduction
Msc-II CHO-450 Chemistry of Natural Products		<ul style="list-style-type: none"> a. understand different Secondary metabolites and their importance. b. become familiar with many reagents used in organic synthesis. c. understand nature better by studying mechanisms in biological reactions. d. understand various laboratory methods to determine structure of unknown organic sample. e. develop interest in Biogenesis of naturally occurring essential compounds.
Msc-II CHO-451 Organometallic Reagents in Organic Synthesis		<ul style="list-style-type: none"> a. Industrial applications of organometallic compounds in organic reactions. b. Mechanisms of organometallic reactions. c. Stereochemistry of the organometallic reactions.
Msc-II CHO-452 B) Applied Organic Chemistry		<ul style="list-style-type: none"> a. understand the Principles of mass spectroscopy, gas chromatography and HPLC b. apply the techniques for structure determination of organic molecules. c. perform statistical analysis of chemical data by

		developing analytical mind
	Msc-II CHO-453 Ternary Mixture Separation	<ul style="list-style-type: none"> a. understand various Pericyclic and photochemical reactions and rearrangements. b. understand and write mechanism of reactions and their applications.
	Msc-II CHO-453: Carbohydrates Synthesis and Isolation of Natural Products	<ul style="list-style-type: none"> a. understand the stereochemistry of carbohydrates and their reactions. b. understand the concept of chiral templates and chiral drugs c. understand the synthesis of various drugs. d. understand the mode of action of different anti-fungal, anti-bacterial and anti-viral drugs.
	Msc-II CHO-454 PracticalConvergent and Divergent Organic Syntheses.	<ul style="list-style-type: none"> a. How to synthesize organic molecules. b. How to maintain reaction conditions. c. Arrangement of assembly. d. How to follow reaction by using thin layer chromatography e. -Methods of purification of samples.