

Rayat Shikshan Sanstha's
Arts, Science and Commerce College, Mokhada, Dist. Palghar
Department of Commerce
List of Programs and Courses

Sr. No.	Program Name	Course code	Course Name
1	F.Y.B.Sc. Sem-I	USCH101	Chemistry-I
2	F.Y.B.Sc. Sem-I	USCH102	Chemistry-II
3	F.Y.B.Sc. Sem-I	USCHP1	Chemistry Practicals
4	F.Y.B.Sc. Sem-II	USCH201	Chemistry-I
5	F.Y.B.Sc. Sem-II	USCH202	Chemistry-II
6	F.Y.B.Sc. Sem-II	USCHP2	Chemistry Practicals
7	S.Y.B.Sc. Sem-III	USCH301	Chemistry-I
8	S.Y.B.Sc. Sem-III	USCH302	Chemistry-II
9	S.Y.B.Sc. Sem-III	USCH303	Chemistry-III
10	S.Y.B.Sc. Sem-III	USCHP1	Chemistry Practicals I
11	S.Y.B.Sc. Sem-III	USCHP2	Chemistry Practicals II
12	S.Y.B.Sc. Sem-III	USCHP3	Chemistry Practicals III
13	S.Y.B.Sc. Sem-IV	USCH401	Chemistry-I
14	S.Y.B.Sc. Sem-IV	USCH402	Chemistry-II
15	S.Y.B.Sc. Sem-IV	USCH403	Chemistry-III
16	S.Y.B.Sc. Sem-IV	USCHP4	Chemistry Practicals I
17	S.Y.B.Sc. Sem-IV	USCHP5	Chemistry Practicals II
18	S.Y.B.Sc. Sem-IV	USCHP6	Chemistry Practicals III
19	T.Y.B.SC. CHEMISTRY Sem-V	USCH501	Physical Chemistry

20	T.Y.B.SC. CHEMISTRY Sem-V	USCH502	Inorganic Chemistry
21	T.Y.B.SC. CHEMISTRY Sem-V	USCH503	Organic Chemistry
22	T.Y.B.SC. CHEMISTRY Sem-V	USCH504	Analytical Chemistry
23	T.Y.B.SC. CHEMISTRY Sem-V	USCHP05	Physical & Inorganic Chemistry Practicals
24	T.Y.B.SC. CHEMISTRY Sem-V	USCHP06	Organic & Analytical Chemistry Practicals
25	T.Y.B.Sc. Sem-VI Chemistry	USCH601	Physical Chemistry
26	T.Y.B.Sc. Sem-VI Chemistry	USCH602	Inorganic Chemistry
27	T.Y.B.Sc. Sem-VI Chemistry	USCH603	Organic Chemistry
28	T.Y.B.Sc. Sem-VI Chemistry	USCH604	Analytical Chemistry
29	T.Y.B.Sc. Sem-VI Chemistry	USCHP07	Physical & Inorganic Chemistry Practicals
30	T.Y.B.Sc. Sem-VI Chemistry	USCHP08	Organic & Analytical Chemistry Practicals



Rayat Shikshan Sanstha's,
Arts, Science and Commerce College, Mokhada
Dist. Palghar Maharashtra 401604

Programme Name: B. Sc. Chemistry

Programme Outcomes

Sr. No.	Programme Outcome
1.	Improve the knowledge of students in chemical sciences.
2.	Create awareness of the students in environmental problems.
3.	Understanding the need of modern tools in chemical sciences.
4.	Awareness of the knowledge of instruments to students.
5.	Information regarding the market for chemical industry.
6.	Developing the practical skill of the students.
7.	Understanding the basic information of drugs and dyes.
8.	General introduction to Dyestuff Chemistry.
9.	Safety in laboratory.
10.	Introduction to quality concepts such as quality control, quality assurance and sampling.

Course Outcomes

Sem.	Course	Outcomes
I	USCH:101 Chemistry-I	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Knowledge about chemical thermodynamics, first law of thermodynamics, thermodynamic terms and chemical calculations based on expressing concentration of solutions. 2. Students Can understand the atomic structure, Rutherford atomic model, Bohr's theory, concept of principles of quantum mechanics, Periodical table and periodicity. 3. Students Can write the IUPAC names of any organic compounds from their structure and draw its structure from its IUPAC name. Bonding and structure of organic compounds, fundamentals of organic reaction mechanisms.
I	USCH:102 Chemistry-II	<p>On Successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Gain the knowledge of chemical kinetics, order and molecularity of reaction, integrated rate equation of first and second order reaction, Liquid state such as surface tension, viscosity, refractive index and liquid crystals. 2. Student comparatively studies the properties of main group elements such as electro negativity, oxidation state, diagonal relationship, allotropy, catenation property. 3. Can draw the Fischer, Newman, Sawhorse projection formulae, Cis-Trans, Syn-Anti, E/Z nomenclature. Introduction of optical isomerism and conformation analysis of alkanes.
I	USCHP1 Practical -I	<p>On Successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. They can determine the rate constant for the saponification reaction between ethyl acetate and NaOH. Determine the pH values of Buffer solutions. Plotting the calibration curve of KMnO₄ by colorimeter. Can write the Material Data Safety Sheet (MSDS). 2. Semi micro qualitative analysis of simple two acidic radicals and two basic radicals from mixture.
II	USCH:201	<p>On Successful completion of this course students will be able to:</p>

		<ol style="list-style-type: none"> 1. Students will be able to use the evidence-based comparative chemistry approach to explain chemical synthesis and analysis. 2. Students will be able to characterize, identify and separate components of organic or inorganic origin and will also be able to analyze them by making use of the modern instrumental methods learned. 3. Students will be able to understand the basic principle of equipment and instruments used in the chemistry laboratory.
II	USCH:202	<p>On Successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic chemistry knowledge and concepts. 2. Appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues, and key issues facing our society in terms of energy, health, and medicine. 3. Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through the use of advanced ICT techniques and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.
II	USCHP2 Practical- II	<p>On Successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. They can find out percentage of Cu (II) in sample by iodometry. 2. They can characterize the organic compound containing C, H, O, N, S and halogens elements.
III	USCH:301 General Chemistry-I	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. They can know the concept of chemical thermodynamics, Partial Molar Properties, Chemical Potential and its variation with Pressure and Temperature. 2. Can know the concept of electrochemistry, Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. 3. Can determine the transference number and its experimental determination using Moving boundary method.

		<ol style="list-style-type: none"> 4. Student can understand the chemical bonding, non-Directional and directional Bonding. 5. Can understand the role of Hybridization and types of hybrid orbital's-sp, sp², sp³, sp³d, sp²d²and sp²d sp³d². Molecular Orbital Theory: Linear combination of atomic orbital's (LCAOs) to give molecular orbitals. 6. They can able to draw the Molecular orbital diagram of O₂, O₂ + O₂⁻, O₂²⁻ etc. 7. Can study the reactions and reactivity of halogenated hydrocarbons such as Alkyl halides, Aryl halides: Reactivity of aryl halides towards nucleophilic substitution reactions. 8. They can be familiar with the concept of organo-magnesium and organo-lithium compounds and reactivity of carbon-metal bond. 9. Student can know the methods of preparation and reactions of alcohols, phenols and epoxies.
<p style="text-align: center;">III</p>	<p style="text-align: center;">USCH:302 General Chemistry-II</p>	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Student learned the basic concepts of Chemical Kinetics: Reversible or opposing, consecutive and parallel reactions. 2. They can study the effect of temperature on the rate of reaction, Arrhenius equation, Concept of energy of activation. 3. Students can familiarize with the theories of reaction rates i. e. collision theory and activated complex theory of bimolecular reactions. 4. Know the concept of Solutions: Ideal solutions and Raoult's law, deviations from Raoult's law-non-ideal solutions. Vapor pressure-composition and temperature - composition curves of ideal and non-ideal solutions. Distillation of solutions. 5. Student can study the partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids with respect to Phenol-Water, Triethanolamine Water and Nicotine-Water systems. 6. Students aware about the selected topics on p block elements i. e, Boron, Silicon, Germanium, Nitrogen family. 7. Student can study the chemistry of carbonyl compounds. 8. They can draw mechanism of Benzoin condensation, Knoevenagel condensation, Claisen Schmidt and Cannizzaro reaction Basics of Analytical Chemistry.

<p style="text-align: center;">III</p>	<p style="text-align: center;">USCH:303 General Chemistry-III</p>	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Learners should be able to decide how to identify a sample and prepare it for analysis. 2. Can select a proper procedure for analysis and identify sources of possible errors in the results obtained. 3. Student can able to select proper titrimetric method identify a suitable gravimetric method. 4. Learners can perform the required calculations involved in the analysis by titrimetric as well as gravimetric.
<p style="text-align: center;">III</p>	<p style="text-align: center;">USCHP3 Practical -III</p>	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Students can able to handle the analytical instruments such as conductometer, Potentiometer, Colorimeter, pH meter etc. 2. Can determine the energy of activation of acid catalyzed hydrolysis of methyl acetate. 3. Can investigate the reaction between $K_2S_2O_8$ and KI with equal initial concentrations of the reactants. 4. They can identify the captions in a given mixture and separating them by analytical method. 5. Check the quality of water sample estimation of its total hardness. 6. Can investigate the purity of organic substances and prepare the derivatives of organic compounds. 7. Can learn the estimation of drugs by titrimetric analysis.
<p style="text-align: center;">IV</p>	<p style="text-align: center;">USCH:401 General Chemistry-I</p>	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. They can know the concept of Electrochemistry and phase equilibria. 2. Can draw the phase diagrams of one-component systems. 2. Can learn the properties of Transition series elements. 3. They can understand the Chemistry of Titanium and vanadium. 4. They can familiarize with the Chemistry of Coordination Compounds. 5. Can apply the eighteen-electron rule to metal ions. 6. Student can know the reaction of carboxylic acids and their derivatives. 7. Learners can write the mechanism of Claisen condensation and Deckman condensation reaction.

<p style="text-align: center;">IV</p>	<p style="text-align: center;">USCH:402 General Chemistry-II</p>	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Learners can know the laws of crystallography and types of crystals and also learn characteristics of simple cubic, face centered cubic and body centered cubic systems. 2. They can derive the Bragg's equation and also determine the Avogadro's number. 3. Student understands the concept of Catalysis. 4. Student can learn the behavior of ions in aqueous medium. 5. Uses and Environmental Chemistry of volatile Oxides and oxo-acids. 6. Student can know the importance of heterocyclic compounds and their synthesis, reaction and applications.
<p style="text-align: center;">IV</p>	<p style="text-align: center;">USCH:403 General Chemistry-III</p>	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. The learner understands the importance of separation in sample treatment and various methods of separations. 2. They can learn how to select a method of separation of an analytic from the matrix 3. They know the principle of solvent extraction and effect of various parameters on solvent extraction of a solute. 4. Student can familiar with the various types of electrodes or half cells. 5. Learner understands the use of statistical methods in chemical analysis, Computation of Confidence limits and confidence interval. 6. Can know the method to draw best fitting straight line. 7. Test for rejection of doubtful result.
<p style="text-align: center;">IV</p>	<p style="text-align: center;">USCHP4 Practical-IV</p>	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Students can able to handle the analytical instruments such as conduct meter, Potentiometer, Colorimeter, pH meter etc. 2. Can compare the strengths of two strong acids by studying kinetics of acid hydrolysis of methyl acetate. 3. Thorough knowledge regarding inorganic preparations. 4. They learn about qualitative Analysis of bi-functional organic compounds. 5. They familiar with the tools in analytical chemistry. 6. They can make acquainted about paper chromatography and solvent extraction techniques.
<p style="text-align: center;">V</p>	<p style="text-align: center;">USCH:501 Physical Chemistry</p>	<p>On successful completion of this course students will be able to:</p>

		<ol style="list-style-type: none"> 1. Students became familiar with rotational and vibrational spectrum for diatomic molecules and concept of Raman Spectroscopy. 2. They can learn about colligative property, and their determination methods. They also understand the concept of collision theory, study of kinetics of fast reaction. 3. They can know the concept of radioactivity, detection and measurement of radioactivity using counters, applications of radioisotopes, nuclear reactions, construction and working of nuclear reactors. 4. Idea about surface chemistry and colloidal state.
V	USCH:502 Inorganic Chemistry	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Student can learn about molecular symmetry and chemical bonding. They also know the concept of point group. 2. Can understand crystal lattice, lattice point, unit cell and lattice constants. Further, understands defects in solids and concept of superconductors. 3. They can learn about various properties and applications of inner transition elements. 4. They can learn the classification and characteristics of non-aqueous solvents, comparative chemistry of Group-16 and 17.
V	USCH:503 Organic Chemistry	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Students can draw the mechanism of reaction, pericyclic reaction and photochemical reaction. 2. They know about stereochemistry of organic compounds, agrochemicals and heterocyclic chemistry. 3. They can write the IUPAC nomenclature of bicyclic and Spiro compounds. Further, they can learn about green chemistry. 4. Student can familiarize with the general introduction of spectroscopy and natural product. 5. This course will be useful to get an insight into spectroscopy.
V	USCH:504 Analytical Chemistry	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Students can understand the concept of quality control, quality assurance and sampling. 2. They can know the concept of Redox and Complexometric titrations.

		<ol style="list-style-type: none"> 3. Learners can familiarize with the instrumentation and application of analytical instruments such as AAS, Turbidimetry, Nephelometry etc. 4. They understand the separation methods such as solvent extraction, HPLC and HPTLC.
V	USCHP5: 501 & 502 & USCHP6: 503 & 504 (Practical's)	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> a) Physical Chemistry: Practical <ol style="list-style-type: none"> 1. Student can able to determine the molecular weight of compound by Rust method. 2. They can determine the order of reaction by fractional change method. 3. Learners can understand the adsorption of acetic acid on charcoal. 4. Students can able to handle the analytical instruments such as conduct meter, Potentiometer, pH meter etc. b) Inorganic Chemistry: Practical <ol style="list-style-type: none"> 1. Thorough knowledge regarding inorganic preparations. 2. They also able to determine the percentage purity of water-soluble salts. c) Organic Chemistry: Practical <ol style="list-style-type: none"> 1. Student can acquire experimental skill in the separation of organic binary mixture containing two solid components. 2. Develop the practical skill in the determination of melting point. d) Analytical chemistry: Practical <ol style="list-style-type: none"> 1. Students can able to handle the analytical instruments such as spectrophotometer, flame photometer, turbidimeter etc. 2. They can determine the Chemical Oxygen Demands (COD) of water sample.
V	Applied Component: Environmental Science and Pollution	<p>Learner shall comprehend the impact of the interrelationship between various components of environment.</p> <ul style="list-style-type: none"> • Learner will apply the knowledge of pollutants to undertake research projects/studies. 1.1Components of environment; biotic and abiotic. Composition of various segments of environment–atmosphere, hydrosphere, lithosphere, biosphere (with respect to composition and interrelationship).

		<p>1.2 Types of pollution</p> <p>1.2.1 Water pollution: Pesticides and heavy metals.</p> <p>1.2.2 Air pollution: Challenges posed by present day pollutants.</p> <p>1.2.3 Others- Noise and nuclear pollution.</p> <p>2.1 Solar energy, wind energy, tidal energy, nuclear energy.</p> <p>2.2 Biomass & bio-fuels, petro crops.</p> <p>2.3 Use of wastes: Water-based biomass, energy from waste & solid waste.</p> <p>Learner and facilitator both will develop conceptual clarity on pollution control and green environmental auditing, besides gaining knowledge about these programmes in the Indian scenario. Learner will develop an acumen to tap the potential for entrepreneurship with respect to environment related products and indoor plants. Learner will comprehend and develop better acumen so as to, take wise and necessary decisions while participating in environment related projects or framing policies/assessing environmental damages/carrying out entrepreneurial activities beneficial to environment.</p>
V	Practical's Course Code USACEVS5P1	<p>Estimation of Pollution: BOD & COD.</p> <p>Measurement of intensity of light by Lux meter</p> <p>Study of types of pollution: water, air, land.</p> <p>Study of applications of various Spectroscopy (any 4), Chromatography and Electrophoresis instruments.</p> <p>Study of product derived by application of green chemistry (Laundry detergents, Polylactic acid packaging, green paints, pharmaceutical drugs- Ibuprofen)</p>
VI	USCH:601 Physical Chemistry	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Student can understand the concept of electrochemical cells, classification of electrochemical cells, decomposition potential and overvoltage. 2. They can know the basic terms, classification, molar mass of polymer and its uses in light emitting polymers, antioxidants and stabilizers. 3. Student can understand the basic knowledge of quantum chemistry and renewable energy sources. 4. They learn the principles and instrumentations of NMR and ESR spectroscopy.
VI	USCH:602 Inorganic Chemistry	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. Student can understand the concept of Crystal Field Theory (CFT), splitting of d-orbital, calculation of CFSE and limitation of CFT. 2. They can learn the molecular orbital theory of coordination compounds, stability and reactivity of metal complexes. Introduction about electronic spectra.

		<ol style="list-style-type: none"> Students can know the characteristics, synthetic methods, chemical reactions of organometallic compounds. Further, introduction of concept of metallocene's and catalysis. They learn the types and general steps in metallurgy and chemistry of group 18. Also know the biological importance of metal ions (Na, K, Fe, Cu).
VI	USCH:603 Organic Chemistry	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> They can know the structure of amino acid and proteins. Student can learn about mechanism of various rearrangement reactions. Further, they also get the knowledge about carbohydrates. They can understand different types of spectroscopies and their applications to organic compounds. Moreover, they know the basic structure DNA/RNA. They get familiarize the classification and preparation of polymers, applications of catalyst and reagents.
VI	USCH:604 Analytical Chemistry	<p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> Student can understand the basic principles of Polarography, DC Polarogram, quantification, applications, advantages and limitations. Principle, advantages and limitations of amperometry titrations. They can learn the chromatographic techniques such as Gas and Ion exchange chromatography. Students acquire the knowledge about analysis of food products and detection of adulterants. Study of cosmetic products. Students can know the instrumentation, application of TGA, DTA. Thermometric titrations and analytical method validation.
VI	USCHP7 601 & 602 & USCHP8 603 & 604 (Practical's)	<p>On successful completion of this course students will be able to:</p> <p>a) Physical Chemistry: Practical</p> <ol style="list-style-type: none"> They acquired skill for handling instruments like potentiometer, conduct meter and colorimeter. Student can determine the molecular weight of polymer using viscometer. Can interpret the order of reaction graphically from given experimental data. <p>b) Inorganic Chemistry: Practical</p> <ol style="list-style-type: none"> Thorough knowledge regarding inorganic preparations.

		<p>2. They also able to determine the percentage purity of water-soluble salts.</p> <p>c) Organic Chemistry: Practical</p> <ol style="list-style-type: none"> 1. Student can acquire experimental skill in the separation of organic binary mixture containing two solid components. 2. Develop the practical skill in the determination of melting and boiling point. <p>d) Analytical Chemistry: Practical</p> <ol style="list-style-type: none"> 1. They acquired skill for handling instruments like Spectrophotometer, potentiometer and pH meter. 2. Analysis of commercial sample and Ion exchange separation. 3. They understand the principle of titrimetric analysis.
		Applied Components
	USACEVS601 Applied Component: Environmental Science and Pollution	<p>Learner will gain knowledge about environmental testing and monitoring laboratories, air, water quality.</p> <ul style="list-style-type: none"> • Learner will be exposed to the know-how regarding establishing environmental testing and monitoring laboratories. learner will study and comprehend the treatment practices applied for domestic waste water and industrial effluents. • Learner will be equipped with the knowledge of some alternatives to conventional resources. Learner will gain an insight into the basics of costing, book keeping and accountancy. • Learner will be equipped to apply the concepts in his entrepreneurial ventures. Learner will develop aptitude to examine and assess the outcome of the framework of current biodiversity hotspots and biosphere reserves. • Learner will be able to list the different aspects of wildlife photography and inspect the positive and negative aspects of it, also be able to recommend how wildlife photography can support biodiversity conservation. • Learner will be able to assess the future challenges that ecotourism can generate for biodiversity conservation. Learner will ponder upon and find out the what, why, where, whom and which of climate change and global warming.
VI	USACEVS6P1 Practical	<p>Study of physical properties of soil: Temperature, moisture, & texture of soil.</p> <p>Population analysis by Quadrant method & Line transect method.</p> <p>Study of air & noise pollution monitoring device, geospatial instrument. Problems on accounting/costing</p> <p>Study of biodegradable plastic products, bio pesticides brands.</p> <p>Learner will be able to identify and evaluate the effects of the different sources of greenhouse substances</p>