Program Outcomes for B.Sc Courses

1) **Chemistry**

Programme outcomes, program specific outcomes, and course outcomes offered:

Name of the programme/ course	Outcome
F. Y, S. Y, and T. Y. B. Sc.	Programme outcome 1. To infuse in the learner a spirit of inquiry into the fundamental aspects of the various core areas of Chemistry. 2. To make the learner proficient in analysing the various observations and chemical phenomena presented to him during the course. 3. To make the learner capable of solving problems in the various units of this course. 4. To give the learner an opportunity to get hands on experience of the various concepts and processes in the various branches of chemistry. 5. To impart various skills of handling chemicals, reagents, apparatus, instruments and the care and safety aspects involved in such handling. 6. To make the learner capable of analysing and interpreting results of the experiments he conducts or performs.
T. Y. B. Sc-Chemistry	Programme specific outcome ✓ **Paper I** • **Unit I** This unit will enable the students to learn various types of molecular spectroscopic methods like rotational, vibrational, Vibration-Rotational spectrum of diatomic molecule and Raman spectroscopy. • **Unit II** In this unit the students will learn various colligative properties like Vapour pressure and relative lowering of vapour pressure, Elevation in boiling point of a solution, Depression in freezing point of a solution, osmotic pressure and their thermodynamic aspects. The students will also learn Collision theory of reaction rates and its applications Unimolecular reaction Lindemann theory and Bimolecular reaction. ✓ **Unit III** This unit will enable the students to learn the basic terms in nuclear Chemistry like -radioactive constants (decay constant, half life and average life) and units of radioactivity, detection and measurement of radioactivity:

Applications of radioisotopes as tracers, nuclear reactions-Fission and Fusion.

- ✓ **Unit IV**

  The students will be made aware of various surface phenomena like Adsorption:-Physical and Chemical Adsorption, its postulates and thermodynamics.

  Learners will also be taught B.E.T. equation for multilayer adsorption for Determination of surface area of an adsorbent using this equation. Colloids and their electrical properties and surfactants.

- ✓ **Paper II**

- **Unit–I:** To enable the learner to recognize various symmetry elements and symmetry operations in a molecule. To understand the relationship between group theory and molecular symmetry. To study the application of MOT for heteronuclear diatomic molecules like CO, NO, HCl as well as in polyatomic species like BeH_2, H_2O and H_3^+.

- **Unit II-** To understand the structure of solids in terms different packing (SC, BCC,HCP, FCC) in crystal lattices and calculation of packing density for these crystals. To know the stoichiometric point defects in solids. To provide basic knowledge of superconductivity, different types of superconductors and applications.

- **Unit III -** learner will come to know chemistry of lanthanides actinides: electronic configuration oxidation states magnetic properties occurrence, extraction, separationand applications of lanthanides.

- **Unit IV-** To make learnerfamiliar with the basic knowledge of the non-aqueous solutions, their classification and applications of *non-aqueous such as liquid ammonia and dinitrogentetraoxide.*To understand the trends in properties and reactivity of the *group 16* elements and *group 17* elements.

- ✓ **Paper III**

- **Unit I**

  This unit will enable the students to learn the basic terminologies like bond fission, reaction intermediates, electrophiles & nucleophiles, ligand, base, electrophilicity vs. acidity & nucleophilicity vs basicity used in Reaction mechanism. They will also lean Neighbouring group participation in nucleophilic substitution reactions, participation of lone pair of electrons, kinetics and its stereochemical outcome, Acyl nucleophilic substitution (Tetrahedral mechanism), Acid catalysed esterification of carboxylic acids and base promoted hydrolysis of esters.

  Students will also learn the basics of Pericyclic reactions, classification and nomenclature and its types like Electrocyclic reactions, cycloaddition, sigma tropic rearrangement, group transfer reactions, cheletropic reaction,

Pyrolytic elimination.The students will also learn the different aspects of Photochemical reactions.

- **Unit II**
  The learner can understand various aspects of Stereochemistry. Molecular chirality and elements of symmetry: Mirror plane symmetry, inversion center, rotation -reflection (alternating) axis.
  Chirality of compounds without a stereogenic center: cummulenes and biphenyls.

- **Unit III**
  o Students will understand different aspects of IUPAC nomenclature of organic compounds and able to draw structures
  o Students will be able to explain organic synthesis,natural products.
  o Students will be able to explain fundamental concept of organic reaction mechanism and electronic effects.

- ✓ **Unit IV**
  The students will learn the various types of organic spectroscopy particularly Electronic and Mass spectrometry.Basic concepts of chromophore, auxochrome, bathochromic and hypsochromic shifts, hyperchromic and hypochromic effects, chromophore-chromophore and chromophore-auxochrome interactions will be made clear to students. In addition mass spectrometric fragmentation of alkanes and carbonyl compounds will be made clear to students.

- ✓ **Paper IV**
- **Unit I** –Students will be able to calculate concentration using different units and conversion between different concentration units.

- **Unit II**
  In this unit the students will learn the various methods of titrimetric analysis like Redox Titrations with numerical. Construction of the titration curves and calculation of Esystem in aqueous medium in case of: (1) One electron system (2) Multielectron system. Complexometric Titrations like use of EDTA as titrant and its standardisation, absolute and conditional formation constants of metal EDTA complexes, Selectivity of EDTA as a titrant.

- **Unit III**
  The students will learn various types of spectroscopy like Atomic Spectroscopy, Flame Emission spectroscopy and Atomic Absorption Spectroscopy.

- **Unit IV**-Students will understand Principal and some technical knowledge of GC and HPTLC.Students will be able to evaluate strength, applications and limitations of important chromatographic technique.

- ✓ **Paper V**

	- **Unit I& II** Pharmaceutical Chemistry Students will understand different medicinal terms and chemical class with examples of analgesics,antipyretics,anti-inflammatory,antidiabetic,cardiovascular drugs etc. - **Unit III –** The student will acquire knowledge on characteristic properties of dyes, naming of dyes, natural dyes, synthetic dyes, types of substrate-natural, synthetic, semi-synthetic fibres, binding forces of dyes on substrates, basic operations involved in dyeing process and Optical brighteners. - ✓ **Unit IV –** The student understands relation between colour and chemical constitution in terms of Armstrong theory, Witts theory, VBT, MOT, Unit processes involved and preparation of Benzene, Naphthalene and Anthraquinone derivatives.
S. Y. B. Sc-Chemistry	✓ **Paper I** - **Unit I** The students will be able to understand basic thermodynamic functions like Free Energy, Helmholtz Free Energy, Gibb's Free Energy, Variation of Gibb's free energy with Pressure and Temperature, Gibbs-Helmholtz equation, van't Hoff reaction isotherm and van't Hoff reaction isochore and their thermodynamic aspects. Electrochemistry in solution phase, Conductivity, equivalent and molar conductivity, Kohlrausch law. The styudents will also be able to determine ionization constant of weak electrolyte, solubility and solubility product of sparingly soluble salts using conductance measurement. - **Unit II** - Student learns different types of hybrid orbitals and structures of molecules, wave mechanical treatment for H_2 molecule on the basis of MOT involving Schrodinger wave equation. - **Unit III** - o Students will understand different aspects of IUPAC nomenclature of organic compounds. - o Students will be able to explain fundamental concept of organic reaction mechanism and preparations and reactions of alkyl halide,alcohols,phenols,organometallics and epoxides. - ✓ **Paper II** - **Unit I** The students willunderstand Arrhenius equation, Concept of energy of activation.Theories of reaction rates: Collision theory and activated complex theory of bimolecular reactions. Comparison between the two theories. Effect of temperature on the rate of reaction. Thermodynamics of ideal solutions and Raoult's law, deviations from Raoult's law.

- **Unit II**
- Learner will understand the Chemistry of Boron compounds, Silicon and Germanium and chemistry of Nitrogen family.
- Unit III-
  - To recognize and assign names to aldehydes and ketones.
  - To write the mechanism for nucleophilic addition and nucleophilic addition-elimination reactions of aldehydes and ketones, and be able to predict the products of such reactions.
  - Be able to explain the relative reactivity of carbonyl compounds toward nucleophilic addition.
  - The students will get familiar with particular properties and reactions for the most important nitrogen containing compound, heterocyclic compound as well as different systems of nomenclature.
  - The students will develop fundamental theoretical understanding of nitrogen containing compound and heterocyclic compound.
- ✓ **Paper III**
- **Unit I**
  Learners should be able to
- Select a method of analysis.
- Decide how to identify a sample and prepare it for analysis.
- Select a procedure for analysis 4. Identify sources of possible errors in the results obtained.
- **Unit II**
  - Learner will come to know terms involved inTitrimetic Analysis
  - Their types calibration of tools primary standard and secondary standard
  - Types and applications of gravimetric method
- **Unit III**
  - On completing the learning of this unit the learner is expected to know.
  - The various instrumental methods of analysis.
  - Advantages of using instruments to make measurements.
  - The various observable properties of a given analyte and the stimulus best suited for its.
  - Analysis. Know about a generalized diagram of an analytical instrument.
  - Select a suitable instrumental method for analysis.
  - Appreciate the basic terms in spectrometry.
  - Use the relationship between absorbance (and its variations) and concentration of the analyte.
  - Chose suitable method for photometric titrations.

F. Y. B. Sc-Chemistry	✓ **Paper I** • **Unit I** Learner should be able to ○ Know the physical chemical properties reaction of binary compounds comparative trends applications of main group elements. ○ Know natural and anthropogenic sources of air pollutants. ○ Know the effects of air pollutants on human health, vegetation and nonliving materials. ○ Take precautionary measures and find solutions knowing the impact of the air pollutants on the environment. **Unit II** Learner should be able to ○ Comprehend the periodic table by knowing arrangement of elements in 18 groups and 7 periods. ○ Understand the periodic trends in Atomic and ionic size; electron gain enthalpy and ionization enthalpy,. ○ Calculate the effective nuclear charge for any electron in any atom or ion as well as for incoming extra electron. ○ Find the electronegativity values by Pauling, Mulliken and AlredRochowelectronegativities if provided the requisite data. ○ Know and use various key terms. ○ Appreciate the Historical perspectives of atomic structure. ○ The learner will come to know that (a).The atomic mass is concentrated in the atomic nucleus while there are empty spaces in the atom. (b). The electron has a spin which can take clockwise and anticlockwise motions. (c). Electrons do not exist in nucleus while protons and neutrons can. (d). Radial distribution curves for orbitals. (e). Orbitals are of different shapes and have different orientations in space. (f). Electrons occupy the orbitals depending upon the energy of orbitals. (g). Preferential occupation of orbitals particularly w.r t. 4s and 3d orbitals. (h).Various quantum numbers which can define a particular orbital. (i). various spectral series in the case of hydrogen. (j). Bohr's model is not applicable to hydrogen atom only but also to other hydogenic species. • **Unit III** ○ Students will understand different aspects of IUPAC nomenclature of organic compoundsand able to draw structures

- o Students will be able to explain concept of hybridization and predict the shapes organic molecules.
- o Students will be able to explain fundamental concept of organicreaction mechanism and electronic effects.
- ✓ **Paper II**
- • **Unit**
- o The learner will be able to measure of reaction rates, differentiate between order and molecularity of reaction, can derive integrated rate equation of first and second order reactions.
- o The student will also learn to determineSurface tension by drop numbermethod.
- o Viscosityby Ostwald viscometer.
- o Refractive indexby Abbe's refractometer.
- • **Unit II**

  The students will be able the comparative chemistry of main group elements in respect of Metallic and non-metallic nature, oxidation states, electronegativity, anomalousbehaviour of second period elements, allotropy, catenation, diagonal relationship.
- • **Unit III**
  - o To distinguish and draw different molecular projections.
  - o To recognize difference between configuration and conformation.
  - o To distinguish among different form of stereoisomerism.
  - o To identify optically active and inactive compounds.
  - o To assign stereo descriptors.
  - o To describe, and sketch the conformations of cyclohexane.
  - o To analyse the stability of cyclohexane in terms of angular strain, torsional strain and steric interactions.
  - o To recognize and distinguish between aromatic and ant-aromatic compounds by their structures.
  - o To know the properties of aromatic and anti-aromatic compounds, and the chemical consequences of aromaticity.
  - o To recognize and be able to write the mechanism of electrophilic aromatic substitution.
  - o To be able to outline the completed electrophilic aromatic substitution reactions of the following types: halogenation, nitration, sulfonation, and Friedel-Crafts acylation & alkylation.

2) Physics

Programme outcomes, program specific outcomes, and course outcomes offered:

Name of the programme/course		Outcome
T. Y. B. Sc. SEM - VI	USPH601: Classical Mechanics	The students are expected to learn: • Various kinds of motions that can occur under a central potential and their applications to planetary orbits. • Moving coordinate system, rectilinear as well as rotating. • The concepts needed for the formalism of Lagrange's equations and derive the equations using D'Alembert's principle and solving examples using this formalism. • Fluid mechanics and the dynamics of rigid bodies. • Nonlinear mechanics.
	USPH602: Electronics	The students are expected to learn: • The basics of semiconductor devices and their applications. • The basic concepts of operational amplifier: its prototype and applications as instrumentation amplifier, active filters, comparators and waveform generation. • The basic concepts of timing pulse generation and regulated power supplies • The basic electronic circuits for universal logic building blocks and basic concepts of digital communication. • Develop quantitative problem solving skills in all the topics covered.
	USPH603: Nuclear Physics	The students are expected to learn: • The fundamental principles and concepts governing classical nuclear and particle physics. • To get knowledge of their applications, interactions of ionizing radiation with matter. • The key techniques for particle accelerators, the physical processes involved in nuclear power generation.

		• To get the knowledge on elementary particles will help students to understand the fundamental constituents of matter and lay foundation for the understanding of unsolved questions about dark matter, antimatter and other research oriented topics.
	USPH604: Special Theory of Relativity	The students are expected to learn: • The significance of Michelson Morley Expt. • The importance of Postulates of STR, Lorentz transformations. Common sense vs. Einstein's concepts of space & time. • To develop the concepts of transformation of physical quantities like mass, momentum, force, energy, current density, magnetic field etc. • to solve problems based on length contraction, time dilation, resolve paradoxes in relativity etc.
	USPHP07: Practicals of Course USPH601 + Course USPH602 and USPHP08: Practicals of Course USPH603 + Course USPH604	The students are expected to learn: • The relevant concepts. • Designing of the experiments. • Handling and operating a number of equipments. • Recording of observations, analysing the data obtained, including plotting of graphs and finding results. • The estimation of possible errors in the measurements.
	USACEI601: Digital Electronics, Microprocessor and its applications, Programming in C++	The students are expected to learn: • Analyze / design and implement combinational logic circuits. • Develop assembly language programing skills and real time applications of microprocessor. • Illustrate how to interface the I/O peripheral (PPI) with 8085 microprocessor • Architecture, silent features, instruction set, programming and interfacing of 8051 microcontroller. • Develop the programming skills in

		programming Language C++.
	USACEI6P1: Practical of Digital Electronics, Microprocessor and its applications, Programming in C++	The students are expected to learn: • Digital electronics circuits. • Learn execution of 8085 programming and 8255 interfacing on programming kit. • Gets familiar with C++ programming. • Get practical training to interface different programmable peripherals and I/O devices to microprocessor and microcontroller.
T. Y. B. Sc. SEM - V	USPH501: Mathematical Methods in Physics	The students are expected to learn: • Some mathematical techniques required to understand the physical phenomena and get exposure to important ideas of statistical mechanics. • Ability to solve problems in probability. • The concept of independent events and work with standard continuous distributions. • The functions of complex variables and solving nonhomogeneous differential equations and partial differential equations. • The concept of microstates, Boltzmann distribution and statistical origins of entropy. • Various concepts of Statistical Mechanics.
	USPH502: Solid State Physics	The students are expected to learn: • The basics of crystallography, Electrical properties of metals, Band theory of solids, demarcation among the types of materials, Semiconductor Physics and Superconductivity, Fermi Probability distribution function, Density of states, Conduction in Semiconductors and BCS Theory of Superconductivity. • To demonstrate quantitative problem solving skills in all the topics covered.
	USPH503: Atomic Physics	The students are expected to learn: • Application of quantum mechanics in

		Atomic Physics.
		• The importance of electron Spin, symmetric & anti symmetric wave functions & vector atom model.
		• The effect of magnetic field on atoms & its application.
		• The Molecular Physics & Its Applications.
	USPH504: Electrodynamics	The students are expected to learn:
		• The laws of electrodynamics and be able to perform calculations using them.
		• The Maxwell's electrodynamics and its relation to relativity
		• How optical laws can be derived from electromagnetic principles.
		• to develop quantitative problem solving skills.
	USPHP05: Practicals of Course USPH501 + Course USPH502 And USPHP06: Practicals of Course USPH503 + Course USPH504	The students are expected to learn:
		• The relevant concepts.
		• Designing of the experiments.
		• Handling and operating a number of equipments.
		• Recording of observations, analysing the data obtained, including plotting of graphs and finding results.
		• The estimation of possible errors in the measurements.
	USACEI501: Analog Circuits, Instruments and Consumer Appliances	The students are expected to learn:
		• The construction, working and uses of different types of transducers and Sensors
		• The concept of signal conditioning, devices used and their operations.
		• Get the insight of the modern medical instruments in principle, which are used in day to day life.
	USACEI5P1: Practical of Analog Circuits, Instruments and Consumer Appliances.	The students are expected to learn:
		• The use of electronic equipments.
		• To get acquainted with the measuring instruments used in laboratory.
		• The concept of D/A and A/D conversion, positive/negative clipper circuit, second order high/low pass filter and square and triangular wave

			generation using OPAMP. • Student can also learn variable dual power supply, making of PCB and different hands-on experiments.
S. Y. B. Sc. SEM - IV	USPH401: Optics and Digital Electronics		The students are expected to learn: • The diffraction, interference and polarization processes and their applications. • Working of interferometers and other optical instruments. • Working of digital circuits and ICs. • To develop quantitative problem solving skills in all the topics covered.
	USPH402: Quantum Mechanics		The students are expected to learn: • The postulates of quantum mechanics and to understand its importance in explaining significant phenomena in Physics. • To develop quantitative problem solving skills in all the topics covered.
	USPH403: Applied Physics-II		The students are expected to learn: • The architecture, salient features, instruction set, and assembly language programming. • Different types of radiations, their effects and radiation detectors. • The advantages and disadvantages of digital electronics in communication system. • Different types of noises and modulation in digital/analog electronics. • Properties of matter and applications of geology. • The microprocessor technology and programming.
	USPHP4: Practical course - 4 (Group A,B,C and Demo)		The students are expected to learn: • The relevant concepts. • Designing of the experiments. • Handling and operating a number of equipments. • Recording of observations, analysing the data obtained, including plotting of graphs and finding results. • The estimation of possible errors in the

		measurements.
S. Y. B. Sc. SEM - III	USPH301: Mechanics and thermodynamics	The students are expected to learn: • The concepts of mechanics & properties of matter. • The basic concepts of thermodynamics & its applications. • Low temperature Physics and its applications. • Concept and working of various types of engines.
	USPH302: Vector calculus, Analog Electronics	The students are expected to learn: • The basics of transistor biasing, operational amplifiers, their applications, oscillators etc. • Numerical problem solving skills. • The basic concepts of mathematical physics and their applications. • Basic laws of electrodynamics.
	USPH303: Applied Physics - I	The students are expected to learn: • The role of Physics in 'interdisciplinary areas related to materials, Bio Physics, Acoustics etc. • The scope of the subject in Industry & Research. • Experimental learning opportunities.
	USPHP3: Practical course - 3 (Group A,B,C and Skill)	The students are expected to learn: • The relevant concepts. • Designing of the experiments. • Handling and operating a number of equipments. • Recording of observations, analysing the data obtained, including plotting of graphs and finding results. • The estimation of possible errors in the measurements.
F. Y. B. Sc. SEM - II	USPH201: Mathematical Physics	The students are expected to learn: • Basic mathematical concepts and applications. • Quantitative problem solving skills in all the topics covered.
	USPH202: Electricity and Electronics	The students are expected to learn: • Network theorems and their applications. • The concepts of DC circuits, AC Circuits, AC Bridges, rectifiers etc and

		their application.
		• The concepts of Digital electronics and its application.
		• Basic concepts of Electrostatics, Magnetostatics and their applications.
	USPHP2: Practical II	The students are expected to learn:
		• The relevant concepts.
		• Designing of the experiments.
		• Handling and operating a number of equipments.
		• Recording of observations, analysing the data obtained, including plotting of graphs and finding results.
		• The estimation of possible errors in the measurements.
F. Y. B. Sc. SEM - I	USPH101: Classical Physics	The students are expected to learn:
		• Newton's laws, various types of forces, concepts of friction and the concepts of elasticity, fluid mechanics.
		• Equivalent Focal length of lenses, aberrations, interference.
		• Behaviour of real gases, thermodynamic systems and laws thermodynamics.
	USPH102: Modern Physics	The students are expected to learn:
		• Radioactivity, carbon dating, structure of nuclei, type isotopes and their applications.
		• Types nuclear detectors, counters and nuclear reactions.
		• Quantum mechanical concepts, X-rays and Compton Effect etc.
	USPHP1: Practical I	The students are expected to learn:
		• The relevant concepts.
		• Designing of the experiments.
		• Handling and operating a number of equipments.
		• Recording of observations, analysing the data obtained, including plotting of graphs and finding results.
		• The estimation of possible errors in the measurements.

3) Zoology

Programme outcomes, program specific outcomes, and course outcomes offered:

Name of the programme/course	Outcome
F.Y.B.Sc. Sem I Course I USZO101	✓ Curiosity will be ignited in the mind of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology. ✓ Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation. ✓ Minds of learners would be impulsed to think differently and would be encouraged ipso facto to their original crude ideas from the field of biological sciences.
F.Y.B.Sc. Sem I Course II USZO102	✓ Learners would work safely in the laboratory and avoid occurrence of accidents (mishaps) which will boost their scholastic performance and economy in use of materials/chemicals during practical sessions. ✓ Learners would understand recent advances in the subject and their applications for the betterment of mankind; and that the young minds would be tuned to think out of the box. ✓ Students will be skilled to select and operate suitable instruments for the studies of different components of Zoology of this course and also of higher classes including research.
F.Y.B.Sc. Sem II Course III USZO201	✓ This unit would allow learners to study about nature of animal population, specific factors affecting its growth and its impact on the population of other life form. ✓ Learners will grasp the concept of interdependence and interaction of physical, chemical and biological factors in the environment and will lead to better understanding about implications of loss of fauna specifically on human being, erupting spur of desire for conservation of all flora and fauna. ✓ Learners would be inspired to choose career options in the field of wild life conservation, research, photography and ecotourism.

F.Y.B.Sc. Sem II Course IV USZO202	✓ Healthy dietary habits would be inculcated in the life style of learners in order to prevent risk of developing health hazards in younger generation due to faulty eating habits. ✓ Promoting optimum conservation of water, encouragement for maintaining adequate personal hygiene, optimum use of electronic gadgets, avoiding addiction, thus facilitating achievement of the goal of healthy young India in true sense. ✓ Learners will be able to promptly recognize stress related problems at initial stages and would be able to adopt relevant solutions which would lead to psychologically strong mind set promoting positive attitude important for academics and would be able to acquire knowledge of cause, symptoms and precautions of infectious diseases.
S.Y.B.Sc. Sem III Course V USZO301	✓ Learner would comprehend and apply the principles of inheritance to study heredity. Learner will understand the concept of multiple alleles, linkage andcrossing over. ✓ Learner will comprehend the structure of chromosomes and its types. Learner will understand the mechanisms of sex determination. Learner would be able to correlate the disorders linked to aparticular sex chromosome. ✓ Learner will understand the importance of nucleic acids as genetic material. Learner would comprehend and appreciate the regulation of geneexpressions.
S.Y.B.Sc. Sem III Course VI USZO302	✓ Learner would understand the increasing complexity of nutritional, excretory and osmoregulatory physiology in evolutionary hierarchy. Learner would be able to correlate the habit and habitat withnutritional, excretory and osmoregulatory structures. ✓ Learner would understand the increasing complexity of respiratory and circulatory physiology in evolutionary hierarchy. Learner will be able to correlate the habit and habitat of animalswith respiratory and circulatory organs. ✓ Learner would understand the process of control and coordination by nervous and endocrine regulation. ☐

	Learner would be amazed by various locomotory structures found in the animal kingdom. Learner would be acquainted with various reproductive strategiespresent in animals.
S.Y.B.Sc. Sem III Course VII USZO303	✓ Learner would gain insight into different types of animal behaviour and their role in biological adaptations. Learner would be sensitized to the feelings which areinstrumental in social behaviour. ✓ Learner would understand the general epidemiological aspects of parasites that affect humans and take simple preventive measures for the same. Learner would comprehend the life cycle of specificparasites, the symptoms of the disease and its treatment. ✓ Learner would gain knowledge on animals useful to mankind and the means to make the most of it. Learner would learn the modern techniques in animal husbandry. Learner would pursue entrepreneurship as a career.
S.Y.B.Sc. Sem IV Course VIII USZO401	✓ Learner will gain insights into the origin of life. ☐ Learner will analyse and critically view the different theories ofevolution. ✓ Learner would understand the forces that cause evolutionary changes in natural populations. Learner would comprehend the mechanisms of speciation ☐ Learner will be able to distinguish between microevolution,macroevolution and megaevolution. ✓ The learner would develop qualities such as critical thinking and analysis. The learner will imbibe the skills of scientific communication andhe/she will understand the ethical aspects of research.
S.Y.B.Sc. Sem IV Course IX USZO402	✓ Learner would acquire insight into the composition of the transport mechanisms adopted by the cell and its organelles for itsmaintenance and composition of cell. ✓ Learner would appreciate the intricacy of endomembrane system. Learner would understand the interlinking of endomembranesystem for functioning of cell. ✓ The learner will realize the importance of biomolecules and theirclinical significance.
S.Y.B.Sc. Sem IV Course X	✓ Learner will be able to understand and compare the

USZO403	different types of eggs and sperms. Learner will be able to understand and compare the differentpre-embryonic stages.
	✓ Learners will able to understand human reproductivePhysiology. Learners will become familiar with advances in ART andrelated ethical issues.
	✓ The learners will be sensitized about the adverse effects ofpollution and measures to control it.
T.Y.B.Sc. Sem V Course XI USZO501	✓ Learners will apprehend the basis of classification and modern classification up to class of the lower invertebrate animals.
	✓ The learners will be familiarized with classification up to phylum Nematoda along with their examples.
	✓ Learners will get an idea of higher groups of invertebrate animal life, their classification and their peculiar aspects.
	✓ Learners will get an idea of general characteristics and details of invertebrate animal systems.
T.Y.B.Sc. Sem V Course XII USZO502	✓ The learner shall comprehend basic haematology. The learner will be able to identify various components of haemostatic systems.
	✓ The learner will be familiar with the terminology used and diagnostic tests performed in a pathological laboratory. The learner shall be acquainted with diagnostic approaches in haematological disorders. The learner will be better equipped for further pathological course or working in a diagnostic laboratory.
	✓ The learner shall comprehend the types of immunity and the components of immune system. The learner will realize the significant role of immune system in giving resistance against diseases.
	✓ The learner shall understand immunopathology and the principles and applications of vaccines. The learner will develop basic understanding of immunology of organ transplantation.
T.Y.B.Sc. Sem V Course XIII USZO503	✓ Learner would appreciate the well planned organization of tissues and cells in the organ systems.
	✓ The course will prepare learner to develop broad understanding of the different areas of toxicology. It

	will also develop critical thinking and assist students in preparation for employment in pharmaceutical industry and related areas.
	✓ Learner will be familiar with various medical terminology pertaining to pathological condition of the body caused due to diseases.
	✓ The learner will be able to collect, organize and analyse data using parametric and non- parametric tests. They will also be able to set up a hypothesis and verify the same using limits of significance.
T.Y.B.Sc. Sem V Course XIV USZO504	✓ Learner will be able to understand the importance of various types of epidermal and dermal derivatives along with their functions.
	✓ Learner will be able to understand the structure, types and functions of human skeleton.
	✓ To study long limb muscles involved in body movements. To identify various arrangements of the long limb muscles and to relate the arrangement with contraction and motion. To study muscle injuries and syndromes.
	✓ Learner will be able to understand the processes involved in embryonic development and practical applications of studying the chick embryology.
T.Y.B.Sc. Sem V Course USACFBIO501	✓ Learner shall understand and learn about the use of sea safety, navigational equipments and oceanographic instruments. Learner shall understand basic physical, chemical and biological oceanography.
	✓ Learner shall comprehend boat building techniques and design of engines used in mechanized boats. Learner shall understand the operations of various types of nets and fishing method.
	✓ Learner shall understand breeding techniques, hatchery and management of fin-fish and shell fishes. Learner shall understand the rearing techniques.
	✓ Learner will be oriented towards understanding the various stages of quality control. Learner will gain knowledge about the postmortem changes, spoilage mechanisms and methods involved in evaluating the freshness and quality of fishes and prawns / shrimps. Learner shall comprehend the value of maintaining and taking sanitary precautions during the processing

	and packaging operations
T.Y.B.Sc. Sem VI Course XV USZO601	✓ Learners will get an idea of origin of Chordates, its taxonomy up to class with reference to phylogeny and their special features. ✓ Learners will understand the characteristic features and examples of class of Reptilia, Aves and Mammalia. ✓ Learners will get an idea of vertebrate animal life after studying one representative animal- shark.
T.Y.B.Sc. Sem VI Course XVI USZO602	✓ The learner shall understand fundamentals of enzyme structure, action and kinetics. The learner shall appreciate the enzyme assay procedures and the therapeutic applications of enzymes. ✓ The learner shall comprehend the adaptive responses of animals to environmental changes for their survival. ✓ The learner shall understand the types and secretions of endocrine glands and their functions. ✓ The learner shall understand the significance of tissue culture as a tool in specialized areas of research. The learner will appreciate its applications in various industries.
T.Y.B.Sc. Sem VI Course XVII USZO603	✓ Learner shall get an insight into the intricacies of chemical and molecular processes that affect genetic material. The course shall prepare learner to recognize the significance of molecular biology as a basis for the study of other areas of biology and biochemistry. Learner shall also understand related areas in relatively new fields of genetic engineering and biotechnology. ✓ The learner shall get acquainted with the vast array of techniques used to manipulate genes which can be applied in numerous fields like medicine, research, etc. for human benefit. ✓ The learner shall become aware of the impact of changes occurring at gene level on human health and its diagnosis. ✓ To introduce learner to bioinformatics - a computational approach to learning the structure and organization of genomes, phylogeny and metabolism.

T.Y.B.Sc. Sem VI Course XVIII USZO604	✓ Learner will understand the different factors affecting environment, its impact and environment management laws. ✓ Learner will be able to understand various methods for wildlife conservation. Learner will be able to apply knowledge to overcome the issues related to wildlife conservation and management. ✓ Learner will understand the paradigms of discovery and commercialization of biological resources and knowledge gained from self-medication observed in animals. ✓ The learners will become acquainted with how and why different animal species are distributed around the globe.
T.Y.B.Sc. Sem VI Course USACFBIO601	✓ Learner will be oriented towards understanding causes, pathogenicity, prophylaxis and preventive measures of various fish diseases and physiological disorders. ✓ Learners will acquire the knowledge and would put in to practice the preservation and processing techniques for commercial ventures. ✓ Learner will gain sound knowledge about the fish by-products and value-added products. ✓ Learner will explore good manufacturing practices while manufacturing these products.

4) Mathematics

Name of the programme/course	Outcome
B.Sc.	**At the graduation in science faculty a student should have** • Acquired the knowledge with facts and figures related to various subjects in pure sciences such as Physics, Chemistry, Botany, Zoology, Mathematics, etc. • Analyzed the given scientific data critically and systematically and the ability to draw the objective conclusions. • Developed flair by participating in various social and cultural activities voluntarily, in order to spread knowledge, creating awareness about the social evils, blind faith, etc. • Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments • Been able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems.
program specific outcomes **(B.Sc. Mathematics)**	**At the completion of B. Sc. in Mathematics students are able to:** • Learn to solve improper differential equations. • Make use of linear equations for solving any differential equations • Understand the Concepts of Matrices and linear equations. • Learn properties of Linear Transformation. • Understand the Concepts of sequence and series and their convergence/divergence. • Formulate and solve LPP.
COURSE OUTCOMES: At the completion of the course the successful students will be able to: F.Y.B.Sc. Semester I
CALCULUS I	• Understand the concept of real numbers, AM_GM inequalities, lub and glb • Learn properties of sequence like convergence, divergence and subsequence. • Find limit and continuity of real valued function
ALGEBRA I	• Understand the concept of integers, congruence relation • Learn about the concept of equivalence relation • Solve problems on polynomials
F.Y.B.Sc.(CBCS) Semester II

CALCULUS II	- Learn properties of series and check convergence of series using Cauchy criterion - Learn about limit and continuity of real valued function their bounds - Use derivative to find maxima and minima of functions
ALGEBRA II	- Learn about the system of equation and matrices - Understand the concept vector space, subspace and related terms like linearly dependent, linearly independent. - Understand the idea of basis and linear transformation
S.Y.B.Sc. Semester III	
CALCULUS III	- Learn the concept of calculus of several variables i.e. function having domain R^n - Calculate the total derivative, higher order partial derivatives and Gradient of the functions. - Find maxima and minima of functions of two variables.
ALGEBRA III	- Find rank of the matrices, understand the concept of linear transformations and related terms like row space, column space, rank, nullity. - Use determinant as a tool to solve system of equations, find area and volume using determinants. - Learn about inner product spaces, orthogonal/ orthonormal bases.
DISCRETE MATHEMATICS	- Find the permutations and formulate and solve the recurrence relations - Learn about the preliminary counting. - Learn about the advanced counting.
S.Y.B.Sc. Semester IV	
CALCULUS IV	- Evaluate the Riemann Integrations of the functions - Use different techniques to solve improper integrals - Learn about Beta and Gamma functions and use integrations to find area and volumes
ALGEBRA IV	- Decide whether a given set forms group under given operation and some group related properties. - Learn about cyclic group and their properties - Understand about the cosets of group and Homomorphism and isomorphism.
ORDINARY	Solve first order first degree differential equations

DIFFERENTIAL EQUATIONS	• Solve second order linear differential equations • Solve system of homogenous linear differential equations
T.Y.B.Sc. Semester V	
Multivariable Calculus II	• Calculate volume and area of given object. • Understand the concept of complex integration. • Relate between single, double and triple integration.
Linear Algebra	• Apply mathematical methods involving arithmetic, algebra, geometry and graph to solve the problem. • Represent mathematical information and communicate mathematical reasoning symbolically and verbally. • Interpret and analyze numeric data, mathematical concepts and identify patterns to formulate and validate reasoning.
Topology of Metric Spaces	• Calculate distance between two numbers, sets and functions and check whether sets are open or close • Learn about completeness property of metric space and use nested interval theorem • Learn about relationship of functions with compactness and fixed point theorem
Numerical Analysis I	• Know basics of error and approximate solution. • Solve algebraic and transcendental equations and system of equations. • Formulate the problem and find the way to solve it
Operations Research I	• Formulate and solve the LPP using graphical and simplex method • Solve LPP using dual simplex method and IPP using graphical and Gomory's method. • Learn about random variables and their distribution • Find probability of events using R and MS Excel
T.Y.B.Sc. Semester VI	
BASIC COMPLEX ANALYSIS	• Find complex series of a function at any given point • Solve integration using residue theorem. • Complex analysis is a basic tool and helpful in further studies of measure theory and topology
ALGEBRA	• Students will have a working knowledge of important mathematical concepts in abstract algebra such as definition of group, order of

	group, order of an element. • Students will be knowledgeable of subgroups such as normal subgroup, cyclic subgroup and their characteristics. • Students will be knowledgeable of concepts such as permutation groups, factor groups and abelian group.
Topology of Metric Spaces and Real Analysis	• Define continuous functions on different metric spaces; differentiate between continuous and uniformly continuous functions, know relationship between continuous functions and compact metric spaces. • Understand the concept of connectedness, separation of sets and their relation with compactness. • Understand the concept of sequence and Series of functions. They can think a function geometrically.
Numerical Analysis II	• Construct the function which approximately fits the given (n_points) data. • Increase the accuracy of the result by reducing the errors. • Derive the formula to solve the integration, differentiation and interpolation.
Operations Research II	• Calculate amount of information through any channel by taking care of entropy and other resistances • Find correct decision under uncertainty and under risk for the given problem • Calculate simple interest, compound interest, annuities and present value. • Understand the concept of shares and mutual funds and related terms

5) Botany

Programme outcomes, program specific outcomes, and course outcomes offered:

Name of the programme/course	Outcome
F.Y.B.Sc. Sem I Course I USBO101	✓ Learner would understand the classification, general characters, cell structure, pigments, reserve food, range of thallus, types of reproduction and alternation of generation of **Chlorophyta** :*Nostoc, Spirogyra* and economic important of Algae. ✓ Learner would understand the classification, general characters, cell structure , pigments, reserve food, range of thallus, types of reproduction and alternation of generation of **Phycomycetes**: *Rhizopus*and *Aspergillus, Spirogyra* and economic important of fungi and mode of nutrition. ✓ Learners would understand the classification, general characters, cell structure, pigments, reserve food, range of thallus, types of reproduction and alternation of generation of **Bryophyta**: *Riccia ,Hepaticea.*
F.Y.B.Sc. Sem I Course II USBO102	✓ Learners would understand the introduction, general characters of plant cell: cell wall, plasma membrane. Learners would understand the Ultra structure and functions of following cell organelles: Endoplasmic reticulum and chloroplast. ✓ Learner would understand the introduction to Ecology and concept of ecosystem. Students would learn the concept of Energy flow in an Ecosystem and types of Ecosystem. ✓ Learner would understand the introduction to genetics and Hybridization experiment of Mendelian Genetics. Learner would understand the Monohybrid and Dihybrid cross and ratio and also understand the concept of Test cross, back cross, multiple Alleles, non Epistatic Interactions and Epistasis Interaction.
F.Y.B.Sc. Sem II Course III USBO201	✓ This unit would allow learners to study about Structure life cycle, systematic position and alternation of generations in *Nephrolepis.* Learners will grasp the concept of Stelar evolution. ✓ Learner would understand about Structure life cycle systematic position and alternation of generations in

	Cycas. Learner would understand the Economic importance of Gymnosperms ✓ Learners would understand the details of Leaf: simple leaf, types of compound leaves, Incisions of leaf, venation, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf base, leaf shapes. Modifications of leaf: spine, tendril, hooks, phyllode, pitcher, Drosera or insectivorous plants. Learner would understand the types of Inflorescence: Racemose: simple raceme, spike, catkin, spadix, and panicle. Cymose: monochasial, dichasial, polychasial. Compound: corymb, umbel, cyathium, capitulum, verticellaster, hypanthodium. And also understand the following families: Malvaceae, Amaryllidaceae
F.Y.B.Sc. Sem II Course IV USBO202	✓ Learner would understand the Simple tissue and complex tissues. Learner would understand the Primary structure of dicot and monocot root, stem and leaf. And also understand the epidermal tissue system: types of hair, monocot and dicot stomata. ✓ Learners will be able understand the concept of Photosynthesis: Light reactions, photolysis of water, photophosphorylation (cyclic and non cyclic), carbon fixation phase (C3, C4 and CAM pathways). ✓ Learner would understand the Concept of primary and secondary metabolites, difference between primary and secondary metabolites. Learner would understand the Grandma's pouch: Following plants have to be studies with respect to botanical source, part of the plant used, active constituents present and medicinal uses: *Oscimum sanctum, Adathodavasica, Zinziberofficinale, Curcuma longa, Santalum album, Aloe vera.*
S.Y.B.Sc. Sem III Course V USBO301	✓ Learner will understand the general characters, cell structure, range of thallus, and economic importance of **Thallophyta**: *Sargassum* Learner will understand the structure, external morphology, internal structure life cycle and alternation generation of **Bryophyta***: Anthoceros*and *Funeria.* ✓ Learner will understand the distinguish characters, systematic position and economic importance of the families of Leguminosae and its sub- family,

	AsteraceaAmaranthaceae and Palmae with the help of Bentham and Hooker's system. Learner will understand the history and rules of ICBN. And also understand the theory of anatomy in relation to anatomy, Cytology, Embryology, Palynology, Chemical constituents and Ecology. ✓ Learner will understand the methods of wet and dry preservation. Learner will understand the introduction, principle and working of microscope and its types. Learner will understand the principles of chromatography and its types.
S.Y.B.Sc. Sem III Course VI USBO302	✓ Learner would understand the ultra structure, origin and function of the Mitochondria, Peroxisomes, Glyoxysome and Ribosomes. Learner would be able to understand cell division and its significance, cell cycle, Mitosis and Meiosis. Learner would understand the Structure and function of DNA and RNA. Its types ✓ Learner would understand the theory of Chromosomal Abbrerations. Learner would understand the sex determination in heterogametic male, heterogametic female, in monocious, dioecious plants, in Drosophila. Learner will be able able to understand the concept of Lyon's hypothesis. Learner would understand the sex linked: eye colour in Drosophila, haemophilia, colour blindness, and sex influenced in baldness in man. And also understand the concept of Extracellular genetics. ✓ Learner would understand the mode of replication in prokaryotes and eukaryotes and molecular mechanism of replication. Learner would understand the principle of Messelson and Stahl Experiment. Learner would understand the process of Central Dogma.
S.Y.B.Sc. Sem III Course VII USBO303	✓ Learner would understand the introduction to pharmacognosy and phytochemistry. Learner would be sensitized to the feelings, what are adulterants and study of Monograph from pharmacopeia. Learner would understand the sources, properties, uses and adulterant of secondary Metabolites. ✓ Learner would understand the outline of types of forest in India and objective, methodology advantages and disadvantages of Agroforesty, Urban Farming and

	Silviculture. Learner would learn the types of fibers, spices and condiment and commercial market and industries.
	✓ Learner would learn the introduction and uses of Aromatherapy and its examples. Learner would learn the Botanical and Nutraceuticals, types of enzymes and biofuel.
S.Y.B.Sc. Sem IV Course VIII USBO401	✓ Learner would understand the classification, general characters, cell structure, types of reproduction and alternation of generation of **Ascomycetae**: *Erysiphe, Xylaria*and economic importance. Learner would understand the symptoms, causative organism, disease cycle and control measures of powdery mildew and late blight of potato. Learner will understand the classification, structure, Method of reproduction, economic importance of Lichens.
	✓ Learner would understand the classification, general characters, cell structure, and types of reproduction and alternation of generation of **Psilophyta and Lepidophyta**: *Selaginella.* Learner would understand the introduction to paleobotany includes the geological time scale, formation and types of fossils and structure and systematic position of genus*Rhynia.*
	✓ Learner would understand the silent feature, classification and economics importance of Coniferophyta. And also understand the structure life cycle and systematic position of *Pinus* and *Cordaites.*
S.Y.B.Sc. Sem IV Course IX USBO402	✓ Learner would understand the Normal Secondary Growth in Dicotyledonous stem and root, Growth rings, periderm , lenticels, tyloses, heart wood sap wood. Learner would understand the Mechanical Tissues system and types of vascular bundles.
	✓ Learner would understand the introduction to aerobic and anaerobic respiration. Learner would understand the concept of Photorespiration and photoperiodism and their types. Learner would understand the mechanism and application of vernalization.
	✓ The learner would understand the biogeochemical cycles: Carbon, Nitrogen and Water. Learner would understand the concept of ecological factors and soil as an edaphic factor, soil composition, and types of

	soil, soil formation, and soil profile. And also study the quantitative and qualitative characters of community.
S.Y.B.Sc. Sem IV Course X USBO403	✓ Learner would understand the introduction to horticulture; branches of horticulture and location in garden, Learner would understand the types of garden and also understand the introduction to National park and Botanical garden and its importance. ✓ Learner would understand the introduction to plant tissue culture in this include laboratory organization and techniques in plant tissue culture, Totipotency, Organogenesis, Organ culture. Learner would comprehend the R-DNA technology includes Gene cloning, Enzyme involved in Gene cloning and vector used for gene cloning. ✓ Learner would gain knowledge of Biostatistics and concept of chi square test and coefficient of correlation. Learner would learn the techniques and information of bioinformatics and include Entrez, BLAST and bioinformatics programme in India.
T.Y.B.Sc. Sem V Course code USBO501	✓ Learners will apprehend the classification and general characters of Rhodophya, Chrysophyta and Bacillariophyta. ✓ The learners will understand the life cycle of Polysiphonia, Batrachospermum, Vaucheria and Pinnularia ✓ Learners will apprehend the classification and general characters of Basidiomycetes, Deuteromycetae and also the life cycle of AgaricusPuccinnia and Alternaria. ✓ Learner will apprehend thee disease causing organism in plant system. ✓ Learner will apprehend the types of microorganism and their cuture.
T.Y.B.Sc. Sem V Course code USBO502	✓ The learner shall understand the paleobotany and the fossils such as Lepdodendron, Lyginopteris, Pentoxylon and contribution of BirbalSahni in the field of Paleobotany. ✓ Learner will undersatand the palynology, and general characters of plant families ✓ Learner will know the anomalous growth in plants and

	types of stmata in different plants ✓ Learner will understand the types of pollen grain, their germination and application in honey industry.
T.Y.B.Sc. Sem V Course code USBO503	✓ Learner would uderstand the structure ad functions of different cell organelles. ✓ Learner will apprehend the role of water and mineral in growth and development of plants. ✓ Learer will know the process of bioremediation and how the toxicity can been reduced. ✓ Learner will know the application of biostatistics in research.
T.Y.B.Sc. Sem V Course code USBO504	✓ Learner will be able to understand the importance of natural antioxidants, mushroom industry ✓ Learner will apprehend the application of plant tissue culture. ✓ Learner will understand the working principals of important instruments used in the field of biology. ✓ Learner will understand the cultivation practices of important medicinal plants and their uses.
T.Y.B.Sc. Sem VI Course code USBO601	✓ Learner shall understand the general characters and life cycle of bryophytes, pteridophytes. ✓ Learner will apprehend the techniques and application of genetic engineering.
T.Y.B.Sc. Sem VI Course code USBO602	✓ Learners will understand the classification Gnetopsida and life cycle of Gnetum and Ephedra. ✓ Learner will know the general characters of plant families ✓ Learner will understand the anatomical adaptation in plants. ✓ Learners will understand the development of embryo in plants.
T.Y.B.Sc. Sem VI Course code USBO603	✓ The learner shall understand the structure of biomolecules, mode of enzyme action ✓ Learner will understand Nitrogen metabolism. ✓ Learner will understand the genetic mapping, gene mutation and metabolic disorders. ✓ Learner will know the application of bioinformatic.
T.Y.B.Sc. Sem VI Course code	✓ Learner shall understand the DNA sequencing. ✓ Learner will understand plant biodiversity and

USBO604	distribution of different types of forest. ✓ Learners will know the economic importance of medicinal and aromatic plants, its cultivation and extraction process. ✓ Learners will know the preservation technique of fruits and vegetables.
T.Y.B.Sc. Sem V Course code USACHO501	✓ Learner will understand the branches and objective of Horticulture, cosutancy etc. ✓ Learner will know different methods Propagation techniques. ✓ Learner will know the application of plant tissue culture in floriculture. ✓ Learner will know the organic and inorganic fertilizers. ✓ Learner will apprehend the operational and management skills of garden.
T.Y.B.Sc. Sem VI Course code USACHO601	✓ Learner will know the principals of garden design, different cultivation practices such as hydroponics, terrarium, dish garden. ✓ Learner will know different types of gardens ✓ Learner will know the green house technology and scope of floriculture. ✓ Learner will know the process of cultivation of medicinal and aromatic plants, fruit crops. ✓ Learner will apprehend the post harvest technology and entrepreneurship in horticulture.