Shri. Gopinath Mahadeo Vedak Pratishthan's

G. M. Vedak College of Science, Tala

Affiliated University of Mumbai,
NAAC Accredited B+, 2017

Program Outcomes, Program Specific Outcomes and Course Outcomes

2019-2020

Tala Indapur Road, At Post Tala,
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Maharashtra, India-402111

Program Outcomes, Program Specific Outcomes and Course Outcomes

DEPARTMENT OF CHEMISTRY

PROGRAM OUTCOMES: B.Sc. CHEMISTRY

Programme Outcomes (POs)	
PO1	Enrichment of knowledge through the basic concept of Chemistry.
PO2	To Know the details of Basic concept and Various principles of chemistry and it will apply for the experiments.

Programme Specific Outcomes (PSOs)	
At the end of the programme, the students will be able to:	
PSO1	To learn Basic concept of chemistry and it will apply in Various Experiments.
PSO2	Graduates from this programme will be eligible to continue M.Sc. Graduates will also have the necessary numerical and computer skills to allow them to move into a range of more general career choices such as accounting or computing.

Course Outcomes B.Sc. Chemistry Semester I		
At the end of the programme, the students will be able to:		
USCH101	Chemical Thermodynamics Chemical calculations Atomic structure, Periodic Table and periodicity Basics of Organic Chemistry: Classification and Nomenclature of Organic Compounds Bonding and Structure of organic compounds Fundamentals of organic reaction mechanism	1. Apply the log of thermodynamic to formulate the relations necessary of analyse the thermodynamic process. 2. Understand the Basic concept of Thermodynamic and it will apply in day to day experiments. 3. Understand the concept of organic Chemistry and it will be apply in nomenclature of Compound 4. Demonstrate qualitative problems solving scheme in all topics covered.
USCH102	Chemical Kinetics Liquid State Comparative chemistry of Main Group Elements Stereochemistry I	1. The Understand the concept of Chemical Kinetics and it apply in to the various experiments to understand the temperature effect on the reaction. 2. To understand the periodic table for to get the details of elements

Course Outcomes B.Sc. Chemistry Semester II		
At the end of the programme, the students will be able to:		
USCH201	Gaseous state Chemical Equilibrium and thermodynamic parameters	Comprehend the basic concept of thermodynamic and its application in physical Situation. Demonstrate tentative problems solving skill in all areas
	Concept of Qualitative Analysis, Acid Base theory	
	Chemistry of Aliphatic Hydrocarbons	
USCH202	Ionic equilibria, Molecular Spectroscopy Solid State Chemistry	To understand the basic concept of spectroscopy it helps to illustrate the structure of compound To understand the concept of oxidation and reduction rules in reaction mechanism
	Chemical bond and Reactivity Oxidation Reduction Chemistry	
	Stereochemistry II: Cycloalkanes and Conformational Analysis Aromatic hydrocarbons	

Course Outcomes B.Sc. Chemistry Semester III		
At the end of the programme, the students will be able to:		
USCH301	Chemical Thermodynamics-II Electrochemistry Chemical Bonding Reactions and reactivity of halogenated hydrocarbons, alcohols, phenols and epoxides	1. Understand the basic laws of electrodynamics and be able to perform calculations using them 2. To infuse in the learner a spirit of inquiry into the fundamental aspects of the various core areas of Chemistry. 3. To make the learner proficient in analysing the various observations and chemical phenomena presented to him during the course.
USCH302	Chemical Kinetics-II, Solutions Selected topics on p block elements Carbonyl Compounds	1. To make the learner capable of solving problems in the various units of this course 2. To give the learner an opportunity to get hands on experience of the various concepts and processes in the various branches of chemistry 3. Understand the basic laws of kinectic and be able to perform calculations using them. 4. Understand the basics of transistor biasing, operational amplifiers, their applications 5. Demonstrate quantitative problem solving skill in all the topics covered.
USCH303	Intorduction to Analytical Chemistry and Statistical	1. To impart various skills of handling chemicals, reagents,

	Treatement of Analytical data Classical Methods of Analysis. Instrumental Methods-I	apparatus, instruments and the care and safety aspects involved in such handling 2. To make the learner capable of analysing and interpreting results of the experiments he conducts or performs 3. The learner will understand the scope of the subject in Industry & Research. 4. Experimental learning opportunities will faster creative thinking & a spirit of inquiry.

Course Outcomes B.Sc. Chemistry Semester IV		
At the end of the programme, the students will be able to:		
USCH401	Electrochemistry-II, Phase Equilibria Comparative Chemistry of the transition metals & Coordination Chemistry Carboxylic acids and their derivatives, Sulphonic acids	1. Understand the resolving power of different optical instruments. 2. Demonstrate quantitative problem solving skills in all the topics covered. 3. Understand the basic laws of electrochemistry and be able to perform calculations using them 4. To infuse in the learner a spirit of inquiry into the fundamental aspects of the various core areas of Chemistry. 5. To make the learner proficient in analysing the various observations and chemical phenomena presented to him during the course
USCH402	Solid state, Catalysis Ions in aqeous medium & Uses and Environmental Chemistry of volatile Oxides and oxo-acids Amines, Diazonium salts, Heterocyclic compounds	1. Demonstrate quantitative problem solving skills in all the topics covered 2. To make the learner capable of solving problems in the various units of this course 3. To give the learner an opportunity to get hands on experience of the various concepts and processes in the various branches of chemistry 4. Understand the basic laws of kinetics and be able to perform calculations using them. 5. Demonstrate quantitative problem solving skill in all the topics covered.

USCH403	Separation Techniques in Analytical Chemistry Instrumental Methods-II Statistical Treatment of analytical data --II	1. Understand the concepts of mechanics & properties of matter & to apply them to problems. 2. Learn about situations in low temperature. Demonstrate tentative problem solving skills in all above areas. 3. To impart various skills of handling chemicals, reagents, apparatus, instruments and the care and safety aspects involved in such handling 4. To make the learner capable of analysing and interpreting results of the experiments he conducts or performs 5. The learner will understand the scope of the subject in Industry & Research. 6. Experimental learning opportunities will faster creative thinking & a spirit of inquiry.

Course Outcomes B.Sc. Chemistry Semester V	
At the end of the programme, the students will be able to:	
USCH501 Physical Chemistry	Learning outcomes: From this course, the students are expected to learn some mathematical techniques required to understand the physical Chemistry at the undergraduate level and get exposure to important ideas of Physical Chemistry 1. The students are expected to be able to solve simple problems in Chemical Thermodynamic, Molecular Spectroscopy, Chemical Kinetics, Nuclear Chemistry and Surface Chemistry. 2. To understand the concept of independent events and work with standard continuous distributions. The students will have idea of the functions of complex variables equations using simple methods
USCH502 Inorganic Chemistry	Learning Outcomes: On successful completion of this course students will be able to: 1. Understand the basics of concept of Molecular Symmetry and chemical Bonding, Molecular Theory, Solid State Chemistry, Super Conductivity, Inner Transition Elements 2. Understand the basic concepts of theory of superconductivity. 3. Demonstrate quantitative problem solving skills in all the topics covered.
USCH503 Organic Chemistry	Learning Outcome: Upon successful completion of this course, the student will understand 1. the application of Sterochemistry in Organic Chemistry. 2. The Concept of Photochemistry, Agraochemistry and Hetrocyclic Chemistry and its application 3. This course will be useful to get an insight into spectroscopy.

USCH504 Analytical Chemistry	Learning outcomes: On successful completion of this course students will be able to: 1. Chromatography helps the monitor the reaction 2. Spectroscopic Study helps to find out the structure of compounds. 3. Develop quantitative problem solving skills.
USCHP05 + USCHP06 Practical Course	1. Understanding relevant concepts. 2. Planning of the experiments 3. Layout and adjustments of the equipments 4. Recording of observations and plotting of graphs. 5. Calculation of results and estimation of possible errors in the observation of results.
USACHFC501 Heavy and Fine Chemicals	Expected learning outcomes 1. The understand the basic concept of pump and it helps in the operation. 2. To understand the various solvents grades it helps to choose the solvent in the experiments.

Course Outcomes B.Sc. Chemistry Semester VI	
At the end of the programme, the students will be able to:	
USCH601 Physical Chemistry	Learning outcomes: From this course, the students are expected to learn some mathematical techniques required to understand the physical Chemistry at the undergraduate level and get exposure to important ideas of Physical Chemistry 1. The students are expected to be able to solve simple problems in Chemical Thermodynamic, Molecular Spectroscopy, Chemical Kinetics, Nuclear Chemistry and Surface Chemistry. 2. To understand the concept of independent events and work with standard continuous distributions. The students will have idea of the functions of complex variables equations using simple methods
USCH602 Inorganic Chemistry	Learning Outcomes: On successful completion of this course students will be able to: 1. Understand the basics of concept of Molecular Symmetry and chemical Bonding, Molecular Theory, Solid State Chemistry, Super Conductivity, Inner Transition Elements 2. Understand the basic concepts of theory of superconductivity. 3. Demonstrate quantitative problem solving skills in all the topics covered.
USCH603 Organic Chemistry	Learning Outcome: Upon successful completion of this course, the student will understand 1. The application of Sterochemistry in Organic Chemistry. 2. The Concept of Photochemistry, Agraochemistry and Hetrocyclic Chemistry and its application 3. This course will be useful to get an insight into spectroscopy.
USCH604 Analytical Chemistry	Learning outcomes: On successful completion of this course students will be able to: 1. Chromatography helps the monitor the reaction 2. Spectroscopic Study helps to find out the structure of compounds. 3. Develop quantitative problem solving skills.

USCHP06 + USCHP07 Practical Course	1. Understanding relevant concepts. 2. Planning of the experiments 3. Layout and adjustments of the equipment's 4. Recording of observations and plotting of graphs. 5. Calculation of results and estimation of possible errors in the observation of results.
USACHFC601 Heavy and Fine Chemicals	Expected learning outcomes 1. The understand the basic concept of pump and it helps in the operation. 2. To understand the various solvents grades it helps to choose the solvent in the experiments.

M.Sc. Organic Chemistry) Course Outcome:

Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCH101 Physical Chemistry	**Chemical Kinetics** • To acquire in depth knowledge about theories of chemical kinetics and to calculate specific rate, activation energy and frequency factor. • To calculate Michaelis Menten constant for enzyme – substrate binding by Linewearver Burk plot. To analyze kinds of radiation utilised in several fields of research and industry • To gain knowledge about kinetics of complex reactions and fast reactions • To distinguish various adsorption isotherms and heterogeneous catalyst reactions
	Quantum Chemistry and Group Theory • To analyze the need for quantum mechanics, relate quantum mechanical operators toobservablesandtheuseofoperatoralgebratosolvesimpleeigenvalueequations, relate molecular phenomena viz translational, rotational and vibrational motion to model systems and solve Schrodinger equation to arrive at the eigenvalues. • To derive eigen values and wave functions of H and He atom using approximation methods. Concept of anti-symmetric wave function and solve Hartree and Hartree Fock equation for helium atom • To apply Molecular orbital and valence bond treatment to simple homonuclear diatomic molecules- H2 + & H2 , MOT of higher diatomic molecules, HMO treatment of simple conjugated systems • To distinguish molecular and crystallographic symmetry, apply multi symmetry operations to derive character tables • To gain knowledge of symmetry based selection rules for vibrational and electronic spectroscopy and predict the spectra of molecules
	Thermodynamics and Electrochemistry • To gain knowledge on basic concepts of ensembles, statistical probabilities in the filling of atomic and molecular energy levels, partition functions and their derivation. • To acquire skill to relate molecular partition functions with thermodynamic and kinetic parameters and derive mathematical expressions • To analyze and apply concepts of partition function to heat capacities of solids and gases, black body radiation, electron gas in metals. • To familiarize the concepts of ion-ion interactions, ion solvent interactions, calculations of ionic activity and ionic strength • To derive mathematical expressions for electro capillary, single and multi-step electrodics and exchange current density.

Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCHP101 Physical Chemistry Practical	**Physical Chemistry Practical** • To determine the order and calculate the rate constant for the reaction • To draw and interpret the phase diagram of two component systems • To apply distribution law to find the partition coefficient and equilibrium constant. • To verify Freundlich adsorption isotherm.

Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCH102 Inorganic Chemistry	**Coordination Chemistry** • To discuss about the theories of bonding in coordination complexes • To evaluate about the formation, reaction mechanism stability constant, and the various methods of determination of stability constant and the stereochemistry of the inorganic complexes. • To explain the electronic and magnetic properties. • To outline the mechanism of electron transfer reactions and Marcus Hush theory • To predict the substitution reaction of complexes • To explain the inorganic cages, clusters an rings which are very much useful for leading current research area of materials science Course Title: Analytical Chemistry • To build a better understanding of "Analytical Chemistry"; to evolve proper analytical data and practice to report the results with uncertainty component. • To explore the analysis of complex chemical materials/ manufactured chemical matrices very systematically with suitable analytical methods. • To demonstrate the instrumental based chemical analysis in all the arena of chemical processes and products through separations, quantifications and structural determination of chemicals • To establish the competency of chemical analysis in the applied research, chemical processes and testing/quality control laboratories with regulatory compliances. • To design new analytical routes for the day to day evolution of newly discovered chemical products and invent the characters of chemicals.
	Organometallics and Bioinorganic Chemistry • To understand the structure, bonding, preparation and reactivity of organometallic compounds. Students will learn about synthetically useful transformations including oxidations, reductions, organometallic reactions, and reactions of electron deficient species. The emphasis will be on developing a mechanistic understanding of selectivity and synthetic strategy. • To gain information on the mechanism of the catalytic processes of

	organometallic complexes that is useful for the current synthetic organic chemistry field. • To understand elaborately on the content of biological inorganic processes that helps the students in the future research of biomimetic and computational chemistry. • To gain complete knowledge on the oxygen carriers and iron sulphur proteins and able to Explain how metal ions take part in biological system and their physiological effect on biological system. • To comprehend photosynthesis and photosystem1 & photosystem2, vitamin B12 model system and their reaction Course Title: Chemistry of aromatic Compounds and Concerted Reactions • To use oxidation and reduction reagent for preparing a new synthetic compound. • To apply the concept of aromaticity to identify aromatic, anti-aromatic and non -aromatic compounds. • To apply logically the concept of direction for both electrophilic and nucleophilic reactions in aromatic compounds. • To identify the different types of rearrangement reactions and predict the mechanisms involved • To use the Woodward-Hoffmann rule to predict the stereochemistry of product under thermal and photochemical conditions for different types of pericyclic reaction Course Title: Organic Chemistry Practical • To get hands-on experience in the separation of two component mixture, purification and identification of the functional groups present. • To Expertise in various preparatory methods of organic compounds by single and double stage methods • To use various purification techniques and extraction methods involving natural products.
Course Code: PSCH102 Inorganic Chemistry	**Solid State and Nano Chemistry** • To explain the complete description of chemistry behind the solids; learnt the preparation, characterization of solids and describe the principles concerning solid state structures • To predict the advances in solar energy harvesting materials for fabrication of alternate energy materials • To develop magnetic materials and superconducting materials for advanced material fabrications • To relate diffraction intensities mathematically to structural parameters and derive extinction conditions • To describe specific crystal structures by applying basic crystallographic concepts and describe the experimental use of the diffraction phenomenon and give an account of the generation of X-ray radiation and its effects of on matter

Course Code: PSCHP102 Inorganic Chemistry Practical	**Inorganic Chemistry Practical** • To Train the students in a semi-micro qualitative analysis of inorganic mixture and help the students excel in the R&D laboratories. • Explore their knowledge in the volumetric analysis of metal ions. • Basic exposure to prepare the pure metal complexes • Makes awareness to separate the metal ions through chromatography techniques

Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCH103 Organic Chemistry	**Stereochemistry and Reaction Mechanism** • To Identify the absolute configuration of molecules – D/L, R/S, erythro/threo, meso/dl,EZ, Pro R, Pro S, Re and surface. • To apply the concept of conformational analysis for cyclic and acyclic acyclic systems. • To determine the reaction mechanism by kinetic andnon-kinetic Methods, mechanism and applications of aliphatic nucleophilic substitution reactions. • To get a detailed picture of electrophilic, nucleophilic and free radical addition reaction mechanisms with stereo chemical aspects. Mechanism of carbene, nitrene intermediates and application in name reactions. • To explain the reaction mechanism and stereochemistry of E1, E2 and E1CB and to predict it regioselectivity.

Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCHO303 Natural products and Spectroscopy	**Chemistry of Natural Products** • To explain the fundamental concept of nucleic acids and its functioning. • To propose the total synthesis of peptide and to elucidate the structure of various steroids. • To write the synthesis of camphor α, β- carotenoids and lycopene. • To outline the synthesis of complex organic compounds like morphine cocaine reserpine and synthesis of flavones iso flavones and anthocyanin. • To gain expertise in the bio synthesis of cholesterol terpenoids alkaloids amino acids and bile acid. • To explain the fundamental concept of nucleic acids and its functioning. • To propose the total synthesis of peptide and to elucidate the structure of various steroids. • To write the synthesis of camphor α, β- carotenoids and lycopene. • To outline the synthesis of complex organic compounds like morphine cocaine reserpine and synthesis of flavones iso flavones and

	anthocyanin. • To gain expertise in the bio synthesis of cholesterol terpenoids alkaloids amino acids and bile acid.
Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCHO301 Theoretical organic chemistry-I	**Spectroscopy – I** • To acquire knowledge about the principle of micro wave ,Infrared spectroscopy , FTIR and IR spectra of poly atomic molecules • To predict the structure of organic compounds and interpret spectrum of a molecule from its IR data and Raman spectra to organometallic compounds and simple inorganic compounds • To learn about UV-Visible spectroscopy and apply the knowledge gained to Calculate λ max values for a molecule • To predict the term symbols, interpret the Orgel diagram, Tanabe-Sugano diagram, electronic spectra of inorganic and organometaliic organometallic compounds. • To apply the concept of PES, UPS , ESCA , Auger spectroscopy and NQR in the study of surface characterisation of Inorganic compounds
	Synthetic Methodology • To apply the retrosynthetic approach to develop methodology for synthesizing new compounds involving C-C and C=C. • To logically approach the usage of various reagents for organic synthesis • To apply the methodology involved in advanced name reactions for synthesizing new compounds • To approach synthesis of complex organic compounds in a logical manner. • To apply green chemistry principle for synthesis of organic compounds
	Photochemistry • To explain the fundamentals of photochemistry, Absorption and Emission of radiation, Stern Volmer analysis. Quantum efficiency and Molecular structure and photo physical and photo chemical reactivity . • To demonstrate the fast reaction techniques such as flash photolysis and fluorescence and life time measurements • To discuss about Photo chemistry of ketones, Norrish Type-I, Norrish type –II reactions, Photochemistry of olefins, Paterno – -Buchi reaction and synthesis of Vitamin D. • To explain the various types of inorganic photochemical reactions, mechanism of solar energy conversion using ruthenium bipyryidyl complexes • To revive about solar spectrum, Photo chemistry of vision, photocatalysis and photodynamic therapy.

Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCH104 Analytical Chemistry	**Electro Analytical Practical** • To explain the principle of conductivity, potentiometry and colorimetry experiments. • To determine the strength of unknown solutions by potentiometric and Conduct metric methods. • To determine the strength of unknown solutions by colorimetric
Course Code: PSCHP104 Analytical Chemistry Practical	**Analytical Chemistry Practical** • To imbibe the techniques of analysis of complex chemical materials • To quantitative estimation of organic compounds and inorganic metal ions • To interpret all specrto-analytical data for molecular identification

Course Outcomes M.Sc. Organic Chemistry	
Course Code: PSCHO401 Theoretical Organic Chemistry-II	**Spectroscopy II** • To explain the bonding properties related structural identification of coordination complexes. • To compute magnetic properties based structural determination coordination complexes and some specific inorganic elements. • To discuss principle, instrumentation of Electron Spin Resonance spectroscopy and its applications and application of free electron character available in a molecular entity to predict structure of complexes. • To explain the surface characterization of inorganic compounds • To discuss the principles, chemical shifts, coupling constants, and application of iH, 19F, 31Pand solid state NMR spectroscopy. • To discuss the Principles and instrumentation of different types of mass spectrometer. • To Outline Salient features of fragmentation pattern of organic compounds.
Course Code: PSCHP104 Analytical Chemistry Practical	**Analytical Chemistry Practical** • To imbibe the techniques of analysis of complex chemical materials • To quantitative estimation of organic compounds and inorganic metal ions • To interpret all specrto-analytical data for molecular identification

DEPARTMENT OF PHYSICS

PROGRAM OUTCOMES: B.SC. PHYSICS

Programme Outcomes (POs)	
PO1	Development of analytical and mathematical abilities towards day to day real world problems.
PO2	To get familiar with current and recent scientific and technological developments.
PO3	Enrichment of knowledge through problem solving hands on activities, study visits, projects, etc.
PO4	To know the fundamental laws and principles in a variety of areas of physics along with their applications

Programme Specific Outcomes (PSOs)	
At the end of the programme, the students will be able to:	
PSO1	Define the physics underlying various phenomena's
PSO2	Learn basic postulates of new physical principles
PSO3	To gain expertise in experimental physics through statistical error analysis and practice.
PSO4	Graduates from this programme will be eligible to continue M.Sc. Graduates will also have the necessary numerical and computer skills to allow them to move into a range of more general career choices such as accounting or computing.

Course Outcomes B.Sc. Physics Semester I	
At the end of the programme, the students will be able to:	
USPH101 Classical Physics	1. Understand Newton's laws and apply them in calculations of the motion of simple systems 2. Use the free body diagrams to analyze the forces on the object 3.Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them

	4. Understand the concepts of lens system and interference 5. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process 6. Demonstrate quantitative problem solving skills in all the topics covered
USPH102 Modern Physics	1. Understand the concept of lens and apply it to practical eyepieces 2. Understand the phenomenon of interference with examples 3. Get an idea about the nucleus and its properties 4. Get a glimpse of dual nature of light 5. Study the particle nature of matter with Compton effect

Course Outcomes B.Sc. Physics Semester II	
At the end of the programme, the students will be able to:	
USPH201 Mathematical Physics	1. Understand the basic mathematical concepts and applications of them in physical situations. 2. Demonstrate quantitative problem solving skills in all the topics covered
USPH202 Electricity and Electronics	1. Understand the details of electronics 2. Understand the working of various electronic equipments used in day-to-day life 3. Understand the working behind Logic Gates

Course Outcomes B.Sc. Physics Semester III	
At the end of the programme, the students will be able to:	
USPH301 Mechanics and thermodynamics	1. Understand the concepts of mechanics & properties of matter & to apply them to problems. 2. Comprehend the basic concepts of thermodynamics & its applications in physical situation. 3. Learn about situations in low temperature. 4. Demonstrate tentative problem solving skills in all above areas.
USPH302	1) Understand the basic concepts of mathematical physics and their applications in physical situations. 2) Understand the basic laws of electrodynamics and be able to perform calculations using them.

Vector calculus, Analog electronics	3) Understand the basics of transistor biasing, operational amplifiers, their applications 4) Understand the basic concepts of oscillators and be able to perform calculations using them. 5) Demonstrate quantitative problem solving skill in all the topics covered.
USPH303 Applied Physics-I	1. Students will be exposed to contextual real life situations. 2. Students will appreciate the role of Physics in 'interdisciplinary areas related to materials, Bio Physics, Acoustics etc. 3. The learner will understand the scope of the subject in Industry & Research. 4. Experimental learning opportunities will faster creativethinking & a spirit of inquiry.

Course Outcomes B.Sc. Physics Semester IV	
At the end of the programme, the students will be able to:	
USPH401 Optics and Digital electronics	1) Understand the diffraction and polarization processes and applications of them in physical situations. 2) Understand the applications of interference in design and working of interferometers. 3) Understand the resolving power of different optical instruments. 4) Demonstrate quantitative problem solving skills in all the topics covered.
USPH402 Quantum Physics	1) Understand the postulates of quantum mechanics and to understand its importance in explaining significant phenomena in Physics. 2) Demonstrate quantitative problem solving skills in all thetopics covered
USPH403 Applied Physics-II	1. Understand the concepts of mechanics & properties of matter & to apply them to problems. 2. Comprehend the basic concepts of thermodynamics & its applications in physical situation. 3. Learn about situations in low temperature. 4. Demonstrate tentative problem solving skills in all above areas.

Course Outcomes B.Sc. Physics Semester V	
At the end of the programme, the students will be able to:	
USPH501 Mathematical Methods in Physics Thermal and Statistical Physics	Learning outcomes: From this course, the students are expected to learn some mathematical techniques required to understand the physical phenomena at the undergraduate level and get exposure to important ideas of statistical mechanics. The students are expected to be able to solve simple problems in probability, understand the concept of independent events and work with standard continuous distributions. The students will have idea of the functions of complex variables; solve nonhomogeneous differential equations and partial differential equations using simple methods. The units on statistical mechanics would introduce the students to the concept of microstates, Boltzmann distribution and statistical origins of entropy. It is also expected that the student will understand the difference between different statistics, classical as well as quantum.
USPH502 Solid State Physics	Learning Outcomes: On successful completion of this course students will be able to: 1. Understand the basics of crystallography, Electrical properties of metals, Band Theory of solids, demarcation among the types of materials, Semiconductor Physics and Superconductivity. 2. Understand the basic concepts of Fermi probability distribution function, Density of states, conduction in semiconductors and BCS theory of superconductivity. 3. Demonstrate quantitative problem solving skills in all the topics covered.
USPH503 Atomic and Molecular Physics	Learning Outcome: Upon successful completion of this course, the student will understand 1) the application of quantum mechanics in atomic physics 2) the importance of electron spin, symmetric and antisymmetric wave functions and vector atom model 3) Effect of magnetic field on atoms and its application 4) Learn Molecular physics and its applications. 5) This course will be useful to get an insight into spectroscopy.
USPH504 Electrodynamics	Learning outcomes: On successful completion of this course students will be able to: 1) Understand the laws of electrodynamics and be able to perform

	calculations using them. 2) Understand Maxwell's electrodynamics and its relation to relativity 3) Understand how optical laws can be derived from electromagnetic principles. 4) Develop quantitative problem solving skills.
USPHP05 + USPHP06 Practical Course	1) Understanding relevant concepts. 2) Planning of the experiments 3) Layout and adjustments of the equipments 4) Recording of observations and plotting of graphs. 5) Calculation of results and estimation of possible errors in the observation of results.
USACCS501 Advanced Microprocessor, Microcontrollers & Python Programing	Expected learning outcomes 1) Develop a basic understanding of programming and the Python programming Language. 2) Students will use their problem solving abilities to implement programs in Python. 3) Familiarization about the basic constructs of programming such as data, operations, conditions, loops, functions etc. 4) Introduction to advanced topics in Python such as Exception Handling, Multithreaded programming, Graphical user interface & Database connectivity.

Course Outcomes B.Sc. Physics Semester VI	
At the end of the programme, the students will be able to:	
USPH601 Classical Mechanics	This course will introduce the students to different aspects of classical mechanics. They would understand the kinds of motions that can occur under a central potential and their applications to planetary orbits. The students should also appreciate the effect of moving coordinate system, rectilinear as well as rotating. The students are expected to learn the concepts needed for the important formalism of Lagrange's equations and derive the equations using D'Alembert's principle. They should also be able to solve simple examples using this formalism. The introduction to simple concepts from fluid mechanics and understanding of the dynamics of rigid bodies is also expected. Finally, they should appreciate the drastic effect of adding nonlinear corrections to usual problems of mechanics and nonlinear mechanics can help understand the irregularity we observe around us in nature.
USPH602 Electronics	1) Understand the basics of semiconductor devices and their applications.

	2) Understand the basic concepts of operational amplifier: its prototype and applications as instrumentation amplifier, active filters, comparators and waveform generation. 3) Understand the basic concepts of timing pulse generation and regulated power supplies 4) Understand the basic electronic circuits for universal logic building blocks basic concepts of digital communication. 5) Develop quantitative problem solving skills in all the topics covered.
USPH603 Nuclear Physics	1) Upon successful completion of this course, the student will be able to understand the fundamental principles and concepts governing classical nuclear and particle physics and have a knowledge of their applications interactions of ionizing radiation with matter the key techniques for particle accelerators the physical processes involved in nuclear power generation. 2) 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	1) Understand the significance of Michelson Morley experiment and failure of the existing theories to explain the null result 2) Understand the importance of postulates of special relativity, Lorentz transformation equations and how it changed the way we look at space and time, Absolutism and relativity, Common sense versus Einstein concept of Space and time. 3) Understand the transformation equations for: Space and time, velocity, frequency, mass, momentum, force, Energy, Charge and current density, electric and magnetic fields. 4) Solve problems based on length contraction, time dilation, velocity addition, Doppler effect, mass energy relation and resolve paradoxes in relativity like twin paradox etc.
USPHP07 + USPHP08 Practical Course	1) Understanding relevant concepts. 2) Planning of the experiments 3) Layout and adjustments of the equipments 4) Recording of observations and plotting of graphs. 5) Calculation of results and estimation of possible errors in the observation of results.
USACCS601 Microcontrollers & Python Programming (Version 3.x for Python)	Expected learning outcomes 1) Develop a basic understanding of programming and the Python programming Language. 2) Students will use their problem solving abilities to implement programs in Python. 3) Familiarization about the basic constructs of programming such as data, operations, conditions, loops, functions etc. 4) Introduction to advanced topics in Python such as Exception Handling, Multithreaded programming, Graphical user interface & Database connectivity.

DEPARTMENT OF ZOOLOGY

Programme outcomes (PO`s)
F Y. B. Sc. Zoology (Semester-I) Programme Outcomes: B. Sc Zoology

Department of Zoology	After successful completion student should be able to of three year degree program in Zoology.
Programme Outcomes	**PO`s 1:** To acquaint the students with the different organs in animals anf its functions like echolocation, bioluminescence.  **PO`s 2:** Students understands the property of regenerations , mimicry and camouflage. **PO`s 3:** Teacher makes the taught understand about biodiversity .  **PO`s 4**: Pupils understands about innovative and novel work of scientists/philosopher/entrepreneurs in the field of biological sciences. **PO`s 5**: Students learnt about handling of different instruments and working for a particular experiments,  **PO`s 6**: The pupils understands about applications of biotechnology. **PO`s 7:** Students understands meaning of symbols.  **PO`s 8:** To acquaint the students by biogenesis and units of measurement, **PO`s 9:** Create an awareness of the impact of Zoology on the environment, society, and development outside the scientific community.  **PO`s 10:** Demonstrate use of instruments. **PO`s 11:** To study and understand the different types of Instruments with the help of teaching aids like PPT`s, Videos, charts, models etc. **PO`s 12:** To inculcate the scientific temperament in the students and outside the scientific community.
Programme Specific Outcomes	**PSO-1**. Gain the knowledge of Zoology through theory and practical **PSO-2.** Study and understand the Structures and function Classification, anatomy, poisons, of animals. **PSO-3.** Understand the testing of hypothesis. **PSO-4**. Know structure-activity relationship **PSO-5..** Understand good laboratory practices and safety.

	PSO-6. Develop research oriented skills. **PSO-7**.Make aware and handle the sophisticated instruments/equipment's **PSO-8**.: Use modern Zoological tools, Charts, Models, and Equipments.

Course Outcomes B. Sc Zoology Semester-I Paper II INSTRUMENTATION and ANIMAL BIOTECHNOLOGY	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit 1: Laboratory safety, Units and Measurement	➢ 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
Unit 2: Animal Biotechnology	➢ 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.
Unit 3: Instrumentation	➢ 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. Zoology (Semester-II) Programme Outcomes: B. Sc. Zoology

Department of Zoology	After successful completion student should be able to;
Programme Outcomes	**PO`s 1:** To acquaint the students with the ecologies, population density. **PO`s 2:** Students understands the property of concepts of ecosystems. **PO`s 3:** Teacher makes the taught understand about Parks and sanctuaries , **PO`s 4**: Pupils understands about Ecotourism. **PO`s 5**: Students learnt about handling of Nutrition and health and hygiene. **PO`s 6**: The pupils understands about common diseases and its treatment. **PO`s 7:** Students understands meaning of symbols. **PO`s 8:** To acquaint the students by biogenesis and units of measurement,

	PO`s 9:** Create an awareness of the impact of Zoology on the environment, society, and development outside the scientific community. **PO`s 10: Demonstrate use of instruments. **PO`s 11:** To study and understand the different types of Instruments with the help of teaching aids like PPT`s, Videos **PO`s 12:** To inculcate the scientific temperament in the students and outside the scientific community.
Programme Specific Outcomes	**PSO-1**. Gain the knowledge of Zoology through theory and practical **PSO-2.** Study and understand the Structures and function Classification, anatomy, poisons, of animals. **PSO-3.** Understand the testing of hypothesis. **PSO-4**. Know structure-activity relationship **PSO-5..** Understand good laboratory practices and safety. **PSO-6**. Develop research oriented skills. **PSO-7**.Make aware and handle the sophisticated instruments /equipment's **PSO-8**.: Use modern Zoological tools, Charts, Models, and Equipments.

Course Outcomes B. Sc Zoology Semester-II Paper I Ecology and Wildlife Management	
Course	**Outcomes**
Unit 1: Population ecology	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
Unit 2: Ecosystem	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
Unit 3: National parks and Sanctuaries of India	Learners would be inspired to choose career options in the field of wild life conservation, research, photography and ecotourism.

S. Y. B. Sc. Zoology (Semester-III) Programme Outcomes: B. Sc Zoology

Department of Zoology	Department of Zoology
Programme outcomes (PO`s)	**PO`s 1:** To acquaint students with the different types of organs involved in nutrition and excretion in various animals. **PO`s 2:** Demonstrate about control and co-ordination in animals and an understanding of major concepts in all disciplines of Zoology. **Pos`s 3:.** Create an awareness of the impact of Zoology on the environment, society, and development outside the scientific community **PO`s 4:** To study and understand the respiration and circulation with the help of teaching aids like Videos, charts , models etc. **PO`s 5:** To inculcate the scientific temperament in the students and outside the scientific community. **PO`s 6:** The pupils develops an understanding about locomotion and reproduction in animals. **PO`s-7**. Use modern techniques, decent equipment's and Zoology PPT`s and videos. **PO`s 8:** To acquaint the taught with origin , evolution of life and universe **PO`s 9**: The students understands about population genetics. **PO`s 10:** Students get acquainted with Genetics, Linkage and crossing over**.** **PO`s11:** As students are getting first hand experience by the use of internet, they easily understands about Hereditary and chromosomes, Nucleic acids. **PO`s 12:** Students understands various types of ailments occurring due to parasitology, Relationship between parasites & host, . **PO`s 13:** Students get acquainted with the economy of Zoology as it creates source of income from various animals. **PO`s 14:** The pupils are highlighted with the behavior of animals on various occasion like land occupied by others, mate sharing and food
Programme Specific Outcomes	PSO-1. Gain the knowledge of Zoology through theory and practical. PSO-2. Study and understand the Structures and function of excretory organs . PSO-3. Understand the testing of hypothesis. PSO-4. Know structure-activity relationship PSO-5.. Understand good laboratory practices and safety. PSO-6. Develop research oriented skills. PSO-6.Make aware and handle the sophisticated instruments/equipments PSO-7: Use modern Zoological tools, Charts, Models, and Equipments PO`s -8: Various illness, their causes are understood by students due to observing blood report.

Course Outcomes B. Sc Zoology Semester-III Paper I Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids	
Course	**Outcomes**
	After completion of these courses students should be able to;
Unit 1: Fundamentals of Genetics	➢ Learner would comprehend and apply the principles of inheritance to study heredity. ➢ Learner will understand the concept of multiple alleles, linkage and crossing over.
Unit: 2: Chromosomes and Heredity	➢ 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 a particular
Unit: 3 Nucleic acids	➢ Learner will understand the importance of nucleic acids as genetic material. ➢ Learner would comprehend and appreciate the regulation of gene expressions

Course Outcomes B. Sc Zoology Semester-III Paper II Nutrition and Excretion, Respiration and Circulation, Control and Coordination of Life Processes, Locomotion and Reproduction	
Course	**Outcomes**
	After completion of these courses students should be able to;
Unit: 1: Nutrition and Excretion	➢ 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 animals with respiratory and circulatory organs
Unit: 2 : Respiration and Circulation	➢ 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 animals with respiratory and circulatory organs
Unit: 3 Control and Coordination, Locomotion and Reproduction	➢ 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 strategies present in animals

Course Outcomes B. Sc Zoology Semester-III Paper III Ethology, Parasitology, Economic Zoology	
Course	**Outcomes**
	After completion of these courses students should be able to;
Unit: 1 Ethology	➢ Learner would gain insight into different types of animal behavior and their role in biological adaptations.

	➢ Learner would be sensitized to the feelings which are instrumental in social behavior.
Unit: 2 Parasitology	➢ 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 specific parasites, the symptoms of the disease and its treatment
Unit 3 Economic Zoology	➢ 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. Zoology (Semester-IV) Programme Outcomes: B. Sc Zoology

Department of Zoology	**Department of Zoology**
Programme outcomes (PO`s)	**PO`s 1:** To acquaint the students with origin of earth, universe and life. **PO`s 2:**.Studends understands Evidences of evolution. **Pos`s 3:.** The pupils are getting awareness of scientific writings, various research methodology and ethics and research structure. **PO`s 4:** The students get acquaint with cell biology, and various organells. **PO`s 5:** The pupils geta an understanding of origin of life .universe **PO`s 6:** Students understands what are cells, endomembrane, nucleous. **PO`s-7**. Use modern techniques, decent equipment's and Zoology PPT`s and videos. **PO`s 8:** To acquaint the taught with pollution and its types. **PO`s 9**: The students understands about about the sericulture, aquaculture & dairy industry which generates money. **PO`s 13:** Students get acquainted with the economy of Zoology as it creates source of income from various animals. **PO`s 14:** The pupils are highlighted with the knowledge of reproduction, pollution and embryology.
Programme Specific Outcomes	PSO-1. Gain the knowledge of Zoology through theory and practical. PSO-2. Study and understand the Structures and function of excretory organs . PSO-3. Understand the testing of hypothesis. PSO-4. Know structure-activity relationship PSO-5.. Understand good laboratory practices and safety. PSO-6. Develop research oriented skills. PSO-7.Make aware and handle the sophisticated instruments/equipments PSO-7.: Use modern Zoological tools, Charts, Models, and Equipments PO`s -8: Various illness, their causes are understood by students due to observing blood report.

Course Outcomes B. Sc Zoology Semester-IV Paper I Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids	
Course	**Outcomes**
	After completion of these courses students should be able to;
Unit 1: Fundamentals of Genetics	➢ Learner would comprehend and apply the principles of inheritance to study heredity. ➢ Learner will understand the concept of multiple alleles, linkage and crossing over.
Unit: 2: Chromosomes and Heredity	➢ 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 a particular sex chromosome
Unit: 3 Nucleic acids	➢ Learner will understand the importance of nucleic acids as genetic material. ➢ Learner would comprehend and appreciate the regulation of gene expressions

Course Outcomes B. Sc Zoology Semester-IV Paper I Origin and Evolution of Life, Population Genetics and Evolution, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research	
Course	**Outcomes**
	After completion of these courses students should be able to;
Unit 1: Origin and Evolution of Life	➢ Learner will gain insights into the origin of life. ➢ Learner will analyse and critically view the different theories of evolution.
Unit: 2: Population Genetics and Evolution	➢ 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
Unit: 3 Scientific Attitude methodology, Scientific Writing and Ethics in Scientific Research	➢ The learner would develop qualities such as critical thinking and analysis ➢ The learner will imbibe the skills of scientific communication and he/she will understand the ethical aspects of research

Course Outcomes B. Sc Zoology Semester-IV Paper II Cell Biology, Endomembrane System and Biomolecules	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit 1: Cell Biology	➢ Learner would acquire insight into the composition of the transport mechanisms adopted by the cell and its organelles for its maintenance and composition of cell
Unit: 2: Endomembrane System	➢ Learner would appreciate the intricacy of endomembrane system. Learner would understand the interlinking of endomembrane system for functioning of cell
Unit: 3 Biomolecules	➢ The learner will realize the importance of biomolecules and their clinical significance

Course Outcomes B. Sc Zoology Semester-IV Paper III Comparative Embryology, Aspects of Human Reproduction, Pollution and its effect on organisms	
UNIT 1: Comparative Embryology	➢ Learner will be able to understand and compare the different types of eggs and sperms ➢ Learner will be able to understand and compare the different pre-embryonic stages
UNIT3: Pollution and its effect on organisms	➢ The learners will be sensitized about the adverse effects of pollution and measures to control it.
UNIT3: Pollution and its effect on organisms	➢ The learners will be sensitized about the adverse effects of pollution and measures to control it.

T. Y. B. Sc. Zoology (Semester-VI) Programme Outcomes: B. Sc Zoology

Programme outcomes (PO`s)	**PO`s 1:** Demonstrate classification of vertebrates and shark`s all systems. **Po`s 2:.** Create an awareness of the impact of Zoology on the environment, society, and development outside the scientific community **PO`s 3:** To study and understand the different types of phyla with the help of teaching aids like PPT`s, Videos, charts , models etc. **PO`s4:** To inculcate the scientific temperament in the students and outside the scientific community. **PO`s 5:** The pupils develops an understanding about principals of taxonomy. **PO`s 6:** To acquaint the taught with the concept of enzymology, homeostasis, endocrinology and tissue culture. **PO`s 7**: The students understands molecular biology, mutations. **PO`s 8** Scientific Attitude methodology inculcates scientific temperament in the learners. **PO`s 9**:To students develop an insight repairs mechanisms of DNA.

	PO`s 10**: The pupil understands about genetic engineering. **PO`s 11: Students understands the meaning of environment and its management, wildlife management, bioprospecting and Zoogeography.
Programme Specific Outcomes	**PSO-1**. Gain the knowledge of Zoology through theory and practical. **PSO-2.** Study and understand the Structures and function Classification, anatomy, poisons, of animals. **PSO-3.** Understand the testing of hypothesis. **PSO-4**. Know structure-activity relationship **PSO-5..** Understand good laboratory practices and safety. **PSO-6**. Develop research oriented skills. **PSO-7**.Make aware and handle the sophisticated instruments/ equipment's **PSO-8**.: Use modern Zoological tools, Charts, Models, and equipments.

Course Outcomes B. Sc Zoology Semester-VI Paper I Taxonomy - Chordates and Type Study	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Phylum Chordata: Group Protochordata and Group Euchordata I	➢ Learners will get an idea of origin of Chordates, its taxonomy up to class with reference to phylogeny and their special features.
Unit II: Group Euchordata II	➢ Learners will get an idea of pisces which are aquatic while tetrapod are terrestrial, arborial and terrestrial animals,
Unit III: Group Euchordata III	➢ Learners will understand the characteristic features and examples of class of Reptilia, Aves and Mammalia
Unit IV: Type study: Shark	➢ Learners will get an idea of vertebrate animal life after studying one representative animal - shark

Course Outcomes B. Sc Zoology Semester-VI Paper II Physiology and Tissue Culture	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Enzymology	➢ 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
Unit II: Homeostasis	➢ The learner shall comprehend the adaptive responses of animals to environmental changes for their survival
Unit III: Endocrinology	➢ The learner shall understand the types and secretions of endocrine glands and their functions

Unit IV: Animal Tissue Culture	➢ 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.

Course Outcomes B. Sc Zoology Semester-VI Paper III Genetics and Bioinformatics	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Molecular Biology	➢ 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
Unit II: Genetic Engineering	➢ 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.
Unit III: Human Genetics	➢ The learner shall become aware of the impact of changes occurring at gene level on human health and its diagnosis.
Unit IV: Bioinformatics	➢ Learner shall become aware of the computational point of view of studying the genomes.

**Course Outcomes B. Sc Zoology Semester-VI Paper IV **Environmental Biology and Zoopharmacognosy	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Environment management	➢ Learner will understand the different factors affecting environment, its impact and environment management laws
Unit II: Wildlife Management	➢ 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.
Unit III: Bioprospecting and Zoopharmacognosy	➢ Learner will understand the paradigms of discovery and commercialization of biological resources and knowledge gained from self-medication observed in animals
Unit IV: Zoogeography	➢ The learners will become acquainted with how and why different animal species are distributed around the globe.

T. Y. B. Sc. Zoology (Semester-V) Programme Outcomes: B. Sc Zoology

Programme outcomes (PO`s)	**PO`s 1:**Demonstrate classification of invertebrates and vertebrates. **Pos`s 2:.** Create an awareness of the impact of Zoology on the environment, society, and development outside the scientific community **PO`s 3:** To study and understand the different types of phyla with the help of teaching aids like PPT`s, Videos, charts , models etc. **PO`s 4:** To inculcate the scientific temperament in the students and outside the scientific community. **PO`s 5:** The pupils develops an understanding about principals of taxonomy. **PO`s-6**. Use modern techniques, decent equipment's and Zoology PPT`s and videos. **PO`s 7:** To acquaint the taught with the concept of hematology and immunity and its application. **PO`s 8**: The students understands application of clinical practices. **PO`s 9**: Scientific Attitude methodology inculcates scientific temperament in the learners. **PO`s 10**:To students develop an insight about tissues and its culture. **PO`s 11**: The pupil understands about toxicology due to various factors and about hemotoxins, neurotoxins and their source. **PO`s 12:** To calculate relations between co-relation, variations , various parameters , students develop an understanding by solving problems. **PO`s 13**: Students understands about skin and its derivatives, skeleton, muscles and embryology.
Programme Specific Outcomes	**PSO-1**. Gain the knowledge of Zoology through theory and practical. **PSO-2.** Study and understand the Structures and function Classification, anatomy, poisons, of animals. **PSO-3.** Understand the testing of hypothesis. **PSO-4**. Know structure-activity relationship **PSO-5..** Understand good laboratory practices and safety. **PSO-6**. Develop research oriented skills. **PSO-7**.Make aware and handle the sophisticated instruments/equipment's **PSO-8**.: Use modern Zoological tools, Charts, Models, and Equipment.

Course Outcomes B. Sc Zoology **Semester-V Paper I** Taxonomy - Invertebrates and Type Study	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Principles of Taxonomy	➢ Learners will apprehend the basis of classification and modern classification up to class of the lower invertebrate animals.
Unit II: Kingdom Animalia I	➢ The learners will be familiarized with classification up to phylum Nematoda along with their examples.

Unit III: Kingdom Animalia II	➢ Learners will get an idea of higher groups of invertebrate animal life, their classification and their peculiar aspects.
Unit IV: Type study: Sepia	➢ Learners will get an idea of general characteristics and details of invertebrate animal systems

Course Outcomes B. Sc Zoology Semester-V Paper II Haematology and Immunology	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Basic Haematology	➢ The learner shall comprehend basic haematology. The learner will be able to identify various components of haemostatic systems
Unit II: Applied Haematology	➢ 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
Unit III: Basic Immunology	➢ 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.
Unit IV: Applied Immunology	➢ The learner shall understand immunopathology and the principles and applications of vaccines. ➢ The learner will develop basic understanding of immunology of organ transplantation.

Course Outcomes B. Sc Zoology Semester-V Paper III Histology, Toxicology, Pathology and Biostatistics	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Mammalian Histology	➢ Learner would appreciate the well planned organization of tissues and cells in the organ systems
Unit II: Toxicology	➢ 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
Unit III: General Pathology	➢ Learner will be familiar with various medical terminology pertaining to pathological condition of the body caused due to diseases
Unit IV: Biostatistics	➢ 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.

Course Outcomes B. Sc Zoology Semester-V Paper IV Anatomy and Developmental Biology	
Course	**Outcomes**
After completion of these courses students should be able to;	
Unit I: Integumentary system and derivatives	➢ Learner will be able to understand the importance of various types of epidermal and dermal derivatives along with their functions
Unit II: Human Osteology	➢ Learner will be able to understand the structure, types and functions of human skeleton.
Unit III: Muscles of long bones of Human limbs	➢ Learner will be able to understand the types of long limb muscles, its arrangement and their role in body movements
Unit IV: Developmental biology of Chick	➢ Learner will be able to understand the processes involved in embryonic development and practical applications of studying the chick embryology.

Department of Information Technology

F.Y.B.Sc. Information Technology SEM I

1. Imperative Programming

Objective:

Imperative programming is a programming paradigm that uses statements that change a program's state. In much the same way that the imperative mood in natural languages expresses commands, an imperative program consists of commands for the computer to perform. Imperative programming focuses on describing *how* a program operates.

Expected Learning Outcomes:

- Understand the concepts and terms used to describe languages that support the imperative, functional, object-oriented, and logic programming paradigms.
- Solve problems using the functional paradigm.
- Solve problems using the object-oriented paradigm.
- Solve problems using the logic programming paradigm.
- Critically evaluate what paradigm and language are best suited for a new problem.

2. Digital Electronic

Objective:

- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Regulators and Amplifiers

Expected Learning Outcomes:

- Understand the current voltage characteristics of semiconductor devices.
- Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation.
- Design and analyze of electronic circuits.
- Evaluate frequency response to understand behavior of Electronics circuits.

3. Operating Systems

Objective:

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management
- To learn programmatically to implement simple OS mechanisms

Expected Learning Outcomes:

- Analyze the structure of OS and basic architectural components involved in OS design

- Analyze and design the applications to run in parallel either using process or thread models of different OS
- :Analyze the various device and resource management techniques for timesharing and distributed systems
- Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- Interpret the mechanisms adopted for file sharing in distributed Applications
- Conceptualize the components involved in designing a contemporary OS

4. Discrete Mathematics

Objective:

- Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic
- Express a logic sentence in terms of predicates, quantifiers, and logical connectives
- Apply the operations of sets and use Venn diagrams to solve applied problems;
- solve problems using the principle of inclusion-exclusion

Expected Learning Outcomes:

- Students completing this course will be able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Students completing this course will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
- Students completing this course will be able to use tree and graph algorithms to solve problems.
- Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

5. Communication Skills

Objective:

- Object oriented Programming Supporting Business Priorities
- Reaching the Right Audiences
- Defining Critical Messages
- Choosing Correct Channels
- Building Teams
- Servicing Customers
- Learning by Listening

Expected Learning Outcomes:

- Students will be able to understand and apply knowledge of human communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication, etc. from multiple perspectives.

- Students will be able to understand and evaluate key theoretical approaches used in the interdisciplinary field of communication. I.e., students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language, summarize the work of central thinkers associated with particular approaches, and begin to evaluate the strengths and weaknesses of their approaches.

- Students will be able to understand the research methods associated with the study of human communication, and apply at least one of those approaches to the analysis and evaluation of human communication.

- Students will be able to find, use, and evaluate primary academic writing associated with the communication discipline.

- Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others. Such skills could include communication competencies such as managing conflict, understanding small group processes, active listening, appropriate self-disclosure, etc.

- Students will be able to communicate effectively orally and in writing.

6. Object oriented Programming

Objective:
Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm

Expected Learning Outcomes:

- Understand the features of C++ supporting object oriented programming Understand the relative merits of C++ as an object oriented programming language
- Understand how to produce object-oriented software using C++
- Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism
- Understand advanced features of C++ specifically stream I/O, templates and operator overloading

7. Microprocessor and Architecture

Objectives:

- To introduce students with the architecture and operation of typical microprocessors and microcontrollers.
- To familiarize the students with the programming and interfacing of microprocessors and microcontrollers.
- To provide strong foundation for designing real world applications using microprocessors and microcontrollers.

Expected Learning Outcomes:

- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.
- Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
- Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.

8. Web Programming

Objectives:

- Technical Communicators need an awareness of the potential and constraints of web programming and how it affects writing in a web environment. Topics covered are web history, website organization, HTML, graphics use, page and site design, with a brief look at XML, CSS, and JavaScript. Students use Notepad and a web editor to create code, and an FTP program to publish. Students produce a website to showcase future web work.

Expected Learning Outcomes:

- Apply a structured approach to identifying needs, interests, and functionality of a website.
- Design dynamic websites that meet specified needs and interests.
- Write well-structured, easily maintained, standards-compliant, accessible HTMLcode.
- Write well-structured, easily maintained, standards-compliant CSS code to present HTML pages in different ways.
- Use JavaScript to add dynamic content to pages.
- Critique JavaScript code written by others, identifying examples of both good and bad practice.
- Select appropriate HTML, CSS, and JavaScript code from public repositories of open-source and free scripts that enhances the experience of site visitors.

F.Y.B.Sc. Information Technology SEM II

1. Green Computing

Objectives:

- To reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, the recyclability or biodegradability of defunct products and factory waste. Green computing is important for all classes of systems, ranging from handheld system to large-scale data centres

Expected Learning Outcomes:

- To cut down to as little as possible the amount of energy used.
- To minimize the inclusion of harmful materials.
- To use as many biodegradable materials as possible.
- To extend as far as possible the life of the equipment.

S.Y.B.Sc. Information Technology Sem III

1. Python Programming

Objectives:

- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to identify Python object types.
- To learn how to use indexing and slicing to access data in Python programs.
- To define the structure and components of a Python program.
- To learn how to write loops and decision statements in Python.

Expected Learning Outcomes:

- Problem solving and programming capability

2. Data Structures

Objectives:

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques

Expected Learning Outcomes:

- Ability to analyze algorithms and aalgorithm correctness.
- Ability to summarize searching and sorting techniques
- Ability to describe stack,queue and linked list operation.

3. Computer Networks

Objectives:

- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols.

Expected Learning Outcomes:

- Describe the functions of each layer in OSI and TCP/IP model.
- Explain the functions of Application layer and Presentation layer paradigms and Protocols. 3. Describe the Session layer design issues and Transport layer services.

4. Database Management Systems

Objectives:

- To describe a sound introduction to the discipline of database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra.

Expected Learning Outcomes:

- Explain the features of database management systems and Relational database.
- Design conceptual models of a database using ER modelling for real life applications and also construct queries in Relational Algebra. S.Y.B.Sc. Information Technology Sem III

5. Applied Mathematics

Objectives:

- The concepts of Set theory and Relation.
- The concepts of Functions and define the recursive functions.
- The concept of Laplace transforms.

Expected Learning Outcomes:

- Apply the Set theory and Relation concepts.
- Apply the Functions and define the recursive functions.
- Apply Laplace transform to different applications

S.Y.B.Sc. Information Technology Sem IV

1. Core Java

Objectives:

- List and use Object Oriented Programming concepts for problem solving.
- Write programs using Java collection API as well as the java standard class library.
- Solve the inter-disciplinary applications using the concept of inheritance

Expected Learning Outcomes:

- Use an appropriate programming environment to design, code, compile, run and debug computer programs.
- Demonstrate basic problem solving skills: analysing problems, modelling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters, abstract classes, interfaces, inheritance and polymorphism).

2. Introduction to Embedded Systems

Objectives:

- To have knowledge about the basic functions of embedded systems.
- Expected Learning Outcomes:

- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

3. Computer Oriented Statistical Techniques

Objectives:

- The fundamentals and concepts of statistical and optimization methods, in particular, with reference to frequency distribution and measures of central tendency, measures of dispersion, skew ness and kurtosis, theory of probability, linear programming problems, transportation, assignment and game problems.
- To understand important theorems, different formulae and practical applications of these statistical and optimization methods in the field of Computer Sciences and Applications.

Expected Learning Outcomes:

- Recognize the error in the number generated by the solution.
- Compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Rapshon method.
- Apply method of interpolation and extrapolation for prediction.

4. Software Engineering

Objectives:

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analysing software requirements.

Expected Learning Outcomes:

- Define various software application domains and remember different process model used in software development.
- Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.

5. Computer Graphics and Animation

Objectives:

- Explore basics of computer graphics
- Survey application areas
- Brief introduction to graphics and course administration

Expected Learning Outcomes:

- Explain the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two and three dimensions.
- Apply the concepts of colour models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.
- Interpret the mathematical foundation of the concepts of computer graphics.

T.Y.B.Sc. Information Technology SEM V

1. Software Project Management

Objectives:

- To understand need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.

Expected Learning Outcomes:

- Generate project schedule and can construct, design and develop network diagram for different type of Projects. They can also organize different activities of project as per Risk impact factor.

2. Internet of Things

Objectives:

- To learn the concepts of IOT.
- To identify the different technology.
- To learn different applications in IOT.

Expected Learning Outcomes:

- Apply the concepts of IOT.
- Identify the different technology.
- Apply IOT to different applications.
- Analysis and evaluate protocols used in IOT.
- Design and develop smart city in IOT.
- Analysis and evaluate the data received through sensors in IOT.

3. Advanced Web Programming

Objectives:

- To enhance and enrich their skills in Web programming.
- Learn to develop Web applications that use three-tier architecture, session management, object-oriented techniques, and advance database interactions.

Expected Learning Outcomes:

- Apply three-tier architecture concepts and advanced database techniques in web applications.
- Use object-oriented techniques in Web programming.
- develop rich interactive environments for the Web

4. Linux System Administration

Objectives:

- Understand Linux architecture in general, booting process, how to install Centos7 OS, system initialization and some basic commands to get started.

Expected Learning Outcomes:

- To Perform essential Linux commands such as installation, searches and manipulating files
- To Operate running Linux systems by managing the boot process, scheduling jobs, updating the system, monitoring system performance and managing security
- To Manage users and groups by adding/deleting/modifying, configuring LDAP and PAM, modifying user processes and resources

5. Enterprise Java

Objectives:

- To equip advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network. The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business.

Expected Learning Outcomes:

- Identify advance concepts of java programming with database connectivity.
- Design and develop platform independent applications using a variety of component based frameworks
- Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications.

T.Y.B.Sc. Information Technology SEM VI

1. Software Quality Assurance

Objectives:

- To provide information about the quality of the product to the relevant people.

Expected Learning Outcomes:

- critically evaluate alternative standards, models and techniques aimed at achieving quality assurance in a variety of software development environments;
- propose and defend innovative solutions to software quality assurance and measurement problems in the context of various software development environments

2. Security in Computing

Objectives:

- To provide protection of computer systems from the theft of or damage to their hardware, software, or electronic data, as well as from the disruption or misdirection of the services they provide.

Expected Learning Outcomes:

- identify some of the factors driving the need for network security
- identify and classify particular examples of attacks
- define the terms vulnerability, threat and attack
- identify physical points of vulnerability in simple networks

3. Business Intelligence

Objectives:

- To understand comprehensive and in-depth knowledge of Business Intelligence (BI) principles and techniques by introducing the relationship between managerial and technological perspectives.

Expected Learning Outcomes:

- To achieve optimal execution, decision makers need the capacity to collect first-hand, in-depth, and contextual business data from highly distributed systems around the globe.
- To employ analytics techniques to discover possible business relationships.
- Decision makers can acquire the necessary skills and strategies by studying and utilizing a seamlessly integrated set of computational and business techniques, together referred to as business intelligence (BI).

4. Principles of Geographic Information Systems

Objectives:

- GIS applications are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data in maps, and present the results of all these operations.

Expected Learning Outcomes:

- Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T).
- Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space.
- Demonstrate organizational skills in file and database management.

5. IT Service Management

Objectives:

- The IT Services are aligned to the business needs. It is imperative that the IT Services underpin the business processes but it is also increasingly important that IT should act as an agent for Change to facilitate business transformation.

Expected Learning Outcomes:

- Revolution is the way they operate, communicate and do business
- Develop and innovate, gain market advantage and differentiate themselves to their end customers.

DEPSRTMEN OF COMPUTER SCIENCE

F. Y. B.Sc. Computer Science SEM I

1. Computer Organization and Design USCS101

Objectives:

- To understand the structure and operation of modern processors and their instruction sets

Expected Learning Outcomes:

- To learn about how computer systems work and underlying principles
- To understand the basics of digital electronics needed for computers
- To understand the basics of instruction set architecture for reduced and complex instruction sets 4) To understand the basics of processor structure and operation
- To understand how data is transferred between the processor and I/O devices

2. Programming with Python- I USCS102

Objectives:

- The objective of this paper is to introduce various concepts of programming to the students using Python.

Expected learning outcomes

- Students should be able to understand the concepts of programming before actually starting to write programs.
- Students should be able to develop logic for Problem Solving.
- Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.
- Students should be able to apply the problem solving skills using syntactically simple language
-

3. Free and Open-source Software USCS103

Objectives:

- The objective of this paper is to introduce various concepts of programming to the students using Python.

Expected learning outcomes

- Students should be able to understand the concepts of programming before actually starting to write programs.
- Students should be able to develop logic for Problem Solving.
- Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.
- Students should be able to apply the problem solving skills using syntactically simple language i.e. Python (version: 3.X or higher)

4. Database Systems USCS104

Objectives:

- The objective of this course is to introduce the concept of the DBMS with respect to the relational model, to specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases

Expected Learning Outcomes

- Students should be able to evaluate business information problem and find the requirements of a problem in terms of data.
- Students should be able to design the database schema with the use of appropriate data types for storage of data in database. 3) Students should be able to create, manipulate, query and back up the databases.

5. Discrete Mathematics USCS105

Objectives:

- The purpose of the course is to familiarize the prospective learners with mathematical structures that are fundamentally discrete. This course introduces sets and functions, forming and solving recurrence relations and different counting principles. These concepts are useful to study or describe objects or problems in computer algorithms and programming languages.

Expected Learning Outcomes:

- To provide overview of theory of discrete objects, starting with relations and partially ordered sets.
- Study about recurrence relations, generating function and operations on them.
- Give an understanding of graphs and trees, which are widely used in software.
- Provide basic knowledge about models of automata theory and the corresponding formal languages.

6. Descriptive Statistics and Introduction to Probability USCS106

Objectives:

- The purpose of this course is to familiarize students with basics of Statistics. This will be essential for prospective researchers and professionals to know these basics.

Expected Learning Outcomes:

- Enable learners to know descriptive statistical concepts
- Enable study of probability concept required for Computer learners

7. Soft Skills Development USCS107

Objectives:

- To help learners develop their soft skills and develop their personality together with their technical skills. Developing professional, social and academic skills to harness hidden strengths, capabilities and knowledge equip them to excel in real work

environment and corporate life. Understand various issues in personal and profession communication and learn to overcome them

Expected Learning Outcomes:

- To know about various aspects of soft skills and learn ways to develop personality
- Understand the importance and type of communication in personal and professional environment.
- To provide insight into much needed technical and non-technical qualities in career planning.
- Learn about Leadership, team building, decision making and stress management

F. Y. B.Sc. Computer Science SEM II

1. Programming with C USCS201

Objectives:

- The objective of this course is to provide a comprehensive study of the C programming language, stressing upon the strengths ofC, which provide the students with the means of writing modular, efficient, maintainable, and portable code.

Expected Learning Outcomes

- Students should be able to write, compile and debug programs in C language.
- Students should be able to use different data types in a computer program.
- Students should be able to design programs involving decision structures, loops and functions.
- Students should be able to explain the difference between call by value and call by reference
- Students should be able to understand the dynamics of memory by the use of pointers.
- Students should be able to use different data structures and create/update basic data files

2. Programming with Python – II USCS202

Objective:

- The objective of this paper is to explore the style of structured programming to give the idea to the students how programming can be used for designing real-life applications by reading/writing to files, GUI programming, interfacing database/networks and various other features.

Expected Learning Outcomes

- Students should be able to understand how to read/write to files using python.
- Students should be able to catch their own errors that happen during execution of programs.
- Students should get an introduction to the concept of pattern matching.
- Students should be made familiar with the concepts of GUI controls and designing GUI applications.

- Students should be able to connect to the database to move the data to/from the application.
- Students should know how to connect to computers, read from URL and send email.

3. Linux USCS203

Objectives:

- This course introduces various tools and techniques commonly used by Linux programmers, system administrators and end users to achieve their day to day work in Linux environment. It is designed for computer students who have limited or no previous exposure to Linux.

Expected Learning Outcomes:

- Upon completion of this course, students should have a good working knowledge of Linux, from both a graphical and command line perspective, allowing them to easily use any Linux distribution. 2) This course shall help student to learn advanced subjects in computer science practically.
- Student shall be able to progress as a Developer or Linux System Administrator using the acquired skill set.

4. Data Structures USCS204

Objectives:

- To explore and understand the concepts of Data Structures and its significance in programming. Provide and holistic approach to design, use and implement abstract data types. Understand the commonly used data structures and various forms of its implementation for different applications using Python.

Expected Learning Outcomes:

- Learn about Data structures, its types and significance in computing
- Explore about Abstract Data types and its implementation
- Ability to program various applications using different data structure in Python

5. Calculus USCS205

Objectives:

- The course is designed to have a grasp of important concepts of Calculus in a scientific way. It covers topics from as basic as definition of functions to partial derivatives of functions in a gradual and logical way. The learner is expected to solve as many examples as possible to a get compete clarity and understanding of the topics covered.

Expected Learning Outcomes:

- Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions. 2) Ability to appreciate real world applications which uses these concepts.
- Skill to formulate a problem through Mathematical modeling and simulation.

6. Statistical Methods and Testing of Hypothesis USCS206

Objectives:

- The purpose of this course is to familiarize students with basics of Statistics. This will be essential for prospective researchers and professionals to know these basics.

Expected Learning Outcomes:

- Enable learners to know descriptive statistical concepts
- Enable study of probability concept required for Computer learners

7. Green Technologies USCS207

Objectives:

- To familiarize with the concept of Green Computing and Green IT infrastructure for making computing and information system environment sustainable. Encouraging optimized software and hardware designs for development of Green IT Storage, Communication and Services. To highlight useful approaches to embrace green IT initiatives.

Expected Learning Outcomes:

- Learn about green IT can be achieved in and by hardware, software, network communication and data center operations.
- Understand the strategies, frameworks, processes and management of green IT

S. Y. B. Sc. COMPUTER SCIENCE SEMESTER III

1. Theory of Computation USCS301

Objectives:

- To provide the comprehensive insight into theory of computation by understanding grammar, languages and other elements of modern language design. Also to develop capabilities to design and develop formulations for computing models and identify its applications in diverse areas.

Expected Learning Outcomes:

- Understand Grammar and Languages
- Learn about Automata theory and its application in Language Design
- Learn about Turing Machines and Pushdown Automata
- Understand Linear Bound Automata and its applications

2. Core Java USCS302

Objectives:

- The objective of this course is to teach the learner how to use Object Oriented paradigm to develop code and understand the concepts of Core Java and to cover-up with the pre-requisites of Core java.

Expected Learning Outcomes:

- Object oriented programming concepts using Java.
- Knowledge of input, its processing and getting suitable output.
- Understand, design, implement and evaluate classes and applets.
- Knowledge and implementation of AWT package.

3. Operating System USCS303

Objectives:

- Learners must understand proper working of operating system. To provide a sound understanding of Computer operating system, its structures, functioning and algorithms.

Expected Learning Outcomes:

- To provide a understanding of operating system, its structures and functioning
- Develop and master understanding of algorithms used by operating systems for various purposes.

4. Database Management Systems USCS304

Objectives:

- To develop understanding of concepts and techniques for data management and learn about widely used systems for implementation and usage.

Expected Learning Outcomes:

- Master concepts of stored procedure and triggers and its use.
- Learn about using PL/SQL for data management
- Understand concepts and implementations of transaction management and crash recovery.

5. Combinatorics and Graph Theory USCS305

Objectives:

- To give the learner a broad exposure of combinatorial Mathematics through applications especially the Computer Science applications.

Expected Learning Outcomes:

- Appreciate beauty of combinatorics and how combinatorial problems naturally arise in many settings.
- Understand the combinatorial features in real world situations and Computer Science applications.
- Apply combinatorial and graph theoretical concepts to understand Computer Science concepts and apply them to solve problems

6. Physical Computing and IoT Programming USCS306

Objectives:

- To learn about SoC architectures; Learn how Raspberry Pi. Learn to program Raspberry Pi. Implementation of internet of Things and Protocols.

Expected Learning Outcomes:

- Enable learners to understand System On Chip Architectures.
- Introduction and preparing Raspberry Pi with hardware and installation.
- Learn physical interfaces and electronics of Raspberry Pi and program them using practical's
- Learn how to make consumer grade IoT safe and secure with proper use of protocols.

7. Web Programming USCS307

Objectives:

- To provide insight into emerging technologies to design and develop state of - the art web applications using client-side scripting, server-side scripting, and database connectivity.

Expected Learning Outcomes:

- To design valid, well-formed, scalable, and meaningful pages using emerging technologies.
- Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites
- To develop and implement client-side and server-side scripting language programs.
- To develop and implement Database Driven Websites.
- Design and apply XML to create a markup language for data and document centric applications.

S. Y. B. Sc. COMPUTER SCIENCE SEMESTER IV

1. Advanced Java USCS402

Objectives:

- Explore advanced topic of Java programming for solving problems.

Expected Learning Outcomes:

- Understand the concepts related to Java Technology
- Explore and understand use of Java Server Programming

2. Computer Networks USCS403

Objectives:

- In this era of Information, its computation and its exchange techniques, Learner should be able to conceptualize and understand the framework and working of communication networks. And on completion, will be able to have a firm grip over this very important segment of Internet.

Expected Learning Outcomes:

- Learner will be able to understand the concepts of networking, which are important for them to be known as a 'networking professionals'.
- Useful to proceed with industrial requirements and International vendor certifications.

3. Software Engineering USCS404

The Nature of Software, Software Engineering, The Software Process, Generic Process Model, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent

4. Linear Algebra using Python USCS405

Objectives:

- To offer the learner the relevant linear algebra concepts through computer science applications.

Expected Learning Outcomes:

- Appreciate the relevance of linear algebra in the field of computer science.
- Understand the concepts through program implementation
- Instill a computational thinking while learning linear algebra.

5. .Net Technologies USCS406

Objectives:

- To explore .NET technologies for designing and developing dynamic, interactive and responsive web applications.

Expected Learning Outcomes:

- Understand the .NET framework
- Develop a proficiency in the C# programming language
- Proficiently develop ASP.NET web applications using C#
- Use ADO.NET for data persistence in a web application

6. Android Developer Fundamentals USCS407

Objectives:

- To provide the comprehensive insight into developing applications running on smart mobile devices and demonstrate programming skills for managing task on mobile. To provide systematic approach for studying definition, methods and its applications for Mobile-App development.

Expected Learning Outcomes:

- Understand the requirements of Mobile programming environment.
- Learn about basic methods, tools and techniques for developing Apps
- Explore and practice App development on Android Platform
- Develop working prototypes of working systems for various uses in daily lives.

T. Y. B. Sc. COMPUTER SCIENCE SEMESTER V

1. Linux Server Administration USCS502

Objectives:

- Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. Effectively operate a Linux system inside of a network environment to integrate with existing service solutions. Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.

Expected Learning Outcomes:

- Learner will be able to develop Linux based systems and maintain. Learner will be able to install appropriate service on Linux server as per requirement. Learner will have proficiency in Linux server administration.

2. Software Testing and Quality Assurance USCS503

Objectives:

- To provide learner with knowledge in Software Testing techniques. To understand how testing methods can be used as an effective tools in providing quality assurance concerning for software. To provide skills to design test case plan for testing software

Expected Learning Outcomes:

- Understand various software testing methods and strategies. Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software.
- Design SQA activities, SQA strategy, formal technical review report for software quality control and assurance.

3. Information and Network Security USCS504

Objectives:

- To provide students with knowledge of basic concepts of computer security including network security and cryptography.

Expected Learning Outcomes:

- Understand the principles and practices of cryptographic techniques. Understand a variety of generic security threats and vulnerabilities, and identify & analyze particular security problems for a given application.
- Understand various protocols for network security to protect against the threats in a network

4. Architecting of IoT USCS505

Objectives:

- Discovering the interconnection and integration of the physical world. Learner should

get knowledge of the architecture of IoT.

Expected Learning Outcomes:

- Learners are able to design & develop IoT Devices. They should also be aware of the evolving world of M2M Communications and IoT analytics.

5. Game Programming USCS507

Objectives:

- Learner should get the understanding computer Graphics programming using Directx or Opengl. Along with the VR and AR they should also aware of GPU, newer technologies and programming using most important API for windows.

Expected Learning Outcomes:

- Learner should study Graphics and gamming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn.

T Y. B. Sc. COMPUTER SCIENCE SEMESTER VI

1. Wireless Sensor Networks and Mobile Communication USCS601

Objectives:

- In this era of wireless and adhoc network, connecting different wireless devices and understanding their compatibility is very important. Information is gathered in many different ways from these devices. Learner should be able to conceptualize and understand the framework. On completion, will be able to have a firm grip over this very important segment of wireless network.

Expected Learning Outcomes:

- After completion of this course, learner should be able to list various applications of wireless sensor networks, describe the concepts, protocols, design, implementation and use of wireless sensor networks.
- Also implement and evaluate new ideas for solving wireless sensor network design issues.

2. Cyber Forensics USCS603

Objectives:

- To understand the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered

Expected Learning Outcomes :

- The student will be able to plan and prepare for all stages of an investigation - detection, initial response and management interaction, investigate various media to collect evidence, report them in a way that would be acceptable in the court of law.

3. Information Retrieval USCS604

Objectives:

- To provide an overview of the important issues in classical and web information retrieval. The focus is to give an up-to- date treatment of all aspects of the design and implementation of systems for gathering, indexing, and searching documents and of methods for evaluating systems.

Expected Learning Outcomes:

- After completion of this course, learner should get an understanding of the field of information retrieval and its relationship to search engines. It will give the learner an understanding to apply information retrieval models.

4. Data Science USCS606

Objectives:

- Understanding basic data science concepts. Learning to detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and

localization. Making aware of how to address advanced statistical situations, Modeling and Machine Learning.

Expected Learning Outcomes:

- After completion of this course, the students should be able to understand & comprehend the problem; and should be able to define suitable statistical method to be adopted.

5. Ethical Hacking USCS607

Objectives:

- To understand the ethics, legality, methodologies and techniques of hacking.

Expected Learning Outcomes:

- Learner will know to identify security vulnerabilities and weaknesses in the target applications.
- They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines.

Department of Mathematics

Course Outcomes F.Y.B.Sc. Semester-I

Course Code	Units	Course Outcomes
USMT101 (Calculus-I)	UNIT I Real Number System UNIT II Sequences UNIT III Limits and Continuity	Students will be able to: 1. Define real number system and order properties and properties of real numbers. 2. Define intervals and neighborhood and its properties. 3. Prove that Arithmetic Mean > Geometric Mean 4. Prove some simple inequalities by using AM>GM 5. Apply Hausdroff property to find disjoint neighborhood of two distinct real numbers. 6. Apply Archimedean property. 7. Define different types of sequence. 8. Discuss the behavior of the geometric sequence and series. 9. Prove properties of convergent and divergent sequence. 10. Verify the given sequence in convergent and divergent by using behavior of Monotonic sequence. 11. Explain subsequences and upper and lower limits of a sequence. 12. Give examples for convergence, divergence and oscillating series. 13. Prove theorems on different test of convergence and divergence of a series of positive terms. 14. Verify the given series is convergent or divergent by using different test.
USMT102 (Algebra-I)	UNIT I Integers and Divisibility UNIT II Functions and Equivalence Relation UNIT III Polynomials	Students will be able to: 1. Explain statements and logic and various methods of proof. 2. Define a set and explain the basic concept of set theory such as union, intersection and complement. 3. Define relations, equivalence relations and determine if a relation is an equivalence relation and find the corresponding equivalence class. 4. Define functions. 5. State Well-ordering property. 6. Prove binomial theorem for non-negative exponents and apply it find coefficients of terms in the expansion. 7. Explain the various properties of integers and algebra of polynomials and determine the roots of a given polynomial and vice-versa. 8. Define prime numbers. Prove Euclid's lemma and fundamental theorem of arithmetic. 9. Define congruence modulo relation and state its properties.

Course Outcomes F.Y.B.Sc. Semester-II

Course Code	Units	Course Outcomes
USMT201 (Calculus-II)	UNIT I Infinite Series UNIT II Continuous functions and Differentiation UNIT III Applications of Differentiability	Students will be able to: 1. Define continuity and sequential continuity and limits of real valued functions. 2. Define discontinuous functions and removable discontinuity. 3. State and prove algebra of limits, continuous functions and differentiability. 4. State and prove properties of continuous functions. 5. Define differentiation at a point and an open set. 6. Apply chain rule to find derivative of composite functions. 7. Determine local maxima, local minima, stationary points using second derivative test. 8. Define higher order derivatives and various methods to find derivatives.
USMT202 (Algebra-II)	UNIT I System of Linear Equations and Matrices UNIT II Vector Spaces UNIT III Basis & Linear Transformation	Students will be able to: 1. Formulate the equation of lines and planes. 2. Define matrices, types of matrices, invertible matrices. 3. Express system of linear equations in matrix form, perform elementary row operations, Gaussian elimination. 4. Define Vector Space, linear span, linear independence and linear dependence, basis. 5. Determine dimension of a vector space. 6. Define subspace, subspace test, Explain the properties of subspace

Course Outcomes S.Y.B.Sc. Semester-III

Course Code	Units	Course Outcomes
USMT301 (Calculus-III)	UNIT I Functions of Several Variables UNIT II Differentiation UNIT III Applications	Students will be able to: 1. Define the Euclidean inner product and Euclidean norm function in and find distance between two points. 2. Define open ball, open set and determine whether the given set is open set. 3. Define scalar and vector valued functions and explain the basic results on limits and continuity of such functions. 4. Evaluate partial and directional derivative and prove mean value theorem. 5. Define differentiability over a scalar field, total derivative, gradient, partial derivatives, higher order derivatives and chain rule for differentiability. 6. State and prove sufficient condition for equality of mixed partial derivative. 7. Define differentiability over vector fields. 8. Evaluate Jacobian matrix. 9. Find maxima, minima, stationary points using second derivative test in vector fields.
USMT302 (Algebra-III)	UNIT I Linear Transformation and Matrices UNIT II Determinants UNIT III Inner Product Spaces	Students will be able to: 1. Define elementary and invertible matrices. Perform elementary row operations to convert a given matrix to row echelon form to find rank of a matrix. 2. Define linear transformations, kernel and image of a linear transformation and rank nullity theorem. 3. Define linear isomorphism, inverse of a linear isomorphism. 4. Given a linear transformation find the corresponding matrix representation. 5. Define determinant. 6. Use determinant to evaluate area and volume. 7. Explain linear dependence and independence using concept of determinants. 8. Define dot product and inner product and general inner product space. 9. Define orthogonal and orthonormal sets. 10. Find orthonormal basis using Gram-Schmidt orthogonalisation process

Course Code	Units	Course Outcomes
USMT303 (Discrete Mathematics)	UNIT I Permutations and Recurrence Relation UNIT II Preliminary Counting UNIT III Advanced Counting	Students will be able to: 1. Define permutation and combination and basic results on permutation. 2. Define recurrence relation and obtain recurrence relation in counting problems. 3. Solve homogeneous and non homogeneous recurrence relation using various methods. 4. Define finite, countable and uncountable sets. 5. State and prove various principles of preliminary counting. 6. State and prove binomial and multinomial theorem. 7. Define circular permutations. Solve problems using the various formulae. 8. State and prove principal of inclusion and exclusion and apply it to solve problems. 9. Define derangement

Course Outcomes S.Y.B.Sc. Semester-IV

Course Code	Units	Course Outcomes
USMT401 (Calculus-IV)	UNIT I Riemann Integration UNIT II Indefinite Integrals and Improper Integrals UNIT III Beta and Gamma Functions and Applications	Students will be able to: 1. Define Upper/Lower Riemann sums and state its properties. 2. Evaluate Upper/Lower integrals. 3. Define Riemann integral on a closed and bounded interval. 4. State and prove algebra of Riemann integrals.. 5. Prove Fundamental theorem of integral calculus, Mean Value theorem. 6. Evaluate Integration by parts. 7. Define Improper integrals-type 1 and type 2. 8. Define Beta and gamma functions and state their properties. 9. Explain the relationship between beta and gamma functions. 10. Find Area between curves, finding volumes by slicing, volumes of solids of revolution-Disks and Washers, Cylindrical Shells, Lengths of plane curves, Areas of surfaces of revolution

Course Code	Units	Course Outcomes
USMT402 (Algebra-IV)	UNIT I Groups and Subgroups UNIT II Cyclic Groups and Cyclic subgroups UNIT III Lagrange's Theorem and Group Homomorphism	Students will be able to: 1. Define group, center, Normalizer of a group. 2. Find cycles and transpositions of a given permutations. 3. Prove Lagrange's theorem ,Euler's theorem and Fermat's theorem 4. Define cyclic groups. 5. Define subgroup. Find subgroups of cyclic groups. 6. Define cosets. State and prove Lagrange's theorem. 7. Prove a group has no proper subgroup if it is cyclic group of prime order. 8. Define normal subgroups , quotient groups and index of a subgroup. 9. Define homomorphism, kernel of a homomorphism, isomorphism.
USMT403 (Ordinary Differential Equations)	UNIT I First order First degree Differential equations UNIT II Second order Linear Differential equations UNIT III Linear System of Ordinary Differential Equations	Students will be able to: 1. Define differential equation, order and degree, ordinary differential equation. 2. Verify the conditions of existence and uniqueness theorem. 3. Identify different types of differential equation and solve them using appropriate methods. 4. Define homogeneous and non-homogeneous second order differential equations. 5. Solve such equations using different methods based on the type. 6. Define system of differential equations and solve the system. 7. Define Wronskian