Nagpur Shikshan Mandal's

SHRI MATHURADAS MOHOTA COLLEGE OF SCIENCE

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Program Specific Outcomes (PSOs) and Course Outcomes (COs) of Undergraduate department
(Part of B.Sc. Program, offered in combination with three different subjects)

Program Outcomes (POs)

After completion of BSc programme, the students will be able to –

1. Understand the core fundamentals of basic sciences.
2. Understand the diverse day to day applications of various fields.
3. Demonstrate, solve and an understanding of major concepts in all disciplines of science.
4. Analyse any data in a scientific manner, interpret the data and come to a logical conclusion.
5. Apply the acquired knowledge and the applications of basic sciences to community.
6. Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
7. Have sustainable development.
8. Develop skills in handling scientific instruments, planning and performing in laboratory experiments.
9. Go for higher studies i.e. MSc and then do some research for the welfare of mankind.
10. Look for professional job-oriented courses, Indian Army, Indian Navy, Indian Air Force as officers, Indian Civil Services.

After completion of M.Sc. programme, the students will be able to –

1. Understand the core fundamentals and theories of basic sciences with more focus and maturity.
2. Analyse problems, formulate a hypothesis, evaluate the results and draw reasonable conclusions
3. Develop written and oral communication skills by as these students give frequent presentations and seminars on various scientific theories and activities.
4. To inculcate the scientific temperament in the students and outside the scientific community.
5. Handle the sophisticated instruments/equipment.
6. Enable students acquire jobs in R & D in scientific laboratories, industries, teaching at both school or college level (with NET), management, marketing and sales, in public sector organizations and to pursue research.
7. Go to serve in industries or may opt for establishing their own industrial unit.

After completion of Ph.D. programme, the students will be able to –

1. Apply a thorough knowledge of methods and techniques applicable to their own research to discover, interpret and communicate new knowledge through original research.
2. Work cohesively with M.Sc. students, research supervisor and other fellow workers, to create, develop and exchange research knowledge
3. Critically and creatively evaluate critical research issues
4. Influence and benefit the society by offering employability
5. Identify open problems and areas needing development in their fields.

Programme specific outcomes of Chemistry:

PSO	Programme outcomes
PSO-1	To explain nomenclature, structures, reactivity, and preparation of the chemical reactions
PSO-2	Know structure-activity relationship
PSO-3	Solve the problem and also think methodically, independently and draw a logical conclusion.
PSO-4	Make aware and handle the sophisticated instruments and good laboratory practices as well as safety.
PSO-5	Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry.
PSO-6	Develop research oriented skills.
PSO-7	Create an awareness regarding the impact of chemistry on the environment, and society.
PSO-8	To inculcate the scientific temperament in the students and outside the scientific community.

Course outcome of Chemistry:

Course	COs	Course outcomes
B. Sc. Semester- I Paper-I Inorganic Chemistry	CO-1	Learn the basic concepts of structure of atom.
	CO-2	Students learn about the formation of different chemical bonds in different molecules.
	CO-3	Learn the concept of geometry of molecules.
	CO-4	Explain the formation of various types of simple covalent bonds.
B. Sc. Semester- I paper-II Physical Chemistry	CO-1	To understand the concept of thermodynamics and spontaneity of chemical reaction.
	CO-2	To describe the different gases law and their derivation.
	CO-3	To study the properties and structure of liquid state.
	CO-4	To explain the adsorption and role of catalyst in chemical reaction.
B. Sc. Semester- II Paper-I Organic Chemistry	CO-1	Be able to understand the concept of structure and bonding of organic compounds
	CO-2	To explain the basic concept of stereochemistry of organic compounds
	CO-3	Be able to understand the physical and chemical properties of alkanes, alkenes & cycloalkanes
	CO-4	To explain the preparation and properties of dienes & aromatic compounds. Describe the application of fuel chemistry
B. Sc. Semester- II paper-II Physical Chemistry	CO-1	To comprehend the concept of thermodynamics
	CO-2	To study the phase equilibria and colligative properties of liquids
	CO-3	To understand the rate, order, kinetics and molecularity of reaction
	CO-4	To understand the basic needs of nuclear chemistry & effect of pollutant gases on environment.
B. Sc. Semester- III Paper-I Inorganic Chemistry	CO-1	Differentiate between geometry and shapes of molecules. Construct molecular orbital diagram of diatomic molecules and selected heteronuclear dia-Atomic molecules.
	CO-2	Understand characteristics properties of first transition series elements. Write the electronic configuration of second and third series elements and compare them with first series elements.
	CO-3	Write the electronic configuration of lanthanides and Actinides, and understand their Complex formation tendencies.

	CO-4	Identify the errors in chemical analysis. Understand the soil composition and their types.
B. Sc. Semester- III paper-II Organic Chemistry	CO-1	To explain the orientation, directive influence of aromatic compounds & chemical reactions of halogen derivative of alkanes.
	CO-2	To study the physical, chemical properties and reaction mechanism of alcohols and phenols.
	CO-3	To describe the synthesis, diverse chemical reaction & mechanism of nucleophilic addition of aldehyde & ketones.
	CO-4	Be able to understand the different methods of preparation & reaction of acid and its derivatives and applicability of pesticides
B. Sc. Semester- IV Paper-I Inorganic Chemistry	CO-1	Differentiate simple salt, double salt and complexes
	CO-2	Understand the isomerism in coordination compounds. Analyse the redox cycle.
	CO-3	Understand the different instrumental and separation techniques used in chemistry.
	CO-4	Compare different types of silicon. Know about water quality and its parameters.
B. Sc. Semester- IV paper-II Physical Chemistry	CO-1	Students will understand the importance of various solids and their classification.
	CO-2	Learn about different types of theories and laws from physical chemistry.
	CO-3	Explain the spectroscopic study of diatomic molecules.
	CO-4	Understand the basis of classical mechanics and quantum mechanics.
B. Sc. Semester- V Paper-I Organic Chemistry	CO-1	To describe the preparation, reaction & mechanism of N-containing aliphatic & aromatic amines.
	CO-2	To understand the concept of Molecular orbital picture & aromaticity of basic heterocyclic compounds.
	CO-3	To determine the elements of organic compounds and describe the application of organometallic compound.
	CO-4	To explain the basic concept of UV-VIS spectroscopy & how is it applicable for organic compounds.
B. Sc. Semester- V paper-II Physical Chemistry	CO-1	Understand the failure of classical mechanics. Know about wave functions.
	CO-2	Derive Schrodinger wave equation in 1D and 3D box. Understand the criteria for forming MO from AO (LCAO).
	CO-3	Understand the solution, its types and colligative properties and its applications. Students will know about magnetic properties of substances.
	CO-4	Understand the interaction of radiation with matter.
B. Sc. Semester- VI Paper-I Inorganic Chemistry	CO-1	Understand the crystal field theory of coordination compounds and Interpret electronic spectra of transition metal complexes.
	CO-2	Understand the magnetic properties of the metal complexes in terms of magnetic susceptibility, Magnetic moment and do its calculation. Understand the difference between thermodynamic and kinetic stability of the metal complexes.
	CO-3	Know about organometallic compounds and their applications. Understand metal carbonyls and the bonding in them.
	CO-4	Explain the role of trace elements in biological processes. Differentiate hard and soft acids and bases.
B. Sc. Semester- VI	CO-1	Be able to recognize the concept of organic spectroscopy
	CO-2	To explain the importance of enolates and carbohydrate chemistry

paper-II Organic Chemistry	CO-3	To develop the ability how amino acids, protein & nucleic acids essential for daily life.
	CO-4	To explain the synthetic applicability of dyes & drugs chemistry.

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Program Matrix
Name of program: B Sc
Number of courses: 12
(Low Correlation= L; Moderate Correlation =M; High Correlation =H)

Chemistry Department:

PSO	Programme outcomes
PSO-1	To explain nomenclature, structures, reactivity, and preparation of the chemical reactions
PSO-2	Know structure-activity relationship
PSO-3	Solve the problem and also think methodically, independently and draw a logical conclusion.
PSO-4	Make aware and handle the sophisticated instruments and good laboratory practices as well as safety.
PSO-5	Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry.
PSO-6	Develop research oriented skills.
PSO-7	Create an awareness regarding the impact of chemistry on the environment, and society.
PSO-8	To inculcate the scientific temperament in the students and outside the scientific community.

	Course outcomes (Cos)	Programme outcomes (POs)							
		Domain specific (PSO)							
	Name of course: B Sc Semester-I, Paper-I	1	2	3	4	5	6	7	8
CO-1	Learn the basic concepts of structure of atom.		M	L		L	L		
CO-2	Students learn about the formation of different chemical bonds in different molecules.	M				L			
CO-3	Learn the concept of geometry of molecules.	L	M	M					
CO-4	Explain the formation of various types of simple covalent bonds.	L							
	Name of course: B Sc Semester-I, Paper-II								
CO-1	To understand the concept of thermodynamics and spontaneity of chemical reaction.			L	L				
CO-2	To describe the different gases law and their derivation.		M			M			
CO-3	To study the properties and structure of liquid state.	M		M				M	
CO-4	To explain the adsorption and role of catalyst in chemical reaction.	M				M	M		
	Name of course: B Sc Semester-II, Paper-I								
CO-1	Be able to understand the concept of structure and bonding of organic compounds	H	M			M			
CO-2	To explain the basic concept of stereochemistry of organic compounds	M	M		M		M		
CO-3	Be able to understand the physical and chemical properties of alkanes, alkenes & cycloalkanes	M			M			M	
CO-4	To explain the preparation and properties of dienes & aromatic compounds. Describe the application of fuel chemistry	M		H		L	M		
	Name of course: B Sc Semester-II, Paper-II								
CO-1	To comprehend the concept of thermodynamics		M			L			
CO-2	To study the phase equilibria and colligative properties of liquids	M					M		
CO-3	To understand the rate, order, kinetics and molecularity of reaction			M					
CO-4	To understand the basic needs of nuclear chemistry & effect of pollutant gases on environment.				M			M	
	Name of course: B Sc Semester-III, Paper-I								
CO-1	Differentiate between geometry and shapes of molecules. Construct molecular orbital diagram of diatomic molecules and selected heteronuclear dia-Atomic molecules.	M	M			L			

CO	Course Outcome									
CO-2	Understand characteristics properties of first transition series elements. Write the electronic configuration of second and third series elements and compare them with first series elements.	M							M	
CO-3	Write the electronic configuration of lanthanides and Actinides, and understand their Complex formation tendencies.						M	M		
CO-4	Identify the errors in chemical analysis. Understand the soil composition and their types.						M			M
Name of course: B Sc Semester-III, Paper-II										
CO-1	To explain the orientation, directive influence of aromatic compounds & chemical reactions of halogen derivative of alkanes.	M				L		M		
CO-2	To study the physical, chemical properties and reaction mechanism of alcohols and phenols.	L	M			L		M		
CO-3	To describe the synthesis, diverse chemical reaction & mechanism of nucleophilic addition of aldehyde & ketones.	M	M	M						
CO-4	Be able to understand the different methods of preparation & reaction of acid and its derivatives and applicability of pesticides	M				L		M		
Name of course: B Sc Semester-IV, Paper-I										
CO-1	Differentiate simple salt, double salt and complexes		M					M		
CO-2	Understand the isomerism in coordination compounds. Analyse the redox cycle.	M				M				
CO-3	Understand the different instrumental and separation techniques used in chemistry.		M							
CO-4	Compare different types of silicon. Know about water quality and its parameters.		M	M						
Name of course: B Sc Semester-IV, Paper-II										
CO-1	Students will understand the importance of various solids and their classification.		M	H						M
CO-2	Learn about different types of theories and laws from physical chemistry.				M				M	
CO-3	Explain the spectroscopic study of diatomic molecules.		M					M		
CO-4	Understand the basis of classical mechanics and quantum mechanics.	M				M				
Name of course: B Sc Semester-V, Paper-I										
CO-1	To describe the preparation, reaction & mechanism of N-containing aliphatic & aromatic amines.	H				M				
CO-2	To understand the concept of Molecular orbital picture & aromaticity of		M	H				M		

	basic heterocyclic compounds.							
CO-3	To determine the elements of organic compounds and describe the application of organometallic compound.			M	M		M	
CO-4	To explain the basic concept of UV-VIS spectroscopy & how is it applicable for organic compounds.		H	M		H		
Name of course: B Sc Semester-V, Paper-II								
CO-1	Understand the failure of classical mechanics. Know about wave functions.			M				
CO-2	Derive Schrodinger wave equation in 1D and 3D box. Understand the criteria for forming MO from AO (LCAO).	M			M			
CO-3	Understand the solution, its types and colligative properties and its applications. Students will know about magnetic properties of substances.	M		M		M		
CO-4	Understand the interaction of radiation with matter.					M		
Name of course: B Sc Semester-VI, Paper-I								
CO-1	Understand the crystal field theory of coordination compounds and Interpret electronic spectra of transition metal complexes.	M			M			
CO-2	Understand the magnetic properties of the metal complexes in terms of magnetic susceptibility, Magnetic moment and do its calculation. Understand the difference between thermodynamic and kinetic stability of the metal complexes.	H		M		M		
CO-3	Know about organometallic compounds and their applications. Understand metal carbonyls and the bonding in them.				M			M
CO-4	Explain the role of trace elements in biological processes. Differentiate hard and soft acids and bases.				M			
Name of course: B Sc Semester-VI, Paper-II								
CO-1	Be able to recognize the concept of organic spectroscopy		H			M		
CO-2	To explain the importance of enolates and carbohydrate chemistry	M		M				
CO-3	To develop the ability how amino acids, protein & nucleic acids essential for daily life.			M				
CO-4	To explain the synthetic applicability of dyes & drugs chemistry.	H		M				

Physics Department

Programme Specific Outcomes

PSO	Programme Specific Outcomes
PSO-1	To explain basic concept physics through experiments
PSO-2	To solve the problems on related topics from the syllabus provided by university by various tricks.
PSO-3	To prepare the students for various entrance examinations by providing guidance for higher studies such as NET/GATE.
PSO-4	To develop the skills for fabrication of basic instruments, kits of the practical experiment provided in the syllabus.
PSO-5	To inculcate scientific temperament and competence building in the students through various scientific programms
PSO-6	To create the interest in research field, small projects are provided to students
PSO-7	To aware about the science knowledge by visiting various research labs, higher technical institutes and industries.

Course Outcomes

Course	COs	Course Outcomes
B. Sc. Semester-I Paper -I		**After Completion of Paper-I of Semester-I, students should be able to-**
	CO-1	To understand basic concepts of elasticity and plasticity, their applications in real life problems such as cantilever and bending of beams etc.
	CO-2	To understand concept of viscosity in general and the applications such as Bernoulli's theorem and equation of continuity in particular and they should be able to apply concept of terminal velocity to solve the numericals and why viscosity varies with temperature
	CO-3	To understand to correlate and apply the crux of surface tension and angle of contact in daily life and to understand what is importance of frame of reference , laws of motions and their impact in daily life phenomenon.
	CO-4	To gain the conservation of momentum phenomenon and their application in rotational dynamics and to know how moment of Inertia plays a vital role in studying motion of bodies having different shapes and sizes.
B. Sc. Semester-I Paper -II		**After Completion of Paper-II of Semester-I, students should be able to-**
	CO-1	To understand similarities and differences between Coulomb's Law and Newton's Law of Gravitation and their significance to Understand the concept of Electric Field and Electric Potential and their related phenomenon.
	CO-2	To know the concept of Dielectrics, their importance. Applications od Dielectrics in Capacitors, industries etc.
	CO-3	To know the differences between static and dynamic electric and magnetic fields. What are the applications of both fields. To understand various laws that governs electrical circuits such as Kirchhoff's voltage and current laws, Faradays Laws, Lenz's Law etc. , their applications in LC,RC and LCR Circuits.
	CO-4	To understand concept of Phase Diagrams, phase difference in pure L,C,R circuts and whats is importance of Quality factor Q and Power Factor in A.C. Circuits.
B. Sc. Semester-II Paper -I		**After Completion of Paper-I of Semester-II, students should be able to-**
	CO-1	To understand the relations between Oscillatory, Periodic and Simple Harmonic Motions. What is the difference between Forced and Damped Oscillations.
	CO-2	Able to understand how phenomenon of resonance could be achieved by Forced oscillations. What is mean by power dissipiation and quality factor.
	CO-3	To understand transport of mass, viscosity and conductivity in fluids, along with this they should have clear cut understanding of all gas laws such as Boyles Law, Charles Law etc. To Understand what is Thermal Equilibrium and relation between Heat Energy, internal energy and Work Done.
	CO-4	To Understand how Entropy is related to amount of heat and temperature, Carnot Engine its efficiency and Refrigerator. To understand different scales of measuring the temperatures such as Kelvin Scale, Fahrenheit Scale, Degree Celsius Scale etc and interconversion in these scales. What is mean by Joule Coefficient.

B. Sc. Semester-II Paper -II	After Completion of Paper-II of Semester-II, students should be able to-	
	CO-1	To understand Kepler's Laws of Planetary Motion, concept of Gravitation, Gravitational potential at different points in Solid Sphere etc.
	CO-2	To understand facts and figures of our Solar System and Milky Way Galaxy. To measure size and distances of Planets by Parallax Method.
	CO-3	To understand all theories about Magnetism, differences between Dia, Para and Ferromagnetic Materials. To understand Meissner's Effect, Superconductivity Phenomenon and importance of Curie temperature in Ferromagnetism.
	CO-4	To understand basic concept about magnetic field such as magnetic dipole moment, Lorentz Equation, Ampere Circuital Law, Biot-Savart Law and Guass Law in Magnetism.
B.Sc. Semester III Paper - I	CO- 1	To understand concept of wave propagation. Classification of waves. Basic terminology of music science.
	CO- 2	To understand Transducers with reference to acoustics, microphone, loudspeakers, methods of recording and reproduction of sound and architectural acoustics of building.
	CO- 3	To understand Ultrasonics: theory, production properties and application
	CO- 4	To understand Concepts of rectifier and power supply
B.Sc. Semester III Paper - II	CO- 1	To understand the basic concepts of interference (Newton's rings and Michelson's interferometer)
	CO- 2	To understand the basic theory of diffraction, its application
	CO- 3	To understand the basic concept of polarization, Nicol prism positive and negative crystals
	CO- 4	To understand the fundamentals of E.M. waves: theoretical derivation.
B.Sc. Semester IV Paper - I	CO- 1	To Introduce crystal Physics
	CO- 2	To understand theory and generation of X-rays, properties and usage of X Rays hard and soft X-rays
	CO- 3	To understand application of X-Ray in solid state Physics Braggs law and Bragg spectrometer.
	CO- 4	To understand Lasers: concept, construction and application of Laser different types of Laser.
B.Sc. Semester IV Paper - II	CO- 1	To understand semiconductor devices: Diodes, BJT and their characteristics
	CO- 2	To understand construction and characteristics, working of JFET and MOSFET.
	CO- 3	To understand concept of molecular spectroscopy: vibrational, rotational and electronic spectra of molecules. And its applications
	CO- 4	To understand Raman Effect: theory and its application
B. Sc. Semester-V Paper -I	CO-1	To understand all atomic models, quantum numbers, L-S and J-J Coupling. To understand Pauli's Exclusion Principle, Zeeman , Anomalous Zeeman Effect and Stark Effect.
	CO-2	To understand Free electron theory and hence its dependence on electrical and thermal conductivity. To understand Bloch Theorem and hence kroning –penny model., Hall effect in semiconductors and metals/

	CO-3	To understand the concept of Probability distribution, Boltzman distribution law, r.m.s, value of speed of molecules etc.
	CO-4	To understand Bose-Einstein statistics and its application to Black body radiation. To understand Fermi-Dirac distribution, Concept of Negative temperature and overall comparison between M-B, B-E and F-D statistics.
B. Sc. Semester-V Paper -II	CO-1	To Understand why Classical theory fails to explain phenomenon occurred in motion of microbodies and how Planck's radiation law explain them all. To understand what is wave-particle duality,de-Broglie Hypothesis and Heisenberg Uncertainity principle.
	CO-2	To Understand significance of Scrodinger wave equation in real life problems and what are the properties of well behaved wave function. To understand how Eigen values and Eigen functions actually represents wave function and particle.
	CO-3	To understand the terms Nano science and nanotechnology in broad perspective. To understand what is 1D,2D and 3D materials, synthesis approaches such as Top down and Bottom up approach of nanomaterials.
	CO-4	To understand various synthesis and characterization methods of Nanomaterials and their application in life.
B. Sc. Semester-VI Paper -I	CO-1	To understand the basics of relativity in general and Einstein's special theory of relativity in particular. The concept of Ether, its properties , evidence , a hypothetical medium for propagation of light is to be understood by Famous Michelson-Morley Experiment
	CO-2	General idea of Mass and energy and their basics in Physics, its interdependence and inter-conversion is to be demonstrated by famous Einstein Mass-Energy relation $E = MC^2$. To understand its practical importance
	CO-3	To know the importance and necessity of modern days green and clean energy sources using nuclear energy is demonstrated by Nuclear reactions and Nuclear reactors. The misconception about Nuclear power and energy is explained by fission and fusion reaction
	CO-4	Importance and applicability of Physics concepts for Bio medical instrumentation such as EEG, ECG for Human Body demonstrated. Working mechanism and principle of operation using Physics Phenomenon s are also vital importance
B. Sc. Semester-VI Paper -II	CO-1	To understand the basic concept of amplifiers , its application in electronic industries. More emphasis on Operational amplifiers its significance to instrumentation in Physics
	CO-2	To understand the concept of light wave propagation through fibres in general and through optical fibres. Application of optical fibres in telecommunication network , types of fibres and its application in Biomedical instrumentations is to be understood..
	CO-3	To understand basics of wave propagation, radio waves , its applicability in radio wave communication. To understand the modulation process, its importance and types of AM, FM , PM Etc.
	CO-4	To understand the importance of side bands, Guard bands in radio frequency communication.

		To understand the basic concepts of different logics, Boolean Algebra and its application to digital circuits as a basic parts using different logic gates, its operation and application

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DEPARTMENT OF PHYSICS

Programme Specific Outcomes (PSOs)

PSO	Programme Specific Outcomes
PSO-1	To explain basic concept physics through experiments
PSO-2	To solve the problems on related topics from the syllabus provided by university by various tricks.
PSO-3	To prepare the students for various entrance examinations by providing guidance for higher studies such as NET/GATE.
PSO-4	To develop the skills for fabrication of basic instruments, kits of the practical experiment provided in the syllabus.
PSO-5	To inculcate scientific temperament and competence building in the students through various scientific programms
PSO-6	To create the interest in research field, small projects are provided to students
PSO-7	To aware about the science knowledge by visiting various research labs, higher technical institutes and industries.

	Course Outcomes	Programme Outcomes (POs)						
		Programme Specific Outcomes (PSOs)						
	Name of Course-B. Sc. Semester-I, Paper -I	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO-1	To understand basic concepts of elasticity and plasticity, their applications in real life problems such as cantilever and bending of beams etc.	M						
CO-2	To understand concept of viscosity in general and the applications such as Bernoulli's theorem and equation of continuity in particular and they should be able to apply concept of terminal velocity to solve the numericals and why viscosity varies with temperature	M						
CO-3	To understand to correlate and apply the crux of surface tension and angle of contact in daily life and to understand what is importance of frame of reference , laws of motions and their impact in daily life phenomenon.		L					
CO-4	To gain the conservation of momentum phenomenon and their application in rotational dynamics and to know how moment of Inertia plays a vital role in studying motion of bodies having different shapes and sizes.	H						
	Name of Course-B. Sc. Semester-I,Paper -II							
CO-1	To understand similarities and differences between Coulomb's Law and Newton's Law of Gravitation and their significance to Understand the concept of Electric Field and Electric Potential and their related phenomenon.		M					
CO-2	To know the concept of Dielectrics, their importance. Applications od Dielectrics in Capacitors, industries etc.	M						
CO-3	To know the differences between static and dynamic electric and magnetic fields. What are the applications of both fields. To understand various laws that governs electrical circuits such as Kirchhoff's voltage and current laws, Faradays Laws, Lenz's Law etc. , their applications in LC,RC and LCR Circuits.		H					
CO-4	To understand concept of Phase Diagrams, phase difference in pure L,C,R circuts and whats is importance of Quality factor Q and Power Factor in A.C. Circuits.							M
	Name of Course-B. Sc. Semester-II,Paper -I							

CO-1	To understand the relations between Oscillatory, Periodic and Simple Harmonic Motions. What is the difference between Forced and Damped Oscillations.				M				
CO-2	Able to understand how phenomenon of resonance could be achieved by Forced oscillations. What is mean by power dissipiation and quality factor.	M							
CO-3	To understand transport of mass, viscosity and conductivity in fluids, along with this they should have clear cut understanding of all gas laws such as Boyles Law, Charles Law etc. To Understand what is Thermal Equilibrium and relation between Heat Energy, internal energy and Work Done.		M						
CO-4	To Understand how Entropy is related to amount of heat and temperature, Carnot Engine its efficiency and Refrigerator. To understand different scales of measuring the temperatures such as Kelvin Scale, Fahrenheit Scale, Degree Celsius Scale etc and interconversion in these scales. What is mean by Joule Coefficient.		H						
	Name of Course-B. Sc. Semester-II,Paper -II								
CO-1	To understand Kepler's Laws of Planetary Motion, concept of Gravitation, Gravitational potential at different points in Solid Sphere etc.	M							
CO-2	To understand facts and figures of our Solar System and Milky Way Galaxy. To measure size and distances of Planets by Parallax Method.	M							
CO-3	To understand all theories about Magnetism, differences between Dia, Para and Ferromagnetic Materials. To understand Meissner's Effect, Superconductivity Phenomenon and importance of Curie temperature in Ferromagnetism.	M							
CO-4	To understand basic concept about magnetic field such as magnetic dipole moment, Lorentz Equation, Ampere Circuital Law, Biot-Savart Law and Guass Law in Magnetism.	M							
	Name of Course-B. Sc. Semester-III,Paper -I								
CO - 1	To understand concept of wave propagation. Classification of waves. Basic terminology of music science.	M							
CO - 2	To understand Transducers with reference to acoustics, microphone, loudspeakers, methods of recording and reproduction of sound and				H				

CO	Description								
	architectural acoustics of building.								
CO - 3	To understand Ultrasonics: theory, production properties and application				M				
CO - 4	To understand Concepts of rectifier and power supply			H					
	Name of Course-B. Sc. Semester-III,Paper -II								
CO - 1	To understand the basic concepts of interference (Newton's rings and Michelson's interferometer)				M				
CO - 2	To understand the basic theory of diffraction, its application	M							
CO - 3	To understand the basic concept of polarization, Nicol prism positive and negative crystals				M				
CO - 4	To understand the fundamentals of E.M. waves: theoretical derivation.	M							
	Name of Course-B. Sc. Semester-IV,Paper -I								
CO - 1	To Introduce crystal Physics	M							
CO - 2	To understand theory and generation of X-rays, properties and usage of X Rays hard and soft X-rays						M		
CO - 3	To understand application of X-Ray in solid state Physics Braggs law and Bragg spectrometer.						M		
CO - 4	To understand Lasers: concept, construction and application of Laser different types of Laser.						M		
	Name of Course-B. Sc. Semester-IV,Paper -II								
CO - 1	To understand semiconductor devices: Diodes, BJT and their characteristics		M						
CO - 2	To understand construction and characteristics, working of JFET and MOSFET.		M						
CO - 3	To understand concept of molecular spectroscopy: vibrational, rotational and electronic spectra of molecules. And its applications	M							
CO - 4	To understand Raman Effect: theory and its application			M					
	Name of Course-B. Sc. Semester-V,Paper -I								
CO-1	To understand all atomic models, quantum numbers, L-S and J-J Coupling. To understand Pauli's Exclusion Principle, Zeeman , Anomalous Zeeman Effect and Stark Effect.			M					
CO-2	To understand Free electron theory and hence its dependence on electrical			M					

	and thermal conductivity. To understand Bloch Theorem and hence kroning –penny model., Hall effect in semiconductors and metals/								
CO-3	To understand the concept of Probability distribution, Boltzman distribution law, r.m.s, value of speed of molecules etc.	M		M					
CO-4	To understand Bose-Einstein statistics and its application to Black body radiation. To understand Fermi-Dirac distribution, Concept of Negative temperature and overall comparison between M-B, B-E and F-D statistics.			L					
	Name of Course-B. Sc. Semester-V,Paper -II								
CO-1	To Understand why Classical theory fails to explain phenomenon occurred in motion of microbodies and how Planck's radiation law explain them all. To understand what is wave-particle duality,de-Broglie Hypothesis and Heisenberg Uncertainity principle.						H		
CO-2	To Understand significance of Scrodinger wave equation in real life problems and what are the properties of well behaved wave function. To understand how Eigen values and Eigen functions actually represents wave function and particle.	L							
CO-3	To understand the terms Nano science and nanotechnology in broad perspective. To understand what is 1D,2D and 3D materials, synthesis approaches such as Top down and Bottom up approach of nanomaterials.						M		
CO-4	To understand various synthesis and characterization methods of Nanomaterials and their application in life.						M		
	Name of Course-B. Sc. Semester-VI,Paper -I								
CO-1	To understand the basics of relativity in general and Einstein's special theory of relativity in particular. The concept of Ether, its properties , evidence , a hypothetical medium for propagation of light is to be understood by Famous Michelson- Morley Experiment	M							
CO-2	General idea of Mass and energy and their basics in Physics, its interdependence and inter-conversion is to be demonstrated by famous		M						

CO	Description							
	Einstein Mass-Energy relation $E= MC^2$. To understand its practical importance							
CO-3	To know the importance and necessity of modern days green and clean energy sources using nuclear energy is demonstrated by Nuclear reactions and Nuclear reactors. The misconception about Nuclear power and energy is explained by fission and fusion reaction				M			
CO-4	Importance and applicability of Physics concepts for Bio medical instrumentation such as EEG, ECG for Human Body demonstrated. Working mechanism and principle of operation using Physics Phenomenon s are also vital importance							M
Name of Course-B. Sc. Semester-VI,Paper -II								
CO-1	To understand the basic concept of amplifiers , its application in electronic industries. More emphasis on Operational amplifiers its significance to instrumentation in Physics							M
CO-2	To understand the concept of light wave propagation through fibres in general and through optical fibres. Application of optical fibres in telecommunication network , types of fibres and its application in Biomedical instrumentations is to be understood..					M		
CO-3	To understand basics of wave propagation, radio waves , its applicability in radio wave communication. To understand the modulation process, its importance and types of AM, FM, PM Etc.	M						
CO-4	To understand the importance of side bands, Guard bands in radio frequency communication. To understand the basic concepts of different logics, Boolean Algebra and its application to digital circuits as a basic parts using different logic gates, its operation and application			M				

Botany Department:
Programme Specific Outcomes (PSOs)

PSO	Programme Specific Outcomes:
PSO-1	Understanding phylogenetic relationships of plants.
PSO-2	Identification of plants becomes easier.
PSO-3	Students will apply statistical method to interpret their data collected from various fields
PSO-4	Students will be able to explain plant development at molecular level, development of plant, plant anatomy, photosynthesis and life cycle of plants
PSO-5	Students will be able to develop practical skill in experimental techniques.

Course outcome of Botany:

Course	COs	Course outcomes
B. Sc. Semester- I Paper-I VIRUSES, PROKARYOTES AND ALGAE, BIOFERTILIZERS	CO-1	Understanding the microbial organisms in nature.
	CO-2	Understanding the concept of prokaryotes
	CO-3	Understanding the microbial organisms in nature and their diversity with Lower Plants
	CO-4	Understanding the Biofertilizers
B. Sc. Semester- I paper-II FUNGI, LICHEN, PLANT PATHOLOGY, BRYOPHYTA, MUSHROOM CULTIVATION	CO-1	Identify the different plant diseases,
	CO-2	Understand Cell structure, Reproduction and Economic importance of fungi, lichens
	CO-3	Understand Cell structure, Reproduction and Economic importance of Bryophytes
	CO-4	Skill based : Mushroom cultivation
B. Sc. Semester- II Paper-I PTERIDOPHYTA & GYMNOSPERMS, SOIL ANALYSIS	CO-1	Understanding the nature and life cycle of non flowering plants: Pleobotany
	CO-2	Understanding the Pteridophytes
	CO-3	Understanding the Gymnosperm
	CO-4	Understanding the concept of Soil analysis
B. Sc. Semester- II paper-II PALAEOBOTANY & MORPHOLOGY OF ANGIOSPERMS, FLORICULTURE	CO-1	Understand Root and leaf Morphology
	CO-2	Understand types of Inflorescences, flowers
	CO-3	Understand details structure of Flower and its parts, fruits.
	CO-4	Understanding the concept of floriculture
B. Sc. Semester- III Paper-I ANGIOSPERM TAXONOMY, EMBRYOLOGY, INDOORE GARDENING	CO-1	Understand the Modern trends in Taxonomy
	CO-2	Understand classification, Identification and taxonomical study Angiospermic plants.
	CO-3	Study of plant embryology
	CO-4	Understand the Principles of Indoor gardening
B. Sc. Semester- III Paper-II ANATOMY AND HORTICULTURE	CO-1	Study tissue system and meristem
	CO-2	Study of internal structure of Dicot and monocot plant parts.
	CO-3	Study of internal structure of plant parts
	CO-4	Study of concept of horticulture
B. Sc. Semester- IV Paper-I CELL BIOLOGY, PLANT	CO-1	Study of Cell Organelles
	CO-2	Study of biological activities in Cell
	CO-3	Plant breeding and evolution

BREEDING & Evolution, Seed technology	CO-4	Plant Nursery
B. Sc. Semester- IV Paper-II GENETICS & MOLECULAR BIOLOGY, PLANT NURSERY	CO-1	Study of Genetics Mendelian, Linkages, crossing over
	CO-2	Study of Genetics mutation
	CO-3	Understanding of Molecular Biology
	CO-4	Skill development: Plant nursery
B. Sc. Semester- V Paper-I BIOCHEMISTRY & PLANT PHYSIOLOGY-I, PLANT NUTRITION, HYDROPHONICS	CO-1	Understanding of plant and water relation
	CO-2	Concept of Photosynthesis respiration
	CO-3	Study of Nitrogen fixation, Plant movement, photoperiodism
	CO-4	Skill development: Mineral nutrition and hydroponics
B. Sc. Semester-V Paper-II PLANT ECOLOGY – I, ORGANIC FARMING	CO-1	Study of plant and environment
	CO-2	Understanding of Ecosystem
	CO-3	Study of plant succession and adoption
	CO-4	Skill development: organic farming
B. Sc. Semester- VI Paper-I BIOCHEMISTRY, BIOTECHNOLOGY, & HERBAL TECHNOLOGY	CO-1	Study of Biochemistry, enzymology and lipids
	CO-2	Understanding of plant tissue culture
	CO-3	Understanding of Genetic engineering
	CO-4	Skill development: Herbal technology
B. Sc. Semester- VI Paper-II PHYTOGEOGRAPHY, UTILIZATION OF PLANTS, TECHNIQUES & PHARMACOGNOSY	CO-1	Study of Phytogeography, pollution and natural resources
	CO-2	Study of plant utilization and ethnobotany
	CO-3	Understanding working of instruments and microscopy
	CO-4	Skill development: Pharmacognosy

Department of Botany:

Programme Specific Outcomes (PSOs)

PSO	Programme Specific Outcomes:
PSO-1	Understanding phylogenetic relationships of plants.
PSO-2	Identification of plants becomes easier.
PSO-3	Students will apply statistical method to interpret their data collected from various fields
PSO-4	Students will be able to explain plant development at molecular level, development of plant, plant anatomy, photosynthesis and life cycle of plants
PSO-5	Students will be able to develop practical skill in experimental techniques.

Course outcomes

	Course outcomes (Cos)	Programme outcomes (POs)				
		Domain specific (PSO)				
	Name of course: B Sc Semester-I PAPER I	1	2	3	4	5
CO-1	Understanding the microbial organisms in nature.	L	M	L	L	M
CO-2	Understanding the concept of prokaryotes	M	L	L	L	M
CO-3	Understanding the microbial organisms in nature and their diversity with Lower Plants	M	M	L	L	M
CO-4	Understanding the Biofertilizers	-	L	M	-	H
	Name of course: B Sc Semester -I PAPER II					
CO-1	Identify the different plant diseases,	-	L	L	L	M
CO-2	Understand Cell structure, Reproduction and Economic importance of fungi, lichens	M	M	L	L	M
CO-3	Understand Cell structure, Reproduction and Economic importance of Bryophytes	M	M	L	L	L
CO-4	Skill based : Mushroom cultivation	L	M	L	L	H
	Name of course: B Sc Semester -II PAPER I					
CO-1	Understanding the nature and life cycle of non flowering plants: Pleobotany	M	M	L	L	M
CO-2	Understanding the Pteridophytes	M	M	L	M	M
CO-3	Understanding the Gymnosperm	M	M	L	M	M
CO-4	Understanding the concept of Soil analysis	L	L	M	L	H
	Name of course: B Sc Semester -II PAPER II					
CO-1	Understand Root and leaf Morphology	M	M	L	M	H
CO-2	Understand types of Inflorescences, flowers	M	M	L	M	H
CO-3	Understand details structure of Flower and its parts, fruits.	M	H	L	H	M
CO-4	Understanding the concept of floriculture	L	H	L	M	H

		Name of course: B Sc Semester -III PAPER I					
CO-1	Understand the Modern trends in Taxonomy		H	M	M	M	M
CO-2	Understand classification, Identification and taxonomical study Angiospermic plants.		H	H	M	H	M
CO-3	Study of plant embryology		M	L	L	ML	
CO-4	Understand the Principles of Indoor gardening		L	M	L	L	H
		Name of course: B Sc Semester -III PAPER II					
CO-1	Study tissue system and meristem		M	L	L	M	L
CO-2	Study of internal structure of Dicot and monocot plant parts.		M	M	L	M	M
CO-3	Study of internal structure of plant parts		M	M	L	M	M
CO-4	Study of concept of horticulture		L	M	L	M	H
		Name of course: B Sc Semester -IV PAPER I					
CO-1	Study of Cell Organelles		L	M	L	H	M
CO-2	Study of biological activities in Cell		L	L	L	H	L
CO-3	Plant breeding and evolution		H	L	M	M	L
CO-4	Plant Nursery		L	M	L	M	H
		Name of course: B Sc Semester -IV PAPER II					
CO-1	Study of Genetics Mendelian, Linkages, crossing over		H	L	H	H	H
CO-2	Study of Genetics mutation		H	L	H	H	L
CO-3	Understanding of Molecular Biology		H	L	H	H	L
CO-4	Skill development: Plant nursery		L	H	M	L	H
		Name of course: B Sc Semester -V PAPER I					
CO-1	Understanding of plant and water relation		L	L	L	H	L
CO-2	Concept of Photosynthesis respiration		L	L	M	H	L
CO-3	Study of Nitrogen fixation, Plant movement, photoperiodism		L	L	L	H	L
CO-4	Skill development: Mineral nutrition and hydroponics		L	M	M	M	H
		Name of course: B Sc Semester -V PAPER II					
CO-1	Study of plant and environment		M	M	M	M	L
CO-2	Understanding of Ecosystem		L	M	L	M	L
CO-3	Study of plant succession and adaptation		L	M	M	M	L
CO-4	Skill development: organic farming		L	L	M	L	H
		Name of course: B Sc Semester -VI PAPER I					
CO-1	Study of Biochemistry, enzymology and lipids		L	L	M	M	L
CO-2	Understanding of plant tissue culture		L	M	M	M	L

CO-3	Understanding of Genetic engineering	M	L	M	H	L
CO-4	Skill development: Herbal technology	L	M	L	M	H
	Name of course: B Sc Semester -VI PAPER II					
CO-1	Study of Phytogeography, pollution and natural resources	H	M	M	L	L
CO-2	Study of plant utilization and ethnobotany	M	H	L	M	M
CO-3	Understanding working of instruments and microscopy	L	L	M	M	H
CO-4	Skill development: Pharmacognosy	L	M	M	M	H

Zoology Department:

Programme specific outcomes (PSOs)

PSO1	Learn scientific way of classification and identification of animals. Also, understand anatomical, morphological and physiological similarities and differences among non-chordates and chordates
PSO2	Understand the importance and role of every animal in maintaining harmony with the environment for coexistence
PSO3	Understand not only the basic concepts of cell biology, molecular biology, genetics, animal physiology, developmental biology and immunology, but also learn how to apply this knowledge in real life
PSO4	Understand how to apply basic knowledge of zoology in its applied branches like aquaculture, entomology
PSO5	Understand the principles behind every technique used in various biotechniques like filtration, sterilization, separation along with others like microtechnique and biotechnology so as to evolve into skilled and employable workforce
PSO6	Understand and implement basic concepts of biology and blend the knowledge with concepts from other branches of science to have proficiency in interdisciplinary branches like bioinformatics and biostatistics for better analysis of the experimental data

Course Outcomes (COs)

After completion of these courses, the students would be able to:

SEMESTER-I	**Structure and Function of Invertebrates (Protozoa to Annelida) Paper I**
CO1	Understand the general characters of Phylum Protozoa and various taxa under Protozoa up to classes and able to identify animals based on their character.
CO2	Describe anatomical and morphological features of *Paramecium* and *Plasmodium* with the knowledge of their life cycles
CO3	Understand the modes of infection of parasitic protozoans of humans like *Entamoeba*, *Trypanosoma*, *Giardia* and *Leishmania* and learn the methods to control these protozoans
CO4	Describe general characteristics of Phylum Porifera and understand classification up to classes
CO5	Understand structure, reproduction and development of *Sycon* as an example of poriferans and understand various types of canal systems in observed in sponges
CO6	Learn general characteristics of Phylum Coelenterata with classification of animals under various taxa up to classes
CO7	Describe structure, life cycle of *Obelia* as representative coelenterate and study dynamics of coelenterate corals communities
CO8	Understand the general characters of Phylum Platyhelminthes and characteristics of different taxa up to classes under the phylum
CO9	Understand life cycle, morphology and reproductive systems of *Ascaris*
CO10	Learn anatomy, morphology and life cycle of *Taenia solium* and parasitic

	adaptations observed in Helminths
CO11	Describe characteristics of Phylum Annelida and various taxa up to classes
CO12	Describe morphology and various systems including digestive and urinogenital systems of Leech
CO13	Understand various life forms during indirect development and study Trochophore larva in details
CO14	Understand importance of worms and practice vermiculture and understand its importance
CO15	Able to handle laboratory equipment's, prepare temporary and permanent mountings and understand basic principles of staining
SEMESTER-I	**Environmental Biology Paper II**
CO1	Understand different zones of atmosphere, their importance and components of air
CO2	Learn the global distribution and physico-chemical properties of water
CO3	Describe various types of rocks and understand the process of formation of soil
CO4	Understand the renewable and non- renewable energy sources, the differences between them and their importance its types and their importance with example of pond ecosystem
CO5 & CO6	Understand the meaning and importance of food chains and webs for maintaining balance in the ecosystems and the concept of ecological pyramids
CO7	Describe various models of energy flow in an ecosystem, namely, Single Channel, Y – Shape and Universal model
CO8	Understand the concept and importance of biodiversity, its conservation and causes of depletion of biodiversity
CO9	Study the Wildlife Conservation Acts (1972 and 1984),
CO10	Understand the concept of National parks and sanctuaries with examples of Tadoba, Kanha, Bharatpur and Nagzira
CO11	Describe the concept of hot spots of biodiversity and enlist such hot spots in India
CO12	Describe the causes, effects of water-, noise-, and air-pollution and study various control measures
CO13	Understand the concepts and causes of acid rain, greenhouse effect, ozone depletion leading to global warming; also to study measures to control global warming
CO14	Understand the concepts of bioaccumulation and biomagnifications; describe the effects of heavy metals (lead, cadmium and mercury) on organisms
CO15	Able to understand how to measure pH using pH paper and pH meter; estimate dissolved oxygen and carbon dioxide in water samples by understanding basic principles of titration; study various physical and chemical properties of water
CO16	Prepare temporary and permanent mountings and master principles of staining Life
SEMESTER-II	**Diversity of Animals-Non-chordates (Arthropoda to Hemichordata) Paper III**
CO1	Understand the general characters of Phylum Arthropoda and categorization of animals into various taxa up to classes
CO2	Learn mouth parts, digestive system and reproductive system of cockroach as representative of arthropods
CO3	Identify various insect vectors, namely, mosquitoes, houseflies, sandflies, Tse-Tse

	flies and study their importance in completion of life cycles of various pathogens wherever applicable
CO4	Understand indirect development in arthropods and study crustacean larvae, namely, Nauplius, Zoea, and Megalopa
CO5	Understand the concept of social behavior in insects with the example of honeybees; learn the intricacies of behavior of honeybees contributing to their colony
CO6	Learn general characters of Phylum Mollusca and its taxa up to classes
CO7	Understand morphology and digestive, respiratory and reproductive systems of *Pila* that represents Phylum Mollusca
CO8	Understand economic importance of molluscs with reference to pearl formation
CO9	Understand indirect development in molluscs with study of molluscan larvae, namely, Glochidium and Veliger
CO10	Describe general characteristics of Phylum Echinodermata and classify animals into various taxa up to classes
CO11	Describe external features of starfish and study digestive and water vascular systems with a reference to locomotion
CO12	Understand indirect development in echinoderms through Bipinnaria and Auricularia larvae
CO13	Learn about general characters of Phylum Hemichordata and its phylogeny
CO14	Understand reproduction, development through Tornaria larva in *Balanoglossus* and study affinities of *Balanoglossus* with other minor and major phyla
CO15	Achieve fluency in handling laboratory instruments; prepare temporary and permanent mountings
SEMESTER-II	**Cell Biology Paper IV**
CO1	Understand the concept of a cell and study ultrastructure of prokaryotic and eukaryotic cell
CO2	Describe various models of structure of plasma membrane with emphasis on Fluid Mosaic Model and understand various functions of plasma membrane
CO3	Understand the ultrastructure and functions of smooth and rough endoplasmic reticulum.
CO4	Understand the ultrastructure and functions of Golgi complex
CO5	Describe structural details of mitochondria and understand the process of oxidative phosphorylation through Glycolysis, Kreb's Cycle, Electron Transport Chain and Terminal Oxidation
CO6	Learn the structural details, concept of polymorphism in lysosomes and their functions
CO7	Describe the ultrastructure of nuclear membrane and understand the importance of it.
CO8	Understand the structure, types of chromosomes including Lamp-brush and polytene chromosomes and the concept of nucleosome
CO9	Learn the structure and functions of nucleolus.
CO10	Explain structure, types of ribosome with emphasis on Lake's model
CO11	Understand the cell cycle and its phases; also study the importance of synaptonemal complex, crossover and recombination.

CO12	Describe the process and types of cell division, namely, mitosis and meiosis; understand the special uncontrolled cell division leading to cancer and factors responsible for it
CO13	Describe the process of cellular aging and events leading to the apoptosis
CO14	Perform cell biology experiments with available material from plant source to have better understanding of cell biology; able to use information technology resources to have understanding of animal systems
SEMESTER-III	**Life and Diversity of Animals-Chordates (Protochordata to Amphibia) Paper V**
CO1	Describe animals belonging to protochordata up to order scientifically
CO2	Understand the structure and digestive system in *Herdmania*; study the process of development through A*scidian* tadpole and also to understand retrogressive metamorphosis
CO3	understand morphology and anatomy through various systems, namely, digestive, circulatory, excretory systems and sense organs in *Amphioxus*
CO4	Learn general characters of Cyclostomata with reference to *Petromyzon* and *Myxine*
CO5	Describe characteristics of Chondrichthyes and Osteichthyes
CO6	Understand the evolution of fishes in terms of occurrence of paired fins; learn about occurrence and importance of accessory respiratory organs in fishes
CO7	Study the phenomenon of migration in fishes
CO8	Describe Amphibia and classify the amphibians up to order by studying the identifying characters
CO9	Understand occurrence and importance of parental care and its various types; describe neoteny in Amphibia
CO10	Describe the process of gametogenesis in vertebrates and describe type of eggs and the process of fertilization of eggs based on their types
CO11	With emphasis on fish development, understand post fertilization changes
CO12	Describe types of scales in fishes and study development of placoid scales
CO13	Understand the development of frogs through cleavages, blastulation and gastrulation; learn about various morphogenetic movements with reference to frog gastrula
CO14	Understand the concept and importance of fate map
CO15	Understand the development of respiratory organs and aortic arches in frog
C016	Prepare permanent preparations of fish scales and other biological samples; understand the histology of various organs of lower vertebrates and fish and frogs
SEMESTER-III	**Genetics Paper VI**
CO1	Understand the principles of inheritance with the help of Mendel's experiments and also understand allelic interactions that do not follow Mendelian laws
CO2	Understand the phenomenon of gene interactions with emphasis on epistasis and altered Mendelian ratios
CO3	Understand Quantitative genetics with the help of polygenic traits; understand impact of inbreeding, outbreeding and hybrid vigor on gene pool, gene and allelic frequencies and overall recombination process.
CO4	Describe the concept and importance of extracellular genome with reference to mitochondrial DNA and plasmids

CO5	Learn about the phenomenon of inheritance through cytoplasm with reference to Kappa particles in *Paramecium*, CO2 sensitivity in *Drosophila* and milk factor in mice
CO6	Understand theories of linkage, its types and effects of linkage on crossing over
CO7	Understand different concepts of genes, namely, cistron, muton and recon.
CO8	Understand the altered physiology and inheritance of genetic disorders in humans with reference to hemoglobin disorders, namely, thalassemia and sickle cell anemia and the metabolic disorder phenylketonuria.
CO9	Understand various patterns of sex determination, namely, ZZ, XY, XO and ZW patterns; also describe genic balance mechanism of sex determination in Drosophila and role of environment in sex determination of Bonellia
CO10	Describe various structural chromosomal aberrations, namely, addition, deletion, duplication and inversion and understand their effects
CO11	Describe numerical chromosomal aberrations with reference to Turner, Klinefelter and Down syndromes
CO12	Understand the concept of mutations and describe spontaneous and induced mutations; also describe various types of mutagenic agents and their effects on DNA sequences and expressions
CO13	Understand the concept of lethal genes and the consequences
CO14	Learn the basic concepts of population genetics with emphasis on Hardy Weinberg equilibrium
CO15	Understand the importance of genetic counselling to deal with various hereditary diseases and disorders
CO16	Describe the use and importance of DNA fingerprinting, amniocentesis and karyotyping techniques and the usefulness of sperm banks to understand the applicability of genetics
CO17	Demonstrate the genetic crosses using coloured beads to understand Mendelian principles; perform population surveys for various traits and testing the hypothesis with appropriate statistical tools
CO18	Understand the Hardy-Weinberg principle with suitable example and perform calculations to find out gene and allele frequencies in a population
SEMESTER-IV	**Life and Diversity of Animals-Chordates (Reptilia, Aves and Mammals) Paper VII**
CO1	Understand the classification of reptiles considering the temporal vacuities
CO2	Study snakes with reference to the poison apparatus, biting mechanism and also understand the importance of snake venom
CO3	Compare Ratitae with Caranitae; understand flight adaptations
CO4	Understand Migration in birds
CO5	Describe the general characters of subclasses Prototheria, Metatheria and Eutheria of class Mammalia
CO6	Understand and discuss Darwinism and Neo-Darwinism
CO7	Understand the cursorial, aquatic, terrestrial, fossorial and volant adaptations with suitable examples
CO8	Describe the genetic basis of evolution with reference to species and demes and the variations responsible for the process
CO9	Understand the Caucasoid, Negroid, Mongoloid and Australoid races in man to

	know more about racial differences among the members of the same species
CO10	Compare aortic arches and hearts in reptiles, birds and mammals
CO11	Understand the structure of egg of a hen and study the development of chick embryo up to primitive streak stage
CO12	Understand the development and functions of extra embryonic membranes in chick
CO13	Describe structure and the importance of blastocyst in mammals
CO14	Describe implantation of embryo in mammals; study types of placenta on the basis of morphological and histological structures and the functions
CO15	Understand the concept of stem cells; study the sources, types and importance of stem cells in human welfare
CO16	Understand the behavior in birds with respect to the diurnal and rhythmic behavior and pheromones and reproductive behavior in mammals
CO17	Discuss the skeletal systems in birds and mammals with examples of fowl and rabbit respectively
CO18	Prepare permanent mountings of chick embryos representing various developmental milestones
SEMESTER-IV	**Molecular Biology and Immunology Paper VIII**
CO1	Understand the landmark experiments that proved DNA and RNA as genetic materials
CO2	Understand the intricacies of the proposed and accepted models for structures of DNA
CO3	Learn about various forms of DNA, their properties and understand the physico-chemical parameters in which those forms exist
CO4	Understand various forms of RNA and describe their structures, their properties and roles in cellular physiology
CO5	Understand structural details of the prokaryotic and eukaryotic genes and describe various other structural elements regulating these genes
CO6	Describe Griffith's experiment to understand bacterial transformation; also learn about other modes of recombination, namely, conjugation and transduction in bacteria
CO7	Understand various experiments including Meselson-Stahl experiment which helped understand the replication process
CO8	Describe the semiconservative model of replication with the help of concepts like origin of replication and directionality of replication
CO9	Learn about the concept and characteristics of genetic code including Wobble hypothesis
CO10	Understand the mechanism of processes transcription and translation with various regulating factors to describe the process of protein synthesis
CO11	Understand regulation of gene expression with emphasis on Lac operon and Trp operon
CO12	Describe the concept of immunity and understand the importance of having an immune system; study innate and acquired immunity in addition to different organs of the immune system
CO13	Understand the basics of structure, diversity, functions and types of antigens and antibodies

CO14	Understand the mechanism of antigen-antibody interactions based on structural details to explain humoral immunity
CO15	Understand the intricacies of the B cell response and the T cell response to understand the humoral as well as cell mediated immunity
CO16	Understand the concept and pathways of the complement system and its importance
CO17	Describe one of the most important the molecular players of the immune response which are cytokines and learn about cytokines related disorders
CO18	Describe impaired immune system causing autoimmune diseases and learn about the ways in which those can be treated
CO19	Understand the immunodeficiencies including AIDS and others and understand the ways to manage those diseases
CO20	Understand the principles and working of laboratory instruments used in molecular biology experiments; learn to stain nucleic acids and also to isolate DNA from a suitable source
CO21	Demonstrate the antigen-antibody interaction and learn about organs of the immune system
SEMESTER-V	**General Mammalian Physiology-I: (Enzymology; digestive, respiratory and circulatory systems) Paper IX**
CO 1	Understand the concept, chemical nature and distribution of enzymes
CO2	Describe the general properties and classification of enzymes
CO3	Understand various physico-chemical factors and conditions affecting the enzyme action
CO4	Describe the histology and physiology of digestive glands, namely, salivary, gastric, intestinal glands, liver, and pancreas
CO5	Understand the endocrinology of gastrointestinal hormones
CO6	Understand the physiology of digestion and absorption of proteins, carbohydrates, and lipids
CO7	Describe various fat soluble and water-soluble vitamins with reference to their sources, the deficiencies and related diseases
CO8	Learn about the types, distribution and the physico-chemical properties including binding dynamics with the respiratory gases of various respiratory pigments
CO9	Understand the detailed mechanism of respiration including transport of O2 and CO2 along with various respiratory pigments and working of respiratory organs.
CO10	Understand the disorders of respiratory systems with special reference to effect of smoking
CO11	Learn about normal and abnormal constituents and functions of blood
CO12	Describe the importance of intrinsic and extrinsic blood clotting factors and understand the principles behind ABO blood grouping system and Rh factor
CO13	Learn about different phases of cardiac cycle; understand the principle behind ECG and describe various factors regulating blood pressure
CO14	Demonstrate enzyme action on substrate by using salivary amylase
CO15	Perform detection tests for carbohydrates, proteins and fats
CO16	Detect presence of vitamins A and C
CO17	Measure total WBC and RBC counts; demonstrate presence of haemin crystals
CO18	Measure lung capacity by using suitable method

CO19	Understand the histology of various mammalian organs with the help of available permanent slides.
SEMESTER-V	**Applied Zoology-I (Aquaculture and Economic Entomology) Paper X**
CO 1	Understand and discuss the parameters used for construction of various ponds used for rearing various stages of fish
CO2	Explain breeding of fishes by bund and Chinese hatcheries and understand the practice and importance of induced breeding using hypophysation and the new generation drugs
CO3	Explain different culture methods, namely, polyculture, cage culture, sewage fed fish culture and integrated fish farming
CO4	Learn about commercial aspects of aquaculture by studying fish products and by products and study different methods of fish preservation
CO5	Explore commercial aspects aquaculture with respect to prawn culture and pearl culture
CO6	Understand commercial setup required for culturing aquarium fish species and study the process of fabrication and setting up of aquaria, their maintenance and breeding of aquarium fishes
CO7	Learn about different diseases caused by different causative agents, namely, fungi, bacteria, protozoa and helminths
CO8	Describe the use, mode of action, merits and demerits of using different classes of chemicals as insecticides.
CO9	Explain use, merits and demerits of using predators and parasites as biological control agents for insect pests
CO10	Describe the life cycle of, damage caused by and control measures for plant pests, *Earias vitella*, *Sitophilus oryzae* and animal pests *Musca nebulo* and *Stomoxys calcitrans*
CO11	Explain life cycles, rearing methods of different species of silkworms, namely, *Bombyx mori* and *Antheraea mylitta*
CO12	Understand cocoon processing steps for synthesis of silk fabric, namely, cocoon boiling, reeling, rereeling, winding, doubling, twisting and weaving
CO13	Explain types, life cycles of honey bees and explain methods of apiculture along with commercial importance of bee products
CO14	Understand the life cycle of the lac insect, *Laccifer lacca* and the processing of raw lac to prepare various products and understand their economic importance
CO15	Describe the economically important food and aquarium fishes; study various systems through virtual dissection or through other available media; prepare permanent mountings of scales and zooplanktons following ethical guidelines
CO16	Describe various economically important insect species; study various mountings related to insects
CO17	Understand different breeding/ rearing setups by visiting different facilities/ educational centres
SEMESTER-VI	**General Mammalian Physiology-II: (Nervous, muscular, excretory, endocrine and reproductive systems) Paper XI**
CO1	Describe neuronal cell types and understand the structure of neurons including electron micrographs of different regions of neurons

CO2	Understand the conduction of impulse across the nerve
CO3	Understand the ultrastructure of a striated muscle and the physiology of muscle contraction with the help of sliding filament theory
CO4	Describe various properties of muscles, namely, twitch, tetanus, tonus, summation, All or None Principle and muscle fatigue with better understanding of muscle physiology
CO5	Learn about the structural details of a uriniferous tubule
CO6	Understand the mechanism of urine formation with emphasis on counter – current mechanism and describe the idea of dialysis
CO7	Describe normal and abnormal constituents of urine
CO8	Understand the position, morphology, histology and physiology of the pituitary, thyroid, parathyroid, adrenal and pineal glands
CO9	Understand the oestrous and menstrual cycles to describe reproductive physiology of females
CO10	Describe the chemical nature and functions of male and female sex hormones
CO11	Describe the causes of infertility in males and females
CO12	Understand the concept and importance of contraception and describe different mechanical and hormonal contraceptives
CO13	Understand the concept and importance of in vitro fertilization
CO14	Perform experiments for detection of various normal and abnormal constituents of urine
CO15	Perform qualitative analysis of the semen sample
CO16	Study different endocrine gland of fish with suitable diagrams/ digital tools
CO17	Observe various histological slides to understand the ultrastructure of various organs of muscular, nervous, endocrine, reproductive and excretory systems
SEMESTER-VI	**Applied Zoology-II (Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics) Paper XII**
CO1	Explain various techniques of sterilization from crude to the most sophisticated techniques, namely, filtration, autoclaving, dry heat sterilization, wet sterilization and radiation
CO2	Understand various separation techniques, namely, centrifugation, chromatography, agarose gel electrophoresis, SDS-PAGE
CO3	Describe the working principles of colorimeter and spectrophotometers
CO4	Understand basics of microtomy and the steps involved from tissue fixation to section cutting and also understand the ways of troubleshooting the process of microtomy/ section cutting and the spreading of tissue sections
CO5	Understanding the basic concepts of staining with various kinds of stains and describe double staining using hematoxylin and eosin
CO6	Describe basics and practical applications of histochemical staining techniques for carbohydrates, proteins and lipids
CO7	Understand basic concepts of recombinant DNA technology and describe the types and uses of DNA manipulation enzymes
CO8	Learn the theoretical aspects of shotgun cloning
CO9	Understand the concept of cloning vectors, their types and the merits and limitations
CO10	Understand the principles behind insertion of DNA fragment and ligation using

	blunt and cohesive ends
CO11	Describe the application of biotechnology for recombinant insulin and vaccine production
CO12	Understand the basic concepts, importance and role of bioinformatics in life sciences and describe the concept and types of databases used in bioinformatics including nucleotide and protein databases
CO13	Understand the concept and importance of biostatistics and learn about tabulation and presentation of data
CO14	Understand the meaning and importance concepts used in biostatistics, namely, sampling errors, mean, mode, median, probability, standard error and standard deviation
CO15	Perform experiments related to use of various biotechniques studied in theory including sterilization and separation techniques
CO16	Get acquainted with microtechnique and staining procedures
CO17	Use computer software to analyze biological data using statistical tools
CO18	Practice using various basic computer programs
CO19	Perform specific searches related to biological information using bioinformatic tools and databases
CO20	Understand working principles of various sophisticated instruments by visiting biotechnology institutions and research centers

Zoology Department:
Programme specific outcomes (PSOs)

PSO1	Learn scientific way of classification and identification of animals. Also, understand anatomical, morphological and physiological similarities and differences among non-chordates and chordates
PSO2	Understand the importance and role of every animal in maintaining harmony with the environment for coexistence
PSO3	Understand not only the basic concepts of cell biology, molecular biology, genetics, animal physiology, developmental biology and immunology, but also learn how to apply this knowledge in real life
PSO4	Understand how to apply basic knowledge of zoology in its applied branches like aquaculture, entomology
PSO5	Understand the principles behind every technique used in various biotechniques like filtration, sterilization, separation along with others like microtechnique and biotechnology so as to evolve into skilled and employable workforce
PSO6	Understand and implement basic concepts of biology and blend the knowledge with concepts from other branches of science to have proficiency in interdisciplinary branches like bioinformatics and biostatistics for better analysis of the experimental data

	Course Outcomes (COs)	**Program Outcomes (POs)**					
	Course Name:	**Domain Specific (PSO)**					
SEMESTER-I	**Structure and Function of Invertebrates (Protozoa to Annelida) Paper I**	1	2	3	4	5	6
CO1	Understand the general characters of Phylum Protozoa and various taxa under Protozoa up to classes and able to identify animals based on their character.	M	L	H	L	L	L
CO2	Describe anatomical and morphological features of *Paramecium* and *Plasmodium* with the knowledge of their life cycles	L	L	L	L	L	L
CO3	Understand the modes of infection of parasitic protozoans of humans like *Entamoeba*, *Trypanosoma*, *Giardia* and *Leishmania* and learn the methods to control these protozoans	M	M	M	M	L	L
CO4	Describe general characteristics of Phylum Porifera and understand classification up to classes	L	L	L	M	L	L
CO5	Understand structure, reproduction and development of *Sycon* as an example of poriferans and understand various	M	M	M	M	L	L

	types of canal systems in observed in sponges						
CO6	Learn general characteristics of Phylum Coelenterata with classification of animals under various taxa up to classes	L	L	L	L	L	L
CO7	Describe structure, life cycle of *Obelia* as representative coelenterate and study dynamics of coelenterate corals communities	M	M	L	L	L	L
CO8	Understand the general characters of Phylum Platyhelminthes and characteristics of different taxa up to classes under the phylum	M	M	L	L	L	L
CO9	Understand life cycle, morphology and reproductive systems of *Ascaris*	M	H	L	L	L	L
CO10	Learn anatomy, morphology and life cycle of *Taenia solium* and parasitic adaptations observed in Helminths	H	M	L	L	L	L
CO11	Describe characteristics of Phylum Annelida and various taxa up to classes	H	M	L	L	L	L
CO12	Describe morphology and various systems including digestive and urinogenital systems of Leech	M	M	L	L	L	L
CO13	Understand various life forms during indirect development and study Trochophore larva in details	H	M	M	L	L	L
CO14	Understand importance of worms and practice vermiculture and understand its importance	L	H	L	L	H	M
CO15	Able to handle laboratory equipment's, prepare temporary and permanent mountings and understand basic principles of staining	L	L	L	L	L	L
SEMESTER-I	**Environmental Biology Paper II**						
CO1	Understand different zones of atmosphere, their importance and components of air	M	M	L	L	L	L
CO2	Learn the global distribution and physico-chemical properties of water	M	H	L	L	L	L
CO3	Describe various types of rocks and understand the process of formation of soil	M	L	L	L	L	L
CO4	Understand the renewable and non- renewable energy sources, the differences between them and their importance its types and their importance with example of pond ecosystem	M	M	L	L	L	L
CO5 & CO6	Understand the meaning and importance of food chains and webs for maintaining balance in the ecosystems and the concept of ecological pyramids	M	L	L	L	L	L
CO7	Describe various models of energy flow in an ecosystem, namely, Single Channel, Y – Shape and Universal model	L	L	L	L	L	L
CO8	Understand the concept and importance of biodiversity, its conservation and causes of depletion of biodiversity	M	L	L	L	L	L
CO9	Study the Wildlife Conservation Acts (1972 and 1984),	L	M	L	L	L	L
CO10	Understand the concept of National parks and sanctuaries with examples of Tadoba, Kanha, Bharatpur and Nagzira	M	M	L	L	L	L

CO11	Describe the concept of hot spots of biodiversity and enlist such hot spots in India	M	M	H	L	L	L
CO12	Describe the causes, effects of water-, noise-, and air-pollution and study various control measures	L	H	H	L	L	L
CO13	Understand the concepts and causes of acid rain, greenhouse effect, ozone depletion leading to global warming; also to study measures to control global warming	L	H	H	L	L	L
CO14	Understand the concepts of bioaccumulation and biomagnifications; describe the effects of heavy metals (lead, cadmium and mercury) on organisms	L	M	H	L	L	L
CO15	Able to understand how to measure pH using pH paper and pH meter; estimate dissolved oxygen and carbon dioxide in water samples by understanding basic principles of titration; study various physical and chemical properties of water	L	M	H	L	L	L
CO16	Prepare temporary and permanent mountings and master principles of staining Life	L	L	H	L	L	L
SEMESTER-II	**Diversity of Animals-Non-chordates (Arthropoda to Hemichordata) Paper III**						
CO1	Understand the general characters of Phylum Arthropoda and categorization of animals into various taxa up to classes	H	H	L	L	L	L
CO2	Learn mouth parts, digestive system and reproductive system of cockroach as representative of arthropods	H	H	L	L	L	L
CO3	Identify various insect vectors, namely, mosquitoes, houseflies, sandflies, Tse-Tse flies and study their importance in completion of life cycles of various pathogens wherever applicable	H	H	L	L	L	L
CO4	Understand indirect development in arthropods and study crustacean larvae, namely, Nauplius, Zoea, and Megalopa	L	L	L	L	L	L
CO5	Understand the concept of social behavior in insects with the example of honeybees; learn the intricacies of behavior of honeybees contributing to their colony	H	H	L	L	L	L
CO6	Learn general characters of Phylum Mollusca and its taxa up to classes	H	H	L	L	L	L
CO7	Understand morphology and digestive, respiratory and reproductive systems of *Pila* that represents Phylum Mollusca	M	M	L	L	L	L
CO8	Understand economic importance of molluscs with reference to pearl formation	M	M	L	L	L	L
CO9	Understand indirect development in molluscs with study of molluscan larvae, namely, Glochidium and Veliger	L	L	L	L	L	L
CO10	Describe general characteristics of Phylum Echinodermata and classify animals into various taxa up to classes	H	M	L	L	L	L
CO11	Describe external features of starfish and study digestive and water vascular systems with a reference to locomotion	H	M	L	L	L	L

CO12	Understand indirect development in echinoderms through Bipinnaria and Auricularia larvae	H	M	L	L	L	L
CO13	Learn about general characters of Phylum Hemichordata and its phylogeny	L	L	L	L	L	L
CO14	Understand reproduction, development through Tornaria larva in *Balanoglossus* and study affinities of *Balanoglossus* with other minor and major phyla	M	M	L	L	L	L
CO15	Achieve fluency in handling laboratory instruments; prepare temporary and permanent mountings	M	M	L	L	L	L
SEMESTER-II	**Cell Biology Paper IV**						
CO1	Understand the concept of a cell and study ultrastructure of prokaryotic and eukaryotic cell	H	M	L	L	L	L
CO2	Describe various models of structure of plasma membrane with emphasis on Fluid Mosaic Model and understand various functions of plasma membrane	H	L	L	L	L	L
CO3	Understand the ultrastructure and functions of smooth and rough endoplasmic reticulum.	H	L	L	L	L	L
CO4	Understand the ultrastructure and functions of Golgi complex	H	L	H	L	M	L
CO5	Describe structural details of mitochondria and understand the process of oxidative phosphorylation through Glycolysis, Kreb's Cycle, Electron Transport Chain and Terminal Oxidation	H	L	H	L	M	L
CO6	Learn the structural details, concept of polymorphism in lysosomes and their functions	H	L	H	L	L	L
CO7	Describe the ultrastructure of nuclear membrane and understand the importance of it.	H	L	H	L	L	L
CO8	Understand the structure, types of chromosomes including Lamp-brush and polytene chromosomes and the concept of nucleosome	H	L	L	L	L	L
CO9	Learn the structure and functions of nucleolus.	H	L	L	L	L	L
CO10	Explain structure, types of ribosome with emphasis on Lake's model	H	L	L	L	L	L
CO11	Understand the cell cycle and its phases; also study the importance of synaptonemal complex, crossover and recombination.	H	L	L	L	L	L
CO12	Describe the process and types of cell division, namely, mitosis and meiosis; understand the special uncontrolled cell division leading to cancer and factors responsible for it	H	L	M	L	L	L
CO13	Describe the process of cellular aging and events leading to the apoptosis	H	M	M	L	L	L
CO14	Perform cell biology experiments with available material from plant source to have better understanding of cell biology; able to use information technology resources to	H	L	H	M	M	M

	have understanding of animal systems						
SEMES TER-III	**Life and Diversity of Animals-Chordates (Protochordata to Amphibia) Paper V**						
CO1	Describe animals belonging to Protochordata up to order scientifically	H	M	L	L	L	L
CO2	Understand the structure and digestive system in *Herdmania*; study the process of development through A*scidian* tadpole and also to understand retrogressive metamorphosis	H	L	L	L	L	L
CO3	understand morphology and anatomy through various systems, namely, digestive, circulatory, excretory systems and sense organs in *Amphioxus*	H	M	L	L	L	L
CO4	Learn general characters of Cyclostomata with reference to *Petromyzon* and *Myxine*	H	L	L	L	L	L
CO5	Describe characteristics of Chondrichthyes and Osteichthyes	H	L	L	L	L	L
CO6	Understand the evolution of fishes in terms of occurrence of paired fins; learn about occurrence and importance of accessory respiratory organs in fishes	M	M	L	L	L	L
CO7	Study the phenomenon of migration in fishes	H	M	L	L	L	L
CO8	Describe Amphibia and classify the amphibians up to order by studying the identifying characters	H	M	L	L	L	L
CO9	Understand occurrence and importance of parental care and its various types; describe neoteny in Amphibia	H	M	L	L	L	L
CO10	Describe the process of gametogenesis in vertebrates and describe type of eggs and the process of fertilization of eggs based on their types	H	L	L	L	L	L
CO11	With emphasis on fish development, understand post fertilization changes	L	L	L	L	L	L
CO12	Describe types of scales in fishes and study development of placoid scales	H	L	L	L	L	L
CO13	Understand the development of frogs through cleavages, blastulation and gastrulation; learn about various morphogenetic movements with reference to frog gastrula	L	L	L	L	L	L
CO14	Understand the concept and importance of fate map	L	L	L	L	L	L
CO15	Understand the development of respiratory organs and aortic arches in frog	M	L	L	L	L	L
C016	Prepare permanent preparations of fish scales and other biological samples; understand the histology of various organs of lower vertebrates and fish and frogs	H	L	L	L	H	L
SEMES TER-III	**Genetics Paper VI**						
CO1	Understand the principles of inheritance with the help of Mendel's experiments and also understand allelic interactions that do not follow Mendelian laws	H	L	H	H	L	H
CO2	Understand the phenomenon of gene interactions with	-	-	H	M	M	M

	emphasis on epistasis and altered Mendelian ratios						
CO3	Understand Quantitative genetics with the help of polygenic traits; understand impact of inbreeding, outbreeding and hybrid vigor on gene pool, gene and allelic frequencies and overall recombination process.	M	M	H	M	-	H
CO4	Describe the concept and importance of extracellular genome with reference to mitochondrial DNA and plasmids	L	L	H	L	-	M
CO5	Learn about the phenomenon of inheritance through cytoplasm with reference to Kappa particles in *Paramecium*, CO2 sensitivity in *Drosophila* and milk factor in mice	H	L	H	L	-	M
CO6	Understand theories of linkage, its types and effects of linkage on crossing over	L	M	H	-	-	M
CO7	Understand different concepts of genes, namely, cistron, muton and recon.	H	L	H	H	-	H
CO8	Understand the altered physiology and inheritance of genetic disorders in humans with reference to hemoglobin disorders, namely, thalassemia and sickle cell anemia and the metabolic disorder phenylketonuria.	M	M	H	M	-	M
CO9	Understand various patterns of sex determination, namely, ZZ, XY, XO and ZW patterns; also describe genic balance mechanism of sex determination in Drosophila and role of environment in sex determination of Bonellia	H	M	H	M	M	H
CO10	Describe various structural chromosomal aberrations, namely, addition, deletion, duplication and inversion and understand their effects	-	M	H	L	L	L
CO11	Describe numerical chromosomal aberrations with reference to Turner, Klinefelter and Down syndromes	-	M	H	M	L	M
CO12	Understand the concept of mutations and describe spontaneous and induced mutations; also describe various types of mutagenic agents and their effects on DNA sequences and expressions	-	M	H	M	H	H
CO13	Understand the concept of lethal genes and the consequences	-	L	H	L	L	H
CO14	Learn the basic concepts of population genetics with emphasis on Hardy Weinberg equilibrium	-	H	H	M	L	H
CO15	Understand the importance of genetic counselling to deal with various hereditary diseases and disorders	M	M	H	L	-	H
CO16	Describe the use and importance of DNA fingerprinting, amniocentesis and karyotyping techniques and the usefulness of sperm banks to understand the applicability of genetics	H	M	H	-	-	H
CO17	Demonstrate the genetic crosses using coloured beads to understand Mendelian principles; perform population surveys for various traits and testing the hypothesis with	M	M	H	M	M	H

	appropriate statistical tools						
CO18	Understand the Hardy-Weinberg principle with suitable example and perform calculations to find out gene and allele frequencies in a population	L	M	H	M	L	H
SEMES TER-IV	**Life and Diversity of Animals-Chordates (Reptilia, Aves and Mammals) Paper VII**						
CO1	Understand the classification of reptiles considering the temporal vacuities	H	H	-	-	-	M
CO2	Study snakes with reference to the poison apparatus, biting mechanism and also understand the importance of snake venom	M	M	L	-	-	M
CO3	Compare Ratitae with Caranitae; understand flight adaptations	H	M	L	-	-	M
CO4	Understand Migration in birds	M	M	L	-	-	M
CO5	Describe the general characters of subclasses Prototheria, Metatheria and Eutheria of class Mammalia	H	M	L	-	-	L
CO6	Understand and discuss Darwinism and Neo-Darwinism	M	H	L	-	-	L
CO7	Understand the cursorial, aquatic, terrestrial, fossorial and volant adaptations with suitable examples	M	H	L	-	-	L
CO8	Describe the genetic basis of evolution with reference to species and demes and the variations responsible for the process	M	H	M	-	-	M
CO9	Understand the Caucasoid, Negroid, Mongoloid and Australoid races in man to know more about racial differences among the members of the same species	M	M	L	-	-	L
CO10	Compare aortic arches and hearts in reptiles, birds and mammals	M	H	L	-	-	M
CO11	Understand the structure of egg of a hen and study the development of chick embryo up to primitive streak stage	M	M	L	-	-	M
CO12	Understand the development and functions of extra embryonic membranes in chick	H	H	L	-	-	M
CO13	Describe structure and the importance of blastocyst in mammals	M	H	L	-	-	M
CO14	Describe implantation of embryo in mammals; study types of placenta on the basis of morphological and histological structures and the functions	M	M	L	-	-	M
CO15	Understand the concept of stem cells; study the sources, types and importance of stem cells in human welfare	H	H	L	-	L	M
CO16	Understand the behavior in birds with respect to the diurnal and rhythmic behavior and pheromones and reproductive behavior in mammals	M	H	M	-	M	M
CO17	Discuss the skeletal systems in birds and mammals with examples of fowl and rabbit respectively	H	M	M	-	-	L
CO18	Prepare permanent mountings of chick embryos representing various developmental milestones	M	L	M	-	H	M
SEMES	**Molecular Biology and Immunology**						

TER-IV	Paper VIII						
CO1	Understand the landmark experiments that proved DNA and RNA as genetic materials	M	M	H	M	H	M
CO2	Understand the intricacies of the proposed and accepted models for structures of DNA	M	M	H	L	H	M
CO3	Learn about various forms of DNA, their properties and understand the physico-chemical parameters in which those forms exist	M	M	H	L	H	M
CO4	Understand various forms of RNA and describe their structures, their properties and roles in cellular physiology	M	M	H	L	H	M
CO5	Understand structural details of the prokaryotic and eukaryotic genes and describe various other structural elements regulating these genes	M	L	H	M	L	L
CO6	Describe Griffith's experiment to understand bacterial transformation; also learn about other modes of recombination, namely, conjugation and transduction in bacteria	L	M	H	M	H	M
CO7	Understand various experiments including Meselson-Stahl experiment which helped understand the replication process	M	M	H	M	H	M
CO8	Describe the semiconservative model of replication with the help of concepts like origin of replication and directionality of replication	L	M	H	M	H	M
CO9	Learn about the concept and characteristics of genetic code including Wobble hypothesis	M	M	H	M	H	M
CO10	Understand the mechanism of processes transcription and translation with various regulating factors to describe the process of protein synthesis	L	L	H	L	L	L
CO11	Understand regulation of gene expression with emphasis on Lac operon and Trp operon	L	M	H	M	L	L
CO12	Describe the concept of immunity and understand the importance of having an immune system; study innate and acquired immunity in addition to different organs of the immune system	L	M	H	L	L	L
CO13	Understand the basics of structure, diversity, functions and types of antigens and antibodies	H	M	L	L	L	L
CO14	Understand the mechanism of antigen-antibody interactions based on structural details to explain humoral immunity	L	L	H	L	L	L
CO15	Understand the intricacies of the B cell response and the T cell response to understand the humoral as well as cell mediated immunity	L	L	H	-	L	L
CO16	Understand the concept and pathways of the complement system and its importance	L	-	H	-	L	L
CO17	Describe one of the most important the molecular players of the immune response which are cytokines and learn	L	L	H	-	L	L

	about cytokines related disorders						
CO18	Describe impaired immune system causing autoimmune diseases and learn about the ways in which those can be treated	L	L	H	-	L	M
CO19	Understand the immunodeficiencies including AIDS and others and understand the ways to manage those diseases	-	L	H	-	-	M
CO20	Understand the principles and working of laboratory instruments used in molecular biology experiments; learn to stain nucleic acids and also to isolate DNA from a suitable source	M	L	H	L	H	M
CO21	Demonstrate the antigen-antibody interaction and learn about organs of the immune system	L	M	H	L	L	M
SEMESTER-V	**General Mammalian Physiology-I**: **(Enzymology; digestive, respiratory and circulatory systems) Paper IX**						
CO 1	Understand the concept, chemical nature and distribution of enzymes	-	H	L	L	L	L
CO2	Describe the general properties and classification of enzymes	-	H	L	L	L	L
CO3	Understand various physico-chemical factors and conditions affecting the enzyme action	-		L	L	L	M
CO4	Describe the histology and physiology of digestive glands, namely, salivary, gastric, intestinal glands, liver, and pancreas	-	L	L	L	L	L
CO5	Understand the endocrinology of gastrointestinal hormones	-	L	L	L	L	L
CO6	Understand the physiology of digestion and absorption of proteins, carbohydrates, and lipids	-	H	L	-	L	L
CO7	Describe various fat soluble and water-soluble vitamins with reference to their sources, the deficiencies and related diseases	-	H	L	L	L	L
CO8	Learn about the types, distribution and the physico-chemical properties including binding dynamics with the respiratory gases of various respiratory pigments	-					
CO9	Understand the detailed mechanism of respiration including transport of O_2 and CO_2 along with various respiratory pigments and working of respiratory organs.	-	-	H	H	H	M
CO10	Understand the disorders of respiratory systems with special reference to effect of smoking	-	-	H	L	-	M
CO11	Learn about normal and abnormal constituents and functions of blood	-	-	H	M	H	M
CO12	Describe the importance of intrinsic and extrinsic blood clotting factors and understand the principles behind ABO blood grouping system and Rh factor	-	-	H	M	M	M
CO13	Learn about different phases of cardiac cycle; understand the principle behind ECG and describe various factors regulating blood pressure	-	-	H	M	L	M

CO14	Demonstrate enzyme action on substrate by using salivary amylase	-	-	L	M	M	M
CO15	Perform detection tests for carbohydrates, proteins and fats	-	-	H	M	M	M
CO16	Detect presence of vitamins A and C	-	-	H	M	M	M
CO17	Measure total WBC and RBC counts; demonstrate presence of haemin crystals	-	-	H	M	H	M
CO18	Measure lung capacity by using suitable method	-	-	H	M	M	M
CO19	Understand the histology of various mammalian organs with the help of available permanent slides.	-	-	H	M	M	M
SEMESTER-V	**Applied Zoology-I (Aquaculture and Economic Entomology) Paper X**						
CO 1	Understand and discuss the parameters used for construction of various ponds used for rearing various stages of fish	H	H	L	L	L	L
CO2	Explain breeding of fishes by bund and Chinese hatcheries and understand the practice and importance of induced breeding using hypophysation and the new generation drugs	H	H	H	H	L	L
CO3	Explain different culture methods, namely, polyculture, cage culture, sewage fed fish culture and integrated fish farming	H	H	H	H	L	L
CO4	Learn about commercial aspects of aquaculture by studying fish products and by products and study different methods of fish preservation	H	H	H	H	H	L
CO5	Explore commercial aspects aquaculture with respect to prawn culture and pearl culture	H	H	H	H	L	L
CO6	Understand commercial setup required for culturing aquarium fish species and study the process of fabrication and setting up of aquaria, their maintenance and breeding of aquarium fishes	H	H	H	H	L	L
CO7	Learn about different diseases caused by different causative agents, namely, fungi, bacteria, protozoa and helminths	H	H	H	H	L	L
CO8	Describe the use, mode of action, merits and demerits of using different classes of chemicals as insecticides.	H	H	H	H	L	L
CO9	Explain use, merits and demerits of using predators and parasites as biological control agents for insect pests	H	H	H	H	L	L
CO10	Describe the life cycle of, damage caused by and control measures for plant pests, *Earias vitella*, *Sitophilus oryzae* and animal pests *Musca nebulo* and *Stomoxys calcitrans*	H	H	H	H	L	L
CO11	Explain life cycles, rearing methods of different species of silkworms, namely, *Bombyx mori* and *Antheraea mylitta*	H	H	H	H	L	L
CO12	Understand cocoon processing steps for synthesis of silk fabric, namely, cocoon boiling, reeling, rereeling, winding, doubling, twisting and weaving	H	H	H	H	L	L
CO13	Explain types, life cycles of honey bees and explain	H	H	H	H	L	L

	methods of apiculture along with commercial importance of bee products						
CO14	Understand the life cycle of the lac insect, *Laccifer lacca* and the processing of raw lac to prepare various products and understand their economic importance	H	H	H	H	L	L
CO15	Describe the economically important food and aquarium fishes; study various systems through virtual dissection or through other available media; prepare permanent mountings of scales and zooplanktons following ethical guidelines	H	L	H	H	L	L
CO16	Describe various economically important insect species; study various mountings related to insects	L	H	H	H	L	L
CO17	Understand different breeding/ rearing setups by visiting different facilities/ educational centres	L	H	H	H	L	L
SEMESTER-VI	**General Mammalian Physiology-II**: (Nervous, muscular, excretory, endocrine and reproductive systems) Paper XI						
CO1	Describe neuronal cell types and understand the structure of neurons including electron micrographs of different regions of neurons	-	-	H	-	H	L
CO2	Understand the conduction of impulse across the nerve	-	-	H	-	M	L
CO3	Understand the ultrastructure of a striated muscle and the physiology of muscle contraction with the help of sliding filament theory	-	-	H	-	M	L
CO4	Describe various properties of muscles, namely, twitch, tetanus, tonus, summation, All or None Principle and muscle fatigue with better understanding of muscle physiology	-	-	H	-	M	L
CO5	Learn about the structural details of a uriniferous tubule	-	-	H	-	L	L
CO6	Understand the mechanism of urine formation with emphasis on counter – current mechanism and describe the idea of dialysis	L	-	H	-	L	L
CO7	Describe normal and abnormal constituents of urine	-	-	H	-	L	L
CO8	Understand the position, morphology, histology and physiology of the pituitary, thyroid, parathyroid, adrenal and pineal glands	M	L	L	L	H	L
CO9	Understand the oestrous and menstrual cycles to describe reproductive physiology of females	L	L	M	L	M	L
CO10	Describe the chemical nature and functions of male and female sex hormones	L	L	M	L	L	L
CO11	Describe the causes of infertility in males and females	M	L	M	-	-	-
CO12	Understand the concept and importance of contraception and describe different mechanical and hormonal contraceptives	M	L	L	-	-	L
CO13	Understand the concept and importance of in vitro fertilization	M	-	L	-	-	-

CO14	Perform experiments for detection of various normal and abnormal constituents of urine	-	L	L	-	L	L
CO15	Perform qualitative analysis of the semen sample	-	L	M	L	L	L
CO16	Study different endocrine gland of fish with suitable diagrams/ digital tools	L	-	L	-	-	-
CO17	Observe various histological slides to understand the ultrastructure of various organs of muscular, nervous, endocrine, reproductive and excretory systems	L	-	H	-	H	L
SEMES TER-VI	**Applied Zoology-II (Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics) Paper XII**						
CO1	Explain various techniques of sterilization from crude to the most sophisticated techniques, namely, filtration, autoclaving, dry heat sterilization, wet sterilization and radiation	-	-	M	H	H	L
CO2	Understand various separation techniques, namely, centrifugation, chromatography, agarose gel electrophoresis, SDS-PAGE	-		H	H	H	L
CO3	Describe the working principles of colorimeter and spectrophotometers	-	-	L	H	H	L
CO4	Understand basics of microtomy and the steps involved from tissue fixation to section cutting and also understand the ways of troubleshooting the process of microtomy/ section cutting and the spreading of tissue sections	-	-	H	H	H	L
CO5	Understanding the basic concepts of staining with various kinds of stains and describe double staining using hematoxylin and eosin	-	-	H	H	H	L
CO6	Describe basics and practical applications of histochemical staining techniques for carbohydrates, proteins and lipids	-	-	H	H	H	L
CO7	Understand basic concepts of recombinant DNA technology and describe the types and uses of DNA manipulation enzymes	-	-	H	H	H	L
CO8	Learn the theoretical aspects of shotgun cloning	-	-	H	-	L	L
CO9	Understand the concept of cloning vectors, their types and the merits and limitations	-	-	H	-	L	L
CO10	Understand the principles behind insertion of DNA fragment and ligation using blunt and cohesive ends	-	-	H	-	L	L
CO11	Describe the application of biotechnology for recombinant insulin and vaccine production	L	H	L	-	H	L
CO12	Understand the basic concepts, importance and role of bioinformatics in life sciences and describe the concept and types of databases used in bioinformatics including nucleotide and protein databases	-	L	L	-	L	H
CO13	Understand the concept and importance of biostatistics and learn about tabulation and presentation of data	-	L	L	-	L	H
CO14	Understand the meaning and importance concepts used in	-	L	L	-	L	H

	biostatistics, namely, sampling errors, mean, mode, median, probability, standard error and standard deviation						
CO15	Perform experiments related to use of various biotechniques studied in theory including sterilization and separation techniques	-	L	L	-	H	H
CO16	Get acquainted with microtechnique and staining procedures	-	L	L	-	H	L
CO17	Use computer software to analyze biological data using statistical tools	-	L	L	-	L	H
CO18	Practice using various basic computer programs	-	L	-	L	L	H
CO19	Perform specific searches related to biological information using bioinformatic tools and databases	-	-	L	-	L	H
CO20	Understand working principles of various sophisticated instruments by visiting biotechnology institutions and research centers	-	L	L	-	H	H

Mathematics Department:

Program Specific Outcomes (PSOs)

	Program Outcomes
PSO-1	The program helps the students to understand concept so that, they can recognize to apply the definitions and techniques which they have studied.
PSO-2	The program helps the students to acquire good knowledge and understanding in advanced areas so that, they are able to set career goals by pursuing higher education
PSO-3	Mathematical Science develops scientific temper and analytical ability amongst students to join research development in multidisciplinary research.
PSO-4	Knowledge in Mathematics will be helpful for students in working on field projects, real life problems and technical issues, in order to provide them experiential training on- applying mathematical modeling for arriving at the conclusion.
PSO-5	Students will be able to evaluate primary literature, in oral and written form so that they can present ideas clearly and confidently with skills to negotiate with others.
PSO-6	Studying three subjects throughout a 3- year degree programme in Mathematical Sciences enhances student's overall development, critical thinking, analytical aptitude and problem-solving skill.
PSO-7	Students will be able to analyze information logically and make a reasoned judgment by observation, understanding and evaluation of sources, such as data, facts and research findings.
PSO-8	Students will be able to work as a leader in a team for group projects and group activities so that they can participate actively, in a healthy spirit

Course	COs	Course Outcome
B. Sc. Semester-I Paper-I **Elementary Mathematics**	CO-1	Students will be able to find nth root of unity and study about elementary functions using theory of complex numbers.
	CO-2	Students will be able to find Rank of Matrix and solve homogeneous as well as non-homogeneous system of linear equations.
	CO-3	Students will be able to solve cubic and biquadratic equations and find the nature of roots of polynomials of any degree.
	CO -4	Students will be able to solve Diophantine Equation using concept of Number Theory.
B. Sc. Semester- I paper-II **Differential and Integral Calculus**	CO-1	Students will be able to solve higher order derivative problems and apply this concept to find Series expansion of functions and evaluate limits using L'Hospitals Rule.
	CO-2	Students will be able to study Partial Differentiation and apply this concept to find Envelope and Asymptote of family of curves.
	CO-3	Students will be able to find Extreme values in functions of several variable.
	CO -4	Students will be able to find integration of Algebraic rational functions, Trigonometric Functions and Irrational functions.
B. Sc. Semester- II Paper-I **Geometry, Differential and Difference Equation**	CO-1	Students will be able to find Equation of Sphere, right circular Cone and Cylinder.
	CO-2	Students will be able to solve first order linear differential equation.
	CO-3	Students will be able to solve second order linear differential equation.
	CO -4	Students will be able to solve linear difference equation and Higher order Difference equation.
B. Sc.	CO-1	Students will learn about Vector Differentiation and can apply the

		concept to find Gradient, Divergence and Curl.
Semester- II paper-II **Vector Analysis**	CO-2	Students will be able to Evaluate double as well as triple Integration and apply this concept to find area bounded by curve and volume of given region.
	CO-3	Students will be able to calculate line integral, Surface integral and Volume integral.
	CO -4	Students will learn Greens Theorem, Stokes Theorem and Gauss Divergence Theorem to evaluate Integrals.
B. Sc. Semester- III Paper-I **Partial Differential Equation**	CO-1	Students will be able to study simultaneous differential equation of order one which is considered as origin of first order PDEqn.
	CO-2	Students will be able to study linear and nonlinear partial differential equation using charpits method and Jacobi method.
	CO-3	Students will be able to solve Higher order linear Partial differential Equation
	CO -4	Students will be able to find Extremals of Functionals using Euler's Equation.
B. Sc. Semester- III paper-II **Modern Algebra**	CO-1	Students will be able to study Group and properties of Group and Subgroups.
	CO-2	Students will be able to study concept of Normal subgroup, Permutation Group, Homomorphism and Isomorphism.
	CO-3	Students will be able to study Ring theory and properties of Ring, subring and Ideals.
	CO -4	Students will be able to learn field theory, Integral domain, Euclidean Domain, Principle Ideal Domain and unique Factorisation Domain.
B. Sc. Semester- IV Paper-I **Real Analysis**	CO-1	Students will be able to apply the monotone convergence theorem to prove convergence of bounded monotone sequence.
	CO-2	Students will be able to apply Inverse and Implicit function theorems in solving problems.
	CO-3	Students will be able to demonstrate competence with properties of real numbers by finding Supremum and Infimum of set and using the completeness property of real numbers.
	CO -4	Students will be able to recognize the importance of Riemann and Lebesgue integral of a bounded function.
B. Sc. Semester- IV paper-II **Mathematical Methods**	CO-1	Students will be able to apply the concepts of Fourier Integrals and Fourier transform to solve problems and partial differential equations.
	CO-2	Students will be able to acquire the knowledge of Laplace transform, their properties and inverse Laplace transform to obtain the solution of ordinary differential equation.
	CO-3	Students will be able to understand concepts of finite Fourier transform, finite sturm-Liouville transform and generalized finite Fourier transform.
	CO -4	Students will be able to solve problems using Finite Hankel transform, Finite Legendre transform and finite Mellin transform.
B. Sc. Semester- V Paper-I **Complex Analysis**	CO-1	Students will be able to understand the knowledge on complex numbers and their elementary properties.
	CO-2	Students will be able to define the limits and continuity for complex functions and consequences of continuity.
	CO-3	Students will be able to apply the concept and analyticity and Cauchy Riemann equations, Cauchy integral function, types of

		convergence, complex contour integrals.
	CO -4	Students will be able to apply the Cauchy integral theorem and Residue theorem to solve complex integrations and obtain singularity, residues of complex functions.
B. Sc. Semester- V paper-II **Mechanics**	CO-1	Students will be able to learn fundamental of dynamics, review Newton's laws of motion, Gallilean invariance principle and related problems.
	CO-2	Students will be able to learn work energy theorem, conservative system, its physical application and related problems.
	CO-3	Students will be able to find the radial and transverse components of velocity and acceleration using path of motion of particle.
	CO -4	Students will be able to study the basic concepts of Lagrange's dynamics, principle of virtual work using D'Alembert principle and differential equation of an orbit
B. Sc. Semester- VI Paper-I **Linear Algebra**	CO-1	Students will be able to recognize and use basic properties of subspaces and vector spaces.
	CO-2	Students will be able to discuss the kernel and image of a linear transformation in terms of nullity and rank of the matrix.
	CO-3	Students will be able to use equivalent forms to identify matrices and solve linear systems
	CO -4	Students will be able to describe the determinant of a product of matrices relates to the determinant of the individual matrices.
B. Sc. Semester- VI paper-II **Special theory of Relativity**	CO-1	Students will be able to demonstrate the knowledge and broad understanding of special relativity and define the frame of reference.
	CO-2	Students will be able to derive the transformation equation for components of velocity in acceleration of a particle using Lorentz transformation.
	CO-3	Students will be able to discuss the geometrical representation of Space-Time.
	CO -4	Students will be able to derive the expression for the kinetic energy of a particle moving at a relativistic speed and hence establish the relationship showing the equivalence of its mass and energy.

Mathematics Department:

Programme Specific Outcomes (PSOs)

	Program Outcomes
PSO-1	The program helps the students to understand concept so that, they can recognize to apply the definitions and techniques which they have studied.
PSO-2	The program helps the students to acquire good knowledge and understanding in advanced areas so that, they are able to set career goals by pursuing higher education
PSO-3	Mathematical Science develops scientific temper and analytical ability amongst students to join research development in multidisciplinary research.
PSO-4	Knowledge in Mathematics will be helpful for students in working on field projects, real life problems and technical issues, in order to provide them experiential training on- applying mathematical modeling for arriving at the conclusion.
PSO-5	Students will be able to evaluate primary literature, in oral and written form so that they can present ideas clearly and confidently with skills to negotiate with others.
PSO-6	Studying three subjects throughout a 3- year degree programme in Mathematical Sciences enhances student's overall development, critical thinking, analytical aptitude and problem-solving skill.
PSO-7	Students will be able to analyze information logically and make a reasoned judgment by observation, understanding and evaluation of sources, such as data, facts and research findings.
PSO-8	Students will be able to work as a leader in a team for group projects and group activities so that they can participate actively, in a healthy spirit

Course Outcome (COs)		Program Outcomes (POs)							
		Domain Specific (PSO)							
	Name of Course-B. Sc. Semester-I, Paper -I	1	2	3	4	5	6	7	8
CO1	Students will be able to find nth root of unity and study about elementary functions using theory of complex numbers.	H	M		M	L	H	M	L
CO2	Students will be able to find Rank of Matrix and solve homogeneous as well as non-homogeneous system of linear equations.	H		H		M	H		
CO3	Students will be able to solve cubic and biquadratic equations and find the nature of roots of polynomials of any degree.	H	L			M	L	H	L
CO4	Students will be able to solve Diophantine Equation using concept of Number Theory.	H	M	L		L	L	M	
	Name of Course-B. Sc. Semester-I, Paper -II								
CO1	Students will be able to solve higher order derivative problems and apply this concept to find Series expansion of functions and evaluate limits using L'Hospitals Rule.	H	H		M	M	M		L

CO	Description									
CO2	Students will be able to study Partial Differentiation and apply this concept to find Envelope and Asymptote of family of curves.	H	M				L	L		
CO3	Students will be able to find Extreme values in functions of several variable.	H	M	L		M	M			L
CO4	Students will be able to find integration of Algebraic rational functions, Trigonometric Functions and Irrational functions.	H	H					L		
Name of Course-B. Sc. Semester-II, Paper -I										
CO1	Students will be able to find Equation of Sphere, right circular Cone and Cylinder.	H	M			L				
CO2	Students will be able to solve first order linear differential equation.	H	H				M	L		
CO3	Students will be able to solve second order linear differential equation.	H	M		L			L		
CO4	Students will be able to solve linear difference equation and Higher order Difference equation.	H			M	L				
Name of Course-B. Sc. Semester-II, Paper -II										
CO1	Students will learn about Vector Differentiation and can apply the concept to find Gradient, Divergence and Curl.	H	M							
CO2	Students will be able to Evaluate double as well as triple Integration and apply this concept to find area bounded by curve and volume of given region.	H	H	M		L	H			L
CO3	Students will be able to calculate line integral, Surface integral and Volume integral.	H	L		M			L		
CO4	Students will learn Greens Theorem, Stokes Theorem and Gauss Divergence Theorem to evaluate Integrals.	H					M			
Name of Course-B. Sc. Semester-III, Paper -I										
CO1	Students will be able to study simultaneous differential equation of order one which is considered as origin of first order PDEqn.	H	M			M				M
CO2	Students will be able to study linear and nonlinear partial differential equation using charpits method and Jacobi method.	H	H		L		M	L		
CO3	Students will be able to solve Higher order linear Partial differential Equation	H	M		M		M			M
CO4	Students will be able to find Extremals of Functionals using Euler's Equation.	H		L						
Name of Course-B. Sc. Semester-III, Paper -II										
CO1	Students will be able to study Group and properties of Group and Subgroups.	H				M	M	H		
CO2	Students will be able to study concept of Normal subgroup, Permutation Group, Homomorphism and Isomorphism.	H	L			M	L	L		

		1	2	3	4	5	6	7	8
CO3	Students will be able to study Ring theory and properties of Ring, subring and Ideals.	H	M				M	M	L
CO4	Students will be able to learn field theory, Integral domain, Euclidean Domain, Principle Ideal Domain and unique Factorisation Domain.	H		M			L	H	
Name of Course-B. Sc. Semester-IV, Paper -I									
CO1	Students will be able to apply the monotone convergence theorem to prove convergence of bounded monotone sequence.	H	H	M	H	L	M	L	M
CO2	Students will be able to apply Inverse and Implicit function theorems in solving problems.	H	M	M	L	L		H	
CO3	Students will be able to demonstrate competence with properties of real numbers by finding Supremum and Infimum of set and using the completeness property of real numbers.	H	H	L	L	M	H	H	M
CO4	Students will be able to recognize the importance of Riemann and Lebesgue integral of a bounded function.	H	H				M	H	
Name of Course-B. Sc. Semester-IV, Paper -II									
CO1	Students will be able to apply the concepts of Fourier Integrals and Fourier transform to solve problems and partial differential equations.	H	H			L	M		
CO2	Students will be able to acquire the knowledge of Laplace transform, their properties and inverse Laplace transform to obtain the solution of ordinary differential equation.	H	M	L				M	L
CO3	Students will be able to understand concepts of finite Fourier transform, finite sturm-Liouville transform and generalized finite Fourier transform.	H	M		L				
CO4	Students will be able to solve problems using Finite Hankel transform, Finite Legendre transform and finite Mellin transform.	H	L						
Name of Course-B. Sc. Semester-V, Paper -I									
CO1	Students will be able to understand the knowledge on complex numbers and their elementary properties.	H				H	M		L
CO2	Students will be able to define the limits and continuity for complex functions and consequences of continuity.	H	M					M	
CO3	Students will be able to apply the concept and analyticity and Cauchy Riemann equations, Cauchy integral function, types of convergence, complex contour integrals.	H	H	M		H	L	M	
CO4	Students will be able to apply the Cauchy integral theorem and Residue theorem to solve complex integrations and obtain singularity, residues of complex	H	M		L			L	

	functions.								
	Name of Course-B. Sc. Semester-V, Paper -II								
CO1	Students will be able to learn fundamental of dynamics, review Newton's laws of motion, Gallilean invariance principle and related problems.	H	M	L	M	L	M	H	L
CO2	Students will be able to learn work energy theorem, conservative system, its physical application and related problems.	H	M	L	L	M	M		L
CO3	Students will be able to find the radial and transverse components of velocity and acceleration using path of motion of particle.	H	M	M			L		L
CO4	Students will be able to study the basic concepts of Lagrange's dynamics, principle of virtual work using D'Alembert principle and differential equation of an orbit	H	M	M			L	L	
	Name of Course-B. Sc. Semester-VI, Paper -I								
CO1	Students will be able to recognize and use basic properties of subspaces and vector spaces.	H	M	L	L		M	L	L
CO2	Students will be able to discuss the kernel and image of a linear transformation in terms of nullity and rank of the matrix.	H					L		
CO3	Students will be able to use equivalent forms to identify matrices and solve linear systems	H		L	L	M			
CO4	Students will be able to describe the determinant of a product of matrices relates to the determinant of the individual matrices.	H	M		M	M	M	M	L
	Name of Course-B. Sc. Semester-VI, Paper -II								
CO1	Students will be able to demonstrate the knowledge and broad understanding of special relativity and define the frame of reference.	H	M	M	L	M	M	L	L
CO2	Students will be able to derive the transformation equation for components of velocity in acceleration of a particle using Lorentz transformation.	H	M	M		M	M	L	
CO3	Students will be able to discuss the geometrical representation of Space-Time.	H	M	L					L
CO4	Students will be able to derive the expression for the kinetic energy of a particle moving at a relativistic speed and hence establish the relationship showing the equivalence of its mass and energy.	H	M		M	M		L	L

Electronics Department:

Program Specific Outcome (PSOs):

PSO-1	Ability to design and conduct electronics experiments, as well as to analyze and interpret data
PSO-2	Utilize the basic knowledge of science Electronics and Communication
PSO-3	To provide opportunity to students to learn the latest trends in Electronics
PSO-4	To provide opportunities to the students for becoming researchers and developers
PSO-5	To satisfy the needs of the core Electronics Industry useful for the society in all walks of life.
PSO-6	To provide opportunities to the students to formulate, analyze and resolve the problems in Electronics Industry
PSO-7	To prepare students to share the teams working on recent multi-disciplinary projects for entrepreneurship.

Course Outcome (COs):

Course	COs	Course outcome
B. Sc. Semester-I Paper-I Basic Circuit Components And Network Analysis	CO-1	To enrich the students with the basic requirement of electronic circuits.
	CO-2	To describe the theorems useful for circuit operation.
	CO-3	To explore the use of energy sources for circuit operations.
	CO -4	To familiarize about the use of transducers in instrumentation systems.
B. Sc. Semester-I Paper-Ii Fundamentals Of Digital Electronics	CO-1	To enrich the students with the basic requirement of digital electronics.
	CO-2	To describe the use of Boolean Algebra for circuit operations.
	CO-3	To elaborate the use of flip flops as memory in data processing system.
	CO -4	To explore the use of binary circuits in digital system.
	CO-5	To familiarize about the basic building blocks required for digital system.
B. Sc. Semester-II Paper-I Semiconductor Devices	CO-1	To explain about semiconductors used for the fabrication of semiconductor devices.
	CO-2	To acquire the knowledge of transistor used in many electronic circuits.
	CO-3	To familiarize about the field effect transistor and its operation.
	CO -4	To explore the use of power devices required in electronics circuits.
	CO-5	To familiarize about the applications of diode, transistor and power devices.
B. Sc. Semester-II Paper-II Advanced Digital Electronics	CO-1	To enrich the students with the digital ICS used in electronics circuits.
	CO-2	To enhance the use of Flip-Flops in the construction of counters.
	CO-3	To familiarize the use of Counters & Registers in data processing system.
	CO -4	To explore the use of binary memory in digital system.
	CO-5	To disseminate about the building blocks required for digital system.
B. Sc. Semester-III Paper-I Analog Circuits	CO-1	To illustrate applications of diode as clippers, clamper and rectifier.
	CO-2	To describe the role of transistor in amplification, signal analysis and two port hybrid circuit for testing amplifier parameters.
	CO-3	To elaborate the concept of feedback and construction of feedback

		amplifier and oscillators.
	CO -4	To explore the use of power amplifier in electronics circuits.
	CO-5	To familiarize about the applications of diode and transistor.
B. Sc. Semester-III Paper-II Linear Integrated Circuits	CO-1	To study DC & AC characteristics of operational amplifier
	CO-2	To elucidate and design linear and nonlinear circuits of OP-AMP.
	CO-3	To study timer IC and its applications.
	CO -4	To elaborate the role of filters in electronics circuits.
	CO-5	To explore the knowledge of linear integrated circuits and its uses.
B. Sc. Semester-IV Paper-I Basic Communication Electronics	CO-1	To understand functioning of basic processes in communication systems.
	CO-2	To understand analogue modulation & demodulation techniques.
	CO-3	To Understand transmission and reception systems.
	CO -4	To understand propagation of radio waves in communication systems.
	CO-5	To understand the process of analogue signal communication system.
B. Sc. Semester-IV Paper-II Analogue And Digital Circuits	CO-1	To study DAC and ADC used for data conversions in electronics system.
	CO-2	To elucidate and design regulated DC power supply for operating electronic devices.
	CO-3	To study PLL IC 565 and its applications.
	CO -4	To elaborate the role of transducers in Bioelectronics circuits.
	CO-5	To explore the knowledge of Analogue and Digital circuits and its uses.
B. Sc. Semester-V Paper-I Modern Communication Systems	CO-1	To understand the concept optical communication and its operation
	CO-2	To understand various digital modulation and demodulation techniques.
	CO-3	To analyze the performance of digital communication system in terms of error rate and spectral efficiency
	CO -4	To understand the telecommunication traffic, channel and cellular capacity
	CO-5	To understand various application of cellular technology
B. Sc. Semester-V Paper-II Introduction To Microprocessor	CO-1	To understand importance of Microprocessors as a programmable digital system element in computer system.
	CO-2	To understand architecture and features of 8085 Microprocessor.
	CO-3	To explore some basic concepts of microprocessors through assembly language programming.
	CO -4	To grown-up the in-depth understanding of the operation of microprocessors and machine language programming & interfacing techniques.
	CO-5	To augmented the knowledge of interfacing the peripheral to increase the flexibility of microprocessor
B. Sc. Semester-VI Paper-I Programming In 'C	CO-1	After completion of course, Students are able to work on programming in C platforms and develop their programming skills
	CO-2	Familiar with elements of C language
	CO-3	Understand operators, Expression and Preprocessors
	CO-4	Understand different decision making and concept of looping in C
	CO-5	Understand Array, Structure, Function and Pointers, their declaration and use
B. Sc. Semester-VI Paper-II Microcontroller	CO-1	To understand architecture and features of 8051 Microcontroller.
	CO-2	To learn Programming of 8051 microcontroller.
	CO-3	To learn interfacing of 8051 Microcontroller with real world input

8051 And Its Applications		and output devices.
	CO -4	To understand the coding and interfacing of 8051 with various IO devices.
	CO-5	To understand importance of Microcontrollers in atomization and control system

Electronics Department:
Program Specific Outcome (PSOs)

PSO-1	Ability to design and conduct electronics experiments, as well as to analyze and interpret data
PSO-2	Utilize the basic knowledge of science Electronics and Communication
PSO-3	To provide opportunity to students to learn the latest trends in Electronics
PSO-4	To provide opportunities to the students for becoming researchers and developers
PSO-5	To satisfy the needs of the core Electronics Industry useful for the society in all walks of life.
PSO-6	To provide opportunities to the students to formulate, analyze and resolve the problems in Electronics Industry
PSO-7	To prepare students to share the teams working on recent multi-disciplinary projects for entrepreneurship.

Course Outcome:

COs	Name of course: B Sc Semester-I	Domain specific (PSO)				Domain independent (PO)		
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO-1	To enrich the students with the basic requirement of electronic circuits.	H	H	H	L	L	L	L
CO-2	To describe the theorems useful for circuit operation.	M	H	L	L	L	L	M
CO-3	To explore the use of energy sources for circuit operations.	H	M	H	M	M	M	H
CO -4	To familiarize about the use of transducers in instrumentation systems.	H	H	M	H	H	M	M
	Name of course: B Sc Semester -I							
CO-1	To enrich the students with the basic requirement of digital electronics.	H	H	L	L	L	M	M
CO-2	To describe the use of Boolean Algebra for circuit operations.	M	M	M	L	L	L	M
CO-3	To elaborate the use of flip flops as memory in data processing system.	H	H	L	M	M	M	L
CO -4	To explore the use of binary circuits in digital system.	H	H	M	M	L	L	M
CO-5	To familiarize about the basic building blocks required for digital system.	M	M	L	M	M	L	M
	Name of course: B Sc Semester -II							
CO-1	To explain about semiconductors used for the fabrication of semiconductor devices.	M	M	M	L	M	M	L
CO-2	To acquire the knowledge of transistor used in many electronic circuits.	M	M	L	M	M	M	M

The header row spans: **Course Outcome** | **Program Outcome (PSOs)**

CO	Description							
CO-3	To familiarize about the field effect transistor and its operation.	H	H	M	H	L	H	M
CO -4	To explore the use of power devices required in electronics circuits.	H	H	M	H	H	H	M
CO-5	To familiarize about the applications of diode, transistor and power devices.	H	H	M	M	H	H	M
	Name of course: B Sc Semester -II							
CO-1	To enrich the students with the digital ICS used in electronics circuits.	L	L	L	M	L	L	L
CO-2	To enhance the use of Flip-Flops in the construction of counters.	H	M	L	M	L	H	L
CO-3	To familiarize the use of Counters & Registers in data processing system.	H	M	H	H	L	H	M
CO -4	To explore the use of binary memory in digital system.	L	M	L	H	M	L	M
CO-5	To disseminate about the building blocks required for digital system.	M	L	M	M	L	L	M
	Name of course: B Sc Semester -III							
CO-1	To illustrate applications of diode as clippers, clamper and rectifier.	H	H	M	L	M	L	H
CO-2	To describe the role of transistor in amplification, signal analysis and two port hybrid circuit for testing amplifier parameters.	L	H	M	M	M	L	M
CO-3	To elaborate the concept of feedback and construction of feedback amplifier and oscillators.	L	M	H	M	H	M	M
CO -4	To explore the use of power amplifier in electronics circuits.	M	H	M	M	H	M	M
CO-5	To familiarize about the applications of diode and transistor.	M	H	M	L	L	M	M
	Name of course: B Sc Semester -III							
CO-1	To study DC & AC characteristics of operational amplifier	H	L	L	M	M	H	L
CO-2	To elucidate and design linear and nonlinear circuits of OP-AMP.	H	H	M	H	H	H	M
CO-3	To study timer IC and its applications.	H	H	L	L	M	H	M
CO -4	To elaborate the role of filters in electronics circuits.	H	H	M	H	M	H	M
CO-5	To explore the knowledge of linear integrated circuits and its uses.	L	M	M	M	L	M	L
	Name of course: B Sc Semester -IV							
CO-1	To understand functioning of basic processes in communication systems.	L	H	M	H	M	M	M
CO-2	To understand analogue modulation & demodulation techniques.	M	H	M	L	M	M	M
CO-3	To Understand transmission and reception systems.	L	M	L	L	L	M	L
CO -4	To understand propagation of radio waves in communication systems.	L	M	L	L	L	L	L
CO-5	To understand the process of analogue	L	M	L	L	L	L	L

	signal communication system.							
	Name of course: B Sc Semester -IV							
CO-1	To study DAC and ADC used for data conversions in electronics system.	H	H	M	L	M	H	M
CO-2	To elucidate and design regulated DC power supply for operating electronic devices.	H	H	M	M	H	L	M
CO-3	To study PLL IC 565 and its applications.	L	M	L	L	L	L	L
CO -4	To elaborate the role of transducers in Bioelectronics circuits.	M	H	H	M	H	H	H
CO-5	To explore the knowledge of Analogue and Digital circuits and its uses.	M	H	L	M	H	M	H
	Name of course: B Sc Semester -V							
CO-1	To understand the concept optical communication and its operation	L	M	H	H	M	H	H
CO-2	To understand various digital modulation and demodulation techniques.	M	H	H	H	H	M	M
CO-3	To analyze the performance of digital communication system in terms of error rate and spectral efficiency	L	H	M	L	L	H	L
CO -4	To understand the telecommunication traffic, channel and cellular capacity	L	M	H	H	M	H	H
CO-5	To understand various application of cellular technology	L	M	H	H	H	H	H
	Name of course: B Sc Semester -V							
CO-1	To understand importance of Microprocessors as a programmable digital system element in computer system.	M	H	M	M	M	L	M
CO-2	To understand architecture and features of 8085 Microprocessor.	M	M	L	L	L	M	M
CO-3	To explore some basic concepts of microprocessors through assembly language programming.	H	L	M	L	L	H	H
CO -4	To grown-up the in-depth understanding of the operation of microprocessors and machine language programming & interfacing techniques.	H	M	L	M	L	H	H
CO-5	To augmented the knowledge of interfacing the peripheral to increase the flexibility of microprocessor	M	H	H	M	M	H	H
	Name of course: B Sc Semester -VI							
CO-1	After completion of course, Students are able to work on programming in C platforms and develop their programming skills	H	L	H	H	M	M	M
CO-2	Familiar with elements of C language	M	L	M	H	M	M	M
CO-3	Understand operators, Expression and Preprocessors	H	M	H	H	H	H	H
CO -4	Understand different decision making and concept of looping in C	M	L	H	H	M	H	H
CO-5	Understand Array, Structure, Function and	H	M	H	H	H	H	H

	Pointers, their declaration and use							
	Name of course: B Sc Semester -VI							
CO-1	To understand architecture and features of 8051 Microcontroller.	M	H	M	H	L	L	M
CO-2	To learn Programming of 8051 microcontroller.	H	M	M	H	M	M	H
CO-3	To learn interfacing of 8051 Microcontroller with real world input and output devices.	H	M	H	H	H	H	H
CO -4	To understand the coding and interfacing of 8051 with various IO devices.	H	M	H	H	H	H	H
CO-5	To understand importance of Microcontrollers in atomization and control system	M	H	H	H	M	H	H

Geology Department:
Program Specific Outcome (PSOs)

PSOs	Program Outcomes
PSO-1	This programme will provide learning via problem solving and hands on training methodologies.
PSO-2	This programme will help provide pupils with a fundamental grasp of geology and its applications.
PSO-3	This study provides basic knowledge, training, skills and eligibility degree for various higher academic courses.
PSO-4	To develop intellectual ability and geological skills through an appropriate blending of theoretical subject education, practical exercises and field training.
PSO-5	Students can continue further education and will become successful geologist or obtain positions in the industry, government, public or consulting sectors.
PSO-6	This study will encourage students to pursue further education and, eventually research in many sub-disciplines of the topic in India and abroad.
PSO-7	This programme will develop appropriate skills in the students to make them competent to take up self-employment in innovative geology related fields
PSO-8	At the end of three years of B. Sc. Geology course, students would obtain a thorough knowledge of the core ideas of geological sciences

Course Outcomes

Course	COs	Course Outcomes
B.Sc. Semester-I Paper-I Introduction to Geology	CO-1	Students will be able to know branches of geology, earth origin, processes and various hypothesis of origin of the Earth (Solar System).
	CO-2	Students will be able to understand broad perspective of crust, mantle and core of the Earth and reorganization of the Earth's layers.
	CO-3	Students will be able to explain volcanoes, their classification, products and distribution.
	CO-4	Students will be able to compare and contrast properties and mechanics of different types of waves, understand the causes and effects of earthquakes and recognize our limited ability to predict seismic activity, compare magnitude versus intensity.
	CO-5	Students will be able to acquire an introductory understanding of geologic time and the importance of both relative and radiometric dating techniques.
	CO-6	Students will be able to develop the concept of isostasy, isostatic anomalies, isostatic models, and evidence.
	CO-7	Students will be able to continental drift as plate motion and develop the concept and theories of continental drift.
B.Sc. Semester-I Paper-II Minerology	CO-1	Students will be able to understand how atoms interact to form minerals and how the structure and chemical composition of minerals
	CO-2	Students will be able to describe chemistry of minerals (Polymorphism, Isomorphism and Pseudo morphism).
	CO-3	Students will be able to demonstrate the silicate structures with examples.
	CO-4	Students will be able to identify the common minerals in hand specimen using their physical properties.
B.Sc. Semester-II Paper-I Physical	CO-1	Students will be able to know geological works of wind, river, underground water, glaciers, oceans and their landforms of erosion and deposition processes.

Geology and General Geology	CO-2	Students will be able to understand evolution of continents and oceans.
	CO-3	Students will be able to know endogenic processes originating within the earth like diastrophism and how they interact to create landforms
	CO-4	Students will be able to explain Geosynclines, classification and evolution of Geosynclines, causes of subsidence and uplift.
	CO-5	Students will be able to demonstrate the mountain building process and types of mountains
	CO-6	Students will be able to know the role of plate tectonics in the development of all Earth's surface features including mountain ranges, ocean basins, etc.
B.Sc. Semester-II Paper-II Optical Mineralogy and Crystallography	CO-1	Students will be able to know general characteristics of light - polarization, refraction, and describe the parts of polarized microscope.
	CO-2	Students will be able to know the refractive index by Becke line method and Abbe refractometer.
	CO-3	Students will be able to understand The properties of uniaxial and biaxial minerals under parallel and crossed nicols
	CO-4	Students will be able to understand the diagnostic characteristics of minerals using petrological microscope
	CO-5	Students will be able to know the symmetry in crystals and classify crystals based on symmetry elements and describe its forms.
	CO-6	Students will be able to know various laws of crystallography governing the consistency of crystal structures with respect to specific chemical composition.
B.Sc. Semester-III Paper-I Igneous Petrology	CO-1	Students will be able to identify rock type and the steps of the rock cycle related to their formation.
	CO-2	Students will be able to recognize different forms of igneous rocks
	CO-3	Students will be able to assign a name to an igneous rock on the basis of its mineralogical and textural characteristics, and appreciate the environment(s) of formation.
	CO-4	Students will be able to understand the origin of magma and its evolution
	CO-5	Students will be able to understand phase equilibrium of magma crystallizing systems.
B.Sc. Semester-III Paper-II Sedimentary and Metamorphic Petrology	CO-1	Students will be able to understand the processes of sedimentation; origin of sediments
	CO-2	Students will be able to identify sedimentary rocks and describe the mineralogy of sedimentary rocks.
	CO-3	Students will be able to recognize the textures of clastic and non-clastic sedimentary rocks and their significance
	CO-4	Students will be able to identify key sedimentary structures and appreciate the significance of such features with regard to geological processes that have operated.
	CO-5	Students will be able to interpret structures and textures of metamorphic rocks and their importance in understanding metamorphic reaction principle.
	CO-6	Students will be able to understand the concept of facies, grade and zone of metamorphism
B.Sc. Semester-IV Paper-I Paleontology	CO-1	Students will be able to demonstrate understanding of the nature of fossils and types of fossilization that turn organic remains into fossils
	CO-2	Students will be able to understand methods of fossil preservation and preparation.

	CO-3	Students will be able to understand the uses of fossils in solving geological problems: paleoenvironments, relative age, paleo-ecology, economic geology, evolution, stratigraphy, paleogeographic and paleoclimatic reconstructions.
	CO-4	Students will be able to recognize the major groups of invertebrate fossils on the basis of their morphology, classification, evolution, and geological history of major invertebrate classes like Brachiopoda, Mollusca, Echinoidea and Trilobita and identify key index fossils to the species level.
	CO-5	Students will be able to understand the classification, morphology, uses and geological history of Foraminifera, Graptoloidea and Anthozoa
	CO-6	Students will be able to recognize characteristic features and assemblage of the Gondwana flora
B.Sc. Semester-IV Paper-II Structural Geology	CO-1	Students will be able to understand the concept of rock deformation in time and space
	CO-2	Students will be able to demonstrate a basic understanding of stress, strain and rheology of Earth's lithosphere.
	CO-3	Students will be able to use stereographic projections in structural analysis.
	CO-4	Students will be able to comprehend how to describe and classify brittle and ductile structures, including faults, folds, joints, unconformity etc
	CO-5	Students will be able to identify and explain different erosional structures such as Inlier and Outlier, Klippe and Fenster,
	CO-6	Students will be able to interpret the outcrops and their relationship with topography
	CO-7	Students will be able to identify linear and planar structures.
	CO-8	Students will be able to understand lineation and foliations and their relation to major structures.
	CO-9	Students will be able to demonstrate brittle and ductile shear zones.
B.Sc. Semester-V Paper-I Economic Geology	CO-1	Students will be able to understand the processes of formation of mineral deposit and various theories of ore genesis explaining how the various types of minerals originate and deposited within the Earth's crust.
	CO-2	Students will be able to demonstrate knowledge of variety of ore forming processes.
	CO-3	Students will be able to describe the variety of minerals deposits and how they are found and formed
	CO-4	Students will be able to explain origin, mode of occurrence, association, uses and Indian occurrences of the ores of important metallic minerals.
	CO-5	Students will be able to explain origin, mode of occurrence, association, specification and grades for uses in industries and Indian occurrences of important non-metallic minerals.
	CO-6	Students will be able to understand origin, composition, occurrences, prospecting and preparation of coal.
	CO-7	Students will be able to understand origin, migration and accumulation of petroleum and natural gas.
	CO-8	Students will be able to understand and compare the geological setting and mineralization of Kolar gold field, Singhbhum copper belt, Malanjkhand copper deposit, Lead zinc deposit of Zawar, Manganese belt of Maharashtra, Iron ore deposits of Bastar, Bauxite deposits of Maharashtra, Mica deposits of Bihar, and Andhra Pradesh. Gondwana

		coal deposits, Neyveli lignite deposit, Gypsum deposit of Rajasthan and beach placers of Kerala.
B.Sc. Semester-V Paper-II Indian Stratigraphy	CO-1	Students will be able to understand time concept in stratigraphic and major stratigraphic boundaries and their causative factors.
	CO-2	Students will be able to explain fundamentals of stratigraphic principles and various methods of stratigraphic analysis.
	CO-3	Students will be able to understand geological time, classification of sequences in terms of Litho-, Bio- and Chrono- stratigraphy.
	CO-4	Students will be able to know about physiographic subdivision of the Indian subcontinent and their characteristics.
	CO-5	Students will be able to understand Archaean Supergroup of Peninsular India, Dharwar Supergroup and associated granitic rocks, Sausar Group, Sakoli Group, Dongargarh Supergroup, Aravalli Supergroup and associated gneissic rocks with reference to its classification, geographic distribution, lithological characteristics, fossil content and economic importance.
	CO-6	Students will be able to acquaint with the important stratigraphic Supergroup and formations such as Cuddapah Supergroup of Cuddapah basin, Kaladgis, Pakhals, Penganga Formation, Delhi Supergroup, Shimla Formation, Vindhyan Supergroup of Vindhyan basin, Kurnool Supergroup, Chhattisgarh Supergroup
	CO-7	Students will be able to know about the classification, geographic distribution, lithological characteristics, fossil content and economic importance of Paleozoic succession of Spiti valley, Gondwana Supergroup, Triassic of Spiti, Jurassic of Kutch, Rajasthan and Spiti.
	CO-8	Students will be able to describe Cretaceous deposits of Narmada Valley namely, Bagh Beds and Lameta Beds
	CO-9	Students will be able to render understanding of Deccan volcanic Province, type of eruptions and Intertrappeans
	CO-10	Students will be able to know about Siwalik System and its vertebrate life
B.Sc. Semester-VI Paper-I Elements of Remote Sensing and Environmental Geology	CO-1	Students will be able to give basic idea, scope and aim of remote sensing.
	CO-2	Students will be able to distinguish remote sensing from aerial heights and space heights
	CO-3	Students will be able to introduce aerial photographs and their types.
	CO-4	Students will be able to apply the underlying principles of interpreting image data
	CO-5	Students will be able to study aerial photos in the form of mosaics and stereopairs.
	CO-6	Students will be able to apply the understanding of photo-geology and remote sensing in geological studies.
	CO-7	Students will be able to interpret lithologic, structural and geomorphic features on aerial photos
	CO-8	Students will be able to understand the concept of environmental geology and render understanding of interdependent nature and processes operative over earth surface
	CO-9	Students will be able to evaluate the concerned impact of human development on environment systems.
	CO-10	Students will be able to understand natural hazards and their impact on environmental system.

B.Sc. Semester-VI Paper-II Elementary Hydrogeology and Geomorphology	CO-1	Students will be able to demonstrate understanding of the hydrologic cycle as it pertains to ground water systems
	CO-2	Students will be able to explain geological factors governing the occurrence and distribution of groundwater
	CO-3	Students will be able to understand zones of aeration and saturation.
	CO-4	Students will be able to explain aquifers and their classification
	CO-5	Students will be able to explain the porosity and permeability.
	CO-6	Students will be able to state Darcy's law.
	CO-7	Students will be able to elucidate the hydrological properties of rocks.
	CO-8	Students will be able to describe the characteristics of Groundwater provinces of India
	CO-9	Students will be able to understand influent and effluent seepages and springs.
	CO-10	Students will be able to explain the concepts of geomorphology and give examples of its application.

Geology Department:

Program Specific Outcome (PSOs):

PSOs	Program Outcomes
PSO-1	This programme will provide learning via problem solving and hands on training methodologies.
PSO-2	This programme will help provide pupils with a fundamental grasp of geology and its applications.
PSO-3	This study provides basic knowledge, training, skills and eligibility degree for various higher academic courses.
PSO-4	To develop intellectual ability and geological skills through an appropriate blending of theoretical subject education, practical exercises and field training.
PSO-5	Students can continue further education and will become successful geologist or obtain positions in the industry, government, public or consulting sectors.
PSO-6	This study will encourage students to pursue further education and, eventually research in many sub-disciplines of the topic in India and abroad.
PSO-7	This programme will develop appropriate skills in the students to make them competent to take up self-employment in innovative geology related fields
PSO-8	At the end of three years of B. Sc. Geology course, students would obtain a thorough knowledge of the core ideas of geological sciences

Course Outcome (COs)		Program Outcomes (POs)							
		Domain Specific (PSO)							
	Course Name:	1	2	3	4	5	6	7	8
	Introduction to Geology								
CO1	Students will be able to know branches of geology, earth origin, processes and various hypothesis of origin of the Earth (Solar System).	L	M	M	M	H	L	L	M
CO2	Students will be able to understand broad perspective of crust, mantle and core of the Earth and reorganization of the Earth's layers.	L	H	M	H	M	M	L	M
CO3	Students will be able to explain volcanoes, their classification, products and distribution.	L	M	M	H	L	H	M	M
CO4	Students will be able to compare and contrast properties and mechanics of different types of waves, understand the causes and effects of earthquakes and recognize our limited ability to predict seismic activity, compare magnitude versus intensity.	M	M	M	H	L	L	M	M

CO	Description								
CO5	Students will be able to acquire an introductory understanding of geologic time and the importance of both relative and radiometric dating techniques.	L	M	H	H		M	L	M
CO6	Students will be able to develop the concept of isostasy, isostatic anomalies, isostatic models, and evidence.	L	M	M	L		H		M
CO7	Students will be able to continental drift as plate motion and develop the concept and theories of continental drift.	L	M	M	M				
Minerology									
CO1	Students will be able to understand how atoms interact to form minerals and how the structure and chemical composition of minerals	L	M	M	M	L	M	L	M
CO2	Students will be able to describe chemistry of minerals (Polymorphism, Isomorphism and Pseudo morphism).	M	M		H				M
CO3	Students will be able to demonstrate the silicate structures with examples.	M	M	L	M				
CO4	Students will be able to identify the common minerals in hand specimen using their physical properties.	H	M	H	M				H
Physical Geology and General Geology									
CO1	Students will be able to know geological works of wind, river, underground water, glaciers, oceans and their landforms of erosion and deposition processes.	L	H	M	H	M	M	M	M
CO2	Students will be able to understand evolution of continents and oceans.	L	M	M	M				M
CO3	Students will be able to know endogenic processes originating within the earth like diastrophism and how they interact to create landforms	L	M		M				
CO4	Students will be able to explain Geosynclines, classification and evolution of Geosynclines, causes of subsidence and uplift.	L	M		H				
CO5	Students will be able to demonstrate the mountain building process and types of mountains	L	M	H	L				
CO6	Students will be able to know the role of plate tectonics in the development of	L	H	H	M				

	all Earth's surface features including mountain ranges, ocean basins, etc.								
	Optical Mineralogy and Crystallography								
CO1	Students will be able to know general characteristics of light - polarization, refraction, and describe the parts of polarized microscope.	H	M	M	H				M
CO2	Students will be able to know the refractive index by Becke line method and Abbe refractometer.	H	M	M	M				H
CO3	Students will be able to understand The properties of uniaxial and biaxial minerals under parallel and crossed nicols	M	M	M	M				H
CO4	Students will be able to understand the diagnostic characteristics of minerals using petrological microscope	H	H	H	H				H
CO5	Students will be able to know the symmetry in crystals and classify crystals based on symmetry elements and describe its forms.	L	M	H	M			M	M
CO6	Students will be able to know various laws of crystallography governing the consistency of crystal structures with respect to specific chemical composition.	M	M	M	M				L
	Igneous Petrology								
CO1	Students will be able to identify rock type and the steps of the rock cycle related to their formation.	L	H	M	H			M	
CO2	Students will be able to recognize different forms of igneous rocks		H	H	M				
CO3	Students will be able to assign a name to an igneous rock on the basis of its mineralogical and textural characteristics, and appreciate the environment(s) of formation.	M	M	H	H			M	H
CO4	Students will be able to understand the origin of magma and its evolution	L	M	M	M				M
CO5	Students will be able to understand phase equilibrium of magma crystallizing systems.	L	M	H	H			M	M
	Sedimentary and Metamorphic Petrology								

CO1	Students will be able to understand the processes of sedimentation; origin of sediments	M	H	M	H	L	L	L	M
CO2	Students will be able to identify sedimentary rocks and describe the mineralogy of sedimentary rocks.	L	M	M	M				M
CO3	Students will be able to recognize the textures of clastic and non-clastic sedimentary rocks and their significance		H	M	M			M	H
CO4	Students will be able to identify key sedimentary structures and appreciate the significance of such features with regard to geological processes that have operated.	L	M	M	M				M
CO5	Students will be able to interpret structures and textures of metamorphic rocks and their importance in understanding metamorphic reaction principle.		H	M	M			M	H
CO6	Students will be able to understand the concept of facies, grade and zone of metamorphism	L	H	M	H				H
	Paleontology								
CO1	Students will be able to demonstrate understanding of the nature of fossils and types of fossilization that turn organic remains into fossils	L	M	M	L		M	L	L
CO2	Students will be able to understand methods of fossil preservation and preparation.	M	M	M	M		M	L	L
CO3	Students will be able to understand the uses of fossils in solving geological problems: paleoenvironments, relative age, paleo-ecology, economic geology, evolution, stratigraphy, paleogeographic and paleoclimatic reconstructions.	L	L	M	M		L		M
CO4	Students will be able to recognize the major groups of invertebrate fossils on the basis of their morphology, classification, evolution, and geological history of major invertebrate classes like Brachiopoda, Mollusca, Echinoidea and Trilobita and identify key index fossils to the species level.		M	M	M				M

CO5	Students will be able to understand the classification, morphology, uses and geological history of Foraminifera, Graptoloidea and Anthozoa	L	M	L	M			M	L
CO6	Students will be able to recognize characteristic features and assemblage of the Gondwana flora	L	M	M	M				M
Structural Geology									
CO1	Students will be able to understand the concept of rock deformation in time and space	M	H	M	M			M	M
CO2	Students will be able to demonstrate a basic understanding of stress, strain and rheology of Earth's lithosphere.	L	H	M	M			M	M
CO3	Students will be able to use stereographic projections in structural analysis.	M	M	M	M			M	M
CO4	Students will be able to comprehend how to describe and classify brittle and ductile structures, including faults, folds, joints, unconformity etc	L	M	M	M				M
CO5	Students will be able to identify and explain different erosional structures such as Inlier and Outlier, Klippe and Fenster,	L	M	M	M				
CO6	Students will be able to interpret the outcrops and their relationship with topography	H	M	M	M			L	M
CO7	Students will be able to identify linear and planar structures.	L	M	M	M				
CO8	Students will be able to understand lineation and foliations and their relation to major structures.	L	M	M	M				
CO9	Students will be able to demonstrate brittle and ductile shear zones.	L	L	L	M				L
Economic Geology									
CO1	Students will be able to understand the processes of formation of mineral deposit and various theories of ore genesis explaining how the various types of minerals originate and deposited within the Earth's crust.	L	M	M	M			M	M
CO2	Students will be able to demonstrate knowledge of variety of ore forming processes.	L	H	M	M			M	M

CO	Description								
CO3	Students will be able to describe the variety of minerals deposits and how they are found and formed	L	M	M	M				H
CO4	Students will be able to explain origin, mode of occurrence, association, uses and Indian occurrences of the ores of important metallic minerals.	L	M	M	M			M	H
CO5	Students will be able to explain origin, mode of occurrence, association, specification and grades for uses in industries and Indian occurrences of important non-metallic minerals.	L	M	M	M			M	M
CO6	Students will be able to understand origin, composition, occurrences, prospecting and preparation of coal.	L	M	M	M	M	M	M	H
CO7	Students will be able to understand origin, migration and accumulation of petroleum and natural gas.	L	M	M	M	M	M		H
CO8	Students will be able to understand and compare the geological setting and mineralization of Kolar gold field, Singhbhum copper belt, Malanjkhand copper deposit, Lead zinc deposit of Zawar, Manganese belt of Maharashtra, Iron ore deposits of Bastar, Bauxite deposits of Maharashtra, Mica deposits of Bihar, and Andhra Pradesh. Gondwana coal deposits, Neyveli lignite deposit, Gypsum deposit of Rajasthan and beach placers of Kerala.	L	M	M	H				M
	Indian Stratigraphy								
CO1	Students will be able to understand time concept in stratigraphic and major stratigraphic boundaries and their causative factors.	L	M	M	M		M		H
CO2	Students will be able to explain fundamentals of stratigraphic principles and various methods of stratigraphic analysis.		M	M	M				
CO3	Students will be able to understand geological time, classification of sequences in terms of Litho-, Bio- and Chrono- stratigraphy.	L	M	M	M				
CO4	Students will be able to know about physiographic subdivision of the Indian subcontinent and their characteristics.	L	M	M	H				M

CO	Description								
CO5	Students will be able to understand Archaean Supergroup of Peninsular India, Dharwar Supergroup and associated granitic rocks, Sausar Group, Sakoli Group, Dongargarh Supergroup, Aravalli Supergroup and associated gneissic rocks with reference to its classification, geographic distribution, lithological characteristics, fossil content and economic importance.		M	M	M				M
CO6	Students will be able to acquaint with the important stratigraphic Supergroup and formations such as Cuddapah Supergroup of Cuddapah basin, Kaladgis, Pakhals, Penganga Formation, Delhi Supergroup, Shimla Formation, Vindhyan Supergroup of Vindhyan basin, Kurnool Supergroup, Chhattisgarh Supergroup	L	M	M	M			M	M
CO7	Students will be able to know about the classification, geographic distribution, lithological characteristics, fossil content and economic importance of Paleozoic succession of Spiti valley, Gondwana Supergroup, Triassic of Spiti, Jurassic of Kutch, Rajasthan and Spiti.	L	H	H	M			M	H
CO8	Students will be able to describe Cretaceous deposits of Narmada Valley namely, Bagh Beds and Lameta Beds		M	M	M				
CO9	Students will be able to render understanding of Deccan volcanic Province, type of eruptions and Intertrappeans		M	M	H				
CO10	Students will be able to know about Siwalik System and its vertebrate life	L							M
	Elements of Remote Sensing and Environmental Geology								
CO1	Students will be able to give basic idea, scope and aim of remote sensing.		M	M	M			M	M
CO2	Students will be able to distinguish remote sensing from aerial heights and space heights	L	M	M	M			M	H
CO3	Students will be able to introduce aerial photographs and their types.	L	M	M	M				

CO4	Students will be able to apply the underlying principles of interpreting image data	L	M	M	H			H	H
CO5	Students will be able to study aerial photos in the form of mosaics and stereopairs.	M	M	H	H			M	M
CO6	Students will be able to apply the understanding of photo-geology and remote sensing in geological studies.	M	M	M	H			M	M
CO7	Students will be able to interpret lithologic, structural and geomorphic features on aerial photos	L	M	M	M			M	H
CO8	Students will be able to understand the concept of environmental geology and render understanding of interdependent nature and processes operative over earth surface	M	M	M	M			H	H
CO9	Students will be able to evaluate the concerned impact of human development on environment systems.		M	M	M				M
CO10	Students will be able to understand natural hazards and their impact on environmental system.		M	M	M				
Elementary Hydrogeology and Geomorphology									
CO1	Students will be able to demonstrate understanding of the hydrologic cycle as it pertains to ground water systems	L	M	M	M				M
CO2	Students will be able to explain geological factors governing the occurrence and distribution of groundwater	L	M	M	M			L	M
CO3	Students will be able to understand zones of aeration and saturation.	L	M	M	M			L	M
CO4	Students will be able to explain aquifers and their classification		M	M	M				
CO5	Students will be able to explain the porosity and permeability.	M	M	M	M			M	H
CO6	Students will be able to state Darcy's law.		M	M	M				
CO7	Students will be able to elucidate the hydrological properties of rocks.	L	M	M	M		M	M	H
CO8	Students will be able to describe the characteristics of Groundwater provinces of India	L	M	M	M		M	M	H

CO9	Students will be able to understand influent and effluent seepages and springs.	L	M	H	H		M	H	H
CO10	Students will be able to explain the concepts of geomorphology and give examples of its application.	M	M	M	H		M	M	H

Industrial Chemistry
Programme specific outcomes (PSOs):

PSO	Programme outcomes
PSO-1	Enhance the students ability to create the industrial perception
PSO-2	To aware the students regarding pollution and environment.
PSO-3	To demonstrate the experiments setup in future goal of industry
PSO-4	To introduce advanced techniques and ideas required for development of industry.
PSO-5	To study of sophisticated spectroscopic techniques.

Course outcomes:

Course	COs	Course outcomes
B. Sc. Semester- I Paper-I Industrial Chemistry	CO-1	To understand the concept of polymerization.
	CO-2	To understand the concept of petroleum and renewable natural resources.
	CO-3	To describe the concept of absorption and evaporation.
	CO-4	To describe the concept of distillation, petroleum and filtration.
B. Sc. Semester- I paper-II Industrial Chemistry	CO-1	To explain the basic concept of surface chemistry and interfacial phenomenon.
	CO-2	To explain the concept of coal, fuels and combustion.
	CO-3	To study the basic principle of catalysis.
	CO-4	To describe the concept of air pollution.
B. Sc. Semester- II Paper-I Industrial Chemistry	CO-1	To explain the basic principle of drying and extraction.
	CO-2	To explain the basic concept of oils, fats and General study of food additives.
	CO-3	Be able to understand the refining of gasoline and non- petroleum fuels.
	CO-4	To explain the manufacturing and properties of glass & various types of corrosion relevant to chemical industry.
B. Sc. Semester- II paper-II Industrial Chemistry	CO-1	To comprehend the concept of polymeric material and their physical properties.
	CO-2	To explain the utilities in chemical industry: boiler, water, steam and air
	CO-3	To study the concept of fluid flow and types of pumps.
	CO-4	To understand the basic concepts of metallurgy and physio-chemical properties of extraction.
B. Sc. Semester- III Paper-I Industrial Chemistry	CO-1	To understand the basic role of material and energy balance.
	CO-2	To explain the basic concept of material balance without chemical reaction.
	CO-3	To study the chemical properties and application of metals and alloys and study the role of adhesives.
	CO-4	To study the manufacturing of pulp and paper and role of Water analysis.
B. Sc. Semester- III paper-II Industrial Chemistry	CO-1	To study the nitrating agents, kinetics and mechanism of nitration process.
	CO-2	To study the reagents and kinetics of halogenation reaction.
	CO-3	To study the basic concept of sulphonation and oxidation reaction.
	CO-4	Be able to understand the concept of hydrogenation and alkylation.
B. Sc.	CO-1	To understand the concept of protective coating and pretreatment of

Semester- IV Paper-I Industrial Chemistry		surface.
	CO-2	To study the concept of manufacturing of paints, their types and different types of pigment.
	CO-3	To understand the concept of industrial manufacturing of sugar and leather.
	CO-4	To study the concept of electrical insulating material and the semiconductors.
B. Sc. Semester- IV paper-II Industrial Chemistry	CO-1	To study the various types of esterification reaction.
	CO-2	To understand the concept of amination by reduction, by aminolysis and by hydrolysis method.
	CO-3	To understand the study of various principle and their respective equipment's.
	CO-4	To study the principle, working, construction and calibration of various instruments.
B. Sc. Semester- V Paper-I Industrial Chemistry	CO-1	To understand the study of classification and industrial preparation of dyes.
	CO-2	To understand the concept of industrial chemical analysis with statistical calculation.
	CO-3	To explain the general principle of fermentation process, manufacturing of antibiotics and synthesis of vitamins.
	CO-4	To explain the synthesis of bulk drugs like antimicrobial, analgesic, barbiturates and blockers.
B. Sc. Semester- V paper-II Industrial Chemistry	CO-1	To study the concepts of titrimetric analysis.
	CO-2	To explain the concept of monograph of tablet and nephalometry.
	CO-3	To study the basic concepts of amperometric titration and polarometry.
	CO-4	To study the basic principle of solvent extraction.
B. Sc. Semester- VI Paper-I Industrial Chemistry	CO-1	To understand the concept of quality control and instrumental method of analysis.
	CO-2	To study the principle and industrial application of spectroscopic method.
	CO-3	To understand the concepts of electro analytical technique and thermo analytical technique.
	CO-4	To study the principle and application of spectrophotometer and atomic spectroscopy.
B. Sc. Semester- VI paper-II Industrial Chemistry	CO-1	To study the application of pharmaceutical chemistry and clinical chemistry.
	CO-2	To explain the study of cause of common dieses and their treatment by drugs.
	CO-3	To explain the study of general anasthetics and importance and application of first aids.
	CO-4	To understand the mechanism of action of sulphonamides and the study of diabetics and hypoglycemic drugs.

Industrial Chemistry:
Programme specific outcomes (PSOs)

PSO	Programme outcomes
PSO-1	Enhance the students ability to create the industrial perception
PSO-2	To aware the students regarding pollution and environment.
PSO-3	To demonstrate the experiments setup in future goal of industry
PSO-4	To introduce advanced techniques and ideas required for development of industry.
PSO-5	To study of sophisticated spectroscopic techniques.

		Course outcomes (Cos)	Programme outcomes (POs) Domain specific (PSO)				
COs		**Name of course: B Sc Semester-I (paper-I)**	**1**	**2**	**3**	**4**	**5**
CO-1		To understand the concept of polymerization.	L	-	L	M	-
CO-2		To understand the concept of petroleum and renewable natural resources.	H	H	L	H	-
CO-3		To describe the concept of absorption and evaporation.	-	L	-	L	M
CO-4		To describe the concept of distillation, petroleum and filtration.	H	H	H	H	-
		Name of course: B Sc Semester -I (paper-II)					
CO-1		To explain the basic concept of surface chemistry and interfacial phenomenon.	-	L	-	-	-
CO-2		To explain the concept of coal, fuels and combustion.	H	H	L	M	-
CO-3		To study the basic principle of catalysis.	-	M	-	-	L
CO-4		To describe the concept of air pollution.	-	H	M	L	-
		Name of course: B Sc Semester -II (paper-I)					
CO-1		To explain the basic principle of drying and extraction.	M	-	M	L	-
CO-2		To explain the basic concept of oils, fats and General study of food additives.	-	-	-	L	-
CO-3		Be able to understand the refining of gasoline and non- petroleum fuels.	H	H	H	H	-
CO-4		To explain the manufacturing and properties of glass & various types of corrosion relevant to chemical industry.	L	L	H	H	-
		Name of course: B Sc Semester -II (paper-II)					
CO-1		To comprehend the concept of polymeric material and their physical properties.	-	L	L	M	-
CO-2		To explain the utilities in chemical industry: boiler, water, steam and air	H	H	H	H	-
CO-3		To study the concept of fluid flow and types of pumps.	L	-	M	L	-
CO-4		To understand the basic concepts of metallurgy and physio-chemical properties of extraction.	-	M	M	L	-
		Name of course: B Sc Semester -III (paper-I)					
CO-1		To understand the basic role of material and energy balance.	M	-	-	L	-
CO-2		To explain the basic concept of material balance without chemical reaction.	M	-	-	L	-
CO-3		To study the chemical properties and application of metals and alloys and study the role of adhesives.	L	M	M	M	-
CO-4		To study the manufacturing of pulp and paper and role of Water	H	H	H	H	-

	analysis.					
	Name of course: B Sc Semester -III (paper-II)					
CO-1	To study the nitrating agents, kinetics and mechanism of nitration process.	L	H	-	L	M
CO-2	To study the reagents and kinetics of halogenation reaction.	L	L	-	L	M
CO-3	To study the basic concept of sulphonation and oxidation reaction.	-	L	-	L	M
CO-4	Be able to understand the concept of hydrogenation and alkylation.	L	L	-	M	L
	Name of course: B Sc Semester -IV (paper-I)					
CO-1	To understand the concept of protective coating and pretreatment of surface.	-	L	L	H	-
CO-2	To study the concept of manufacturing of paints, their types and different types of pigment.	H	H	H	H	-
CO-3	To understand the concept of industrial manufacturing of sugar and leather.	H	H	H	H	-
CO-4	To study the concept of electrical insulating material and the semiconductors.	-	L	M	M	-
	Name of course: B Sc Semester -IV (paper-II)					
CO-1	To study the various types of esterification reaction.	L	L	-	-	M
CO-2	To understand the concept of amination by reduction, by aminolysis and by hydrolysis method.	L	L	-	-	L
CO-3	To understand the study of various principle and their respective equipment's.	M	-	L	-	M
CO-4	To study the principle, working, construction and calibration of various instruments.	M	-	M	M	M
	Name of course: B Sc Semester -V (paper-I)					
CO-1	To understand the study of classification and industrial preparation of dyes.	H	H	H	M	L
CO-2	To understand the concept of industrial chemical analysis with statistical calculation.	-	L	M	L	-
CO-3	To explain the general principle of fermentation process, manufacturing of antibiotics and synthesis of vitamins.	M	L	H	H	L
CO-4	To explain the synthesis of bulk drugs like antimicrobial, analgesic, barbiturates and blockers.	M	M	M	L	L
	Name of course: B Sc Semester -V (paper-II)					
CO-1	To study the concepts of titrimetric analysis.	-	L	-	-	L
CO-2	To explain the concept of monograph of tablet and nephalometry.	-	L	L	L	M
CO-3	To study the basic concepts of amperometric titration and polarometry.	-	L	-	-	L
CO-4	To study the basic principle of solvent extraction.	L	-	M	L	-
	Name of course: B Sc Semester -VI (paper-I)					
CO-1	To understand the concept of quality control and instrumental method of analysis.	M	-	L	L	H
CO-2	To study the principle and industrial application of spectroscopic method.	L	-	H	M	H
CO-3	To understand the concepts of electro analytical technique and thermo analytical technique.	-	L	-	L	H
CO-4	To study the principle and application of spectrophotometer and atomic spectroscopy.	-	-	L	L	H
	Name of course: B Sc Semester -VI (paper-II)					
CO-1	To study the application of pharmaceutical chemistry and clinical	M	M	H	M	M

	chemistry.					
CO-2	To explain the study of cause of common dieses and their treatment by drugs.	-	M	L	-	-
CO-3	To explain the study of general anasthetics and importance and application of first aids.	-	-	L	-	L
CO-4	To understand the mechanism of action of sulphonamides and the study of diabetics and hypoglycemic drugs.	L	L	L	-	M

MICROBIOLOGY DEPARTMENT
Programme Specific outcomes

PSO	Programme outcomes
PSO-1	Learn history of Microbiology and contribution of various scientists. branches of Microbiology, basic structure of organism in details, microbial nutrition requirement for organism and microbial growth, microbiological techniques and control, different type of staining techniques used to distinguish between different type of bacteria and its oragnelles.
PSO-2	Understand the different types of bacteria and viruses, microbial interaction, prevention of food from spoilage, preservation of food from food borne disease and food standards. also study the testing and preservation of milk and milk product in dairy industries.
PSO-3	Understand the basic structure like Nucleic acid, carbohydrates metabolism, amino acids, ezymology in details and various vitamins. also study the fermentation at industrial level and upstream and downstream processing of fermentation
PSO-4	Understand different types of metabolic pathways and its regulation related to carbohydrates amino acid. also study about different type of waste water treatment methods and water testing methods. this also cover air and agriculture microbiology with bioremediation and biomagnification.
PSO-5	Understand the epidemiology and host parasites, disease transmitted and their various sources, control and prevention & spreading of infection, learn about normal flora present in body, study of pathogenic and non-pathogenic organism, morphology, cultural and biochemicals characteristic, pathogenesis, serolgy test and lab diagnosis, gene mutation and regulation of gene.
PSO-6	Understand Immunity, various defence mechnism, organs of immune system, adaptive immunity, and cell mediated immune response. tools and techniques of genetic engineering. also come to know about health care, agriculture and industrial biotechnology.

Course outcome:

Course	COs	Course Outcome
B.Sc. Semester-I Paper-I Fundamental of Microbiology	CO-1	Develope a good knowledge of the Discovery of Microbes and Origin of Life.
	CO-2	Understand the ultrastructure of prokaryotic cell and the comparative characteristic of prokaryotes and eukaryotes
	CO-3	Understand the nutritionall requirements of bacteria for growth and nutrional type of bacteria.
	CO -4	Know about generation time and understand how to calculate generation time of growing bacteria and effect of environment factors (like pH, temperature, salt concentration etc.) on microbial growth.
B.Sc. Semester-I paper-II basic technique in Microbiology	CO-1	Understand Construction, ray diagram and applications of different types of bacteria
	CO-2	Learn procedure and clinical applications of staining of bacteria.
	CO-3	Understand microbial techniques for isolation as well as preservation of pure culture and students will be able to realize the importance of maintenance of pure culture at national and international microbial culture collection centres.
	CO -4	Understand terminologies used in microbial control, concept of microbial death and mechanism of cell injury.
B.Sc.	CO-1	Understand the types and importance of Archaobacteria, Actinomycetes

Semester-II Paper-I Microbial Diversity		and Cyanobacteria.
	CO-2	Know the important characteristics and modes of reproduction in fungi and algae.
	CO-3	Students will be able to learn the Discovery, structure, cultivation of virus.
	CO -4	Understand positive and negative microbial interactions with examples.
B.Sc. Semester-II paper-II Food and Milk Microbiology	CO-1	Understand the classification of food on the basis of ease of spoilage and sources of microorganisms that contaminate food.
	CO-2	Know the physical and chemical methods of food preservation
	CO-3	Know in detail about Methods of Milk Preservation, Methods of Quality Determination of Milk and Production of dairy products (Fermented Foods (Curd, Dahl, Shrikhand and Cheeses).
	CO -4	Know about the objectives and responsibilities of Food Quality Standards (FDA, BIS, FSSAI and HACCP) regulating the *food* quality in the country.
B. Sc. Semester-III Paper-I chemistry of organic constituents and enzymology	CO-1	Understand the definition, importance of carbohydrates with examples, structure and reactions of monosaccharides and in detail classification of carbohydrates.
	CO-2	Understand the definition, properties, titration curve, peptide bond theory, biologically important peptides and in detail classification of amino acids.
	CO-3	Know the definition, action and active site of enzymes, allosteric enzymes, membrane bound enzymes and isozymes, Learn the enzyme kinetics and inhibition.
	CO -4	Understand the composition of nucleosides and nucleotides secondary structure (Watson-Crick Model) of DNA structure and functions of ribonucleic acids differences between DNA and RNA
B.Sc. Semester-III paper-II Industrial Microbiology	CO-1	Understand design of fermentor, types of fermenters which are used for industrial scale fermentations and types of fermentation processes
	CO-2	Learn the concepts of strain and inoculum development, scale up of fermentation processesUnderstand sterilization of fermentors, production media and factors affecting fermentation process.
	CO-3	Learn the techniques involved in downstream bioprocessing, Concept of GMP Practices and Quality Control.
	CO -4	Acquire a detailed knowledge of production of single cell protein and baker's yeast at industrial level by fermentation processes. Production of like alcohol, alcoholic liquors, and organic acids by industrial fermentation processes.
B.Sc. Semester-IV Paper-I Metabolism	CO-1	Understand concept of Metabolism reactions of glycolysis, energetic and regulation of glycolysis, reactions, regulation and anaplerosis in citric acid cycle. Understand the reactions of pentose phosphate , ED and PK pathways
	CO-2	Know the steps of beta and omega oxidation of fatty acid with its energetic Mechanism DNA replication and transcription in protein synthesis.
	CO-3	Know the different general reactions of amino acid breakdown and mechanism of translation in protein synthesis and features of genetic code.
	CO -4	Understand phosphorylation, types of phosphorylation and High Energy Compounds biological oxidation, principles of oxidation and reduction reaction, different types of enzymes of biological oxidation, components of electron transport chain pathway of electron transport and Photophosphorylation.
B.Sc. Semester-IV paper-II	CO-1	Know about fresh water, methods of water treatment and water quality standarad and bacteriological analysis of water to find out portability of water for drinking
	CO-2	Know about waste water, waste water characteristics, methods of waste

Environmental microbiology		water treatment and water quality standards. Learn about the primary, secondary and tertiary sewage treatment and disposal of treated waste water.
	CO-3	Learn about significance of microbiological sampling of air, bioaerosol sampling and air samplers. Acquire knowledge of the nitrogen fixation, biofertilizers and biopesticides, phosphate solubilizing bacteria and mycorrhiza.
	CO -4	Understand definition and significance of bioaccumulation, biomagnification, bioremediation and bioaugumentation.
B.Sc. Semester-V Paper-I medical microbiology	CO-1	Understand the terminologies in medical microbiology, dynamics of disease transmission.
	CO-2	Understand the pathogenesis as well as virulence and Microbial diseases of different organs of human body.
	CO-3	Understand the pathogenesis and diseases caused by pathogenic microorganisms
	CO -4	Learn about the drug susceptibility testing and mechanism of development of drug resistance.
B.Sc. Semester-V paper-II Molecular Biology and Bioinstrumentation	CO-1	Learn about concept of gene, gene within gene, split gene and types of mutation gene regulation, genetic suppression and molecular basis of mutation.
	CO-2	Understand in detail about the types of recombination.
	CO-3	Learn the principles, applications and types of spectroscopy, electrophoresis and centrifugation.
	CO -4	Understand thin layer, ion exchange and gel filtration chromatography, method and applications of isotope tracer technique and measurement of radioactive isotope.
B. Sc. Semester-VI Paper-I Immunology	CO-1	Understand the structure and functions of the cells and organs involved in Immunity
	CO-2	Able to describe antigens, antigenicity, antibodies (structure and classes) and various organs of immune system.
	CO-3	Learn about acquired immunity.and cell mediated immune response.
	CO -4	Understand antigen-antibody interactions, hypersensitivity reaction and classification of hypersensitivity reactions
B.Sc. Semester-VI paper-II Microbial Biotechnology and Recombinant DNA technology	CO-1	Acquire a fairly good knowledge of the tools and the methods for genetic engineering Gene Library, DNA finger printing and PCR.
	CO-2	Learn about production of hormones, vaccines and interferon, hybridoma technology and gene therapy.
	CO-3	Learn about protoplast fusion, production of biopesticides, Biofertilizers and production of soyasause, concept of golden rice and transgenic plants.
	CO -4	Know the definition, construction and applications of biosensors and Biochips production of enzymes and ethics, hazards of biotechnology.

Microbiology Department:
Programme Specific outcomes (PSOs)

PSO	Programme outcomes
PSO-1	Learn history of Microbiology and contribution of various scientists. branches of Microbiology, basic structure of organism in details, microbial nutrition requirement for organism and microbial growth, microbiological techniques and control, different type of staining techniques used to distinguish between different type of bacteria and its oragnelles.
PSO-2	Understand the different types of bacteria and viruses, microbial interaction, prevention of food from spoilage, preservation of food from food borne disease and food standards. also study the testing and preservation of milk and milk product in dairy industries.
PSO-3	Understand the basic structure like Nucleic acid, carbohydrates metabolism, amino acids, ezymology in details and various vitamins. also study the fermentation at industrial level and upstream and downstream processing of fermentation
PSO-4	Understand different types of metabolic pathways and its regulation related to carbohydrates amino acid. also study about different type of waste water treatment methods and water testing methods. this also cover air and agriculture microbiology with bioremediation and biomagnification.
PSO-5	Understand the epidemiology and host parasites, disease transmitted and their various sources, control and prevention & spreading of infection, learn about normal flora present in body, study of pathogenic and non-pathogenic organism, morphology, cultural and biochemicals characteristic, pathogenesis, serolgy test and lab diagnosis, gene mutation and regulation of gene.
PSO-6	Understand Immunity, various defence mechnism, organs of immune system, adaptive immunity, and cell mediated immune response. tools and techniques of genetic engineering. also come to know about health care, agriculture and industrial biotechnology.

	Course outcomes (COs)	Programme outcomes (POs)					
		Domain specific (PSO)					
	Name of course: B.Sc. Semester-I (Paper-I) Fundamental of Microbiology	1	2	3	4	5	6
CO-1	Develop a good knowledge of the Discovery of Microbes and Origin of Life.	M	M	L	H	H	H
CO-2	Understand the ultra structure of prokaryotic cell and eukaryotic cell the comparative	M	M	L	H	H	H
CO-3	Understand the nutrition requirements of bacteria for growth and nutrional type of bacteria .	H	M	M	M	M	H
CO-4	Know about generation time and understand how to calculate generation time of growing bacteria and effect of environment factors (like pH, temperature salt concentration etc) on microbial growth.	H	M	L	H	H	H
	Name of course: B.Sc. Semester-I (Paper-II) Basic technique in Microbiology						
CO-1	Understand Construction, ray diagram and applications of different types of bacteria	L	L	M	M	H	M
CO-2	Learn procedure and clinical applications of staining of bacteria.	L	L	H	H	H	M
CO-3	Understand microbial techniques for isolation as well as preservation of pure culture	M	M	M	H	H	L

		at national and international microbial culture collection centre's						
CO-4		Understand terminologies used in microbial control, concept of microbial death and mechanism of cell injury.	L	L	M	M	M	M
B.Sc. Semester-II (Paper-I) Microbial Diversity								
CO-1		Understand the types and importance of Archaebacteria, Actinomycetes and Cyanobacteria.	L	L	M	M	M	H
CO-2		Know the important characteristics and modes of reproduction in fungi and algae.	L	L	H	M	M	M
CO-3		Students will be able to learn the Discovery, structure, cultivation of viruses.	M	M	M	H	H	L
CO-4		Understand positive and negative microbial interactions with examples.	L	L	M	M	M	H
B.Sc. Semester-II (Paper-II) **Food and Milk Microbiology**								
CO-1		Understand the classification of food on the basis of ease of spoilage and sources of microoragnism that contaminate food.	M	M	H	H	H	H
CO-2		Know the physical and chemical methods of food preservation	L	L	L	H	H	H
CO-3		Know in detail about Methods of Milk Preservation, Methods of Quality Determination of Milk and Production of dairy products (Fermented Foods (Curd, Dahl, Shrikhand and Cheeses).	M	M	M	H	H	L
CO-4		Know about the objectives and responsibilities of Food Quality Standards (FDA,BIS, FSSAI and HACCP) regulating the food quality in the country.	L	L	L	M	M	M
B.Sc. Semester-III (Paper-I) chemistry of organic constituents and enzymology								
CO-1		Understand the definition,importance of carbohydrates with examples, structure and reaction of monosaccharide and in detail classification of carbohydrates.	M	M	M	H	H	M
CO-2		Understand the definition, properties, titration curve, peptide bond theory, biologically important peptides and in detail classification of amino acids .	M	M	H	H	H	M
CO-3		Know the definition, action and active site of enzymes, allosteric enzymes, membrane bound enzymes and isozymes, Learn the enzyme kinetics and inhibition.	M	H	H	M	M	H
CO-4		Understand the composition of nucleosides and nucleotides secondary structure (Watson- Crick Model) of DNA structure and functions of ribonucleicacid differences between DNA and RNA	L	L	M	H	H	M
B.Sc. Semester-III Paper-II Industrial Microbiology								
CO-1		Understand design of fermentors, types of fermentors which are used for industrial scale fermentations and types of fermentation processes	L	L	M	M	M	H
CO-2		Learn the concepts of strain and inoculum development, scale up of fermentation processes Understand sterilization of fermentors, production media and factors affecting fermentation process.	M	M	H	H	H	M
CO-3		Learn the techniques involved in downstream bioprocessing, Concept of GMP Practices and Quality Control.	L	M	H	M	M	L
CO-4		Acquire a detailed knowledge of production of single cell protein and bakers yeast at industrial level by	M	L	L	H	H	M

	fermentation processes.Production of like alcohol, alcoholic liquors, and organic acid by industrial fermentation processes.						
B.Sc. Semester-IV (Paper-I) Metabolism							
CO-1	Understand concept of Metabolism reactions of glycolysis, energetic and regualtion of glycolysis reactions, regulation and anaplerosis in citric acid cycle. Understand the reactions of pentose phosphate , ED and PK pathways	L	L	M	M	M	H
CO-2	Know the steps of beta and omega oxidation of fatty acid with its energetic, Mechanism DNA DNA replication and transcription in protein synthesis.	M	M	H	H	H	L
CO-3	Know the different general reactions of amino acid breakdown and mechanism of translation in protein synthesis and features of genetic code.	M	M	M	H	H	M
CO-4	Understand phosphorylation , types of phosphorylation and high energy compounds biological oxidation, principles of oxidation and reduction reaction, different types of enzymes of biological oxidation, different components of electron transport chain pathway of electron transport and photophosphorylation.	M	M	M	H	H	M
B.Sc. Semester-IV (Paper-II) Environmental microbiology							
CO-1	Know about fresh water, methods of water treatment and water quality standard and bacteriological analysis of water to find out potability of water for drinking	L	L	L	M	M	H
CO-2	Know about waste water, waste water characteristics, methods of waste water treatment and water quality standards. Learn about the primary, secondary and tertiary sewage treatment and disposal of treated waste water.	L	L	L	M	M	M
CO-3	Learn about significance of microbiological sampling of air, bioaerosol sampling and air samplers. Acquire knowledge of the nitrogen fixation, biofertilizers and biopesticides, phosphate solubilizing bacteria and mycorrhiza.	L	L	M	H	M	M
CO-4	Understand definition and significance of bioaccumulation, biomagnifications, bioremediation and bioaugumentation	M	M	M	H	H	M
B.Sc. Semester-V Paper-I medical microbiology							
CO-1	Understand the terminologies in medical microbiology, dynamics of disease transmission	L	L	M	M	M	M
CO-2	Understand the pathogenesis as well as virulence and microbial disease of different organs of human body	L	M	M	H	H	M
CO-3	Understand the pathogenesis and diseases caused by pathogenic microorganisms	M	M	M	M	M	H
CO-4	Learn about the drug susceptibility testing and mechanism of development of drug resistance.	L	L	M	M	H	M
B.Sc. Semester-V (Paper-II) Molecular Biology and Bioinstrumentation							
CO-1	Learn about concept of gene, gene within gene, split gene and types of mutation gene regulation genetic suppression and molecular basis of mutation.	L	L	M	H	H	M
CO-2	Understand in detail about the types of recombination.	M	M	L	M	M	H

CO-3	Learn the principles, applications and types of spectroscopy, electrophoresis and centrifugation.	L	L	M	M	H	M
CO-4	Understand thin layer, ion exchange and gel filtration chromatography, method and applications of isotope tracer technique and measurement of radioactive isotope.	M	M	H	H	M	H
B.Sc. Semester-VI (Paper-I) Immunology							
CO-1	Understand the structure and functions of the cells and organs involved in immunity	L	M	M	H	H	H
CO-2	Able to describe antigens, antigenicity, antibodies (structure and classes) and various organs of immune system.	M	M	H	H	H	M
CO-3	Learn about acquired immunity.and cell mediated immune response.	L	L	M	M	H	M
CO-4	Understand antigen-antibody interactions, hypersensitivity reaction and classification of hypersensitivity reactions	M	M	L	H	H	H
B.Sc. Semester-VI (Paper-II) Biotechnology and Recombinant DNA technology							
CO-1	Acquire a fairly good knowledge of the tools and the methods for genetic engineering gene Library, DNA finger printing and PCR.	L	L	M	M	H	M
CO-2	Learn about production of hormones, vaccines and interferon, hybridoma technology and gene therapy.	L	L	H	M	M	M
CO-3	Learn about protoplast fusion, production of biopesticides, biofertilizers and production of soyasause, concept of golden rice and transgenic plants.	M	M	H	H	H	M
CO-4	Know the definition, construction and applications of biosensors and biochips production of enzymes and ethics, hazards of biotechnology.	M	M	M	H	H	H

Computer Science Department:

Programme Specific outcomes

PSO	Programme outcomes
PSO-1	Analyze and compare alternative solutions to computing problems
PSO-2	Design, correctly implement and document solutions to significant computational problems
PSO-3	Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems
PSO-4	Implement software systems that meet specified design and performance requirements
PSO-5	Work in the IT sector as system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

Course Outcomes

Course	Cos	Course Outcome
B.Sc. Semester-I Paper-I Programming in C	CO-1	Illustrate the flowchart and design an algorithm for a given problem to develop a c programs using operators. Develop conditional and iterative statements to write c programs.
	CO-2	Enables students to develop logics which will help them to create programs, applications in C. Enables students to develop logics which will help them to create programs, applications in C. Develop conditional and iterative statements to write c programs.
	CO-3	Inscribe c programs that use pointers to access arrays, strings and functions. Exercise user defined data types including structures and unions to solve problems. Writing C programs using pointers and to allocate memory using dynamic memory management functions. Inscribe c programs using pointers and to allocate memory using dynamic memory management functions.
	CO-4	Inscribe c programs using pointers and to allocate memory using dynamic memory management functions. Inscribe c programs using pointers and to allocate memory using dynamic memory management functions.
B.Sc. Semester-I Paper-II Fundamentals Of Information Technology	CO-1	Introducing skills relating to IT basics, computer applications, programming, interactive Medias, internet basics.
	CO-2	Helps Students to peruse specialized Programs leading to technical and professional careers and certifications in the IT industry.
	CO-3	Introducing skills relating to IT basics, computer applications, programming, interactive Medias, internet basics.
	CO-4	It provides introductory overview of IT concepts including hardware, software, networks, IT careers and skills.
B.Sc. Semester-II Paper-I Object Oriented Programming Using 'C++'	CO-1	Describe OOPs concepts.
	CO-2	Understand tokens, expressions and control structures. Use functions and pointers in C++ Programs.
	CO-3	Explain arrays and strings and create programs using them. Able to solve real world problems using OOP techniques.
	CO-4	Explain arrays and strings and create programs using them.

B.Sc. Semester-II Paper-II System Analysis and Design	**CO-1**	It examines the issues and professional responsibilities that need to be considered at different phases in the development of information systems for an organization.
	CO-2	A farm basis for understanding the life cycle of a systems development project. An understanding of the analysis and development techniques required as a team member of a medium-scale information systems development project
	CO-3	Experience in developing information systems models. Experience in developing systems project documentation.
	CO-4	An understanding of the ways in which an analyst's interaction with system sponsors and users play a part in information systems development.
B.Sc. Semester-III Paper-I Data Structures	**CO-1**	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
	CO-2	Demonstrate different methods for traversing trees.
	CO-3	Compare alternative implementations of data structures with respect to performance. Compare and contrast the benefits of dynamic and static data structures implementations
	CO-4	Compare alternative implementations of data structures with respect to performance. Compare and contrast the benefits of dynamic and static data structures implementations.
B.Sc. Semester-III Paper-II Operating Systems	**CO-1**	Learn different types of operating systems along with concept of file systems algorithms used in operating system.
	CO-2	Learn different types of Process scheduling algorithms used in operating system.
	CO-3	Provide students knowledge of memory management and deadlock handling algorithms.
	CO-4	Implement various algorithms required for management, scheduling, allocation and communication used in Operating System.
B.Sc. Semester-IV Paper-I Java Programming	**CO-1**	Able to understand the use of OOPs concepts. Able to solve real world problems using OOP techniques. Able to understand the use of abstraction.
	CO-2	Able to understand the use of Packages and Interface in java. Able to develop and understand exception handling, multithreaded applications with synchronization.
	CO-3	Able to design GUI based applications and develop applets for web applications. Able to handle IO streams, Use and create package and interfaces in a Java program.
	CO-4	Able to design GUI based applications and develop applets for web applications. Able to handle IO streams, Use and create package and interfaces in a Java program.
B.Sc. Semester-IV Paper-II Linux Operating	**CO-1**	Discuss the architecture, networking and basic commands of LINUX. Implement various file processing commands used in LINUX.
	CO-2	Apply Regular expression to perform pattern matching using utilities like grep,sed and awk. Construct various shell scripts for simple applications.

System	**CO-3**	Explain the process management using system calls. Analyze the structure of OS and basic architectural components involved in OS design.
	CO-4	Analyse and design the applications to run in parallel either using process or thread models of different OS. Analyse the various device and resource management techniques for timesharing and distributed systems. Interpret the mechanisms adopted for file sharing in distributed Applications.
B.Sc. Semester-V Paper-I Visual Basic Programming	**CO-1**	The student will use VB to build Windows applications using structured and object based programming techniques. Students are exposed to the following concepts and skills at an introductory conceptual level
	CO-2	Design, formulate, and construct applications with VB Integrate variables and constants into calculations applying VB. Determine logical alternatives with VB decision structures.
	CO-3	Design, formulate, and construct applications with VB. Integrate variables and constants into calculations applying VB. Determine logical alternatives with VB decision structures.
	CO-4	Assemble multiple forms, modules, and menus into working VB solutions Create VB programs using multiple array techniques. Build integrated VB solutions using files and structures with printing capabilities.
B.Sc. Semester-V Paper-II Database Management System	**CO-1**	Enables students obtain a broad understanding of database concepts and database management system software. Helps obtain a high level understanding of major DBMS concepts and their functions.
	CO-2	Helps to program a data-intensive applications using DBMS APIs. Helps students understand software development processes and to apply software engineering principles in software development.
	CO-3	Familiarization with Database Management System. Comprehensive knowledge of database models. Be familiar with relational database theory, and able to write relational algebra expressions for queries.
	CO-4	Usage of DML and TCL statements. An ability to work in one or more significant application domains.
B.Sc. Semester-VI Paper-I Compiler Construction	**CO-1**	Compiler design principles provide an in-depth view of translation and optimization process.
	CO-2	Studying compilers enables you to design and implement your own domain-specific language.
	CO-3	It studies Phases of the compilation process, Syntax and semantic specification of language
	CO-4	The course students will understand the overall structure of a compiler, and will know significant details of a number of important techniques commonly used.
B.Sc. Semester-VI Paper-II SQL And Pl/SQL	**CO-1**	Ability to code database transactions using SQL. Skill to write PL/SQL programs.
	CO-2	Master the basics of SQL and construct queries using SQL. Be familiar with relational database theory, able to write relational algebra expressions for queries
	CO-3	Master the basics of PL/SQL Composite Data types like Procedures,

		Functions, Packages and Triggers.
		An ability to work in one or more significant application domains
	CO-4	Master the basics of PL/SQL Composite Data types like Procedures,
		Functions, Packages and Triggers.
		An ability to work in one or more significant application domains.

Computer Science Department:
Programme specific outcomes (PSOs)

PSO	Programme outcomes
PSO-1	Analyze and compare alternative solutions to computing problems
PSO-2	Design, correctly implement and document solutions to significant computational problems
PSO-3	Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems
PSO-4	Implement software systems that meet specified design and performance requirements
PSO-5	Work in the IT sector as system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

Course outcome of B.Sc Computer Science

	Course outcomes (COs)	Programme outcomes (POs)				
		Domain specific (PSO)				
	Name of course: B.Sc. Semester-I (Paper-I) **Programming in C**	1	2	3	4	5
CO-1	Illustrate the flowchart and design an algorithm for a given problem to develop a c programs using operators. Develop conditional and iterative statements to write c programs.	M	M	L	H	H
CO-2	Enables students to develop logics which will help them to create programs, applications in C. Develop conditional and iterative statements to write c programs.	M	M	L	H	H
CO-3	Exercise user defined data types including structures and unions to solve problems.	H	M	M	M	M
CO-4	Writing C programs using pointers and to allocate memory using dynamic memory management functions.	H	M	L	H	H
	Name of course: B.Sc. Semester-I (Paper-II) **Fundamentals Of Information Technology**					
CO-1	Introducing skills relating to IT basics, computer applications, programming, interactive Medias, internet basics.	L	L	M	M	H
CO-2	Helps Students to peruse specialized Programs leading to technical and professional careers and certifications in the IT industry.	L	L	H	H	H
CO-3	Introducing skills relating to IT basics, computer applications, programming, interactive Medias, internet basics.	M	M	M	H	H
CO-4	It provides introductory overview of IT concepts including hardware, software, networks, IT careers and skills.	L	L	M	M	M
	B.Sc. Semester-II (Paper-I)					

	Object Oriented Programming Using 'C++'					
CO-1	Describe OOPs concepts.	L	L	M	M	M
CO-2	Understand tokens, expressions and control structures. Use functions and pointers in C++ Programs.	L	L	H	M	M
CO-3	Explain arrays and strings and create programs using them. Able to solve real world problems using OOP techniques.	M	M	M	H	H
CO-4	Explain arrays and strings and create programs using them.	L	L	M	M	M
	B.Sc. Semester-II (Paper-II) System Analysis and Design					
CO-1	It examines the issues and professional responsibilities that need to be considered at different phases in the development of information systems for an organization.	M	M	H	H	H
CO-2	A farm basis for understanding the life cycle of a systems development project. An understanding of the analysis and development techniques required as a team member of a medium-scale information systems development project	L	L	L	H	H
CO-3	Experience in developing information systems models. Experience in developing systems project documentation.	M	M	M	H	H
CO-4	An understanding of the ways in which an analyst's interaction with system sponsors and users play a part in information systems development.	L	L	L	M	M
	B.Sc. Semester-III (Paper-I) Data Structures					
CO-1	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms	M	M	M	H	H
CO-2	Demonstrate different methods for traversing trees.	M	M	H	H	H
CO-3	Compare alternative implementations of data structures with respect to performance.	M	H	H	M	M
CO-4	Compare and contrast the benefits of dynamic and static data structures implementations.	L	L	M	H	H
	B.Sc. Semester-III Paper-II Operating Systems					
CO-1	Learn different types of operating systems along with concept of file systems algorithms used in operating system.	L	L	M	M	M
CO-2	Learn different types of Process scheduling algorithms used in operating system.	M	M	H	H	H
CO-3	Provide students knowledge of memory management and deadlock handling algorithms.	L	M	H	M	M
CO-4	Implement various algorithms required for management, scheduling, allocation and communication used in Operating System.	M	L	L	H	H
	B.Sc. Semester-IV (Paper-I) Java Programming					
CO-1	Able to understand the use of OOPs concepts. Able to solve real world problems using OOP techniques.	L	L	M	M	M

	Able to understand the use of abstraction.					
CO-2	Able to understand the use of Packages and Interface in java. Able to develop and understand exception handling, multithreaded applications with synchronization.	M	M	H	H	H
CO-3	Able to design GUI based applications and develop applets for web applications.	M	M	M	H	H
CO-4	Able to handle IO streams, Use and create package and interfaces in a Java program.	M	M	M	H	H
	B.Sc. Semester-IV (Paper-II) **Linux Operating System**					
CO-1	Discuss the architecture, networking and basic commands of LINUX. Implement various file processing commands used in LINUX.	L	L	L	M	M
CO-2	Apply Regular expression to perform pattern matching using utilities like grep,sed and awk. Construct various shell scripts for simple applications.	L	L	L	M	M
CO-3	Explain the process management using system calls. Analyze the structure of OS and basic architectural components involved in OS design.	L	L	M	H	M
CO-4	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. Interpret the mechanisms adopted for file sharing in distributed Applications.	M	M	M	H	H
	B.Sc. Semester-V Paper-I **Visual Basic**					
CO-1	The student will use VB to build Windows applications using structured and object based programming techniques. Students are exposed to the following concepts and skills at an introductory conceptual level	L	L	M	M	M
CO-2	Design, formulate, and construct applications with VB Integrate variables and constants into calculations applying VB.	L	M	M	H	H
CO-3	Determine logical alternatives with VB decision structures. Create VB programs using multiple array techniques.	M	M	M	M	M
CO-4	Assemble multiple forms, modules, and menus into working VB solutions Build integrated VB solutions using files and structures with printing capabilities.	L	L	M	M	H
	B.Sc. Semester-V (Paper-II) **Database Management System**					
CO-1	Enables students obtain a broad understanding of database concepts and database management system software. Helps obtain a high level understanding of major DBMS concepts and their functions.	L	L	M	H	H
CO-2	Helps to program a data-intensive applications using DBMS APIs. Helps students understand software development processes and to apply software engineering principles in software development.	M	M	L	M	M
CO-3	Familiarization with Database Management System. Comprehensive knowledge of database models. Be familiar with relational database theory, and able to write relational algebra expressions for	L	L	M	M	H

	queries.					
CO-4	Usage of DML and TCL statements. An ability to work in one or more significant application domains.	M	M	H	H	M
	B.Sc. Semester-VI (Paper-I) **Compiler Construction**					
CO-1	Compiler design principles provide an in-depth view of translation and optimization process.	L	M	M	H	H
CO-2	Studying compilers enables you to design and implement your own domain-specific language.	M	M	H	H	H
CO-3	It studies Phases of the compilation process, Syntax and semantic specification of language	L	L	M	M	H
CO-4	The course students will understand the overall structure of a compiler, and will know significant details of a number of important techniques commonly used.	M	M	L	H	H
	B.Sc. Semester-VI (Paper-II) **SQL And Pl/SQL**					
CO-1	Ability to code database transactions using SQL. Skill to write PL/SQL programs.	L	L	M	M	H
CO-2	Master the basics of SQL and construct queries using SQL. Be familiar with relational database theory, able to write relational algebra expressions for queries	L	L	H	M	M
CO-3	Master the basics of PL/SQL Composite Data types like Procedures, Functions, Packages and Triggers.	M	M	H	H	H
CO-4	An ability to work in one or more significant application domains.	M	M	M	H	H

Program Specific Outcome (PSOs):
Information Technology (IT) Department

PSO	Programme outcomes
PSO-1	Learning information Technology emphasizing the knowledge of programming, hardware organization, operating systems, theory of computation and principles of programming language.
PSO-2	Understand, analyze and develop computer programs in the areas related to algorithm, web design and networking for efficient design of computer based system. Design, correctly implement and document solutions to significant computational problems
PSO-3	Apply standard software engineering practices and strategies in software project development using open source programming environment to deliver a quality of product for business success
PSO-4	Implement software systems that meet specified design and performance requirements
PSO-5	Work in the IT sector as system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

Course outcome of B. Sc (IT)

Course	COs	Course Outcomes
B.Sc.(IT) Semester-I Paper-I Fundamentals of Information Technology	CO-1	Familiar with parts of computer
	CO-2	Understand the input and output devices.
	CO-3	Be familiar with software applications
	CO-4	Understand file management
B.Sc.(IT) Semester-I Paper-II Methodology of Programming in C	CO-1	Understand the basic concept of C Programming, and its different modules.
	CO-2	Acquire knowledge about the basic concept of writing a program.
	CO-3	Design programs involving decision structures, loops and functions.
	CO-4	Explain the difference between call by value and call by reference.
B.Sc.(IT) Semester-I Paper-III System Analysis And Design	CO-1	Demonstrate knowledge on the different phases of System Development Life Cycle (SDLC).
	CO-2	Appreciate the use of systems design techniques, methodologies, and tools
	CO-3	Discuss the initial phases of the System Development Life Cycle (SDLC) using analytical tools and quantitative techniques used to identify problems.
	CO-4	Define problems and opportunities that initiate projects.
B.Sc.(IT) Semester-I Paper-IV Web Technology	CO-1	Understand fundamental tools and technologies for web design.
	CO-2	Specify design rules in constructing web pages and sites.
	CO-3	Create a table, link, list (ordered and unordered), CSS within a web page
	CO-4	Create a web page having form tools.
B.Sc.(IT) Semester-I	CO-1	An understanding of the ways in which multimedia-based learning application that can be

Paper-V **Multimedia Application Development**		used in education management courses.
	CO-2	An understanding of multimedia applications are used because they have met all aspects of Display Design, Navigation, Animation, Text, Typography
	CO-3	Multimedia-based learning applications can be used using a computer.
	CO-4	Ease of use of multimedia, Material accuracy aspects, Content compliance, complete presentation of material, Suitability of practice questions with indicators.
B.Sc.(IT) Semester-I **Paper-VI** **Applied Mathematics-I**	CO-1	To express a logic sentence in terms of predicates, quantifiers, and logical connectives.
	CO-2	Apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
	CO-3	Use tree and graph algorithms to solve problems.
	CO-4	Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
B.Sc.(IT) Semester-II **Paper-I** **Fundamentals Of Digital Electronics**	CO-1	Perform conversions among different number systems, became familiar with basic logic gates and understand Boolean algebra
	CO-2	Understand the design of sequential Circuits such as Flip-Flops, Registers, and Counters
	CO-3	simple Boolean functions by using basic Boolean properties &design of combinational circuits such as MUX,DEMUX, Encoder and Decoder etc.
	CO-4	Obtain a basic level of Digital Electronics knowledge and set the stage to perform the analysis and design of Complex Digital electronic Circuits
B.Sc.(IT) Semester-II **Paper-II** **Object Oriented Programming (C++)**	CO-1	Know the principles of oops concept and control structure.
	CO-2	Analysis & Create the concept of classes and object, array, functions, constructor and destructor.
	CO-3	Understand the concept of inheritance and classification, pointers virtual function and polymorphism.
	CO-4	Able to work with files, file pointers and its manipulations.
B.Sc.(IT) Semester-II **Paper-III** **Operating Systems**	CO-1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
	CO-2	Understand the difference between process & thread, issues of scheduling of user level processes / threads and their issues & use of locks, semaphores, monitors for synchronizing multiprogramming
	CO-3	Gain knowledge about the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
	CO-4	Demonstrate the design and management concepts along with issues and challenges of main memory, virtual memory and file system
B.Sc.(IT) Semester-II **Paper-IV** **Web Programming**	CO-1	Understand the major areas and challenges of web programming.
	CO-2	Distinguish web-related technologies.
	CO-3	Use advanced topics in ASP5, XML, JavaScript.

	CO-4	Design and implement typical static web pages and interactive web applications and dynamic web applications and Understand, analyze and create XML documents.
B.Sc.(IT) Semester-II Paper-V Database Management System	CO-1	Analyze Database design methodology
	CO-2	To understand the features of database management systems and Relational database
	CO-3	Draw various data models for Data Base and Write queries mathematically.
	CO-4	Understand types of Data Base failures and Recovery.
B.Sc.(IT) Semester-II Paper-VI Applied Mathematics-II	CO-1	Understand the basic principles of sets and operations insets.
	CO-2	Apply counting principles to determine probabilities.
	CO-3	Determine when a function is 1-1 and "onto".
	CO-4	Demonstrate different traversal methods for trees and graphs.
B.Sc.(IT) Semester-III (Paper-I) Microprocessors and ALP	CO-1	Learn about the architecture and programming of the microprocessor 8085 and8086.
	CO-2	Know the basic concepts Pin Diagram of 8086 ,Interfacing to 8086.
	CO-3	Know the basic concepts of Mother board and hard disk.
	CO-4	Know the basic concepts of Advance Micro-processor.
B.Sc.(IT) Semester-III Paper-II Data Structures	CO-1	Student will be introduced to different searching and sorting techniques.
	CO-2	Ability to describe stack, queue and linked list operation.
	CO-3	Student will be able to use stacks for evaluating postfix expressions, convert expressions from infix to postfix.
	CO-4	Apply graph and tree traverse technique to various applications.
B.Sc.(IT) Semester-III Paper-III Data Communication & Network-I	CO-1	Introduction of Data Communication and Networking.
	CO-2	Introduction of Transmission Media and Different types of media.
	CO-3	Familiar with Wireless Communication and its Mode and Media.
	CO-4	Understand Network Topologies and its Types and application.
B.Sc.(IT) Semester-III Paper-IV Linux Operating System	CO-1	To know the basic concepts of Linux Operating System.
	CO-2	Familiar with Linux commands.
	CO-3	Understand shell programming.
	CO-4	Familiar with system administration.
B.Sc.(IT) Semester-III Paper-V E- Commerce	CO-1	Describe the major types of E-commerce.
	CO-2	Explain the process that should be followed in building an E- commerce presence.
	CO-3	Identify the key security threats in the E-commerce environment.
	CO-4	Describe how procurement and supply chains relate to B2B E- commerce.
B.Sc.(IT) Semester-III (Paper-VI Statistical Method	CO-1	To understand the concept of Statistical methods, Scope of Statistics and Primary Data and Secondary Data.
	CO-2	To learn about Frequency Distribution and Central Tendency Mead, Median and Mode.
	CO-3	To gain knowledge of Measure of Dispersion, Skewness and

		Kurtosis
	CO-4	To get the knowledge of Correlations and Regression.
B.Sc.(IT) Semester-IV Paper-I Software Engineering-I	CO-1	Students will apply software testing and quality assurance techniques at the module level, and understand these techniques at the system and organization level.
	CO-2	Students will be able to understand waterfall (linear) lifecycle process.
	CO-3	Students will be able to understand prototyping, spiral approaches.
	CO-4	Student will have a working knowledge of technical documentations and make presentations on various aspects of a software development project
B.Sc.(IT) Semester-IV Paper-II Java Programming	CO-1	Understanding of Java Language, elements and its Features.
	CO-2	Understanding of Class and members loops and Concept of Inheritance.
	CO-3	Introduction of Graphic Class , AWT Application and Layouts.
	CO-4	Java API Packages and Threads Implementation.
B.Sc.(IT) Semester-IV Paper-III Data Communication & Network-II	CO-1	Describe the functions of each layer in OSI and TCP/IP model.
	CO-2	Describe the Session layer design issues and Protocols.
	CO-3	Describe the Transport layer services and Protocols.
	CO-4	Describe the ISDN Architecture, ISDN Protocols and B_ISDN.
B.Sc.(IT) Semester-IV Paper-IV Oracle	CO-1	Know the basic concepts and the applications of data base systems and utilize the knowledge of basics of SQL and construct queries using SQL
	CO-2	Learn how to apply relational database theory ,and be able to write relational algebra expressions for queries
	CO-3	Understand the design principles for logical design of datab including the ER method and normalization approach.
	CO-4	Know the basic concepts and the applications of Cursor and Trigger.
B.Sc.(IT) Semester-IV Paper-V Compiler Construction	CO-1	Understand the basic about Compiler and Translator.
	CO-2	Learn about Lexical and Syntactic Structure of a language.
	CO-3	Learn about Phases of Compiler.
	CO-4	Understand the basic about DAG, Code Generation, Code Optimization and Parsing.
B.Sc.(IT) Semester-IV Paper-VI Numerical Methods	CO-1	Understand numerical techniques to find the roots of non-linear equations and solution of system of linear equations.
	CO-2	Understand the difference operators and the use of interpolation.
	CO-3	Understand numerical differentiation.
	CO-4	Apply integration and numerical solutions of ordinary and partial differential equations.
B.Sc.(IT) Semester-V	CO-1	Identify the different project contexts and suggest an appropriate Management strategy.

Paper-I **Software Project** **Management**	**CO-2**	Practice the role of professional ethics in successful software development.
	CO-3	Determine an appropriate project management approach through an evaluation of the business context and scope of the project.
	CO-4	Know the scope of the project
B.Sc.(IT) Semester-V **Paper-II** **Dotnet** **Framework And** **C#**	**CO-1**	Identify and understand different components of a compiler and their functioning
	CO-2	Know lexical, syntax and semantic analysis processes.
	CO-3	Understand and define the role of lexical analyzer, use of regular expression and transition diagrams.
	CO-4	Understand Finite state machine and purpose.
B.Sc.(IT) Semester-V **Paper-III** **Network Security**	**CO-1**	Describe network security services and applied mechanisms.
	CO-2	Understand Symmetrical and Asymmetrical cryptography.
	CO-3	To know Data integrity ,Authentication ,Digital Signatures.
	CO-4	Understand Web Security.
B.Sc.(IT) Semester-V **Paper-IV** **Data Warehousing**	**CO-1**	The Introduction, Definition, Components of Data Warehousing.
	CO-2	Data Warehousing Schemas and different Modeling.
	CO-3	OLAP in Data Warehousing and its Types.
	CO-4	Backup and Recovery of Data Warehousing.
B.Sc.(IT) Semester-V **Paper-V** **Visual Programming**	**CO-1**	Explore Visual Basic's Integrated Development Environment (IDE).
	CO-2	Implement syntax rules in Visual Basic programs.
	CO-3	Write and apply procedures ,sub-procedures, and functions to create manageable code
	CO-4	Apply ADO Data Controls and handle Errors
B.Sc.(IT) Semester-V **Paper-VI** **Graph Theory**	**CO-1**	To understand and apply the fundamental concepts in graph theory.
	CO-2	To apply graph theory based tools in solving practical problems.
	CO-3	To improve the proof writing skills.
	CO-4	To understand Directed Graphs, Polish Notation and its Algorithms
B.Sc.(IT) **Semester-VI** **Paper-I** **Enterprise** **Resource** **Planning**	**CO-1**	To understand the steps and activities in the ERP life cycle
	CO-2	To be able to identify the important business functions by software like ERP
	CO-3	Identify customer relationship management to use and design databases for different applications.
	CO-4	To understand and apply SWOT
B.Sc.(IT) **Semester-VI** **Paper-II** **Advance Java** **Programming**	**CO-1**	To acquire knowledge on creation of software components using JAVA Beans.
	CO-2	To learn Server-Side Programming using Servlets and Java Server Pages.
	CO-3	Understanding of JDBC/ ODBC and Remote Database.
	CO-4	Introduction of RMI and Client Server Model.
B.Sc.(IT) **Semester-VI** **Paper-III** **Cloud Computing**	**CO-1**	Understand the basics about cloud computing.[
	CO-2	Learn about cloud computing architecture and types.
	CO-3	Learn about cloud application platforms.
	CO-4	Characteristics of SaaS, Software Utility Application.
B.Sc.(IT)	**CO-1**	Define Data Mining , KDDVs Data Mining , DBMS Vs Data

Semester-VI Paper-IV Data Mining		Mining.
	CO-2	Understand the basic about data mining, classification an d major issues
	CO-3	Learn about cluster Analysis and major clustering methods.
	CO-4	Classification, Classification Techniques and Algorithms.
B.Sc.(IT) Semester-VI Paper-IV Animation Techniques	**CO-1**	Know the basic concepts Animation
	CO-2	gain knowledge of Creating animation in Flash
	CO-3	To Understand 3D Animation , Color Model
	CO-4	To Understand Motion Captions, and Motion Capture Software
B.Sc.(IT) Semester-VI Paper-VI Operation Research	**CO-1**	Formulate a real-world problem as a mathematical programming model
	CO-2	Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand.
	CO-3	Understand the relationship between a linear program and its dual, including strong duality and complementary lacking
	CO-4	Solve specialized linear programming problems like transportation and assignment problems.

Information Technology Department:
Programme specific outcomes (PSOs)

PSO	Programme outcomes
PSO-1	Learning information Technology emphasizing the knowledge of programming, hardware organization, operating systems, theory of computation and principles of programming language.
PSO-2	Understand, analyze and develop computer programs in the areas related to algorithm, web design and networking for efficient design of computer based system. Design, correctly implement and document solutions to significant computational problems
PSO-3	Apply standard software engineering practices and strategies in software project development using open source programming environment to deliver a quality of product for business success
PSO-4	Implement software systems that meet specified design and performance requirements
PSO-5	Work in the IT sector as system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

Course outcome of B.Sc(IT)

	Course outcomes (COs)	Programme outcomes (POs)				
		Domain specific (PSO)			Domain independent (PO)	
	Name of course: B.Sc.(IT) Semester-I (Paper-I) **Fundamentals Of Information Technology**	1	2	3	4	5
CO-1	Familiar with parts of computer	M	M	L	H	H
CO-2	Understand the input and output devices.	M	M	L	H	H
CO-3	Be familiar with software applications	H	M	M	M	M
CO-4	Understand file management	H	M	L	H	H
	Name of course: B.Sc.(IT) Semester-I (Paper-II) **Methodology of Programming in C**					
CO-1	Understand the basic concept of C Programming, and its different modules.	L	L	M	M	H

CO-2	Acquire knowledge about the basic concept of writing a program.	L	L	H	H	H
CO-3	Design programs involving decision structures, loops and functions.	M	M	M	H	H
CO-4	: Explain the difference between call by value and call by reference.	L	L	M	M	M
	B.Sc.(IT) Semester-I (Paper-III) **System Analysis And Design**					
CO-1	Demonstrate knowledge on the different phases of System Development Life Cycle (SDLC).	L	L	M	M	M
CO-2	Appreciate the use of systems design techniques, methodologies, and tools	L	L	H	M	M
CO-3	Discuss the initial phases of the System Development Life Cycle (SDLC) using analytical tools and quantitative techniques used to identify problems.	M	M	M	H	H
CO-4	Define problems and opportunities that initiate projects.	L	L	M	M	M
	B.Sc.(IT) Semester-I (Paper-IV) **Web Technology**					
CO-1	Understand fundamental tools and technologies for web design.	M	M	H	H	H
CO-2	Specify design rules in constructing web pages and sites.	L	L	L	H	H
CO-3	Create a table, link, list (ordered and unordered), CSS within a web page	M	M	M	H	H
CO-4	Create a web page having form tools.	L	L	L	M	M
	B.Sc.(IT) Semester-I (Paper-V) **Multimedia Application Development**					
CO-1	An understanding of the ways in which multimedia-based learning application that can be used in education management courses.	M	M	M	H	H
CO-2	An understanding of multimedia applications are used because they have met all aspects of Display Design, Navigation, Animation, Text, Typography	M	M	H	H	H
CO-3	Multimedia-based learning applications can be used using a	M	H	H	M	M

	computer.					
CO-4	Ease of use of multimedia, Material accuracy aspects, Content compliance, complete presentation of material, Suitability of practice questions with indicators.	L	L	M	H	H
	B.Sc.(IT) Semester-I (Paper-VI) **Applied Mathematics-I**					
CO-1	To express a logic sentence in terms of predicates, quantifiers, and logical connectives.	L	L	M	M	M
CO-2	Apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.	M	M	H	H	H
CO-3	Use tree and graph algorithms to solve problems.	L	M	H	M	M
CO-4	Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.	M	L	L	H	H
	Name of course: B.Sc.(IT) Semester-II (Paper-I) **Fundamentals Of Digital Electronics**					
CO-1	Perform conversions among different number systems, became familiar with basic logic gates and understand Boolean algebra	L	L	M	M	M
CO-2	Understand the design of sequential Circuits such as Flip-Flops, Registers, and Counters	M	M	H	H	H
CO-3	simple Boolean functions by using basic Boolean properties &design of combinational circuits such as MUX,DEMUX, Encoder and Decoder etc.	M	M	M	H	H
CO-4	Obtain a basic level of Digital Electronics knowledge and set the stage to perform the analysis and design of Complex Digital electronic Circuits	M	M	M	H	H

		Name of course: B.Sc.(IT) Semester-II (Paper-II) Object Oriented Programming(C++)					
CO-1	Know the principles of oops concept and control structure.	L	L	L	M	M
CO-2	Analysis & Create the concept of classes and object, array, functions, constructor and destructor.	L	L	L	M	M
CO-3	Understand the concept of inheritance and classification, pointers virtual function and polymorphism.	L	L	M	H	M
CO-4	Able to work with files, file pointers and its manipulations.	M	M	M	H	H
		Name of course: B.Sc.(IT) Semester-II (Paper-III) Operating Systems					
CO-1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.	L	L	M	M	M
CO-2	Understand the difference between process & thread, issues of scheduling of user level processes / threads and their issues & use of locks, semaphores, monitors for synchronizing multiprogramming	L	M	M	H	H
CO-3	Gain knowledge about the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.	M	M	M	M	M
CO-4	Demonstrate the design and management concepts along with issues and challenges of main memory, virtual memory and file system	L	L	M	M	H
		Name of course: B.Sc.(IT) Semester-II (Paper-IV) Web Programming					
CO-1	Understand the major areas and challenges of web programming.	L	L	M	H	H
CO-2	Distinguish web-related technologies.	M	M	L	M	M
CO-3	Use advanced topics in ASP5, XML, JavaScript.	L	L	M	M	H
CO-4	Design and implement typical static web pages and interactive web applications and dynamic web applications and Understand, analyze and create XML documents.	M	M	H	H	M

	Name of course: B.Sc.(IT) Semester-II (Paper-V) Database Management System					
CO-1	Analyze Database design methodology	L	M	M	H	H
CO-2	To understand the features of database management systems and Relational database	M	M	H	H	H
CO-3	Draw various data models for Data Base and Write queries mathematically.	L	L	M	M	H
CO-4	Understand types of Data Base failures and Recovery.	M	M	L	H	H
	Name of course: B.Sc.(IT) Semester-II (Paper-VI) Applied Mathematics-II					
CO-1	Understand the basic principles of sets and operations insets.	L	L	M	M	H
CO-2	Apply counting principles to determine probabilities.	L	L	H	M	M
CO-3	Determine when a function is 1-1 and "onto".	M	M	H	H	H
CO-4	Demonstrate different traversal methods for trees and graphs.	M	M	M	H	H
	Name of course: B.Sc.(IT) Semester-III (Paper-I) Microprocessors and ALP					
CO-1	Learn about the architecture and programming of the microprocessor 8085 and8086.	M	M	L	H	H
CO-2	Know the basic concepts Pin Diagram of 8086 ,Interfacing to 8086.	H	M	M	M	M
CO-3	Know the basic concepts of Mother board and hard disk.	H	M	L	H	H
CO-4	Know the basic concepts of Advance Micro-processor.	H	M	M	M	M
	Name of course: B.Sc.(IT) Semester-III (Paper-II) Data Structures					
CO-1	Student will be introduced to different searching and sorting techniques.	L	L	H	H	H
CO-2	Ability to describe stack, queue and linked list operation.	M	M	M	H	H
CO-3	Student will be able to use stacks for evaluating postfix expressions, convert expressions from infix to postfix.	L	L	M	M	M
CO-4	Apply graph and tree traverse technique to various applications.	L	L	H	H	H
	Name of course: B.Sc.(IT) Semester-III (Paper-III) Data Communication & Network-I					

CO-1	Introduction of Data Communication and Networking.	L	L	H	M	M
CO-2	Introduction of Transmission Media and Different types of media.	L	L	H	H	H
CO-3	Familiar with Wireless Communication and its Mode and Media.	L	L	M	M	M
CO-4	Understand Network Topologies and its Types and application.	L	L	H	H	H
Name of course: B.Sc.(IT) Semester-III (Paper-IV) **Linux Operating System**						
CO-1	To know the basic concepts of Linux Operating System.	L	L	L	H	H
CO-2	Familiar with Linux commands.	L	L	H	H	H
CO-3	Understand shell programming.	L	L	L	M	M
CO-4	Familiar with system administration.	L	L	H	H	H
Name of course: B.Sc.(IT) Semester-III (Paper-V) **E- Commerce**						
CO-1	Describe the major types of E-commerce.	M	M	H	H	H
CO-2	Explain the process that should be followed in building an E- commerce presence.	M	H	H	M	M
CO-3	Identify the key security threats in the E-commerce environment.	L	L	M	H	H
CO-4	Describe how procurement and supply chains relate to B2B E-commerce.	M	M	M	H	H
Name of course: B.Sc.(IT) Semester-III (Paper-VI) **Statistical Method**						
CO-1	To understand the concept of Statistical methods, Scope of Statistics and Primary Data and Secondary Data.	M	M	H	H	H
CO-2	To learn about Frequency Distribution and Central Tendency Mead, Median and Mode.	L	M	H	M	M
CO-3	To gain knowledge of Measure of Dispersion, Skewness and Kurtosis	M	L	L	H	H
CO-4	To get the knowledge of Correlations and Regression.	M	M	L	H	H
Name of course: B.Sc.(IT) Semester-IV (Paper-I) **Software Engineering-I**						
CO-1	Students will apply software testing and quality assurance techniques at the module level, and understand these techniques at the system and organization level.	M	M	L	H	H
CO-2	Students will be able to understand waterfall (linear) lifecycle process.	M	M	L	H	H
CO-3	Students will be able to understand prototyping, spiral approaches.	H	M	M	M	M

CO-4	Student will have a working knowledge of technical documentations and make presentations on various aspects of a software development project	H	M	L	H	H
	Name of course: B.Sc.(IT) Semester-IV (Paper-II) **Java Programming**					
CO-1	Understanding of Java Language, elements and its Features.	L	L	M	M	H
CO-2	Understanding of Class and members loops and Concept of Inheritance.	L	L	H	H	H
CO-3	Introduction of Graphic Class , AWT Application and Layouts.	M	M	M	H	H
CO-4	Java API Packages and Threads Implementation.	L	L	M	M	M
	Name of course: B.Sc.(IT) Semester-IV (Paper-III) **Data Communication & Network-II**					
CO-1	Describe the functions of each layer in OSI and TCP/IP model.	L	L	H	M	M
CO-2	Describe the Session layer design issues and Protocols.	M	M	L	H	H
CO-3	Describe the Transport layer services and Protocols.	M	M	L	H	H
CO-4	Describe the ISDN Architecture, ISDN Protocols and B_ISDN.	H	M	M	M	M
	Name of course: B.Sc.(IT) Semester-IV (Paper-IV) **Oracle**					
CO-1	Know the basic concepts and the applications of data base systems and utilize the knowledge of basics of SQL and construct queries using SQL	H	M	L	H	H
CO-2	Learn how to apply relational database theory ,and be able to write relational algebra expressions for queries	L	L	M	M	H
CO-3	Understand the design principles for logical design of databases, inclu the ER method and normalization approach.	L	L	H	H	H
CO-4	Know the basic concepts and the applications of Cursor and Trigger.	M	M	M	H	H
	Name of course: B.Sc.(IT) Semester-IV (Paper-V) **Compiler Construction**					
CO-1	Understand the basic about Compiler and Translator.	L	L	M	M	M
CO-2	Learn about Lexical and Syntactic Structure of a language.	L	L	M	M	M
CO-3	Learn about Phases of Compiler.	L	L	H	M	M
CO-4	Understand the basic about DAG, Code Generation ,Code	M	M	M	H	H

	Optimization and Parsing.					
	Name of course: B.Sc.(IT) Semester-IV (Paper-VI) **Numerical Methods**					
CO-1	Understand numerical techniques to find the roots of non-linear equations and solution of system of linear equations.	L	L	M	M	M
CO-2	Understand the difference operators and the use of interpolation.	M	M	H	H	H
CO-3	Understand numerical differentiation.	L	L	L	H	H
CO-4	Apply integration and numerical solutions of ordinary and partial differential equations.	M	M	M	H	H
	Name of course: B.Sc.(IT) Semester-V (Paper-I) **Software Project Management**					
CO-1	Identify the different project contexts and suggest an appropriate Management strategy.	L	L	L	M	M
CO-2	Practice the role of professional ethics in successful software development.	M	M	M	H	H
CO-3	Determine an appropriate project management approach through an evaluation of the business context and scope of the project.	M	M	L	H	H
CO-4	Know the scope of the project.	M	M	L	H	H
	Name of course: B.Sc.(IT) Semester-V (Paper-II) **Dotnet Framework And C#**					
CO-1	Identify and understand different components of a compiler and their functioning	H	M	L	H	H
CO-2	Know lexical, syntax and semantic analysis processes.	H	M	M	M	M
CO-3	Understand and define the role of lexical analyzer, use of regular expression and transition diagrams.	L	L	M	M	H
CO-4	Understand Finite state machine and purpose.	L	L	H	H	H
	Name of course: B.Sc.(IT) Semester-V (Paper-III) **Network Security**					
CO-1	Describe network security services and applied mechanisms.	L	L	M	M	M
CO-2	Understand Symmetrical and Asymmetrical cryptography.	H	M	M	M	M
CO-3	To know Data integrity ,Authentication ,Digital Signatures.	L	L	M	M	M
CO-4	Understand Web Security.	L	L	H	M	M
	Name of course: B.Sc.(IT) Semester-V (Paper-IV) **Data Warehousing**					

CO-1	The Introduction, Definition, Components of Data Warehousing.	L	L	M	M	M
CO-2	Data Warehousing Schemas and different Modeling.	M	M	M	H	H
CO-3	OLAP in Data Warehousing and its Types.	M	M	H	H	H
CO-4	Backup and Recovery of Data Warehousing.	L	L	L	H	H
	Name of course: B.Sc.(IT) Semester-V (Paper-V) **Visual Programming**					
CO-1	Explore Visual Basic's Integrated Development Environment (IDE).	L	L	L	M	M
CO-2	Implement syntax rules in Visual Basic programs.	M	M	M	H	H
CO-3	Write and apply procedures ,sub-procedures, and functions to create manageable code	M	M	M	H	H
CO-4	Apply ADO Data Controls and handle Errors	M	M	H	H	H
	Name of course: B.Sc.(IT) Semester-V (Paper-VI) **Graph Theory**					
CO-1	To understand and apply the fundamental concepts in graph theory.	L	L	M	H	H
CO-2	To apply graph theory based tools in solving practical problems.	M	H	H	M	M
CO-3	To improve the proof writing skills.	L	L	M	M	M
CO-4	To understand Directed Graphs, Polish Notation and its Algorithms	M	M	H	H	H
	Name of course: B.Sc.(IT) Semester-VI (Paper-I) **Enterprise Resource Planning**					
CO-1	To understand the steps and activities in the ERP life cycle	M	L	L	H	H
CO-2	To be able to identify the important business functions by software like ERP	M	M	L	H	H
CO-3	Identify customer relationship management to use and design databases for different applications.	M	M	L	H	H
CO-4	To understand and apply SWOT	H	M	M	M	M
	Name of course: B.Sc.(IT) Semester-VI (Paper-II) **Advance Java Programming**					
CO-1	To acquire knowledge on creation of software components using JAVA Beans.	L	M	H	M	M
CO-2	To learn Server-Side Programming using Servlets and Java Server Pages.	L	L	M	M	H
CO-3	Understanding of JDBC/ ODBC and Remote Database.	L	L	H	H	H

CO-4	Introduction of RMI and Client Server Model.	M	M	M	H	H
	Name of course: B.Sc.(IT) Semester-VI (Paper-III) **Cloud Computing**					
CO-1	Understand the basics about cloud computing.	M	M	L	H	H
CO-2	Learn about cloud computing architecture and types.	H	M	M	M	M
CO-3	Learn about cloud application platforms	H	M	L	H	H
CO-4	Characteristics of SaaS, Software Utility Application.	M	M	L	H	H
	Name of course: B.Sc.(IT) Semester-VI (Paper-IV) **Data Mining**					
CO-1	Define Data Mining , KDDVs Data Mining , DBMS Vs Data Mining.	L	L	H	H	H
CO-2	Understand the basic about data mining, classification an d major issues	M	M	M	H	H
CO-3	Learn about cluster Analysis and major clustering methods.	L	L	M	M	M
CO-4	Classification, Classification Techniques and Algorithms.	L	L	M	M	H
	Name of course: B.Sc.(IT) Semester-VI (Paper-IV) **Animation Techniques**					
CO-1	Know the basic concepts Animation	L	L	H	M	M
CO-2	gain knowledge of Creating animation in Flash	M	M	M	H	H
CO-3	To Understand 3D Animation , Color Model	L	L	M	M	M
CO-4	To Understand Motion Captions, and Motion Capture Software	L	L	M	M	M
	Name of course: B.Sc.(IT) Semester-VI (Paper-VI) **Operation Research**					
CO-1	Formulate a real-world problem as a mathematical programming model	L	L	L	H	H
CO-2	Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand.	M	M	M	H	H
CO-3	Understand the relationship between a linear program and its dual, including strong duality and complementary lacking	L	L	L	M	M
CO-4	Solve specialized linear programming problems like the transportat and assignment problems.	M	M	M	H	H

Bachelor of Computer Application Department:
Programme specific outcome (PSOs)

PSO	Programme outcomes
PSO-1	Analyze and compare alternative solutions to computing problems
PSO-2	Design, correctly implement and document solutions to significant computational problems
PSO-3	Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems
PSO-4	Implement software systems that meet specified design and performance requirements
PSO-5	Work in the IT sector as system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

Course outcome of B.C.A

Course	COs	Course outcomes (COs)
BCA Sem-I Paper-I Computer Fundamentals	CO-1	Familiar with Fundamental concepts of computer
	CO-2	Get the knowledge about input and output devices and their working
	CO-3	Basic knowledge of Memory storage devices use with computer and computer networks.
	CO-4	Understand Network terminology
BCA Sem-I Paper-II 'C' PROGRAMM ING	CO-1	Students will be able to develop logics which will help them to create programs , applications in C.
	CO-2	Understand complete knowledge of C language
	CO-3	Improve upon a solution to a problem
	CO-4	Design, develop and test programs written in 'C'
BCA Sem-I Paper-III STATISTICAL METHODS	CO-1	Learn about Sampling Methods.
	CO-2	- Know the basic idea of Permutations and Combinations, and Probability Concepts
	CO-3	Apply knowledge of mathematics, science, and engineering.
	CO-4	Evaluate the probabilities and conditional probabilities.
BCA Sem-I Paper-IV DISCRETE MATHEMATI CS – I	CO-1	- Know the basic idea of Propositional calculus Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
	CO-2	Learn about Disjunctive , connective principal conjunctive normal forms
	CO-3	Students completing this course will be able to use tree and graph algorithms to solve problems.
	CO-4	Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
BCA Sem-I Paper-V OPERATING SYSTEMS	CO-1	Learn different types of operating systems along with concept of file systems and CPU scheduling algorithms used in operating system.
	CO-2	Provide students' knowledge of memory management and deadlock handling algorithms
	CO-3	Implement various algorithms required for management, scheduling, allocation and communication used in Operating System
	CO-4	Understand the difference between process & thread, issues of scheduling of user level processes / threads and their issues & use of locks
BCA Sem-I Paper-VI **Office Automation**	CO-1	Learn about Windows Operating system
	CO-2	Know the basics of Word , creating documents , formatting , toolbars , creating templates , mail merge
	CO-3	Understand the use of MS Power point for presentation

	CO-4	Apply knowledge of MS EXCEL, formatting , entering formula , chart creation , functions in EXCEL
BCA Sem-II Paper-I PROGRAMMING IN 'C++	CO-1	- Describe OOPs concepts
	CO-2	Use the functions and pointers in C++ program .
	CO-3	Describe and use constructors and destructors .
	CO-4	Explain arrays and strings and create programs using them.
BCA Sem-II Paper -II SYSTEM ANALYSIS AND DESIGN	CO-1	Understand the steps in software development.
	CO-2	Know the tools for System Analysis and design.
	CO-3	Learn about Data collection
	CO-4	Describe structured tools and techniques of data analysis
BCA Sem-II Paper- III NUMERICAL METHODS	CO-1	solve Algebraic , Polynomial Equations, iterative , bisection , false position methods
	CO-2	Understand the concepts of Integration and differentiation
	CO-3	Apply various interpolation methods and finite difference concepts
	CO-4	Work numerically on the partial differential equations using different methods through the theory of finite differences
BCA Sem-II Paper -IV DISCRETE MATHEMATICS – 2	CO-1	Know the Graph theory concepts like types of graph , representation etc.
	CO-2	Understand the concept of Set theory
	CO-3	Describe Functions , its types , counting concept like Permutations , combinations
	CO-4	Demonstrate different traversal methods for trees and graphs
BCA Sem-II Paper -V LINUX OPERATING SYSTEM	CO-1	Learn about Linux concepts such as Directory structures , file types , data files , Shell , commands
	CO-2	Learn about Vi editor
	CO-3	Learn about Sharing files with other users
	CO-4	Get knowledge of Managing Disk space
BCA Sem-II Paper -VI E COMMERCE	CO-1	Describe the concept of Electronic market , concepts , interorganizational value chains
	CO-2	Get knowledge of Business strategy in electronic age , its competitive advantages , technology ecommerce evaluation
	CO-3	Get knowledge of Business to business Electronic commerce
	CO-4	Learn about Business to consumer electronic commerce
BCA Sem-III Paper -I VISUAL BASIC PROGRAMMING	CO-1	Design, create, build, and debug Visual Basic applications.
	CO-2	Explore Visual Basic's Integrated Development Environment(IDE) .
	CO-3	Implement syntax rules in Visual Basic programs
	CO-4	Explain variables and data types used in program development
BCA Sem-III Paper -II DATA BASE MANAGEMENT SYSTEM	CO-1	Gain a good understanding of the architecture and functioning of database management systems
	CO-2	Understand the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization
	CO-3	Acquire a good understanding of database systems concepts and to be in a position to use and design databases for different applications
	CO-4	Draw various data models for Data Base and Write queries mathematically.
BCA Sem-III Paper -III DATA STRUCTURES	CO-1	Get the knowledge of Concept of data structure its applications in different areas .
	CO-2	To access how the choices of data structure & algorithm methods impact the performance of program.
	CO-3	To Solve problems based upon different data structure & also write programs.
	CO-4	Choose an appropriate data structure for a particular problem.
BCA Sem-III Paper -IV OPERATIONS	CO-1	Formulate a real-world problem as a mathematical programming model
	CO-2	Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand

RESEARCH – I	CO-3	Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
	CO-4	Solve specialized linear programming problems like the transportation and assignment problems
BCA Sem-III Paper -V WEB TECHNOLOGY – I	CO-1	Design and develop web pages
	CO-2	Understand, analyze and apply the role of languages like HTML, DHTML,CSS, XML, JavaScript, in the workings of the web and web applications
	CO-3	Understand, analyze and create web pages using HTML, DHTML and Cascading Styles Sheets.
	CO-4	Understand, analyze and build dynamic web pages using JavaScript and VB Script
BCA Sem-III Paper -VI DIGITAL ELECTRONICS – I	CO-1	-Understand Number system and their conversions
	CO-2	Explain the concepts like Binary arithmetic
	CO-3	Get the knowledge of Logic gates
	CO-4	-Understand the concept of Boolean algebra.
BCA Sem-IV Paper -I SOFTWARE ENGINEERING – I	CO-1	Select and implement different software development process models.
	CO-2	Extract and analyze software requirements specifications for different projects.
	CO-3	Develop some basic level of software architecture/design.
	CO-4	Define the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress
BCA Sem-IV Paper II SQL AND PL/SQL	CO-1	Get detail knowledge of SQL queries and its sublanguages.
	CO-2	Understand the concept of PL/SQL programming .
	CO-3	Learn about Built-in functions of SQL
	CO-4	Understand about table View, Log &Triggers
BCA Sem-IV Paper III THEORY OF COMPUTATION	CO-1	Learn the concept of Finite automation and regular expression
	CO-2	Knowledge of concepts like Set , Context free grammar
	CO-3	Understand the Push down automata , context free languages .
	CO-4	To solve various problems of applying normal form techniques, push down automata and Turing Machines
BCA Sem-IV Paper V WEB TECHNOLOGY – II	CO-1	Get the practical knowledge of concepts of adding VB Script to HTML
	CO-2	Learn Java script
	CO-3	Get knowledge of Web services
	CO-4	To solve various problems of applying normal form techniques, push down automata and Turing Machines
BCA Sem-IV Paper VI DIGITAL ELECTRONICS – II	CO-1	Understand the concept of Combinational circuits
	CO-2	Understand the concept of Sequential circuits , Flip-Flops , Counters
	CO-3	Understand the concept of Assembly language programming
	CO-4	Get the knowledge of Instruction set
BCA Sem-V Paper I COMPUTER GRAPHICS – I	CO-1	Provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations
	CO-2	Make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations
	CO-3	Understand 2D transformation concept like translation , scaling , rotation .
	CO-4	Write programs that demonstrate geometrical transformations
BCA Sem-V Paper II COMPILER CONSTRUCTION	CO-1	Learn about the concepts of Compilers and translators
	CO-2	Get knowledge of High level programming languages , Lexical and syntactic structure of a language
	CO-3	Learn the concept of code generation ,Parsing
	CO-4	Understand Finite state machine and purpose
BCA Sem-V Paper III	CO-1	Students will understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.

VB.NET	CO-2	Students will describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE)
	CO3	Students will create applications using Microsoft Windows Forms
	CO-4	Students will create applications that use ADO. NET
BCA Sem-V Paper IV SOFTWARE ENGINEERING – II	CO-1	Understand the concept of Software architecture
	CO-2	Understand the basic concepts of Software testing , Strategies , approaches of testing
	CO-3	Learn the concept of Risk management in software testing
	CO-4	Use PHP's built in server to server static resources
BCA Sem-V Paper V PHP – I	CO-1	Analyze PHP scripts and determine their behavior
	CO-2	Design web pages with ability to retrieve and present data from a MySQL.
	CO-3	Learn how to take a static websites and turn it into a dynamic website run from a database using PHP
	CO-4	Use PHP's built in server to server static resources
BCA Sem-V Paper VI DATA COMMUNICATION AND NETWORK – I	CO-1	Explain how communication works in computer networks and to understand the basic terminology of computer networks
	CO-2	Explain the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.
	CO-3	Understand design issues in network security and to understand security threats, security services and mechanisms to counter
	CO-4	Connect internet to the system and knowledge of trouble
BCA Sem-VI Paper I COMPUTER GRAPHICS – II	CO-1	Provide comprehensive introduction about computer graphics system, design algorithms and three dimensional transformations
	CO-2	Get knowledge of 3D transformations , Geometric Transformations
	CO-3	Learn computer animation design , functions , motion specifications
	CO-4	Develop new kinds of graphics and animations
BCA Sem-VI Paper II **PROGRMMING IN JAVA**	CO-1	Understand the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements.
	CO-2	Implement, compile, test and run Java programs comprising more than one class, to address a particular software problem
	CO-3	Demonstrate the principles of object oriented programming
	CO-4	Demonstrate simple data structures like arrays in a Java program
BCA Sem-VI Paper III ASP.NET	CO-1	Understand the ASP.Net framework and Page structure
	CO-2	Design web application with variety of controls
	CO-3	Access the data using inbuilt data access tools
	CO-4	Students will be able to create database driven ASP.NET web applications and web services
BCA Sem-VI Paper IV SOFTWARE TESTING	CO-1	Understand the fundamental concept in software testing
	CO-2	Distinguish characteristics of structural testing methods
	CO-3	Discuss about the functional and system testing methods
	CO-4	**Understand different types of testing levels**
BCA Sem-VI Paper V PHP – II	CO-1	Learn how to use HTML forms
	CO-2	Learn how to use PHP's built in server to serve static resources
	CO-3	Learn How to use cookies to store some data in the browser and pass it to next request
	CO-4	learn how to upload files to the website
BCA Sem-VI Paper VI DATA COMMUNICATION AND NETWORK – II	CO-1	Understand network communication using layered concept ,OSI and Internet model.
	CO-2	Understand various types of transmission media , network devices
	CO-3	Learn about different Protocols operations
	CO-4	Identify and describe development history of routing protocols

Bachelor of Computer Application (BCA)
Programme specific outcomes:

PSO	Programme outcomes
PSO-1	Analyze and compare alternative solutions to computing problems
PSO-2	Design, correctly implement and document solutions to significant computational problems
PSO-3	Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems
PSO-4	Implement software systems that meet specified design and performance requirements
PSO-5	Work in the IT sector as system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

Course outcome of B.C.A

	Course outcomes (COs)	Programme outcomes (POs)				
		Domain specific (PSO)				
	Name of course: B.C.A Semester-I (Paper-I) **Computer Fundamentals**	1	2	3	4	5
CO-1	Familiar with Fundamental concepts of computer	M	M	L	H	H
CO-2	Get the knowledge about input and output devices and their working	M	M	L	H	H
CO-3	Basic knowledge of Memory storage devices use with computer and computer networks.	H	M	M	M	M
CO-4	Understand Network terminology	H	M	L	H	H
	Name of course: B.C.A Semester-I (Paper-II) **'C' PROGRAMMING**					
CO-1	Students will be able to develop logics which will help them to create programs , applications in C.	L	L	M	M	H
CO-2	Understand complete knowledge of C language	L	L	H	H	H
CO-3	Improve upon a solution to a problem	M	M	M	H	H
CO-4	Design, develop and test programs written in 'C'	L	L	M	M	M
	Name of course: B.C.A Semester-I (Paper-III) **STATISTICAL METHODS**					
CO-1	Learn about Sampling Methods.	L	L	M	M	M
CO-2	- Know the basic idea of Permutations and Combinations, and Probability Concepts	L	L	H	M	M

CO-3	Apply knowledge of mathematics, science, and engineering.	M	M	M	H	H
CO-4	Evaluate the probabilities and conditional probabilities.	L	L	M	M	M
	Name of course: B.C.A Semester-I (Paper-IV) **DISCRETE MATHEMATICS – I**					
CO-1	- Know the basic idea of Propositional calculus Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.	M	M	H	H	H
CO-2	Learn about Disjunctive , connective principal conjunctive normal forms	L	L	L	H	H
CO-3	Students completing this course will be able to use tree and graph algorithms to solve problems.	M	M	M	H	H
CO-4	Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.	L	L	L	M	M
	Name of course: B.C.A Semester-I (Paper-V) **OPERATING SYSTEMS**					
CO-1	Learn different types of operating systems along with concept of file systems and CPU scheduling algorithms used in operating system.	M	M	M	H	H
CO-2	Provide students' knowledge of memory management and deadlock handling algorithms	M	M	H	H	H
CO-3	Implement various algorithms required for management, scheduling, allocation and communication used in Operating System	M	H	H	M	M
CO-4	Understand the difference between process & thread, issues of scheduling of user level processes / threads and their issues & use of locks	L	L	M	H	H
	Name of course: B.C.A Semester-I (Paper-VI) **Office Automation**					
CO-1	Learn about Windows Operating system	L	L	M	M	M
CO-2	Know the basics of Word , creating documents , formatting , toolbars , creating templates , mail merge	M	M	H	H	H
CO-3	Understand the use of MS Power point for presentation	L	M	H	M	M
CO-4	Apply knowledge of MS EXCEL, formatting , entering formula , chart creation , functions in EXCEL	M	L	L	H	H
	Name of course: B.C.A Semester-II(Paper-V) **PROGRAMMING IN 'C++**					
CO-1	- Describe OOPs concepts	L	L	M	M	M
CO-2	Use the functions and pointers in C++ program .	M	M	H	H	H
CO-3	Describe and use constructors and destructors .	M	M	M	H	H
CO-4	Explain arrays and strings and create programs using them.	M	M	M	H	H

	Name of course: B.C.A Semester-II (Paper-II) **SYSTEM ANALYSIS AND DESIGN**					
CO-1	Understand the steps in software development.	L	L	L	M	M
CO-2	Know the tools for System Analysis and design.	L	L	L	M	M
CO-3	Learn about Data collection	L	L	M	H	M
CO-4	Describe structured tools and techniques of data analysis	M	M	M	H	H
	Name of course: B.C.A Semester-II (Paper-III) **NUMERICAL METHODS**					
CO-1	solve Algebraic , Polynomial Equations, iterative , bisection , false position methods	L	L	M	M	M
CO-2	Understand the concepts of Integration and differentiation	L	M	M	H	H
CO-3	Apply various interpolation methods and finite difference concepts	M	M	M	M	M
CO-4	Work numerically on the partial differential equations using different methods through the theory of finite differences	L	L	M	M	H
	Name of course: B.C.A Semester-II (Paper-IV) **DISCRETE MATHEMATICS – 2**					
CO-1	Know the Graph theory concepts like types of graph , representation etc.	L	L	M	H	H
CO-2	Understand the concept of Set theory	M	M	L	M	M
CO-3	Describe Functions , its types , counting concept like Permutations , combinations	L	L	M	M	H
CO-4	Demonstrate different traversal methods for trees and graphs	M	M	H	H	M
	Name of course: B.C.A Semester-II (Paper-V) **LINUX OPERATING SYSTEM**					
CO-1	Learn about Linux concepts such as Directory structures , file types , data files , Shell , commands	L	M	M	H	H
CO-2	Learn about Vi editor	M	M	H	H	H
CO-3	Learn about Sharing files with other users	L	L	M	M	H
CO-4	Get knowledge of Managing Disk space	M	M	L	H	H
	Name of course: B.C.A Semester-II (Paper-VI) **E COMMERCE**					
CO-1	Describe the concept of Electronic market , concepts , interorganizational value chains	L	L	M	M	H
CO-2	Get knowledge of Business strategy in electronic age , its competitive advantages , technology ecommerce evaluation	L	L	H	M	M
CO-3	Get knowledge of Business to business Electronic commerce	M	M	H	H	H
CO-4	Learn about Business to consumer electronic commerce	M	M	M	H	H
	Name of course: B.C.A Semester-III (Paper-I)					

	VISUAL BASIC PROGRAMMING					
CO-1	Design, create, build, and debug Visual Basic applications.	L	L	H	M	M
CO-2	Explore Visual Basic's Integrated Development Environment(IDE) .	M	M	M	H	H
CO-3	Implement syntax rules in Visual Basic programs	M	M	H	L	L
CO-4	Explain variables and data types used in program development	L	L	H	M	M
	Name of course: B.C.A Semester-III (Paper-II) **DATA BASE MANAGEMENT SYSTEM**					
CO-1	Gain a good understanding of the architecture and functioning of database management systems	L	L	H	M	M
CO-2	Understand the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization	M	M	M	H	H
CO-3	Acquire a good understanding of database systems concepts and to be in a position to use and design databases for different applications	M	M	H	H	H
CO-4	Draw various data models for Data Base and Write queries mathematically.	M	M	H	L	L
	Name of course: B.C.A Semester-III (Paper-III) **DATA STRUCTURES**					
CO-1	Get the knowledge of Concept of data structure its applications in different areas .	M	M	M	H	H
CO-2	To access how the choices of data structure & algorithm methods impact the performance of program.	L	L	H	M	M
CO-3	To Solve problems based upon different data structure & also write programs.	M	M	H	L	L
CO-4	Choose an appropriate data structure for a particular problem.	M	M	M	H	H
	Name of course: B.C.A Semester-III (Paper-IV) **OPERATIONS RESEARCH – I**					
CO-1	Formulate a real-world problem as a mathematical programming model	M	M	H	L	L
CO-2	Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand	H	M	M	L	H
CO-3	Understand the relationship between a linear program and its dual, including strong duality and complementary slackness	L	L	M	H	M
CO-4	Solve specialized linear programming problems like the transportation and assignment problems	M	M	M	M	H
	Name of course: B.C.A Semester-III (Paper-V) **WEB TECHNOLOGY – I**					
CO-1	Design and develop web pages	M	M	M	M	H
CO-2	Understand, analyze and apply the role of languages like HTML, DHTML,CSS, XML,	L	L	M	H	M

	JavaScript, in the workings of the web and web applications					
CO-3	Understand, analyze and create web pages using HTML, DHTML and Cascading Styles Sheets.	M	M	H	L	L
CO-4	Understand, analyze and build dynamic web pages using JavaScript and VB Script	H	M	M	L	H
	Name of course: B.C.A Semester-IV (Paper-I) **SOFTWARE ENGINEERING – I**					
CO-1	Select and implement different software development process models.	M	M	H	L	L
CO-2	Extract and analyze software requirements specifications for different projects.	M	M	H	H	M
CO-3	Develop some basic level of software architecture/design.	M	H	H	L	L
CO-4	Define the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress	L	M	H	M	L
	Name of course: B.C.A Semester-IV (Paper-II) **SQL AND PL/SQL**					
CO-1	Get detail knowledge of SQL queries and its sublanguages.	M	M	H	L	L
CO-2	Understand the concept of PL/SQL programming .	L	M	H	M	L
CO-3	Learn about Built-in functions of SQL	M	M	H	H	L
CO-4	Understand about table View, Log &Triggers	M	M	H	L	L
	Name of course: B.C.A Semester-IV (Paper-III) **THEORY OF COMPUTATION**					
CO-1	Learn the concept of Finite automation and regular expression	M	H	H	M	L
CO-2	Knowledge of concepts like Set , Context free grammar	M	M	H	L	L
CO-3	Understand the Push down automata , context free languages .	M	M	H	L	L
CO-4	To solve various problems of applying normal form techniques, push down automata and Turing Machines	M	M	H	L	L
	Name of course: B.C.A Semester-IV (Paper-IV) **WEB TECHNOLOGY – II**					
CO-1	Get the practical knowledge of concepts of adding VB Script to HTML	M	L	M	L	L
CO-2	Learn Java script	M	M	H	L	L
CO-3	Get knowledge of Web services	M	M	H	L	L
CO-4	To solve various problems of applying normal form techniques, push down automata and Turing Machines	H	M	H	L	L
	Name of course: B.C.A Semester-IV (Paper-VI) **DIGITAL ELECTRONICS – II**					
CO-1	Understand the concept of Combinational circuits	M	M	H	L	L

CO-2	Understand the concept of Sequential circuits , Flip-Flops , Counters	M	L	H	M	L
CO-3	Understand the concept of Assembly language programming	M	M	H	L	L
CO-4	Get the knowledge of Instruction set	L	M	H	L	L
	Name of course: B.C.A Semester-V (Paper-I) **COMPUTER GRAPHICS – I**					
CO-1	Provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations	M	M	H	L	L
CO-2	Make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations	M	M	H	L	L
CO-3	Understand 2D transformation concept like translation , scaling , rotation .	M	L	H	H	L
CO-4	Write programs that demonstrate geometrical transformations	M	M	H	H	L
	Name of course: B.C.A Semester-V (Paper-II) **COMPILER CONSTRUCTION**					
CO-1	Learn about the concepts of Compilers and translators	M	M	M	L	L
CO-2	Get knowledge of High level programming languages , Lexical and syntactic structure of a language	H	M	H	L	L
CO-3	Learn the concept of code generation ,Parsing	M	M	H	L	L
CO-4	Understand Finite state machine and purpose	M	M	H	L	L
	Name of course: B.C.A Semester-V (Paper-III) **VB.NET**					
CO-1	Students will understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.	L	M	H	L	M
CO-2	Students will describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE)	M	M	H	L	L
CO3	Students will create applications using Microsoft Windows Forms	L	M	H	L	M
CO-4	Students will create applications that use ADO. NET	L	M	H	L	M
	Name of course: B.C.A Semester-V (Paper-IV) **SOFTWARE ENGINEERING – II**					
CO-1	Understand the concept of Software architecture	L	M	H	L	M
CO-2	Understand the basic concepts of Software testing , Strategies , approaches of testing	M	M	H	L	M
CO-3	Learn the concept of Risk management in software testing	L	M	H	L	M
CO-4	Use PHP's built in server to server static resources	M	M	M	L	M
	Name of course: B.C.A Semester-V (Paper-V) **PHP – I**					

CO-1	Analyze PHP scripts and determine their behavior	L	M	H	L	M
CO-2	Design web pages with ability to retrieve and present data from a MySQL.	M	M	H	L	M
CO-3	Learn how to take a static websites and turn it into a dynamic website run from a database using PHP	L	M	H	L	M
CO-4	Use PHP's built in server to server static resources	M	M	H	L	M
	Name of course: B.C.A Semester-V (Paper-VI) **DATA COMMUNICATION AND NETWORK – I**					
CO-1	Explain how communication works in computer networks and to understand the basic terminology of computer networks	L	M	H	L	M
CO-2	Explain the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.	L	M	H	L	M
CO-3	Understand design issues in network security and to understand security threats, security services and mechanisms to counter	L	M	H	L	M
CO-4	Connect internet to the system and knowledge of trouble	M	M	M	H	H
	Name of course: B.C.A Semester-VI (Paper-I) **COMPUTER GRAPHICS – II**					
CO-1	Provide comprehensive introduction about computer graphics system, design algorithms and three dimensional transformations	L	M	H	L	M
CO-2	Get knowledge of 3D transformations , Geometric Transformations	M	M	H	L	M
CO-3	Learn computer animation design , functions , motion specifications	L	M	H	L	M
CO-4	Develop new kinds of graphics and animations	L	H	H	M	M
	Name of course: B.C.A Semester-VI (Paper-II) **PROGRMMING IN JAVA**					
CO-1	Understand the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements.	L	M	H	L	M
CO-2	Implement, compile, test and run Java programs comprising more than one class, to address a particular software problem	M	M	H	L	M
CO-3	Demonstrate the principles of object oriented programming	L	M	H	L	M
CO-4	Demonstrate simple data structures like arrays in a Java program	L	M	H	L	M
	Name of course: B.C.A Semester-VI (Paper-III) **ASP.NET**					
CO-1	Understand the ASP.Net framework and Page structure	M	M	H	L	M
CO-2	Design web application with variety of controls	H	M	H	L	M
CO-3	Access the data using inbuilt data access tools	L	M	M	L	M

CO-4	Students will be able to create database driven ASP.NET web applications and web services	L	M	H	L	M
	Name of course: B.C.A Semester-VI (Paper-IV) **SOFTWARE TESTING**					
CO-1	Understand the fundamental concept in software testing	M	M	H	L	M
CO-2	Distinguish characteristics of structural testing methods	M	M	H	L	M
CO-3	Discuss about the functional and system testing methods	L	M	H	L	M
CO-4	**Understand different types of testing levels**	L	M	H	L	M
	Name of course: B.C.A Semester-VI (Paper-V) **PHP – II**					
CO-1	Learn how to use HTML forms	M	M	H	L	M
CO-2	Learn how to use PHP's built in server to serve static resources	M	M	H	L	M
CO-3	Learn How to use cookies to store some data in the browser and pass it to next request	L	L	H	L	M
CO-4	learn how to upload files to the website	L	M	L	L	M
	Name of course: B.C.A Semester-VI (Paper-VI) **DATA COMMUNICATION AND NETWORK – II**					
CO-1	Understand network communication using layered concept ,OSI and Internet model.	L	M	H	L	M
CO-2	Understand various types of transmission media , network devices	H	M	H	L	M
CO-3	Learn about different Protocols operations	M	M	H	L	M
CO-4	Identify and describe development history of routing protocols	L	M	H	L	M

Language Department:
Programme specific outcomes of English:

PSO	Programme outcomes
PSO-1	In pursuance with an emphasis on Language, English gains a deeper understanding of the resources of the written word.
PSO-2	It helps students to explore the entire range of human experience in the area of language, specifically in Fiction, Poetry, and Drama.
PSO-3	It helps students to build skills of analytical and interpretive arguments; becomes careful and critical reader, practice writing in a variety of genres as a process of intellectual inquiry, creative expression and ultimately to become more effective thinkers and communicators who remains well equipped for a variety of careers in our information intensive society.
PSO-4	It offers students the opportunity to study influential writings from the British, American and global Anglophone traditions.
PSO-5	It provides imagination and critical insights into all areas of human experience - war and peace, nature and culture, love and sexuality, selfhood and social identity, justice and atrocity, the burdens of history and the dreams of the future.
PSO-6	Reads complex texts, actively recognizes key passages, raises questions, appreciates complexity and ambiguity, and comprehends the literal and figurative uses of language.
PSO-7	Increases confidence in speaking publicly, articulates clear questions and ideas in class discussion; listens thoughtfully and respectfully other ideas and prepares, organizes and delivers engaging oral presentations.

Course outcomes of English:

Course	COs	Course outcomes
B. Sc. Semester- I & II Compulsory English	CO-1	Comprehend the nature of literary forms like prose, poetry drama, short stories.
	CO-2	Learn to draft an application, letter, and report.
	CO-3	Comprehend and compare passages.
	CO-4	Develop and improve vocabulary skills through one word substitute.
	CO-5	Learn antonyms and synonyms and use them in sentences.
	CO-6	Learn appropriate use of parts of speech.
	CO-7	Learn to draft curriculum vitae.
	CO-8	Learn to identify common errors in English.
	CO-9	Learn to prepare sentences from given words.
B. Sc. Semester- I & II Supplementary English	CO-1	Illustrate the nature of literary forms like prose, poetry drama, short stories.
	CO-2	Comprehend the passage and make a précis of it.
	CO-3	Improve vocabulary by learning one word for a group of words.
	CO-4	Learn word formation.
	CO-5	Improve essay writing skill.
	CO-6	Learn usage of foreign words in English.
	CO-7	Learn to prepare news reports.
	CO-8	Learn to prepare advertisements.
	CO-9	Learn to improve writing skill through expansion of idea.

Hindi (optional):

PSO	Programme outcomes
PSO-1	साहित्य और भाषा की आकलन क्षमता विकसित होती है	
PSO-2	हिंदी साहित्य, भाषा व संस्कृती इनका नजदीक से परिचय होता है	
PSO-3	हिंदी भाषा व साहित्य के अवलोकन में रुची बढती है	
PSO-4	साहित्यकृती को मुक्त प्रतिसाद देने की क्षमता निर्माण होती है	
PSO-5	साहित्यिक भाषा व व्यवहारभाषा इनका ज्ञान मिलता है	
PSO-6	लेखन, वाचन, संभाषण, आकलन इ. भाषिक कौशल्य का विकास होता है	
PSO-7	उपयोजन कौशल्य विकसित होते है	
PSO-8	भाषिक ज्ञाना में वृद्धी होती है	
PSO-9	साहित्य और संस्कृती का परिचय होता है	

Course outcomes of Hindi:

Course	COs	Course outcomes
B. Sc. Semester- I & II Hindi	CO-1	साहित्य की विभिन्न विधाओ (जैसे कविता, कहानी, निबंध, एकांकी,संस्मरण आदि) की समझ बनाना और उनका आनंद उठाना ।
	CO-2	विभिन्न सामाजिक- सांस्कृतिक मूल्यों के प्रति अपने रुझानों को अभिव्यक्त करना ।
	CO-3	पढ़ी सुनी रचनाओं को जानना, समझना, व्याख्यान करना, अभिव्यक्त करना ।
	CO-4	अपनी स्तरानुकूल दृश्य, श्रव्य माध्यमों की सामग्री (जैसे पत्र- पत्रिकाए, नाटक, सिनेमा आदि) में अपनी राय व्यक्त करना ।
	CO-5	दैनिक जीवन में औपचारिक - अनोपचारिक अवसरों पर उपयोग की जा रही भाषा की समझ बनाना ।
	CO-6	हिंदी भाषा साहित्य को समझते हुए सामाजिक परिवेश के प्रति जागरूक होना ।
	CO-7	दैनिक जीवन में तार्किक एवं वैज्ञानिक समझ की ओर बढ़ना ।
	CO-8	पढ़ी- लिखी- सुनी- देखी- समझी गई भाषा का सृजनशील प्रयोग ।
	CO-9	भाषा की नियमबध्द प्रकृति को पहचानना और विश्लेषण करना ।
	CO-10	भाषा के नए संदर्भो परिस्थितियों में प्रयोग करना ।
	CO-11	पाठ विशेष को समझना और उससे जुडे मुद्दों पर अपनी राय देना ।
	CO-12	अन्य विषयों, जैसे- विज्ञान, गणित, सामाजिक विज्ञान, आदि में प्रयुक्त भाषा की समुचित बनाना व उसका प्रयोग करना ।
	CO-13	किसी भी नई रचना/ किताब को पढने/ समझने की जिज्ञासा व्यक्त करना ।

Marathi (optional):

PSO	Programme outcomes
PSO-1	साहित्य व भाषाविषयक आकलनक्षमता वाढते.
PSO-2	मराठी साहित्य, भाषा व संस्कृती यांचा जवळून परिचय होतो
PSO-3	मराठी भाषा व साहित्य अवलोकनाची रूची वाढते.
PSO-4	साहित्यकृतीला मुक्त प्रतिसाद देण्याची क्षमता निर्मान होते.
PSO-5	साहित्यभाषा व व्यवहारभाषा यांचे ज्ञान मिळते.
PSO-6	लेखन, वाचन, संभाषन, आकलन, ई. भाषिक कौशल्यांचा विकास होतो.

Course outcomes of Marathi:

Course	COs	Course outcomes
B. Sc. Semester- I & II Marathi	CO-1	मराठी भाषेतून वैज्ञानिक दृष्टीकोन वृद्धिंगत होतो.
	CO-2	मराठीभाषेतून सामाजिक समता रुजवण्याचा प्रयत्न केला जातो.
	CO-3	साहित्यातून वाचण्याचे महत्व नवीन पिढीला कळते.
	CO-4	मराठी साहित्यातून मराठी तरुंनाना एक प्रेरक दृष्टी प्राप्त होते.
	CO-5	मराठी साहित्यातून मानवताधिष्ठीत विचार समृद्ध होण्यास मदत होते.
	CO-6	भाषेतून मराठी साहित्य, भाषा व संस्कृती यांचा जवळून परिचय होतो.
	CO-7	भाषेद्वारे मानवांच्या भावनांचे प्रगटी करण होते.
	CO-8	मराठी भाषेतून राष्ट्रीय एकात्मतेचे मूल्य रुजवले जाते.
	CO-9	साहित्यातून सामाजिक कार्याचा संदर्भ स्पष्ट केला जातो.
	CO-10	साहित्यातून सामाजिक जागृतीचे ध्येय ठरवले जाते.
	CO-11	साहित्यातून व भाषेतून नवा आशावाद व्यक्त केला जातो.
	CO-12	साहित्यकृतीला मुक्त प्रतिसाद देण्याची क्षमता निर्माण होते.
	CO-13	साहित्यातून लेखन वाचन संभाषण आकलन इत्यादी भाषिक कौशल्यांचा विकास होतो.
	CO-14	मराठी साहित्यातून उत्कृष्ट व्यक्तीमत्वाचा परीचय होतो

English Department:
Programme specific outcomes (PSOs)

PSO	Programme outcomes
PSO-1	In pursuance with an emphasis on Language, English gains a deeper understanding of the resources of the written word.
PSO-2	It helps students to explore the entire range of human experience in the arena of language, specifically in Fiction, Poetry, and Drama.
PSO-3	It helps students to build skills of analytical and interpretive arguments; becomes careful and critical reader, practice writing in a variety of genres as a process of intellectual inquiry, creative expression and ultimately to become more effective thinkers and communicators who remains well equipped for a variety of careers in our information intensive society.
PSO-4	It offers students the opportunity to study influential writings from the British, American and global Anglophone traditions.
PSO-5	It provides imagination and critical insights into all areas of human experience - war and peace, nature and culture, love and sexuality, selfhood and social identity, justice and atrocity, the burdens of history and the dreams of the future.
PSO-6	Reads complex texts, actively recognizes key passages, raises questions, appreciates complexity and ambiguity, and comprehends the literal and figurative uses of language.
PSO-7	Increases confidence in speaking publicly, articulates clear questions and ideas in class discussion; listens thoughtfully and respectfully other ideas and prepares, organizes and delivers engaging oral presentations.

Course outcomes English

COs	Course outcomes	Programme outcomes (POs)						
		Domain specific (PSO)						
	B Sc Semester-I & II, English	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CO-1	Comprehend the nature of literary forms like prose, poetry drama, short stories.	H	M	M	M	H	H	M
CO-2	Learn to draft an application, letter, and report.	H	M	M	M	H	M	M
CO-3	Comprehend and compare passages.	H	M	H	M	M	H	M
CO-4	Develop and improve vocabulary skills through one word substitute.	M	L	H	M	L	M	M
CO-5	Learn antonyms and synonyms and use them in sentences.	M	M	M	M	M	M	M
CO-6	Learn appropriate use of parts of speech.	M	M	M	M	M	M	M
CO-7	Learn to draft curriculum vitae.	H	M	M	M	M	M	M
CO-8	Learn to identify common errors in English.	M	L	M	M	M	M	M
CO-9	Learn to prepare sentences from given words.	M	M	H	M	M	M	M

Course outcomes of Supplementary English

COs	Course outcomes	Programme outcomes (POs)						
		Domain specific (PSO)						
	B Sc Semester-I & II, Supplementary English	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CO-1	Illustrate the nature of literary forms like prose, poetry drama, short stories.	M	M	M	M	M	M	M
CO-2	Comprehend the passage and make a précis of it.	H	M	H	H	M	M	H
CO-3	Improve vocabulary by learning one word for a group of words.	M	M	H	M	M	M	M
CO-4	Learn word formation.	H	M	M	M	M	M	M
CO-5	Improve essay writing skill.	M	M	M	M	M	M	M
CO-6	Learn usage of foreign words in English.	M	L	M	M	L	M	M
CO-7	Learn to prepare news reports.	M	M	H	M	L	M	M
CO-8	Learn to prepare advertisements.	H	M	M	M	M	M	M
CO-9	Learn to improve writing skill through expansion of idea.	M	M	H	M	M	M	M

Hindi (optional):
Programme specific outcomes (PSOs)

PSO	Programme outcomes
PSO-1	साहित्य और भाषा की आकलन क्षमता विकसित होती है	
PSO-2	हिंदी साहित्य, भाषा व संस्कृती इनका नजदीक से परिचय होता है	
PSO-3	हिंदी भाषा व साहित्य के अवलोकन में रुची बढती है	
PSO-4	साहित्यकृती को मुक्त प्रतिसाद देने की क्षमता निर्माण होती है	
PSO-5	साहित्यिक भाषा व व्यवहारभाषा इनका ज्ञान मिलता है	
PSO-6	लेखन, वाचन, संभाषण, आकलन इ. भाषिक कौशल्य का विकास होता है	
PSO-7	उपयोजन कौशल्य विकसित होते है	
PSO-8	भाषिक ज्ञाना में वृद्धी होती है	
PSO-9	साहित्य और संस्कृती का परिचय होता है	

COs	Course outcomes	Programme outcomes (POs)								
		Domain specific (PSO)								
	B Sc Semester-I & II, Hindi	1	2	3	4	5	6	7	8	9
CO-1	साहित्य की विभिन्न विधाओ (जैसे कविता, कहानी, निबंध, एकांकी,संस्मरण आदि) की समझ बनाना और उनका आनंद उठाना ।	M		M		M	M		M	M
CO-2	विभिन्न सामाजिक- सांस्कृतिक मूल्यों के प्रति अपने रुझानों को अभिव्यक्त करना ।		M		M			M		
CO-3	पढ़ी सुनी रचनाओं को जानना, समझना, व्याख्यान करना, अभिव्यक्त करना ।	M	H	M			M			M
CO-4	अपनी स्तरानुकूल दृश्य, श्रव्य माध्यमों की सामग्री (जैसे पत्र- पत्रिकाए, नाटक, सिनेमा आदि) में अपनी राय व्यक्त करना ।				M			M	M	
CO-5	दैनिक जीवन में औपचारिक - अनोपचारिक अवसरों पर उपयोग की जा रही भाषा की समाझ बनाना ।	M			H			M		
CO-6	हिंदी भाषा साहित्य को समझते हुए सामाजिक परिवेश के प्रति जागरूक होना ।		M			M				L
CO-7	दैनिक जीवन में तार्किक एवं वैज्ञानिक समझ की ओर बढ़ना ।	M			M			M		
CO-8	पढ़ी- लिखी- सुनी- देखी- समझी गई भाषा का सृजनशील प्रयोग ।		M			M			M	M
CO-9	भाषा की नियमबध्द प्रकृति को पहचानना और विश्लेषण करना ।	H	M		M		M			
CO-10	भाषा के नए संदर्भों परिस्थितियों में प्रयोग करना ।		M			M		M		
CO-11	पाठ विशेष को समझना और उससे जुडे मुद्दों पर अपनी राय देना ।				M					M
CO-12	अन्य विषयों, जैसे- विज्ञान, गणित, सामाजिक विज्ञान, आदि में प्रयुक्त भाषा की समुचित बनाना व उसका प्रयोग करना ।		M			M			L	
CO-13	किसी भी नई रचना/ किताब को पढने/ समझने की जिज्ञासा व्यक्त करना ।	M			M			L		

Marathi (optional):
Programme specific outcomes (PSOs)

PSO	Programme outcomes
PSO-1	साहित्य व भाषाविषयक आकलनक्षमता वाढते.
PSO-2	मराठी साहित्य, भाषा व संस्कृती यांचा जवळून परिचय होतो
PSO-3	मराठी भाषा व साहित्य अवलोकनाची रूची वाढते.
PSO-4	साहित्यकृतीला मुक्त प्रतिसाद देण्याची क्षमता निर्मान होते.
PSO-5	साहित्यभाषा व व्यवहारभाषा यांचे ज्ञान मिळते.
PSO-6	लेखन, वाचन, संभाषन, आकलन, ई. भाषिक कौशल्यांचा विकास होतो.

Course outcomes of Marathi:

COs	Course outcomes	Programme outcomes (POs)					
		Domain specific (PSO)					
	B Sc Semester-I & II, Marathi	1	2	3	4	5	6
CO-1	मराठी भाषेतून वैज्ञानिक दृष्टीकोन वृद्धिंगत होतो.	M					
CO-2	मराठीभाषेतून सामाजिक समता रुजवण्याचा प्रयत्न केला जातो.				L		
CO-3	साहित्यातून वाचण्याचे महत्व नवीन पिढीला कळते.						
CO-4	मराठी साहित्यातून मराठी तरुंनाना एक प्रेरक दृष्टी प्राप्त होते.					H	H
CO-5	मराठी साहित्यातून मानवताधिष्ठीत विचार समृद्ध होण्यास मदत होते.						
CO-6	भाषेतून मराठी साहित्य, भाषा व संस्कृती यांचा जवळून परिचय होतो.					H	M
CO-7	भाषेद्वारे मानवांच्या भावनांचे प्रगटी करण होते.			M			
CO-8	मराठी भाषेतून राष्ट्रीय एकात्मतेचे मूल्य रुजवले जाते.				L		
CO-9	साहित्यातून सामाजिक कार्याचा संदर्भ स्पष्ट केला जातो.						
CO-10	साहित्यातून सामाजिक जागृतीचे ध्येय ठरवले जाते.					M	
CO-11	साहित्यातून व भाषेतून नवा आशावाद व्यक्त केला जातो.						
CO-12	साहित्यकृतीला मुक्त प्रतिसाद देण्याची क्षमता निर्माण होते.				M		
CO-13	साहित्यातून लेखन वाचन संभाषण आकलन इत्यादी भाषिक कौशल्यांचा विकास होतो.		H				
CO-14	मराठी साहित्यातून उत्कृष्ट व्यक्तीमत्वाचा परिचय होतो			L			

Post Graduate Teaching Department of Chemistry
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
M.Sc. - Chemistry

PROGRAM SPECIFIC OUTCOMES

PSO1	**Chemistry Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of chemistry, including specialized areas of inorganic chemistry, organic chemistry, physical chemistry, analytical chemistry, and elective subjects of nuclear chemistry, medicinal chemistry, polymer chemistry and environmental chemistry.
PSO2	**Problem analysis & Modern tool usage:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions. Find, analyze, evaluate and apply information systematically and to make defensible decisions. Learn, select, and apply appropriate methods and procedures resources, and modern chemistry-related to computing tools with an understanding of the limitations.
PSO3	**Environment and sustainability:** Understand the impact of the professional chemistry solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PSO4	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.
PO5	**Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory role as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.
PO6	**Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. environmental professionals, analytical professionals, educators, researchers, employers, employees).
PO7	**Communication:** Communicate effectively with the society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

Program Matrix

Name of Program : M.Sc. Chemistry

(Low correlation- L/ 1, Moderate correlation- M/2, High correlation- H/3)

	Course Outcome	Program Outcome						
		Domain Specific (PSO)				Domain Independent (PO)		
	Course name: Inorganic Chemistry (CH-1T1)	1	2	3	4	5	6	7
CO1	Be able to predict the geometry of individual molecules or complexes.	H	H	-	M	-	M	-
CO2	Be able to understand the complex formation equilibria in solution and to know unusual methods to the study of reaction rates.	H	L	-	M	-	M	-
CO3	Be informed with boron hydrides, or polyboranes which are the original cluster compounds as well as the first known family of electron-deficient compounds.	H	L	L	M	-	M	-
CO4	Be able to study of clustering of metal atoms.	H	M	L	M	-	M	-
	Course name: Organic Chemistry (CH-1T2)							
CO1	Be able to understand the applicability of concepts like delocalized bonding, conjugation, cross conjugation, resonance, in various carbon containing compounds and develop the understanding of the reactive intermediates.	H	M	-	M	-	M	-
CO2	Be able to study optical activity in compounds without chirality and analyse stereochemical aspects involved in various compounds and the corresponding chemical reactions.	H	H	L	M	-	M	-
CO3	Be able to understand mechanisms of various substitution nucleophillic reactions and get basic knowledge about the anchimeric assistance and isotope	H	L	-	M	-	M	-

	effects.								
CO4	Be able to understand mechanisms of various Aromatic nucleophillic and electrophillic substitution reactions and get acquainted with assorted outcomes like resonance, field, steric effects & its quantitative treatment.	H	L	-	M	-	M	-	

Course name: Physical Chemistry (CH-1T3)

CO1	Get acquainted with various laws of thermodynamics and its application.	H	H	-	M	-	M	-	
CO2	Be able to understand partial molar quantities, its determination and reduced phase rule in various component systems.	H	H	-	M	-	M	-	
CO3	Be able to recapitulation of terms of surface tension and different adsorption isotherms and be able to validate the newly developed analytical method as well as reported methods.	H	M	L	M	-	M	-	
CO4	Able to propose some new methods or modify existing methods of qualitative and quantitative analysis.	H	L	L	M	-	M	-	

Course name: Analytical Chemistry (CH-1T4)

CO1	Get acquainted with various terminology and fundamentals of analytical chemistry including classical and instrumental methods.	H	H	-	M	-	M	-	
CO2	Recapitulate the separation techniques like chromatography.	H	M	L	M	-	M	-	
CO3	Be able to explain analytical techniques in terms of the working principles of volumetry, and gravimetry.	H	H	-	M	-	M	-	
CO4	Able to propose some new methods or modify existing methods of qualitative and quantitative analysis.	H	M	L	M	-	M	-	

Course name: Practical Inorganic Chemistry (CH-1P1)

CO	Be able to understand the basic principles involved in separation and estimation of acidic and basic radicals and be able to apply the knowledge in real sample analysis for quantitative estimation as well as qualitative detection and also be able to assign a numerical value to variables by the quantitative analysts is to	H	H	L	M	-	L	L	

	reflect reality mathematically.							
	Course name: Practical Physical Chemistry (CH-1P2)							
CO	Be able to understand the principles of physical chemistry and interpret them through small experimental performances.	H	H	L	M	-	L	L
	Course name: Seminar (1S1)							
CO	On completion of seminar, the student will be in a position to present the topic in front of subject audience that will enhance confidence level and lead to personality development.	H	L	L	H	L	M	H

COURSE OUTCOME: M.Sc. SECOND SEMESTER 2018-19

	Course name: Inorganic Chemistry (CH-2T1)							
CO1	Will be able to understand the origin of colors in complexes and their magnetic behavior.	H	H	L	M	-	M	-
CO2	Develop ability to understand various reactions of transition metal complexes.	H	L	-	M	-	M	-
CO3	Will know the concept of bonding in various metal carbonyls.	H	L	-	M	-	M	-
CO4	Will be able to know chemistry behind the metal nitrosyls.	H	L	-	M	-	M	-
	Course name: Organic Chemistry (CH-2T2)							
CO1	Be able to acquire knowledge and understand applicability of carbon-carbon multiple bond and carbon-hetero atom multiple bond addition reaction and develop understanding of reaction mechanism in metal hydride reduction.	H	M	-	M	-	M	-
CO2	Be able to analyse various mechanism of molecular rearrangement and concept of elimination reactions.	H	H	-	M	-	M	-
CO3	Be able to understand free radical reactions.	H	M	L	M	-	M	-
CO4	Be able to comprehend various aspects of green chemistry.	H	M	H	M	-	M	-

	Course name: Physical Chemistry (CH-2T3)							
CO1	Be able to understand the eigen value and eigen function and application of schrodinger wave function to various systems.	H	H	-	M	-	M	-
CO2	Be able to determine the activity coefficients and ionic strength.	H	H	-	M	-	M	-
CO3	Able to identify symmetry elements in crystals.	H	H	-	M	-	M	-
CO4	Get the knowledge about various statistics and understand working of different counters.	H	M	-	M	-	M	-
	Course name: Analytical Chemistry (CH-2T4)							
CO1	Be able to understand the working principles and techniques involved in methods of analysis.	H	H	-	M	-	M	-
CO2	Be able to explain the advantages of modern methods over the classical ones.	H	L	-	M	-	M	-
CO3	Apply the principles of spectroscopic techniques in the qualitative and quantitative analysis of various samples.	H	H	M	M	-	M	-
CO4	Be able to develop their own methods for quantitative analysis of metal ions using instrumental methods.	H	H	-	M	-	M	-
	Course name: Practical Organic Chemistry (CH-2P1)							
CO	Be able to perform the qualitative analysis of organic binary mixture and be able to get hands on training for the synthesis of commercially important organic compounds (single and two stage organic).	H	H	L	M	-	L	L
	Course name: Practical Analytical Chemistry (CH-2P2)							
CO	Get expertise in titrimetric analysis based on neutralization, redox, precipitation and complexometric analysis, gravimetric estimation of barium and calcium, separation technique of paper chromatography and electroanalytical techniques as potentiometry, conductometry and optical methods like colorimetry.	H	H	M	M	-	L	L

	Course name: Seminar (2S1)							
CO	On completion of seminar, the student will have an improved knowledge about the subject and will be in a position to present the topic more confidently.	H	M	L	H	L	M	H

COURSE OUTCOME: M.Sc. THIRD SEMESTER 2018-19

	Course name: Inorganic Chemistry Special paper-1 (CH-3T1)							
CO1	Be able to understand the role of various essential and trace metals in biological systems and also medicinal use of metals and metal complexes.	H	L	H	M	-	M	-
CO2	Be able to develop knowledge of energetics involved in bio molecules.	H	L	M	M	-	M	-
CO3	Be able to explain the structure and functions of different biomolecules including storage and transport of dioxygen in them.	H	L	H	M	-	M	-
CO4	Know the principle and role of various metals in coenzyme molecules.	H	L	H	M	-	M	-
	Course name: Organic Chemistry Special paper-I (CH-3T1)							
CO1	Be able to explain what happens when organic molecules are excited by irradiation and be capable to discuss the photochemistry in nature and in various photochemical reactions.	H	L	H	M	-	M	-
CO2	Pericyclic reactions are used in a vast way in nature and also by organic chemist. This course gives the student the theoretical basis of this kind of reaction and also helps them to find a way to carry out these types of reaction.	H	M	H	M	-	M	-
CO3	Get well versed with the various oxidising and reducing agents and the stereochemical aspects involved in various chemical reactions.	H	M	M	M	-	M	-
CO4	Acquire knowledge about the chemistry of compounds of phosphours and sulphur and the application of organoboranes and organosilicon compounds in organic synthesis.	H	L	M	M	-	M	-
	Course name: Physical Chemistry Special paper-I (CH-3T1)							
CO1	Be able to understand the statistical aspects of thermodynamic functions.	H	L	-	M	-	M	-

CO2	Get acquainted with theory of double layer and get some knowledge about electrocatalysis and electrocardiography.	H	M	-	M	-	M	-
CO3	Acquire knowledge of dynamics of complex reactions and fast reactions.	H	L	L	M	-	M	-
CO4	Able to understand different photophysical phenomenon and photochemical reactions.	H	M	L	M	-	M	-

Course name: Analytical Chemistry Special paper-1 (CH-3T1)

CO1	Be able to describe various terminology and fundamentals of radioanalytical and electrochemical methods of analysis.	H	M	M	M	-	M	-
CO2	Be able to differentiate between similar techniques like stripping vs cyclic voltammetry, nephelometry vs turbidimetry etc.	H	H	L	M	-	M	-
CO3	Be able to choose appropriate technique of analysis among these depending on the nature of sample and analyte.	H	H	-	M	-	M	-
CO4	Able to propose new electrochemical sensor for the analysis of environmentally important species and pharmaceutical compounds.	H	H	H	M	-	M	-

Course name: Inorganic Chemistry Special paper-II (CH-3T2)

CO1	Be able to acquire detail knowledge of structure of ionic and covalent crystals and also the structures of AB AB_2 and ABO_3 type of compounds.	H	L	-	M	-	M	-
CO2	Be exposed to defects in solids and spinel chemistry.	H	L	-	M	-	M	-
CO3	Be introduced to material chemistry, physical phenomenon and nano materials.	H	M	L	M	-	M	-
CO4	Study the chemistry of liquid crystals.	H	M	-	M	-	M	-

Course name: Organic Chemistry Special paper-II (CH-3T2)

CO1	Be able to acquire knowledge about terpenoids and porphyrins, the stereochemistry involved alongwith thestructure determination and synthesis of some representative molecules.	H	H	M	M	-	M	-
CO2	Be able to build a learning about alkaloids, the stereochemistry involved alongwith thestructure determination and acquire brief idea about	H	H	M	M	-	M	-

		prostaglandins.							
CO3	Be able to develop the understanding of steroids chemistry and plant pigments.	H	M	H	M	-	M	-
CO4	Be able to quantify the contributions of carbohydrates in nature and get well versed with the properties of amino acids, and structural features of polypeptide.	H	M	M	M	-	M	-

Course name: Physical Chemistry Special paper-II (CH-3T2)

CO1	Be able to understand the electronic structure of atoms and application of Huckel theory to various molecules.	H	L	-	M	-	M	-
CO2	Get knowledge about different characterization techniques for nanoparticles.	H	M	L	M	-	M	-
CO3	Able to understand the structure of double layer and different models used for double layer.	H	L	-	M	-	M	-
CO4	Be to get knowledge of different phenomenological equations, to study rate of entropy production and its application to the cases of chemical reactions.	H	L	L	M	-	M	-

Course name: Analytical Chemistry Special paper-II (CH-3T2)

CO1	Be able to understand the difference between organic and inorganic quantitative analysis and terminology involved such as micro, semi-micro, ultramicro, proximate, ultimate analysis etc.	H	M	M	M	-	M	-
CO2	Summarize various methods of analysis of environmental components like water and air and industrial products like ores and cement.	H	M	H	M	-	M	-
CO3	Able to calculate percentage of various components in these samples.	H	H	H	M	-	M	-
CO4	Summarize the causes and consequences of water and air pollution and the remedies for it.	H	H	H	M	-	M	-

Course name: Environmental Chemistry Elective paper (CH-3T3)

CO1	Acquainted with scientific study of the chemical and biochemical phenomenon that occur in natural places.	H	L	H	M	-	M	-
CO2	Be able to understand how water is important to protect ecosystems and it is an integral part of our environment.	H	M	H	M	-	M	-

| CO3 | Able to understand how air is important for the survival of living beings. | H | M | H | M | - | M | - |
| CO4 | Able to know various phenomenon occurring in soil and concept of radioactive pollution. | H | M | H | M | - | M | - |

Course name: Medicinal Chemistry Elective paper (CH-3T3)

CO1	Become acquainted with various terminology and fundamentals of drug designing including classical methods used for QSAR.	H	M	M	M	-	M	-
CO2	Be able to study pharmacokinetics & pharmacodynamic aspects of drug metabolism and would be able to acquire knowledge and applicability of diuretic and the analgesics and antipyretic drugs.	H	M	M	M	-	M	-
CO3	Be able to get well versed with the cardiovascular and anti neoplastic agents and their applicability.	H	M	M	M	-	M	-
CO4	Able to develop comprehensive knowledge about various psychoactive drugs, coagulant& anticoagulants.	H	M	H	M	-	M	-

Course name: Polymer Chemistry Elective paper (CH-3T3)

CO1	Be able to understand different types of polymers.	H	L	M	M	-	M	-
CO2	Capable of understanding different techniques of molecular mass determination.	H	M	M	M	-	M	-
CO3	Get knowledge about morphology and order in crystalline polymers.	H	M	M	M	-	M	-
CO4	Get acquainted with synthesis and application of commercial polymers.	H	M	H	M	-	M	-

Course name: Nuclear Chemistry Elective paper (CH-3T3)

CO1	Able to understand fundamentals of radioactivity, decay of radioactive material etc.	H	M	-	M	-	M	-
CO2	Able to evaluate various nuclear properties using established models.	H	M	-	M	-	M	-
CO3	Be able to examine interaction of high energy radiation with matter and compare between different types of detectors for neutral, positive and negative radiations.	H	M	L	M	-	M	-
CO4	Be able to predict fission product and power output of fission reactors.	H	H	-	M	-	M	-

	Course name: Spectroscopy-I (core subject centric) paper (CH-3T4)								
CO1	Be able to understand symmetry elements and operations to organic and inorganic molecules.	H	M	-	M	-	M	-
CO2	Learn the mass spectrometry technique and will be able to identify the molecule on the basis of the fragmentation pattern in mass spectrum and learn application of radioactive molecules in Mossbaur spectroscopy.	H	H	-	M	-	M	-
CO3	Be able to understand energy changes at very lower level and capable of predicting the satellite patterns of geographical areas. ESR techniques are used to determine the presence of unpaired electron especially on complexes.	H	H	-	M	-	M	-
CO4	Elucidate the structure determination of organic molecules by IR spectroscopy, problem based on IR spectra.	H	H	-	M	-	M	-
	Course name: Foundation Course: Applied Analytical Chemistry-I (CH-3T4)								
CO1	Get acquainted with various analytical procedures of analysis of pesticides and fertilizers.	H	H	H	M	-	M	-
CO2	Be able to understand the application of analytical chemistry in forensic laboratory.	H	H	H	M	-	M	-
CO3	Be able to carry out analysis of petroleum and petroleum products.	H	H	H	M	-	M	-
CO4	Be able to analyze various alloys commonly used in daily life.	H	H	H	M	-	M	-
	Course name: Practical Inorganic Chemistry Special (CH-3P1)								
CO	Get hands on training of many instrumentation techniques used for study of inorganic compounds and bioinorganic compounds and also become an expert in handling instruments that will be helpful to him/her while working in research laboratory in future.	H	H	L	M	-	L	L
	Course name: Practical Organic Chemistry Special (CH-3P1)								
CO	Be able to isolate natural products using fractional distillations, column	H	H	L	M	-	L	L

	chromatography and extraction methods, get hands on the technique involved for the qualitative analysis of a mixture of three organic compounds and be able to understand application of volumetric analysis in the estimation of organic analyte from given solutions.								
	Course name: Practical Physical Chemistry Special (CH-3P1)								
CO	Be able to learn the setting up various experiments in Kinetics, Thermodynamics, Potentiometry, Conductometry and spectrophotometry.	H	H	L	M	-	L	L
	Course name: Practical Analytical Chemistry Special (CH-3P1)								
CO	Get hands on training of all of various instrumentation techniques like conductometry, potentiometry, spectrophotometry, flame photometry, polarography, polarimetry, nephelometry, cyclic voltammetry and radioanalytical techniques.	H	H	L	M	-	L	L
	Course name: Practical Environmental Chemistry Elective (CH-3P2)								
CO	Be acquainted with analysis of various parameters of air, water and soil.	H	H	H	M	-	L	L
	Course name: Practical Medicinal Chemistry Elective (CH-3P2)					M			
CO	Be able to estimate the active ingredients of various pharmaceutical compounds and get acquainted with the strategies involved in the preparation of many organic and drug moieties.	H	H	M	M	-	L	L
	Course name: Practical Polymer Chemistry Elective (CH-3P2)								
CO	Be able to synthesize various polymers and get knowledge about characterization of polymers.	H	H	L	M	-	L	L
	Course name: Practical Nuclear Chemistry Elective (CH-3P2)								

CO	Get hands on training of all of the radiation detection equipments and analyze various types of dosimeters that may lead to some new types of dosimeters.	H	H	L	M	-	L	L

Course name: Seminar (3S1)

CO	On completion of seminar, the student will be able to consolidate idea about the subject and thereby develop knowledge about the subject which will boost their confidence.	H	M	-	M	L	M	H

COURSE OUTCOME: M.Sc. FOURTH SEMESTER 2018-19

Course name: Inorganic Chemistry Special paper-1 (CH-4T1)

CO1	Be able to describe fundamentals of nanochemistry and mechanism of solid state reactions.	H	H	M	M	-	M	-
CO2	Be able to illustrate the formation of coordination polymers and analytical techniques for polymer characterization.	H	H	-	M	-	M	-
CO3	Be able to understand detail knowledge of catalysis.	H	M	L	M	-	M	-
CO4	Be able to understand the use of inorganic chemistry in electronic world and application of films in various fields.	H	H	-	M	-	M	-

Course name: Organic Chemistry Special paper-I (CH-4T1)

CO1	Be able to quantify the applicability of carbanion intermediate in organic synthesis.	H	M	-	M	-	M	-
CO2	Be able to understand modern methods of organic synthesis using transition metals and organometallic reagents.	H	H	-	M	-	M	-
CO3	Be able to be well familiar with the advanced terminologies, rules and concepts involved in stereochemistry and will have a deeper knowledge about the applicability of stereochemical and the protection deprotection concepts.	H	H	L	M	-	M	-

| CO4 | The students will be able to apply logic behind organic synthesis using retro synthetic approach. | H | H | L | M | - | M | - |

Course name: Physical Chemistry Special paper-I (CH-4T1)

CO1	Able to understand Arrhenius law and reactions in solution phase.	H	M	-	M	-	M	-
CO2	Be able to understand types, reasons and protection from corrosion and corrosion analysis.	H	H	H	M	-	M	-
CO3	Get knowledge about interaction of radiation with matter.	H	H	-	M	-	M	-
CO4	Able to understand classical free electron theory and quantum theory for electrons.	H	M	L	M	-	M	-

Course name: Analytical Chemistry Special paper-I (CH-4T1)

CO1	Be able to describe fundamentals of radioanalytical techniques and applications of them.	H	M	-	M	-	M	-
CO2	Be able to illustrate these analytical techniques of XRF and PIXE.	H	H	-	M	-	M	-
CO3	Be able to compare between similar techniques like TGA, DSC and DTA.	H	H	-	M	-	M	-
CO4	Be able to choose appropriate technique of analysis among these depending on the nature of sample and analyte.	H	H	L	M	-	M	-

Course name: Inorganic Chemistry Special paper-II (CH-4T2)

CO1	Get introduced to photochemistry involving excited states of metal complexes.	H	H	-	M	-	M	-
CO2	Acquaint with role of redox reactions in metal complexes.	H	M	-	M	-	M	-
CO3	Be introduced to organotransition metal chemistry.	H	M	L	M	-	M	-
CO4	Be able to study the transition metal Pi complexes.	H	M	-	M	-	M	-

Course name: Organic Chemistry Special paper-II (CH-4T2)

| CO1 | Get acquainted with basic terminology involved in enzyme chemistry which is important to understand several life processes. | H | L | L | M | - | M | - |

CO2	Come to know importance of heterocyclic compounds as a part of many natural products as well as pharmaceutical drugs.	H	M	M	M	-	M	-
CO3	Be able to analyze structure of nucleic acids, lipids and vitamins which are important building blocks of living system.	H	M	L	M	-	M	-
CO4	Be able to have a brief idea about the terminologies and concepts involved in drugs, dyes and polymer chemistry.	H	M	L	M	-	M	-

Course name: Physical Chemistry Special paper-II (CH-4T2)

CO1	Be able to understand types of solids electronic band structures and magnetic properties of solids.	H	H	L	M	-	M	-
CO2	Get basic ideas of electrostatic interactions.	H	L	L	M	-	M	-
CO3	Get acquainted with different theory of liquids and methods of determination of surface tension.	H	L	M	M	-	M	-
CO4	Be able to understand different models of supercooled liquids and working and application of different batteries.	H	H	L	M	-	M	-

Course name: Analytical Chemistry Special paper-II (CH-4T2)

CO1	Be able to analyze various types of drugs and clinical samples.	H	H	L	M	-	M	-
CO2	Develop various methods of soil and coal analysis.	H	H	M	M	-	M	-
CO3	Able to work on mitigation of corrosion in real time industrial application.	H	H	H	M	-	M	-
CO4	Summarize the causes and consequences of corrosion and the remedies for it.	H	H	H	M	-	M	-

Course name: Environmental Chemistry Elective paper (CH-4T3)

CO1	Be able to understand water pollution and different instrumental methods used for analysis of various metals and anions.	H	H	H	M	-	M	-
CO2	Be acquainted with air pollution and its control measures.	H	H	H	M	-	M	-
CO3	Be able to understand soil pollution and its control measures.	H	H	H	M	-	M	-
CO4	Able to develop knowledge of solid waste pollution.	H	M	H	M	-	M	-

	Course name: Medicinal Chemistry Elective paper (CH-4T3)							
CO1	Get acquainted with various terminology and fundamentals of drug rules and drug acts.	H	M	M	M	-	M	-
CO2	Be able to study and analyse assorted chromatographic separation techniques for drugs: TLC.	H	H	M	M	-	M	-
CO3	Be able to know concepts of analytical and statistical sampling.	H	H	L	M	-	M	-
CO4	Able to know the chemistry of anti-viral, anti-malarial, histamines & antihistamic, antibiotics, anthelminitics, antiamoebic and anti-inflammatory drugs.	H	M	L	M	-	M	-
	Course name: Polymer Chemistry Elective paper (CH-4T3)							
CO1	Get knowledge about types of polymerisation.	H	M	-	M	-	M	-
CO2	Get acquainted with different technique of polymerisation methods.	H	M	L	M	-	M	-
CO3	Be able to understand methods to study characterisation of polymers.	H	M	L	M	-	M	-
CO4	Get knowledge of synthesis and application of biomedical, inorganic and co-ordination polymers.	H	H	H	M	-	M	-
	Course name: Nuclear Chemistry Elective paper (CH-4T3)							
CO1	Be able to understand various aspects of radiation chemistry.	H	M	-	M	-	M	-
CO2	Examine formation of free radicals and their interaction with various solutes and solvents and various kinetic parameters of nuclear reactions.	H	L	L	M	-	M	-
CO3	Categorize various radioanalytical techniques like NAA, IDA, RIA, IRMA etc.	H	H	-	M	-	M	-
CO4	Able to validate and summarize various radiopharmaceuticals depending on diagnostic and therapeutic applications.	H	H	-	M	-	M	-
	Course name: Spectroscopy-II (core subject centric) paper (CH-4T4)							
CO1	Be able to understand theoretical aspects of UV, NMR and electron	H	H	-	M	-	M	-

	spectroscopies.							
CO2	Be able to identify various molecular excitations and calculations of wavelengths of absorption.	H	H	-	M	-	M	-
CO3	Be able to elucidate the structure of molecule based on NMR spectra and be in a position to carry out the spectral analysis for structure determination.	H	H	-	M	-	M	-
CO4	Comprehend the XRD data for crystal structure determination.	H	H	-	M	-	M	-
	Course name: Foundation Course: Applied Analytical Chemistry-II (CH-4T4)							
CO1	Be able to understand the chemistry involved in water treatment for hardness removal and desalination.	H	H	H	M	-	M	-
CO2	Carry out the analysis of leather and polymers.	H	H	H	M	-	M	-
CO3	Comprehend the various processes involved in the metallurgy and extraction of metals from ores.	H	H	H	M	-	M	-
CO4	Be able to carry out analysis of clinical samples like blood and urine.	H	H	M	M	-	M	-
	Course name: Practical Inorganic Chemistry Special (CH-4P1)							
CO	Get hands on synthesis and electroanalytical characterization techniques, various methods of synthesis of inorganic compounds and be in a condition to carry out quantitative analysis of various species using these techniques.	H	H	-	M	-	L	L
	Course name: Practical Organic Chemistry Special (CH-4P1)							
CO	Be able to carry out elemental analysis of organic compounds, get expertise in the estimation of biomolecules and some organic drug molecules. The students will get hands on training of multi-step preparation of small organic molecules and will develop ability to identify various unknown organic molecules using NMR, IR, Mass and UV spectra.	H	H	M	M	-	L	L
	Course name: Practical Physical Chemistry Special (CH-4P1)							

CO	Be able to apply the theoretical knowledge of subject in actual processes like, adsorption, biological kinetic methods of analysis, and experimentally determine the physical parameters like hydrolysis constant, pKa, transport number, etc.	H	H	M	M	-	L	L
	Course name: Practical Analytical Chemistry Special (CH-4P1)							
CO	Get hands on training of all separation techniques like solvent extraction, paper chromatography, ion exchange etc and organoanalytical techniques of estimation of nitrogen, sulphur and halogen along with environmental analysis.	H	H	H	M	-	L	L
	Course name: Project (CH-4P2)							
CO	Learn how to carry out literature survey in a specific area of research, work on a small idea to develop their own observations, analyze the results obtained from the experiments carried out, validate the methods developed by him/her and develop an overall research attitude so that he can become a good researcher in future.	H	H	M	M	L	H	-
	Course name: Seminar (4S1)							
CO	After successful completion these four seminars assigned to them, they will be in a position to explain the concepts they learned from the dais in front of any number of audiences. This will lead to overall personality development of the student for entering into teaching profession.	H	H	L	M	L	M	H

Department of Physics, RTMNU

Name of Programme: M.Sc Physics

Programme specific outcome

After completion of course, the student will be to:

PSO1: Understanding basic principles of Physics which are underlying a wide selection of physical phenomenon.

PSO2: Explore with current state-of-art in the selected area of Physics.

PSO3: Inculcate the habit to plan, design and execute new experiment. Analyze, interpret experimental result and write report on it.

PSO4: Assess the errors involved in an experiment work; searching out and adopting new methodology to reduce errors. Presents the experimental outcome in effective manner.

PSO5: After completing PG degree from this programme, they will be eligible to continue research at the higher degree (Ph.D) level. They will be trained by experimental, computer programming and data interpretation programming skill and exposed to improve their employability in research and development, in scientific and engineering industries.

PSO6: Additionally, they will have necessary numerical and transferable skills to select general career choice such as accounting or computing.

Gumwadkar PR
BOS chairman

Programme matrix
Name of Programme: M.Sc Physics
(Low Correlation = L/1; Moderate Correlation = M/2 and High Correlation = H/3)

CO	Program Outcomes	Program Specific Outcomes (PSOs)					
	Course Name: 1T1 Mathematical Physics	Domain Specific					
		POS1	POS2	POS3	POS4	POS5	POS6
CO1	Curvilinear co-ordinate Systems, Physical ideas about gradient, Applications to the solution of differential equations.	H	M	H	M	H	M
CO2	Elementary ideas about tensors, Cartesian tensors, differential of Cartesian tensors, gradient, divergence and curl , Laplacian of Cartesian tensors, Laplace transform of elementary functions.	H	M	H	M	H	M
CO3	Linear vector spaces - linear independent bases, Dimensionality, inner product, matrices, linear transformation, Orthogonal and Unitary matrices, Cayley Hamilton theorem.	H	H	H	H	L	M
CO4	Linear differential equations, Special Function- Laguerre, Hermite, Legendre polynomials, Special Bessel's function.	H	M	H	H	M	M
	Course Name: 1T2:Complex Analysis and Numerical Methods	Domain Specific					
CO1	Solve simple problems involving complex algebra such as rationalization.	H	M	L	L	M	L
CO2	Given a function, determine if it is analytic. Integrate various functions using calculus of residues.	1	H	H	L	L	H
CO3	Compute pole expansion and product	M	L	H	M	L	M

	expansion of certain functions.						
CO4	Find the roots of a given nonlinear function.	L	L	L	H	M	M
CO5	For a given data, fit a function, interpolate or extrapolate as necessary.	L	L	M	M	H	M
CO6	Solve ordinary differential equations. Compute integrals numerically .	M	M	M	L	L	H
	Course Name: 1T3:Electronic	**Domain Specific**					
CO1	Clear the conceptual knowledge of Semiconductor discrete devices, Bipolar junction transistor (JFET, MOSFET, SCR, UJT), Opto-electronic devices like Photo-diode, solar cell, LED, LCD and photo transistor.	H	L	L	L	H	L
CO2	Gains the knowledge of applications of semiconductor devices in linear and digital circuits, transistor as amplifier, coupling of amplifier, feedback in amplifiers and types of oscillators clipping and clamping circuits also gets the knowledge of transistor as a switch OR, AND and NOT and Gates.	M	H	L	L	M	L
CO3	Explores the field of Digital integrated circuits- NAND and NOR gates building block, simple combinational Circuits, Multivibrators, sweep generator, shift registers, counters, coverters, semiconductor memories (ROM, RAM, and EPROM) along with architecture of 8 bit microprocessor (INTEL 8085).	H		M			M
CO4	Gain understanding of Linear integrated circuits- Operational amplifier and its applications-Inverting and noninverting		H		M		M

	amplifier, adder, integrator, differentiator, waveform generator, comparator and Schmittrigger, Butterwoth active filter, phase shifter.						
CO5	Understand the Communication Electronics in terms of Basic principle of amplitude frequency and phase modulation also Simple circuits for amplitude modulation and demodulation, digital (PCM) modulation and demodulation.	H	H				H
	Course Name: 1T4:Electrodynamics-1	**Domain Specific**					
CO1	Familiar with the static properties of electric and magnetic fields.	H	M	H	H	H	L
CO2	Understand the concept of electric field and they should be able to solve problems.	M	L	H	H	H	L
CO3	Familiar with the definition of electric current and electric current density. They should understand the important information contained in the equation of continuity and they should be able to solve simple problems involving this equation.	M	H	M	H	H	L
CO4	Understanding the concept of the magnetic field and be able to calculate this from given current distributions.	H	H	H	H	M	H
CO5	Understand how the Maxwell equations arise as a synthesis of the various individual electromagnetic phenomena and know how Maxwell's equations lead to electromagnetic waves.	H	H	H	H	M	H

	Course Name: 1=2T1: Quantum Mechanics I	Domain Specific					
CO1	construct operators in coordinate and momentum representation.	H	H	M	M	L	L
CO2	familiar with Dirac notation, notions of inner and outer product and basic mathematical structure.	H	H	L	M	M	L
CO3	write matrix representation for a given operator, understand various transformations and diagonalization.	M	L	H	L	L	M
CO4	Understand tunnelling, parity of eigenfunctions,	L	L	L	H	M	M
CO5	frame a radial equation for a given central force problem and solve it.	L	L	M	H	H	L
CO6	findClebsch-Gordon coefficients for addition of angular momenta.	L	L	M	M	L	H
	Course Name: Statistical Physics	Domain Specific					
CO1	Understand basics of theory of probability and statistical approach for thermodynamical properties.	H	H	H	H	M	M
CO2	Gain the knowledge of theory of indistinguishable particles for fifth state of matter i.e Bose Einstein condensate.	H	H	H	L	M	L
CO3	Demonstrate Fermi Dirac condensation on the basis of BCS theory and its application for free electron gas in metal.	H	H	H	L	M	L
CO4	Describe phase transition phenomenon using Ising model and Landau theory.	H	H	H	L	L	L
	Course Name: 2T3:Classical Mechanics	Domain Specific					

Arjunwadkar P R
BCS chairman

CO1	Solve simple systems by writing Lagrangian.	H	L	H	L	L	L
CO2	Understand cyclic coordinates, canonical transformations.	M	H	H	L	L	L
CO3	Compute Poisson brackets, interpret them.	L	L	L	H	H	M
CO4	Understand central force motion and interpret scattering cross-section.	L	L	L	M	H	M
CO5	Understand Euler angles, Inertia tensor. Compute equations of motion for simple coupled systems.	L	L	L	H	H	L
CO6	Learn Hamilton-Jacobi theory and its importance.	L	L	L	M	M	H
	Course Name: 2T4:Electrodynamics-II	**Domain Specific**					
CO1	Use of Maxwell equations in analysingthe electromagnetic field due to time varying charge and current distribution	H	H	M	M	H	L
CO2	describethe nature of electromagnetic wave and its propagation through different media and interfaces.	H	H	H	M	M	H
CO3	explaincharged particle dynamics and radiation from localized time varying electromagnetic sources	H	H	M	H	M	M
CO4	Formulate and solve electrodynamic problems in relativistically covariant form in four-dimensional space-time	H	M	H	M	H	H

Annwadkar PR
BoS chairman

CO5	be familiar with some elementary phenomena and concepts in quantum electrodynamics.	H	H	H	M	H	M
	Course Name: 1=2T1 Quantum Mechanics I	**Domain Specific**					
CO1	Solve simple problems using perturbation theory.	H	H	M	M	L	L
CO2	Solve simple problems of perturbation theory, understand symmetries of wavefunction.	M	H	H	M	L	L
CO3	Solve simple problems involving time dependent perturbation.	L	H	H	M	M	L
CO4	Solve barrier problem using WKB method.	L	H	H	H	L	L
CO5	Understand the physical meaning of scattering coefficients. Difference between bosons and fermions.	L	L	L	M	H	M
CO6	know about Klein-Gordon equations, Dirac equations. Solve for Hydrogen atom using Dirac's theory.	L	L	L	L	M	H
	Course Name: 3T2 Solid state Physics and Spectroscopy	**Domain Specific**					
CO1	Clear basic concept of crystal classes, lattices, symmetries and to understand the relationship between real and reciprocal lattice.	H	H	M	M	L	M
CO2	Understanding the correlation of crystallography with experimental crystal study by Braggs conditions for X-ray diffraction.	H	M	H	H	L	L
CO3	Explore with the knowledge of different crystal defect and its influence on basic physical behaviour of crystals.	H	H	H	M	M	M

CO4	Gain basic knowledge of dielectric properties of materials and learn the basic of the dielectric behaviour of various materials.	H	M	M	M	H	L
CO5	Describe the spectra of single and multiple electrons atoms including fine and hyperfine structure of alkaline, Helium like atoms, spin and relativity correction, different type of coupling such as L-S and J-J couplings.	H	M	M	M	L	L
CO6	Analyse the spectra of diatomic molecules such as electronic, rotational, vibrational spectra and a basic introductory idea about the Raman Spectroscopy.	H	H	H	M	M	H
CO7	Explain effect of electric and magnetic field on the atomic spectrum.	M	H	H	H	L	L
	Course Name: E1.2:X-rays-I	**Domain Specific**					
CO1	Basic concepts of production of X-rays, Designing concepts conventional of X-ray generators, Basics of Advanced radiation source Synchrotron and its advantages over conventional sources.	H	H	M	L	H	L
CO2	Understanding of interaction of X-rays with the matter, Applications of X-rays based on different physical processes involved after interaction of x-rays with matter.	H	H	H	M	H	L
CO3	Understanding the method of X-ray	H	H	H	M	H	L

	radiography and its applications in medical and industrial fields. Details of materials characterization techniques based on X-ray photoelectron/Auger electron spectroscopies and X- ray fluorescence spectroscopy.						
CO4	Designing concepts of different x-ray spectrographs, Understanding the concepts and methods of x-ray detection. Gaining the knowledge to select proper spectrograph and detectors for particular application.	H	H	H	H	H	L
CO5	Different theoretical concepts regarding x-ray spectra and their interpretation. Knowledge about calculating relative intensities of spectral lines.	H	M	M	L	M	M
CO6	Interpretation of X-ray absorption spectra. Experimental techniques for obtaining X-ray absorption spectra and its important applications.	H	H	H	H	H	M
CO7	Understanding the concept of dispersion of X-rays and its significance.	H	L	L	L	H	L
	Course Name: E1.3:Nanoscience and Nanotechnology	**Domain Specific**					
CO1	Clear basic concept of quantum approach for density of states for quantum well, wires and dots.	H	M	H	H	H	
CO2	Understanding the different methods of synthesis of nanomaterials.	H	H	H	H	H	
CO3	Explore with the knowledge of different instrumentation useful to analyse	H	H	H	H	H	

	materials at nanoscale.						
CO4	Understanding the properties nanomaterials for technology application	H	M	H	H	H	
	Course Name: 4T1: Nuclear and Particle Physics	**Domain Specific**					
CO1	Clear basic concept of nuclear properties; its size, radii, shape charge distribution, spin, parity, mass, nuclear stability and also to understand binding energy, semi empirical mass formula, liquid drop model, laws of radioactive decay.	H	M	M	L	M	L
CO2	Understands elements of deuteron problem, n-n scattering, charge independence, and symmetry of nuclear forces along with electric and magnetic moments of nuclei.	H	M	H	M	L	L
CO3	Gains the knowledge of elementary particles, decay of nuclei, their classification, characteristics, selection rule and their theories.	H	H	H	L	M	L
CO4	Explores the field of nuclear reactions, conservation laws, mechanism, cross section, compound nucleus along with fission and fusion reactions, nuclear energy and elements of nuclear power.	H	M	L	L	L	L
CO5	Explains the interaction of char5ged particles and electromagnetic radiation with matter along with principles of radiation detectors including G-M Counter, proportional counter, Na(Tl) Scintillation detectors, semiconductor detectors.	H	H	M	M	L	L
CO6	Describe classification of elementary particles, strong, weak and	M	M	L	L	M	H

		electromagnetic interactions also will be able to understand Gellamann – Nishijima formula along with properties of elementary particles and their symmetry and conservation laws.						
	CO1	Clear basic concept of nuclear properties; its size, radii, shape charge distribution, spin, parity, mass, nuclear stability and also to understand binding energy, semi empirical mass formula, liquid drop model, laws of radioactive decay.	H	M	L	L	L	L

Course Name: 4T2 Solid State Physics

Domain Specific

CO1	Band theory, Bloch theorem, the Kronig-Penney model, construction of Brillouin zones, extended and reduced zone schemes, Quantum theory of paramagnetism, exchange interactions. Pauli paramagnetic susceptibility.	M	H	H	M	H	H
CO2	Lattice dynamics, energy of atomic motions, adiabatic principle, harmonic approximation, Theories of lattice specific heat, Dulong and Petit'slaw, Einstein and Debye models.	H	M	M	H	H	H
CO3	Free electron theory, electrons moving in one and three dimensional potential wells, quantum state and degeneracy, density of states, electrical and thermal conductivity of metals, semiconductors, free carrier concentration in semiconductors, Fermi level and carrier concentration in semiconductors.	H	M	H	M	H	H
CO4	Superconductivity, Type I and II super conductors, Meissner effect, isotope	M	H	H	H	M	H

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	effect, London equation, coherence length, Josephson junction, high temperature superconductor.						
	Course Name: E2.2:4T3: X-ray-II	**Domain Specific**					
CO1	Concepts of crystal classes, lattices, symmetries, methods of Crystallographic Projections, Point groups, space groups and to understand the relationship between real and reciprocal lattice.	H	L	L	L	H	L
CO2	Conceptual understanding of different X-ray Scattering processes involved in X-ray diffraction.	H	M	L	L	M	L
CO3	Physical Basis of X-ray Crystallography, Different theoretical concepts to interpret and analyse x-ray diffraction pattern.	H	M	M	H	H	M
CO4	Demonstration of different X-ray diffraction based experimental techniques used for materials characterization.	H	H	H	H	H	M
CO5	Interpretation of different phase formation phenomenon in materials using x-ray diffraction technique.	H	H	M	L	H	L
CO6	Comparison of different diffraction techniques with that of x- diffraction. Advantages, disadvantages and applicability	H	H	M	M	H	L
	Course Name: E2.3: 4T3:Nanoscience and Nanotechnology II	**Domain Specific**					
CO1	Understanding the behaviour of materials at nanoscale and their use in different industrial application accordance with properties.	H	H	M	H	H	L

Aijinvedkar 8 M
BCS chairman

CO2	Familiar with concept of Nanophotonics and tuning the optical properties nanomaterials and their use in different applications.	H	H	H	H	M	L
CO3	Understand the concept of Nanomagnetics and magnetic properties of nanomaterials.	H	L	M	H	H	L
CO4	Understanding the electronic properties of nanomaterials and how to use these properties in making the electronic devices of current trends.	H	M	H	H	H	M
CO5	be familiar with different nanocomposite materials and their synthesis techniques and the need of nanocomposite for current and future applications.	H	L	H	M	H	M
	Course Name: S2.2-4T4:Experimental Techniques in Physics	**Domain Specific**					
CO1	Explain different types of radiation, their sources and detectors which are commonly used in experimental techniques.	H	H	M	H	H	H
CO2	Clear the conceptual understanding of functionality of different types of sensors.	I	H	M	L	M	L
CO3	Demonstrate different X-ray and thermal analysis based experimental techniques used for materials characterization in Physics	H	H	M	L	M	M

Ayumwcdkor P K
BdS chairman

CO4	Describe different electron microscopic techniques for morphological studies of materials.	M	M	H	L	H	M
CO5	Gain understanding of magnetic behaviour of materials and different tools for magnetic characterization of materials.	H	L	L	L	M	H
CO6	Explore with different spectroscopic analysis techniques	M	M	H	H	H	M

Anjmwadkar P R
BOS chairman

Program Specific Outcomes

Name of Program : M.Sc. Mathematics

No. of Courses : 30

On successful completion of the M.Sc. MATHEMATICS programme a student will be able to

PSO1	Disciplinary Knowledge	Undestand the basic and advanced knowledge in the field of Mathematics
PSO2	Communication Skills	Effectively communicate and explore ideas of mathematics for propagation of knowledge and popularization of mathematics in society
PSO3	Critical Thinking	Identify, analyse, formulate various problems with scientific approach
PSO4	Problem Solving	Identify and apply the most effective method to solve and evaluate the appropriate solution within a stipulated time
PSO5	Professional Skills	Explain/ demonstrate accurate and efficient use of advanced Mathematical techniques
PSO6	Team Work	Participate constructively in classroom discussion
PSO7	Digitally literacy	Have sound knowledge of mathematical modeling, programming and computational techniques as required for research or employment in industry
PSO8	Ethical and Social awareness	Capable of demonstrating the ethical issues related with the Intellectual Property Rights, copyright etc. and demonstrate highest standards of ethical issues in mathematics

PSO9	Lifelong learning	Continue to acquire mathematical knowledge and skills appropriate to professional activities
PSO10	Research related skills	Pursue research in challenging areas of pure/applied Mathematics.
PSO11	Self-Directed Learning	Work independently to explore new ideas and solutions to mathematical problems
PSO12	Analytical Reasoning	Think logically and analytically over the information to evaluate solution for the mathematical theorems or problems
PSO13	Leadership Quality	Listen and understand the ideas and suggestions of others to imrove quality of learning
PSO14	Scientific Reasoning	Solve mathematical problems systimatically with scientific approach
PSO15	Reflective Thinking	Identify the importance of information provided in theorems, axioms and problems for further justification and application

Program Matrix

Name of Program : M.Sc. Mathematics

(Low Correlation = L/1 ; Moderate Correlation = M/2 ; High Correlation = H/3)

Course Outcomes (Cos)		Program Specific Outcomes(PSO)															
	Course Name: Algebra-I	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	students apply the knowledge of different types of Groups to prove the therom and solve examples.	H	M	M	M					M		L	M			
CO2	students recognize various types of Groups. students solve some examples of different types of Groups	H	M	H	L		L			M			M			
CO3	students apply the knowledge to prove the theorm and solve some examples.	H	M	H	L	L				M		L	M		H	M
CO4	Students interprete Ideals in ring and modules to prove various theorems .	H	L	M	L					M		L	M		H	M
	Course Name: Real Analysis-I															
CO5	Students apply the concept of Uniform convergence to Stone-Weierstrass theorem	H	L	L	L					M		L	M			
CO6	Students apply the knowledge of convergence and continuity of a function to prove some theorems in real analysis	H	M	L	L					M		L	M			
CO7	Students observe the various manifolds and apply their knowledge to differentiable functions and mappings	H	M		L	L				M		L	M			
CO8	Students solve some examples of Lie groups	H	M	L	L					M		L	M			
	Course Name: Topology-I															

CO	Outcome													
CO9	Students recognised countable and uncountable sets and solve some examples in Topological spaces	H	M		L				M		L	M		
CO10	Students recognised the terminologies in Topological spaces and can define bases of topology	H	M		L				M			M		
CO11	Students understood the connectedness and compactness and apply it to continuous functions and homomorphism	H	M		L				M		L	M		
CO12	Students apply the axioms of countability and separbility to understand regular and normal spaces	H			L		L		M		L	M		M
	Course Name: Linear Algebra & Differential Equations													
CO13	Students solve some examples to find transformation matrix, its eigen values and evaluate solution of system of differential equations	H	M		M				M		L	H		
CO14	Students evaluate the system of differential equations with complex eigen values and also with multiplicity eigen values	H	M	M	M				M		L	H		
CO15	Students decomposed the linear operators in diagonalised and nilpotent operators and solve nonhomogeneous linear systems of differential equations	H	M		M				M		L	M		M
CO16	students deal with sinks and sources and identify significance of genericity	H	M		M		L		M		L	M		
	Course Name: Integral Equations													
CO17	Students solve problems to convert ordinary differential equations into integral equations	H	M		H				M		L	H		
CO18	Students identifies various kernals like Green's function type and solve the integral equations	H	M	M	H				M		L	H		

CO	Description														
CO19	Students recognised types of Voltera equations and solve nonlinear Voltera equations, problems on real integral equations and Laplace integral equations	H	M	M	H				M	L	L	H		H	
CO20	Students apply the various types of kernals to study the applications of Hilbert transform and finite Hilbert transform	H	M		H				M		L	H		H	M
	Course Name: Algebra-II														
CO21	Students apply the knowledge of unique factoriation and eqclidean domain.	H	M		L		L		M		L	M			
CO22	Students develop the knowledge of exension fileds and apply it to prove relevent theorems.	H	M		L				M		L	M			M
CO23	Students analysed fundamental theorem of Galois theory to solve various examples	H	M	M	L				M		L	M			M
CO24	Students apply the Galois theory to solve the classical problems	H	M		L		L		M			M			M
	Course Name: Real Analysis-II														
CO25	Students analyse whether given sets /functions are measureble or non mesurable by illustrating their properties	H	M						M			M			
CO26	Students recognizes the importance of Riemann and Lebesgue integral of a bounded function	H	M	M					M			M		H	
CO27	Students analyse and apply Holder and Minkowski inequalities to Lp-spaces and bounded linear functionals on Lp-spaces	H	M						M		L	M			
CO28	Students illustrate their knowledge of compact metric spaces and their types	H	M			L			M		L	M		H	
	Course Name: Topology-II														

CO29	Students apply Urysohn's lemma, Tietze extension theorem to study other results of normal spaces, study the properties of completely regular spaces and with the help of compactness for metric spaces they can study countably compactness and sequentially compactness	H	M		L					M		L	M			M
CO30	Students use the defination of quotient topology to analyse many related results. Net is the generalization of sequence, in that point of view, student can study many results of nets by generalizing the results of sequences. Student can also develop many examples of filters from its defination	H	M		L					M			M			M
CO31	Students can distinguish this product topology into two parts, finite product topology and topology on the product of any number of topological spaces and they justify the nature of these two topologies	H	M		L		M			M		L	M			M
CO32	Students can recognisze that paracompactness is the generalization of compactness and therefore students can generalized the results of compactness into the results of paracompactness with the help of locally finite and discrete families of subsets	H	M		L					M		L	M			M
	Course Name: Differential Geometry															
CO33	Students recognizes concepts of families of curves, their properties and equations	H	M		L					M			M			
C034	Students will be comfortably familiar with orientation, Gauss map, geodesic and parallel transport on oriented surfaces.	H	M		L					M			M			
CO35	Students recognize concepts of surfaces, their properties and equations	H	M		V					M			M			

CO36	Students discuss and understand the importance of concepts of compact surfaces, Hilbert's lemma, two dimensional Riemannian manifolds and solve problems of metrization and continuation	H	M		L				M			M			M
	Course Name: Classical Mechanics														
CO37	Students summaries the fundamental concepts of analytical mechanics	H	M		M				M			H			
CO38	Students illustrate various terminologies in classical mechanics	H	M			L	M		M		L	H			
CO39	Students apply knowledge of the action principle to formulate the problem	H	M		M				M		L	H			
CO40	Students formulate & evaluate solutions of transformation equations	H	M	M	M				M		L	H		H	
	Course Name: Complex Analysis														
C041	students apply knowledge of complex function and illustrate the problems .	H	M		L				M		L	H			
C042	Students interprete the concepts of analyticity, Cauchy-Riemann relations by solving problems and also discuss about zeos of a complex function and represent complex function in Mobius transformation and power series	H	M	M	L				M		L	M			
CO43	Students apply the concept of Cauchy integral theorem and Residue theorem to solve complex integration and recognizes singularity and residue of complex function	H	M		L			L	M		L	H			
CO44	students recognised the theory of maximum principle, convex function and hadamards three circle theorem and pharagmen-lindelof theorem.	H	M		L				M			M			M
	Course Name: Functional Analysis														

CO45	Students illustrate examples of Normed spaces and Banach spaces and also develop the examples of their subspaces	H	M			L	L			M		L	M			M
C046	Students discussed the idea of linear functionals and eloborate theory behind various spaces like dual, Inner product, Hilbert spaces.	H	V			L				M		L	M			M
CO47	Students illustrate concepts and theory of Hilbert spaces, complex vector space, normed space and reflexive space.	H	M			L	L			M		L	M			M
CO48	Students recognised the theory of Category theorem, Uniform boundedness theorem, Open mapping theorem and closed graph theorem	H	M			L				M			M			M
	Course Name: Mathematical Methods															
CO49	Students implement concepts and formulae of Fourier Integrals, fourier Transform to obtain solution of problems and also able to obtain solution of Partial differential equation by Fourier Transform	H	M		M					M		L	H			
CO50	Students apply knowledge of Laplace transform, its properties and inverse Lapalce transform to find solution of ordinary differential equations	H	M	M	M					M		L	H			
CO51	Students evaluate solution of some problems by finite Fourier transform, finite Sturm-Liouville transform	H	M	M	M					M		L	H			
CO52	Students implement knowledge of Finite Hankel transform, finite Legendre transform and finite Mellin transform to solve typical problems	H	M	M	M					M		L	H			M
	Course Name: Fluid Dynamics-I															

CO																			
CO53	Students demonstrate the physical properties of a fluid and solve problems on steady motion	H	M		M	L				M			L	H			
CO54	Students implement their knowledge in two dimentional image systems and develop the proofs of circle theorems	H	M		M					M			L	H			
CO55	Students formulate one, two and three dimentional Wave equation and introduced to spherical, progressive and stationary waves	H	M		M		L			M			L	H		H	
CO56	Students formulate equations of shock waves and analyse it	H	M	M	M					M	L		L	H		H	
	Course Name: General Relativity																	
CO57	Students evaluate and justify the differential forms of tensors	H	M		L					M			L	M			
CO58	Students recognizes the application of the fundamental principles of the general theory of relativity	H	M		L					M				M			
CO59	Students construct important field equations	H	M		L					M			L	M			
CO60	Students evaluate & summaries the solutions of field equations	H	M	M	L					M	L		L	M		H	M
	Course Name: Algebraic Topology-I																	
CO61	Students describe the detailed study of Homotopy theory and its mappings, homotopically equivalent spaces and higher homotopy theory	H	M		L	L				M			L	M			
CO62	Students apply the knowledge to formulate and solve problems which are of a geometrical and topological in nature	H	M	M	L					M			L	M			
CO63	Students demonstrate describe the basic topological results in graph theory and basic results of embedding graphs in surfaces	H	M		L	L				M			L	M			

CO64	Students define and compute homology groups for simple mathematical objects in terms of simplicial complexes	H	M		L				M			M			M
	Course Name: Non-linear Programming-I														
CO65	Students demonstrate the concepts and techniques of non-linear programming for determining optimal solutions to many problems	H	M		L	L			M		L	M			
CO66	Students describe the convex and concave functions, their basic properties, fundamental theorems and evaluate minimization and local minimization problems	H	M		L	L			M		L	V		H	
CO67	Students explains Differentiability of convex and concave functions and their properties	H	√		L	L			M		L	M			
CO68	Students summarises various optimality theorem	H	√		L				M		L	M			M
	Course Name: Operator Theory														
CO69	Students describes spectrum, properties of resolvent and spectrum, also analyse the spectral theorem for bounded linear operators	H	M		L	L			M		L	M			
CO70	Students demonstrate the properties of bounded linear operators on normed, Banach and Hilbert spaces and apply these properties to solve simple problems.	H	M		L	L			M		L	M			
CO71	Students analyse the spectral properties of compact linear operator, solve the operator equations involving compact linear operator and describe theorems of Fredholmtype and its alternative	H	M		L				M		L	M			M
CO72	Students demonstrate spectral properties of various operators and describe spectral family and spectral representation	H	M		L	L			M		L	M			
	Course Name: Elementary Mathematics														

CO	Description														
CO73	Students apply concepts of differentiation to solve different types of problems	H	M		M				M		L	M			
CO74	Students implement concepts of Integration to solve different types of examples	H	M		M				M		L	M			
CO75	Students apply concepts behind determinants and matrices, their types, properties and operations to solve various examples	H	M		M				M		L	M			
CO76	Students implement the knowledge of complex numbers, their geometrical representation, operations and properties to solve relevent examples	H	M		M				M		L	M			
	Course Name: Operation Research-I														
CO77	Students construct a Primal linear programming problem into standard form and evaluate the solution using Simplex method or dual Simplex method	H	M		M				M		L	H		H	
CO78	Students formulate a number of classical assignment problem and transportation problem to evaluate the solutions	H	M		M				M		L	H		H	
CO79	Students understand the best strategy using decision making methods under uncertainty and game theory and determine the best choice using decision tree to evaluate solution of the zero-sum two- person games	H	M		M				M		L	H		H	
CO80	Students illustrate fundamentals of dynamic programming and evaluate the solution of multi-level decision problems using dynamic programming method	H	M		M	L			M		L	H		H	
	Course Name: Dynamical Systems														
CO81	Students develop the knowledge of different theorem on dynamical system.	H	M		L				M		L	M			

CO82	Students recognise the theory and concepts of field of stability of an equilibrium points of dynamical system.	H	M		L				M		L	M		
CO83	students analysed poincare theorem and its application.	H	M		L				M		L	M		
CO84	Students apply the knowledge of asymptotic stability of closed orbits, discrete dynamical system and structural stability.	H	M		L				M		L	M		
	Course Name: Partial Differential Equations													
CO85	Students evaluate solutions of first order PDE by relevent methods	H	M		M				M		L	H		
CO86	Students obtain solution of perticular types of second order PDE	H	M		M				M		L	H		
CO87	Students implement the concepts of Diffusion and parabolic differential equation to obtain their solution	H	M	H	M				M		L	H		
CO88	Students implement the concept of Wave equation to obtain the solutions under given conditions	H	M	H	M				M		L	H		
	Course Name: Advance Numerical Methods													
CO89	Students analyze the error present in any numerical approximation and apply different approaches to the numerical solution of non-linear equations	H	M		H				M		L	H		
CO90	Students apply specific formulae to obtain the numerical solution of various interpolation problems	H	M	H	H				M		L	H		
CO91	Students apply the concepts of Weierstrass and Taylor's theorem to evaluate solution of approximtion problems	H	M	H	H				M		L	H		
CO92	Students apply different numerical integration methods to obtain solution of integration problems	H	M	H	H				M		L	H		
	Course Name: Fluid Dynamics-II													

CO	Description															
CO93	Students demonstrate stress and strain in viscous flow, its analysis, relation between stress and strain, derive the Navier-Stokes equation of motion and solve some exactly solvable problem	H	M	H	H	L			M			L	H			
CO94	Students evalaute the solutions of the problems having the concepts of hydrodynamic process, electromagnetic phenomena in term of Maxwell electromagnetic field equation	H	M		H				M			L	H			
CO95	Students illustrate concepts, properties, conditions and equations in two dimensional boundary layer problem and solve examples on it	H	M	H	H	L			M			L	H		H	
CO96	Students demonstrate detailed information about turbulence flow and solve problems on different conditions	H	M		H	L			M	L		L	H		H	M
	Course Name: Cosmology															
CO97	Students apply the knowledge of physics and geometry of the universe to study structure of the universe	H	M		M				M			L	H			
CO98	Students apply various laws and principles of the universe which are basis of standard cosmology.	H	M		M				M			L	H			
CO99	Students are able to differentiate between present and early stage of the universe.	H	M		M				M			L	H			
CO100	Students formulate and evaluate basic cosmological models of the universe.	H	M	H	M				M	L		L	H		H	M
	Course Name: Algebraic Topology-II															
CO101	Students has knowledge of the advance concepts and methods in algebriac topology	H	M		L				M				M			

CO	Course Outcome																
CO102	Students demonstrate No retraction theorem, Brouwer point theorem and discuss about homology theory, relative homotopy theory and cohomology groups	H	M			L					M		L	M			
CO103	Students demonstrate and discuss the importance of excision theorem, Mayer-Vietoris sequence, Eilenberg-Steenrod axioms for homology theory, relative homotopyn theory, relation between chain and cochain groups	H	M			L	L				M		L	M			M
CO104	Students analyse the important examples of simplicial mapping, chain mappings, cohomology product, cap product, exact sequences in cohology theory and relations between homology and cohomology groups	H	M			L					M		L	M			
	Course Name: Non-linear Programming-II																
CO105	Students implement concept of Duality in non-linear programming for solving many real life problems	H	M			L					M		L	M			
CO106	Students apply various concepts of quasi convex, strictly quasi concave and pseudo convex function to solve science and technology related problems	H	M	M		L					M		L	M			
CO107	Students Develop familiarity with first and second-order optimisation algorithms and gain practical knowledge by implementing the algorithms introduced in the course	H	M			L					M		L	M			
CO108	Students implement advance knowledge to solve many practical problems	H	M	M		L					M		L	M		H	
	Course Name: Advanced Algebra																
CO109	Students illustrate and justify the fundamental concepts of advance algebra and their role in modern mathematics	H	M			L	L				M		L	M			

CO	Description														
CO110	Students demonstrate accurate and efficient use of advanced algebraic techniques	H	M			L	L			M		L	M		
CO111	Students demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from advance algebra	H	M			L	L			M		L	M		
CO112	Students apply theory using advanced algebraic techniques to diverse situations in engineering and other mathematical problems	H	M	L	L					M		L	M		

Course Name: Elementary Discrete Mathematics

CO	Description														
CO113	Students are able to formulate the statements from common language to formal logic truth tables and the rules of proposition to predicate calculus.	H	M		M					M		L	H		
CO114	Students illustrate the concepts, properties, types of Lattices to construct various types of Lattices	H	M		M	L				M		L	H		
CO115	Students implement kowledge of Boolean algebra in boolean expression and switching circuits	H	M		M					M		L	H		
CO116	Students apply the knowledge of graph theory to obtain solution of real life problems	H	M	H	M					M		L	H		

Course Name: Operation Research-II

CO	Description														
CO117	Students distinguish and formulate integer programming problems and evaluate the solution by cutting plane methods	H	M	H	H					M		L	H		H
CO118	Students apply the concepts of of queuing theory to evalaute solution of real life problems	H	M	H	H					M		L	H		H
CO119	Students solve the nonlinear optimization problems using the Kuhn-Tucker optimality conditions	H	M	H	H					M		L	H		H

CO120	Students recognized the importance of generalized linear programming in optimization technique and evaluate the solutions of problems with multiplicity of objectives, which are generally incommensurable and they often conflict each other in a decision making horizon	H	M		H					M		L	H		H	M
	% Attainment	100	100	27.5	95.8	20	0.83	0	0	100	4.17	86.7	100	0	19.2	22.5
	Correlation															

Program Outcomes

Name of Program: M. Sc. Botany

No. Of Courses: 28

Targeted Graduate Attributes: Disciplinary Knowledge, Critical Thinking, Problem Solving, Analytical Reasoning, Communication Skills, Teamwork, Moral and Ethical Awareness

	Program Outcomes
PSO1	Capable of demonstrating comprehensive knowledge and understanding of one or more branches of Botany (discipline) in detail and ability to think critically and clearly about the plant world.
PSO2	Ability to analyse and critical thinking of the basic concepts of different morphological, anatomical, reproductive, cytological, physiological and molecular characters of the plants.
PSO3	After successful completion of the projects ability is developed to undertake supervised research, identification of research questions, critical analysis of the literatures and enhance research related skills in laboratory practices, which are tested in all forms of assessment.
PSO4	Develop the problem solving capacity to identify and define the problem, generating alternative solutions, evaluating and selecting the best alternative, and implementing the selected solution.
PSO5	Professional skills such as identification and classification of all forms of plant kingdom, Gardening, Farming and other related career competencies that often are not taught (or acquired) as part of the Subject.
PSO6	Acquired the knowledge of biotic and abiotic factors, critical thinking of economics, aesthetic and biological importance of preserving local resources and reducing or eliminating the harmful impacts of manmade alterations and could take a step towards the conservation of nature and environmental awareness.
PSO7	Ability to analyse the biological information by using different bio-informatics tools through ICT facilities and can compose the clear information through writing and other media on various digital platforms that can be assessed instantly.

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PSO8	Ability to present data clearly in standard, academic language and present the information in a clear and concise manner which helps to improve the communication skills.
PSO9	Field tours and Excursions develop the ability to identify the plants and to know the real habit and habitat of plant wealth which induces the capacity of working effectively as a team, formulating and inspiring vision.
PSO10	After understanding the plant science in detail, it enhance to think lifelong about the world around us, provide better opportunities and improve our quality of life
PSO11	Field tours and Ethanobotanical survey develop responsible behaviour and ability to engage in the intellectual life of the educational institution, and participate in community by various activities like mushroom cultivation, preparation of biofertilisers and other civic affairs.
PSO12	Capable of demonstrating the ability to identify ethical issues related with Intellectual Property Rights, copyright etc. and an ability to think about well-being of others, public safety.

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Program Matrix

Name of Program: M. Sc. Botany

(Low Correlation = L/1 ; Moderate Correlation = M/2 ; High Correlation = H/3)

Course Outcomes (COs)		Program Outcomes (POs)											
		Domain Specific (PSO)				Domain Independent (PO)							
	Course Name: Microbiology, Algae and Fungi	1	2	3	4	5	6	7	8	9	10	11	12
CO1	Ability to understand at the basic and advance levels of knowledge of general microbiology, bacteria, viruses and archebacteria.	H	L	-	-	-	-	-	-	-	L	-	-
CO2	Capability to critically analyze the criteria for classification of algae, diversified habitats and its uses	H	-	-	L	M	-	-	-	-	L	-	-
CO3	Ability to study the classification and identification of Fungi with evolutionary trends	H	-	-	-	M	-	-	-	-	L	-	-
CO4	Knowledge of different classes of fungi and their pathological effects on plants.	H	L	-	L	-	-	-	-	-	L	-	-
	Course Name: Bryophytes & Pteridophytes												
CO1	Understand the distribution and monographic studies of Bryophytes	H	M	-	-	-	-	-	-	-	L	-	-
CO2	Ability to read and analyse the different classes of Bryophytes	H	L	-	L	M	-	-	-	-	L	-	-
CO3	Understand the general characters and different classes of Pteridophytes	H	M	-	-	M	-	-	-	-	L	-	-
CO4	Ability to understand the evolutionary trends of Pteridolyta	H	L	-	L	-	-	-	-	-	L	-	-
	Course Name: Paleobotany and Gymnosperms												
CO1	Ability to think and understand fossils formation, history, preservation and geological time scale	H	-	-	L	-	-	-	-	-	L	-	-
CO2	Understand the origin of gymnosperm, evolution and classification	H	L	-	-	-	-	-	-	-	L	-	-

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CO3	Ability to read type studies of gymnosperms and analyze relationship of various gymnosperms	H	M	-	L	-	-	-	-	-	L	-	-
CO4	Ability to classify the gymnosperm. Also get the knowledge about their economic importance	H	L	-	L	M	-	-	-	-	L	-	-
	Course Name: Cytology and Genetics												
CO1	Capable of understanding comprehensive knowledge of major concepts, principles, theories and laws of inheritance and types of chromosomal inheritance patterns	H	L	-	-	-	-	-	-	-	L	-	-
CO2	Develop learning methods of cytoplasmic inheritance and chromatin organization.	H	-	-	-	-	-	-	-	-	L	-	-
CO3	Knowledge of population genetics	H	-	-	-	-	-	-	-	-	L	-	-
CO4	Understand the concept of mutations and epigenetics	H	-	-	-	-	-	-	-	-	L	-	-
	Course Name: Practical-I: Algae, fungi, Bryophytes												
CO1	To develop the skill of identification of Algae, fungi, bacteria, bryophytes	H	M	-	-	H	-	-	H	H	L	-	-
CO2	Skill being developed to identify and classify the fungi into different classes	H	M	-	-	H	-	-	H	H	L	-	-
CO3	Capability to identify the disease caused by bacteria and fungi	H	M	-	-	H	-	-	H	H	L	-	-
CO4	Develop the ability to identify the bryophytes and to study its diversity	H	M	-	-	H	-	-	H	H	L	-	-
	Course Name: Practical-II: Pteridophytes, Gymnosperms, Paleobotany, Cytology & Genetics						-						
CO1	Acquire knowledge and skills of identification of pteridophytes	H	M	-	-	H	-	-	H	H	L	-	-
CO2	Develop abilities to identify and classify gymnosperms	H	M	-	-	H	-	-	H	H	L	-	-
CO3	Identification of various types of fossils and their reconstruction	H	L	-	-	H	-	-	H	H	L	-	-
CO4	Enhance the experimental skills in cytology and develop the capacity to solve the genetic problems systematically	H	M	-	M	-	-	-	H	H	L	-	-
	Course Name: Seminar												

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SI	Develop the communication skills, increase the leading ability and acquainted with the thorough knowledge of the topic	L	L	-	L	-	-	L	M	-	M	-	-
	Semester II												
	Course Name: Plant Physiology and Biochemistry												
CO1	Ability to understand the concept of photosynthesis and respiration and enhance experimental skills	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Capability to critically analyze the plant hormones and sensory biology	H	H	-	L	-	-	-	-	-	L	-	-
CO3	Develop the abilities on the aspects of enzymatic activities of different components in plants	H	H	-	-	-	-	-	-	-	L	-	-
CO4	Acquire knowledge and skills of different metabolic components	H	H	-	-	-	-	-	-	-	L	-	-
	Course Name: Plant Development and Reproduction												
CO1	Understanding the basic growth kinetics and growth patterns in plants	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Capable to know the developmental processes occur in different parts of the plants	H	H	-	-	-	-	-	-	-	L	-	-
CO3	Learn various steps of the plant reproduction process and barriers in detail	H	H	-	-	-	-	-	-	-	L	-	-
CO4	Understanding the fruit development, senescence and program cell death	H	H	-	-	-	-	-	-	-	L	-	-
	Course Name: Cell and Molecular Biology-I					-							
CO1	Ability to understand the basic concept of cell wall and membrane architecture structure and their roles	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Understanding of different cellular organelles and problem solving skills under various circumstances	H	H	-	-	-	-	-	-	-	L	-	-
CO3	Ability to know the structure of nucleus and the DNA and critically thinking of their importance in living cells	H	H	-	-	-	-	-	-	-	L	-	-
CO4	Understanding the concept of stress biology and ability to develop practical applications to overcome problems	H	H	-	-	-	L	-	-	-	L	-	-

		1	2	3	4	5	6	7	8	9	10	11	12
	Course Name: Angiosperms-I and Ethnobotany												
CO1	Ability to learn and describe the basic structure of flowers, to identify and classify the plants based on their structure	H	H	-	-	L	-	-	-	-	L	-	-
CO2	Understanding and developing research related skills of the angiosperm taxonomy	M	L	-	L	-	-	-	-	-	L	-	-
CO3	Ability to read and analyze the taxonomic evidences and different tools for identification	H	M	-	L	-	-	-	-	-	L	-	-
CO4	Acquired the knowledge of biosystematics and ethnobotany	H	-	-	-	-	-	-	-	-	L	M	L
	Course Name: Practical-I: Plant Physiology, Plant Biochem., Plant Development & Reproduction												
CO1	Ability to perform and test the enzymatic activities of different components	H	H	-	M	-	-	-	H	-	L	-	-
CO2	Develop the ability to isolate and analysis of different plant components	H	H	-	M	-	-	-	H	-	L	-	-
CO3	Ability to know the mechanism of the growth and differentiation of plant parts	H	H	-	L	-	-	-	H	-	L	-	-
CO4	Learn to use biomolecules for flower formation, seed setting and senescence effects and applying this knowledge in daily life	H	H	-	L			-	H	-	L	-	-
	Course Name: Practical-II: Cell and Molecular Biology I, Angiosperms I												
CO1	Develop the skills to perform cell and molecular biology experiments	H	H	-	M	-	-	-	H	-	L	-	-
CO2	Develop the ability to apply the techniques of stress related problems in plants	H	H	-	M	-	-	-	H	-	L	-	-
CO3	Ability to identify and describe the morphological characters of the different categories of plants	H	H	-	M	L	-	-	H	H	L	L	-
CO4	Develop the capacity to distinguish the plants on the basis of various angiospermic feature	H	H	-	M	L	-	-	H	H	L	L	-

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	Course Name: Seminar												
S1	Create ability to manifest ideas and thoughts in writing and orally to communicate confidently their viewpoints	L	L	-	M	-	-	L	M	-	M	-	-
	Semester III												
	Course Name: Plant Ecology and Conservation Biology												
CO1	Understanding the concept of various types of vegetational organization, analysis of communities and their functions.	H	-	-	-	-	H	-	-	-	L	-	-
CO2	Understanding the structure and function of ecosystem and ability analyse productivity of various ecosystems	H	-	-	-	-	H	-	-	-	L	-	-
CO3	Developing skills in environmental impact assessment, critical thinking of sustainable development of ecosystems, environmental	H	-	-	L	-	H	-	-	-	H	-	L
CO4	Use environmental resources with care and protect them from degradation	H	-	-	-	-	H	-	-	-	H	-	L
	Course Name: Angiosperms-II												
CO1	Ability to read and analyse the different morphological characters for identification of plants at family level	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Capability to critically analyze the characters for distinguishing the angiosperm plant groups	H	M	-	L	L	-	-	-	-	L	-	-
CO3	Study of ancestors of angiosperms and different IUCN categories of threat to bring awareness of their status in nature for conservation point of view	H	M	-	-	-	-	-	-	-	L	-	-
CO4	Understanding and analyzing the concept of plant biodiversity, its role, stability and its importance; to identify hotspots of plants	H	-	-	-	-	M	-	-	-	L	-	L
	Course Name: Elective -I												
	Molecular Biology and Plant Biotechnology – I												
CO1	Learning the mechanism of DNA replication, damage and repair at molecular level and factors responsible for damage	H	H	-	-	-	-	-	-	-	L	-	-

CO2	Understanding the recent techniques and tools of recombinant DNA technology and molecular probing	H	H	-	-	-	-	-	-	-	L	-	-
CO3	Learn to know the concept of polymerase chain reaction and rDNA techniques and its applications	H	H	-	L	-	-	-	-	-	L	-	-
CO4	Ability to use and analyse the concept of proteomics, genomics and various bioinformatics tools	H	H	-	-	-	-	H	-	-	L	-	-
	Reproductive Biology of Angiosperms –I												
CO1	Understanding the structure of male reproductive parts- anther and its significance as experimental material	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Ability to read, understand and analyze different functional aspects of pollen fertility and sterility and factors which influence them	H	H	-	L	-	-	-	-	-	L	-	-
CO3	Understanding the concept of megasporogenesis, types of embryo sac, nutritional aspects for growth of embryo sac	H	H	-	-	-	-	-	-	-	L	-	-
CO4	Learn to know the different types of pollination and pollen-pistil interactions, ability to overcome incompatability problems in plants	H	H	-	-	-	-	-	-	-	L	-	-
	Advanced Phycology and Hydrobiology - I												
CO1	Ability to understand the molecular mechanism of biological nitrogen fixation, biofertilizer sysnthesis and their implications	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Understand the application of biofertilizers using some important species of bacteria and cyanobacteria	H	-	-	-	-	-	-	-	-	L	-	-
CO3	Learn to know the characters of different classes of eukaryotic algae, economic uses of algae	H	L	-	-	-	-	-	-	-	L	-	-
CO4	Understanding about the Industrial products from algae of marine and freshwater	H	-	-	-	-	-	-	-	-	L	-	-
	Paleobotany - I												
CO1	Ability to know about the basic of science of Petrology	H	L	-	-	-			-	-	L	-	-
CO2	Understand the Geological column, time scale and nomenclature	H	L	-	-	-			-	-	L	-	-

CO	Description												
CO3	Learn to know about how the Land Turned Green and Evolution of Microphyllous plants	H	L	-	-	-	-	-	-	-	L	-	-
CO4	Understanding the Diversity of Devonian time flora	H	-	-	-	-	-	-	-	-	L	-	-
	Mycology and Plant Pathology – I												
CO1	Acquire the knowledge of general microbiology.	H	-	-	-	-	-	-	-	-	L	-	-
CO2	Understanding the concept of mycorrhiza and medical mycology.	H	L	-	-	-	-	-	-	-	L	-	-
CO3	Ability to analyse the production of metabolites from fungi	H	L	-	L	-	-	-	-	-	L	-	-
CO4	Understanding the commercial uses of fungi for human welfare.	H	-	-	-	-	-	-	-	-	L	-	L
	Plant Physiology – I												
CO1	Understanding the plant growth and development in detail	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Ability to read and analyse the growth regulators, inhibitors and their commercial applications	H	H	-	-	-	-	-	-	-	L	-	L
CO3	Develop the ability to know the concept of different aspects of seed physiology and its commercial applications	H	H	-	-	-	-	-	-	-	L	-	L
CO4	Ability to understand the basic concepts of stress physiology and its applications	H	H	-	-	-	-	-	-	-	L	-	-
	Palynology – I												
CO1	Understanding the general aspects of palynology	H	M	-	-	-	-	-	-	-	L	-	-
CO2	Learn pollination biology and the concept of paleopalynology and its applications	H	M	-	-	-	-	-	-	-	L	-	-
CO3	Understand the pollen morphology of angiosperms and identifying different types of pollen under light and Electron microscopy	H	M	-	-	-	-	-	-	-	L	-	-
CO4	Learn and analyse the concepts of melittopalynology, analysis of honey quality and adulteration from commercial aspect.	H	M	-	-	L	-	-	-	-	L	-	L
	Course Name: Foundation I												

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CO1	Skills being developed typically form part of the typical vocations requirements	H	-	-	L	M	-	-	-	-	M	M	L
CO2	Enhance understanding of the world around us, provide better opportunities and improve our quality of life	H	-	-	-	M	-	-	-	-	M	M	-
CO3	Career competencies that often acquired as part of the Subject	L	-	-	-	M	-	-	-	-	M	M	-
CO4	Creating and maintaining a positive attitude to learning both for personal and professional development	L	-	-	-	-	-	-	-	-	M	M	-
	Course Name: Practical-I: Plant Ecology and Conservation Biology and Angiosperms II												
CO1	Develop the ability to perform ecological experiments and build up the skill of solving biostatistical problems systematically	H	-	-	M	-	H	-	H	H	L	-	-
CO2	Ability to learn and apply the knowledge of conservation methods	H	-	-	L	-	H	-	H	M	L	-	-
CO3	Capability to identify and classify plants properly by regular field visits	H	M	-	M	M	-	-	H	H	L	-	-
CO4	Develop the ability to use floras and herbarium for plant identification	H	M	-	M	M	-	-	H	L	L	-	-
	Course Name: Practical-II: Elective												
	Molecular Biology and Plant Biotechnology – I												
CO1	Ability to develop skills by perform the techniques of molecular biology experiments	H	H	-	M	-	-	-	H	-	L	-	-
CO2	Ability to use the different bioinformatics tools for analysing molecular biological data	H	H	-	M	-	-	H	H	-	L	-	-
CO3	Developing skills to perform the techniques of rDNA technology	H	H	-	M	-	-	-	H	-	L	-	-
CO4	Ability to develop plants in the laboratory by plant tissue culture techniques and commercial applications for micropropagation	H	L	-	M	-	-	-	H	-	L	-	-
	Reproductive Biology of Angiosperms –I												

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CO1	Ability to study the microtome permanent preparations of reproductive parts	H	L	-	M	-	-	-	H	-	L	-	-
CO2	Develop the skill to perform the different techniques of palynological experiments	H	L	-	M	-	-	-	H	-	L	-	-
CO3	Develop the skill to perform the different techniques of embryological experiments	H	L	-	M	-	-	-	H	-	L	-	-
CO4	Ability to perform plant tissue culture techniques	H	L	-	M	-	-	-	H	-	L	-	-
	Mycology and Plant Pathology – I												
CO1	Acquired the knowledge of drawing Camera Lucida diagrams and computer based photomicrography	H	L	-	M	-	-	-	H	-	L	-	-
CO2	Ability to isolate and identify the fungi from mycoflora	H	L	-	M	-	-	-	H	L	L	-	-
CO3	Ability to identify the plant diseases caused by various pathogens and its remedies	H	L	-	M	-	-	-	H	H	L	-	-
CO4	Develop the ability to identify and prepare the herbarium of pathological specimens	H	L	-	M	-	-	-	H	L	L	-	-
	Advanced Phycology and Hydrobiology - I												
CO1	Develop the ability to isolate, culture and identify the different types bacteria	H	L	-	M	-	-	-	H	L	L	-	-
CO2	Develop the ability to isolate, culture and identify the different types cyanobacteria	H	L	-	M	M	-	-	H	L	L	-	-
CO3	Develop the ability to identify the different types algae belongs to Protochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta	H	L	-	L	M	-	-	H	L	L	-	-
CO4	Develop the ability to identify the different types algae belongs to Pheophyta and Rhodophyta	H	L	-	L	M	-	-	H	L	L	-	-
	Paleobotany - I												
CO1	Learn the techniques to study fossils.	H	L	-	M	-	-	-	H	L	L	-	-
CO2	Develop the ability to Study of different rocks.	H	L	-	M	-	-	-	H	M	L	-	-
CO3	Study of Geological column and time scale.	H	L	-	-	-	-	-	H	-	L	-	-
CO4	Ability to observe the different types of fossils.	H	L	-	L	-	-	-	H	M	L	-	-
	Plant Physiology – I												

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CO1	Learn the techniques of estimation of different secondary metabolites from plants	H	M	-	M	-	-	-	H	-	L	-	-
CO2	Demonstration of effects of different plant growth regulators for commercial purpose	H	L	-	L	-	-	-	H	-	L	-	-
CO3	Ability to critically analyse the effects of different chemicals on seed germination by breaking seed dormancy	H	M	-	M	-	-	-	H	-	L	-	-
CO4	Ability to critically analyse the effects of different radiations on seed germination and seedling growth	H	M	-	M	-	-	-	H	-	L	-	-
	Palynology – I												
CO1	Skill of field study on different pollination mechanism	H	M	-	L	-	-	-	H	L	-	-	-
CO2	Ability to perform different techniques to study the pollen morphology	H	L	-	M	-	-	-	H	-	L	-	-
CO3	Perform the experiments of aero-palynology, melittopalynology and paleopalynology	H	L	-	M	-	-	-	H	-	L	-	-
CO4	Ability to analyse the different techniques to study the pollen physiology and ecology of various plants	H	L	-	M	-	-	-	H	-	L	-	-
	Course Name: Seminar												
S1	Ability to improve language and subject communicating skills effectively.	L	L	-	M	-	-	L	M	-	L	-	-
	Semester IV												
	Course Name: Cell and Molecular Biology-II												
CO1	Ability to understand the concepts of transcription and translation in prokaryotes and eukaryotes at molecular level.	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Understanding and analyzing the different concepts of genes and regulation of gene expression	H	H	-	-	-	-	-	-	-	L	-	-
CO3	Ability to know the genome organization, genetic recombination and mapping in various organisms	H	H	-	-	-	-	-	-	-	L	-	-
CO4	Understanding the concept of signal transduction and different techniques in cell biology	H	H	-	-	-	-	-	-	-	L	-	-
	Course Name: Plant Biotechnology and Plant Breeding												

CO	Description												
CO1	Ability to analyse the concept of recombinant DNA technology and genetic engineering of plants	H	H	-	-	L	-	-	-	-	L	-	-
CO2	Understand the concept of genomics and proteomics	H	H	-	-	-	-	-	-	-	L	-	-
CO3	Learn to know the different aspects of Plant tissue culture techniques and transgenics production	H	H	-	L	L	-	-	-	-	M	-	-
CO4	Ability to analyse the different aspects of bioinformatics and methods of plant breeding	H	H	-	L	L	-	H	-	-	H	-	L
	Course Name: Elective – II												
	Molecular Biology and Plant Biotechnology - II												
CO1	Learn to know the production and applications of transgenics.	H	H	-	L	L	-	-	-	-	M	-	-
CO2	Understanding transgenics and application of transformation and molecular farming	H	H	-	-	-	-	-	-	-	M	-	-
CO3	Learn to know the advanced aspects and techniques of Plant tissue culture in details	H	H	-	-	-	-	-	-	-	M	-	-
CO4	Ability to analyse the concept of DNA fingerprinting, marker assisted breeding and cleaner biotechnology and its applications	H	H	-	-	-	M	-	-	-	M	-	-
	Reproductive Biology of Angiosperms -II												
CO1	Understanding the mechanism of fertilization in angiosperms	H	H	-	-	-	-	-	-	-	L	-	-
CO2	Ability to read and analyse the concept of embryogenesis and polyembryony	H	H	-	-	-	-	-	-	-	L	-	-
CO3	Understanding the concept of apomixes, parthenocarpy and scope of biotechnology	H	H	-	-	-	-	-	-	-	L	-	-
CO4	Learn to know the advanced aspects of Plant tissue culture techniques in reproductive biology	H	H	-	-	L	-	-	-	-	M	-	-
	Advanced Phycology and Hydrobiology - II												
CO1	Ability to understand the basic concept of algal physiology and their cultivation	H	H	-	-	L	-	-	-	-	M	-	-
CO2	Learn to know about different physico-chemical factors of some freshwater and marine ecosystems	H	H	-	-	-	-	-	-	-	L	-	-

CO3	Understand the phytoplanktons and identifying various components of phytoplanktons.	H	L	-	L	-	-	-	-	-	L	-	-
CO4	Ability to read and analyse the ecology and environmental biotechnology of freshwater and marine community	H	L	-	-	-	-	-	-	-	L	-	-
	Paleobotany - II												
CO1	Ability to understand the characters of Progymnospermopsida, Gymnospermopsida and Palaeozoic Gymnosperm	H	H	-	-	-	-	-	-	-	-	-	-
CO2	Ability to know about diversification in Primitive Gymnosperm	H	L	-	-	-	-	-	-	-	-	-	-
CO3	Learn to know about the concept of Deccan Intertrappean flora of India and floristic composition in relation to Pteridophytes, Gymnosperms and Angiosperms	H	L	-	-	-	-	-	-	-	-	-	-
CO4	Ability to understand about Paleopalynology, Paleoecology and paleogeography and its commercial applications	H	L	-	-	-	-	-	-	-	-	-	-
	Mycology and Plant Pathology - II												
CO1	Acquired the knowledge of milestones in phytopatyhalogy of India	H	-	-	-	-	-	-	-	-	-	-	-
CO2	Understanding the principles of plant pathology	H	H	-	-	-	-	-	-	-	L	-	-
CO3	Ability to analyse the diseases caused by fungal pathogens with effective control measures.	H	H	-	-	-	-	-	-	-	L	-	-
CO4	Understanding the plant diseases caused by bacteria, virus, mycoplasma and nematode and their remedies.	H	H	-	-	-	-	-	-	-	L	-	-
	Plant Physiology – II												
CO1	Ability to analyse the structure and role of secondary metabolites in plants	H	H	-	-	-	-	-	-	-	-	-	-
CO2	Ability to use the knowledge of leaf protein, industrial fermentation and biodiesel fermentation for field applications.	H	H	-	-	-	-	-	-	-	M	-	-

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Botany BOS chair man

CO3	Develop the ability to know the concept of neuro or electro physiology and signal transduction in plants	H	H	-	-	-	-	-	-	-	-	-	-
CO4	Ability to understand the basic concepts of nano-biotechnology and its importance.	H	H	-	-	-	-	-	-	-	-	-	-
	Palynology – II												
CO1	Understanding the concept of pollen physiology and biochemistry.	H	H	-	-	-	-	-	-	-	-	-	-
CO2	Learn pollen biotechnology for crop improvement and forensic palynology.	H	M	-	-	-	-	-	-	-	M	-	-
CO3	Understand the concept of aerobiology and its applications	H	L	-	-	-	-	-	-	-	-	-	-
CO4	Learn and analyse the air borne allergens and diagnosis of allergic diseases	H	L	-	-	-	-	-	-	-	-	-	-
	Foundation II												
CO1	Learn new things which helps in social change and other life-affirming endeavours	H	-	-	-	M	-	-	-	-	L	-	-
CO2	Ability to transfer such skills in other domains of one's life and work	H	-	-	-	M	-	-	-	-	M	-	-
CO3	Ability to retain and build on critical reading skills	L	-	-	-	-	-	-	-	-	L	-	-
CO4	Develop some entirely new skills in plant science that will help in some way to enhance life style.	M	-	-	-	H	-	-	-	-	H	-	-
	Course Name: Practical-I: Cell and Molecular Biology-II, Plant Biotechnology and Plant Breeding												
CO1	Learn to develop skills in molecular biology experiments for protein and DNA isolation, separation, purification and applications	H	H	-	M	-	-	-	H	-	L	-	-
CO2	Ability to perform in vitro Transcription, Translation and Conjugation	H	H	-	M	-	-	-	H	-	L	-	-
CO3	Ability to study immunological techniques for diagnosis and disease identification.	H	H	-	M	-	-	-	H	-	L	-	-
CO4	Ability to learn the techniques of chromatography for	H	H	-	M	-	-	-	H	-	L	-	-

	analysis bio-molecules												
	Course Name: Practical-II: Project												
CO1	Capable of self-paced and self-directed learning aimed at improving practical knowledge and research skills and problem solving ability	H	H	H	H	-	-	-	L	-	M	-	-
CO2	Ability of intensive search, investigation, and critical analysis, usually in response to a specific research question or hypothesis.	H	H	H	H	-	-	-	H	L	M	-	-
CO3	Research literature survey and other research tasks are expected to develop a degree of creativity, originality to students are encouraged	H	M	H	H	-	-	L	L	-	M	-	-
CO4	Enhance skills in research and analysis, which are tested in all forms of assessment	H	L	H	H	L	-	-	H	-	M	-	-
	Course Name: Seminar												
S1	Ability to speak and present data clearly in standard academic language form.	L	L	-	L	-	-	L	M	-	M	-	-

T.Srinivan
(T.SRINIVASO)
Botany BOS chairman

Dr. T. Srinivasu
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PROGRAM OUTCOMES
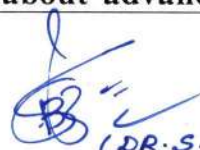
NAME OF PROGRAM: M. Sc. Zoology

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

No. Of Courses: 28

Targeted Graduate Attributes: Disciplinary Knowledge, Critical Thinking, Problem Solving, Analytical Reasoning, Communication Skills, Teamwork, Moral and Ethical Awareness

	Program Outcomes
PO1	Students will able to develop aptitude to manifest wide and extensive knowledge in the field of zoology and life science
PO2	They able to understand the importance of conservation and biodiversity rich environment. Based on this knowledge student can achieve the better opportunity in this field as a scientist, conservationist, taxonomist in the related government (ZSI) and non-government institutions
PO3	This programme will help to provide correct information about related condition of the living organisms including human to the pharmacologist to develop accurate drugs. This knowledge will provide job opportunities in the field of research, pharmaceutical industries, laboratories & teaching.
PO4	Students will understandthe detailed structure & function of the cell at molecular level & acquire the knowledge which will help them to work in the field of research, genetic counselling and lab technician.
PO5	Students will gain the knowledge about advance reproductive technique such as cryopreservation,

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	test-tube baby, in-vitro fertilization, MOET, ICSI, GIFT&ZIFT so that they can join the respective laboratories in this field for practical training & avail better carrier opportunities.
PO6	The study will help them to discover the new species & understand the evolutionary Significance of the vertebrates. This study will also help them to know the importance of the local animals in the ecosystem.
PO7	By acquiring the knowledge of endocrinology students will able to understand & correlate the hormonal regulation of different systems in the body of different animals so that they can work under the guidance of medical endocrinologist & in pathological laboratories.
PO8	With the basic knowledge of molecular biology & biotechnology the students can join the laboratories which provides practical training or workshops for their carrier opportunities & employability in this field.
P09	Students will be able to identify & classify different types of birds & learn their conservation methods. They will also learn about the radiation and its impact on human & other animals and their biological clock.

Program Matrix

Name of Program: M. Sc. Zoology

(Low Correlation = L; Moderate Correlation = M; High Correlation = H)

Course Outcomes (COs)		Program Outcomes (POs)								
		Domain Specific (PSO)								
	Course Name:	1	2	3	4	5	6	7	8	9
	Structure and Function of Invertebrates									
CO1	Students able to **classify** the animals based on morphological and genetic taxonomic parameters.	H	H	M	M	M	H	L	L	L
CO2	Student will **understand** ultrastructure of protozoan locomotary organs and modes of locomotion in protozoans.	H	M	M	H	M	M	M	M	L
CO3	The students will be able to **classify** the poriferans based on different types of spicules	H	H	M	M	M	M	M	M	L
CO4	This study will help the students **to differentiate** between zooids in the coelenterate colonies, **classify** them accordingly	H	H	M	M	M	M	M	M	L
CO5	The study will help them to discover the new species and **understand** origin of life on earth and the evolutionary **Significance** of the metazoans.	H	H	M	M	M	H	M	M	L

CO6	The students will be able **gain knowledge** the Reproductive systems in Platyhelminthes and Aschelminthes.	H	M	M	M	M	M	M	M	L
CO7	The study of **Significance** of Coelom, Symmetry and Metamerism in Animal classification helps to **classify** the animals based on their structural development.	H	M	M	M	M	M	M	M	L
CO8	By Studying Evolution of nephridia students will be able **gain knowledge** the mechanism of excretion in Annelids	H	M	M	H	M	M	M	M	L
CO9	Study of taxonomic position of Peripatus will help the student to **understand** the evolutuionary **Significance** of phylum arthropoda and its affinities with annelida.	H	M	M	M	M	H	M	M	L
CO10	Study of taxonomic position of Peripatus will help the student to **understand** the evolutuionary **Significance** of phylum arthropoda and its affinities with annelida.	H	M	M	M	M	H	M	M	L
CO11	Study of taxonomic position of Neopilina helps the students to **understand** the connecting link between the annelida and mollusca	H	M	M	M	M	H	M	M	L
CO12	Neuroanatomy in selected group of Molluscs will help the student to **understand** the nervous system of mollusca.	H	M	M	H	M	M	M	M	L
CO13	By studying water vascular system in Echinodermata students will be able to **understand** the locomotion and feeding in echinodermata	H	M	M	H	M	M	M	M	L
CO14	Students will be able **gain knowledge** general account and affinities of Ctenophora, Rotifera, Entoprocta and Ectoprocta.	H	M	M	H	M	M	M	M	L
	General Physiology									
CO1	Students will **understand** the classification, mechanism of action of enzymes and regulation of enzyme activity.	H	M	M	H	M	M	M	M	L

CO2	The students will able to **understand** the respiratory mechanism of animals at cellular level	H	M	M	H	M	M	M	M	L
CO3	Students will be able to **understand** the chemical nature, biosynthesis and mechanism of action of neurotransmitters.	M	M	H	M	M	M	M	M	L
CO4	**Gain knowledge** and **understand** the colour change mechanism in different groups of animal	H	M	H	M	M	M	M	M	L
CO5	To **understand** the mechanism of bioluminescence in invertebrates and vertebrates	H	M	H	M	M	M	M	M	L
CO6	Able **gain knowledge** the mechanism of thermoregulation in poikilotherms and homeotherms	H	M	M	H	M	M	M	M	L
CO7	To gain the **knowledge** about the process of osmoregulation in pisces and amphibians	H	M	M	H	M	M	M	M	L
CO8	Learn and **understand** the molecular mechanism of peptide and steroid hormonal action and signal transduction	H	M	M	H	M	M	M	M	L
CO9	Learn and able to **understand** the myogenic and neurogenic heart and cardiac cycle.	H	M	M	H	M	M	M	M	L
CO10	Able **gain knowledge** the mechanism of digestion and absorption of carbohydrates, proteins and lipids along GI tract.	H	M	M	H	M	M	M	M	L
CO11	Student will acquire the **knowledge** of physiology of carbohydrate and lipid metabolism.	H	M	M	H	M	M	M	M	L
CO12	To **understand** the physiology of hydromineral metabolism.	H	M	M	H	M	M	M	M	L
CO13	Learn and **understand** the chemistry and function of cerebrospinal fluid	H	M	M	H	M	M	M	M	L

CO	Description									
CO14	To evaluate and learn the mechanism of reflex action	H	M	M	H	M	M	M	M	L
CO15	Student will able gain knowledge the physiology of environmental stress and strain.	H	M	M	H	M	M	M	M	L
	Cell Biology and Genetics									
CO1	To understand the structure and function of biological membranes	H	M	M	H	M	M	M	M	L
CO2	To understand and learn structure and the function of cell organelles.	H	M	M	H	M	M	M	M	L
CO3	Student will able gain knowledge the structure and function of cytoskeleton.	H	M	M	H	M	M	M	M	L
CO4	Learn and gain the knowledge of cell division and cell cycle.	H	M	M	H	M	M	M	M	L
CO5	Learn and gain the knowledge of cell signalling , receptor proteins	H	M	M	H	M	M	M	M	L
CO6	Learn and gain the knowledge of signal transduction pathways and its regulation	H	M	M	H	M	M	M	M	L
CO7	Learn and gain the knowledge of Cellular communication	H	M	M	H	M	M	M	M	L
CO8	Gain knowledge and understand the genetics of cancer	H	M	M	H	M	M	M	H	L
CO9	Student will be able gain knowledge the mendelian and non-mendelian inheritance	H	M	M	H	M	M	M	M	L

CO10	Able **gain knowledge** the extension of Mendelian principles and Quantitative genetics.	H	M	M	H	M	M	M	M	L
CO11	Learn and gain the **knowledge** of Types, causes and detections of Mutations	H	M	M	H	M	M	M	H	L
CO12	Student will able to **understand** the structural and numerical alterations of chromosomes	H	M	M	H	M	M	M	M	L
CO13	Student will able to **understand** the extra chromosomal inheritance	H	M	M	H	M	M	M	M	L
CO14	Learn and gain the **knowledge** of Microbial genetics	H	M	M	H	M	M	M		L
CO15	Learn and gain the **knowledge** of Human genetics	H	M	M	M	M	M	M	M	L
	Advanced Reproductive Biology									
CO1	Learn the different methods of asexual and sexual reproduction in protozoans	H	M	M	M	M	M	M	M	L
CO2	Learn the process of regeneration in Hydra, Dugesia and Annelid worms	H	M	M	M	M	M	M	M	L
CO3	Learn the process of metamorphosis and vitellogenesis in insects	H	M	M	M	M	M	H	M	L
CO4	To **understand** mechanism of spermatogenesis and oogenesis	H	M	M	M	H	M	H	M	L
CO5	**Gain knowledge** the mechanism of cytological and molecular events of fertilization.	H	M	M	M	H	M	H	M	L

CO6	To **understand** the process of cleavage, blastulation, gastrulation and embryonic induction.	H	M	M	M	H	M	H	M	L
CO7	**Gain knowledge** and **understand** the male accessory sex glands.	H	M	M	M	H	M	H	M	L
CO8	To **understand** the biochemical composition of semen and abnormality of sperm	H	M	M	M	H	M	H	M	L
CO9	**Gain knowledge** the mechanism of sperm capacitation and decapacitation	H	M	M	M	H	M	H	M	L
CO10	To **understand** the pheromones and sexual behaviour of mammals.	H	M	M	M	H	M	H	M	L
CO11	To able **gain knowledge** the neurohormonal control of fish reproduction and mechanism of vitellogenesis in fishes.	H	M	M	M	M	M	H	M	L
CO12	**Gain knowledge** the mechanism of Morphogenetic gradient and organizer concept	H	M	M	M	M	M	H	M	L
CO13	**Gain knowledge** the mechanism of cryopreservation of gametes, embryo and test tube baby	H	M	M	M	H	M	M	M	L
CO14	**Gain knowledge** the mechanism of In vitro fertilization and its **Significance**	H	M	M	M	M	M	H	M	L
	Structure and function of vertebrates									
CO1	Students will be able to **understand** the origin and ancestry of chordate.	H	M	M	M	M	H	M	M	L
CO2	Students will be able to **understand** general organization and affinities of cephalochordate.	H	M	M	H	M	M	M	M	L
CO3	Students will understandstructure, development and metamorphosis of Amoecoetus & characters & affinities of	H	M	M	H	M	M	M	M	L

	Dipnoi									
CO4	Students will be able to **understand** organs and mechanism of respiration in pisces and amphibia.	H	M	M	H	M	M	M	M	L
CO5	**Gain knowledge** vertebrate integument and its derivatives.	H	M	M	H	M	M	M	M	L
CO6	The students will be able to **understand** that what are appendicular skeleton in Amphibia, Reptilia, Aves and Mammals.	H	M	M	H	M	M	M	M	L
CO7	The students will be able to **understand** general body organisation and classification in chelonian.	H	M	M	M	M	M	M	M	L
CO8	The students will be able to **understand** the evolution of urinogenital organs in vertebrates.	H	M	M	M	M	H	M	M	L
CO9	To **understand** the origin of birds and adaptations in cetacean.	H	M	M	M	M	M	M	M	H
CO10	To **understand** the complex anatomy of the brain in teleost, frog, lizard, fowl & rat.	H	M	M	M	M	M	M	M	L
CO11	The students will be able to **understand** the evolution of heart an sense organ in vertebrates.	H	M	M	M	M	M	H	M	L
CO12	The students will be able to **understand** the evolution of man.	H	M	M	M	M	M	H	M	L
	Comparative Endocrinology									
CO1	To **understand** the hormones and functions in Coelentereta and Helminths.	H	M	M	M	M	M	L	M	L
CO2	To **understand** the neurosecretory system in Annelida & Mollusca	H	M	M	H	M	M	M	M	L
CO3	The students will be able to **understand** about the hormones and functions in Echinodermata.	H	M	M	M	M	M	M	M	L
CO4	To **understand** about the neuroendocrine system in crustacean.	H	M	M	M	M	M	M	M	L
CO5	Students will be able **to explain** the Endocrine control of metamorphosis, reproduction and colour change mechanisms in Crustacean..	H	M	M	M	M	M	H	M	L
CO6	The students will be able to **understand** cephalic neuroendocrine system in insects.	H	M	M	M	M	M	H	M	L
CO7	To **understand** the endocrine control of metamorphosis and	H	M	M	M	M	M	H	M	L

CO	Outcome									
	reproduction in insects.									
CO8	Students will be able **to explain** about the pineal organ.	H	M	M	M	M	M	H	M	L
CO9	**Gain knowledge** about the hypothalamo-hypophysial system.	H	M	M	M	M	M	H	M	L
CO10	To **understand** the **To evaluate**pituitary gland, thyroid gland, parathyroid gland and adrenal gland.	H	M	M	M	M	M	H	M	L
CO11	To **understand** the gastro-entero-pancreatic endocrine system.	H	M	M	M	M	M	H	M	L
CO12	**Gain knowledge** the gonadal hormones in vertebrates and their hormonal actions, feedback mechanisms.	H	M	M	M	M	M	H	M	L
	Molecular Biology and Biotechnology									
CO1	To **understand** the Cot ½and Rot ½values, organelle genome, DNA structure, forms of DNA.	H	M	M	M	M	M	M	H	L
CO2	To **understand** the molecular mechanisms of replication and its regulation in prokaryotes and eukaryotes.	H	M	M	H	M	M	M	H	L
CO3	**Gain knowledge** the DNA damage and repair – types of DNA damages, excision repair system; mismatch repair, recombination repair, double strand break repair, and transcription coupled repair.	H	M	M	H	M	M	M	H	L
CO4	**Gain knowledge** the mechanism and regulation of prokaryotic and eukaryotic transcription.	H	M	M	H	M	M	M	H	L
CO5	To **understand** the prokaryotic and eukaryotic translation, genetic code, altered code in elongation, termination factors, fidelity of translation, post translational modifications.	H	M	M	H	M	M	M	H	L
CO6	**Gain knowledge** about mobile DNA elements – transposable elements, IS elements, P elements, retroviruses, retrotansposons.	H	M	M	H	M	M	M	H	L
CO7	To **understand** the antisense and ribozyme technology – initiation of splicing, polyadenylation, molecular mechanisms of antisense molecules, miRNA, siRNA, gene silencing.	H	M	M	H	M	M	M	H	L
CO8	To **understand** isolation and sequencing of DNA, gene amplification, PCR, RAPD, RFLP, MaxamGilbert, Sanger's	H	M	M	M	M	M	M	H	L

	dideoxy methods.									
CO9	To **understand** the splicing and cloning – cloning vectors for recombinant DNA technology- plasmids, cosmids, phagemids, YACS, gene replacement, restriction enzymes.	H	M	M	M	M	M	M	H	L
CO10	**Understand** the hybridization techniques – Southern- Northern hybridization, microarray.	H	M	M	M	M	M	M	H	L
CO11	**Gain knowledge** the application application of restriction fragment length polymorphism (RFLP) in forensic science, disease prognosis and genetic counseling.	H	M	M	M	M	M	M	H	L
CO12	To **understand** the agricultural biotechnology.	H	M	M	M	M	M	M	H	L
CO13	to **understand** Hybridoma technology and monoclonal antibodies.	H	M	M	M	M	M	M	H	L
	Advanced Developmental Biology									
CO1	To **understand** the types ,structure and functions of Foetal membranes & implantation in mammals.	H	M	M	M	H	M	H	M	L
CO2	**Gain knowledge** about the placenta-types, structure, functions of Placenta.	H	M	M	M	H	M	H	M	L
CO3	**Gain knowledge** about metamorphosis in Amphibia and regeneration in vertebrates.	H	M	M	H		H		M	L
CO4	To **understand** the mechanism and **Significance** of Apoptosis.	H	M	M	H	M	M	M	M	L
CO5	**Gain knowledge** about the ageing- mechanism, concepts and models.	H	M	M	H	M	M	M	M	L
CO6	Students will understandabout the polymorphism in insect.	H	M	M	M	M	M	M	M	L
CO7	To **understand** the multiple ovulation and embryo transfer technology (MOET).	H	M	M	M	H	M	M	M	L
CO8	**Gain knowledge** about the animal cloning.	H	M	M	M	M	M	M	H	L
CO9	**Gain knowledge** about the Immunocontraception. classical contraceptive techniques.	H	M	M	M	M	M	H	M	L
CO10	**Gain knowledge** about the anti-androgen and anti-spermiogenic compounds (LDH-CY and SP-10)	H	M	M	M	M	M	H	M	L
CO11	**Gain knowledge** about the role of mutants and transgenics in	H	M	M	M	M	M	M	H	L

	human welfare.									
	Parasitology and Immunology									
CO1	To **understand** life cycle, mode of transmission, infection of*Vibrio cholera, Yersinia pestis and Clostridium titani* and treatment of Cholera, Plague and Tetanus.	H	M	M	M	M	M	M	M	L
	To **understand** the life cycle, mode of transmission, infection of Influenza , H1 N1 viruses, Dengue virus and Hepatitis viruses and treatment of Influenza, Dengue and hepatitis.	H	M	M	M	M	M	M	M	L
CO2	**Gain knowledge** about the Trypanosoma and Entomoeba - Life cycle, mode of transmission, infection of *Trypanosoma , Entomoeba, Leishmania* and *Plasmodium* and treatment of diseases caused by these protozoan parasites.	H	M	M	M	M	M	M	M	L
CO3	**Gain knowledge** about the life cycle, mode of transmission, infection of*Wuchereria* and *Trichinella*and treatment of diseases caused by these parasites.	H	M	M	M	M	M	M	M	L
CO4	**Gain knowledge** about the toxin and antitoxins.	M	H	H	M	M	M	M	M	L
CO5	Immune system- innate and adaptive immunity; Antigens and antibodies and its interaction.	H	M	M	M	M	M	M	H	L
CO6	**Gain knowledge** about the cells and organs of immune system.	H	M	M	M	M	M	M	H	L
CO7	**Gain knowledge** Major Histocompatibility Complex (MHC).		M	M	M	M	M	M		L
CO8	To **understand** complement system and its regulation, biological consequences of complement activation.	H	M	M	M	M	M	M	H	L
CO9	**Gain knowledge** about cytokine and cytokine receptors, Cell mediated cytotoxic responses and leukocyte activation and migration.	H	M	M	M	M	M	M	H	L
CO10	To **understand** types and mechanism of Hypersensitivity reactions and autoimmunity	H	M	M	M	M	M	M	H	L
CO11	To **understand** transplantation immunology	H	M	M	M	M	M	M	H	L
CO12	**Gain knowledge** about the tumour immunology and immunotechniques.	H	M	M	M	M	M	M		L
	Biotechniques, Biostatistics, Ethology, Toxicology and									

	Bioinformatics									
CO1	**Gain knowledge** about the sterilization techniques, media for microbial culture, inoculation methods	H	M	H	M	M	M	M	H	L
CO2	To **understand** the primary culture, cell lines, cell quantification, growth kinetics of cells in culture, cryopreservation of cells	H	M	H	M	M	M	M	H	L
CO3	To **understand** the basic principle of sedimentation and centrifugation along with Radioactive isotopes.	H	M	M	M	M	M	M	H	L
CO4	to **understand** thin layer chromatography , gas chromatography and electrophoretic separation techniques	H	M	M	M	M	M	M	H	L
CO5	To **understand** the Central tendency, Dispersion and Variance.	L	M	M	H	M	M	M	M	L
CO6	To **understand** the probability and probability distribution.	L	M	M	H	M	M	M	M	L
CO7	**Gain knowledge** the types of sampling , standard error (SE), standard deviation (SD) and tests of **Significance** (t- test, z-test, Chi square test).	L	M	M	H	M	M	M	M	L
CO8	To **understand** the neuronal control, genetic and environmental components in development of animal behaviour	H	M	M	M	M	M	H		L
CO9	To **understand** the animal ethics- introduction, concept, organizations and their functions	H	M	M	M	M	M	M	M	L
CO10	CO To **understand** the toxicology, environmental toxicology. tran CO slocation of toxicants	H	H	H	M	M	M	M	M	L
CO11	**Gain knowledge** about the toxicity tests, calculation of LC50 and LD 50 and AntidotalThereapy.	H	H	H	M	M	M	M	M	L
CO12	Introduction and scope of bioinformatics.	H	M	M	M	M	M	M	H	L
CO13	**Gain knowledge** about the Biological databases– Basic local alignment search tool (BLAST), and FASTA, Variants of BLAST, PSI-BLAST.	H	M	M	M	M	M	M	H	L
CO14	**Gain knowledge** about the phylogenetic analysis- Tree style, tree building methods.	H	M	M	M	M	M	M	H	L
	Insect morphology and physiology									

CO	Description									
CO1	To **understand** insects morphology along with other biological attributes which help to **classify** the insects and distinguishing orders, families and species.	H	H	M	M	M	M	M	M	L
CO2	To **understand** the molecular structure, moulting and sclerotization of integument	H	M	M	M	M	M	H		L
CO3	To interpret the morphological structure of the head, thorax and abdomen	H	M	M	H	M	M	M	M	L
CO4	To **understand** the structure of antennae, morphology of legs and genitalia structure	H	M	M	H	M	M	M	M	L
CO5	To get the structure of the wing and mechanism of flight	H	M	M	H	M	M	M	M	L
CO6	To **understand** the morphology of mouthparts types and their feeding mechanism	H	M	M	H	M	M	M	M	L
CO7	**To evaluate** the circulatory system which includes organs, mechanism and chemical composition of haemolymph and function of haemocytes.	H	M	M	H	M	M	M	M	L
CO9	**To evaluate** the male and female reproductive system, structure and function of testis, ovary and mechanism of spermatogenesis and vitellogenesis including specialized reproductive mechanism.	H	M	M	H	M	M	H	M	L
	Classification and industrial insects									
CO1	To **understand** the classification of insects which provide data on the life history, behaviour and development.	H	M	M	M	M	M	M	M	L
CO2	To **understand** insects from an industrial perspective	H	M	M	M	M	M	M	M	L
CO3	**To evaluate the** modern scheme of insect classification and general characters of various orders	H	M	M	M	M	M	M	M	L
CO4	To **understand** the classification and general characters of Thysanura and collembolan.	H	M	H	M	M	H	M	M	L
CO5	To **understand** classification and characters of Mallophaga and siphunculata	H	M	H	M	M	H	M	M	L
CO6	To **understand** characters and classification of Siphonaptera	H	M	M	M	M	M	M	M	L

CO7	To **understand** the characters and classification of Hemipteratera, Lepidoptera and coleopteran	H	M	M	M	M	M	M	M	L
CO8	**To evaluate** Mulberry silkworm Bombyxmori, life cycle, the structure of silk gland and mechanism silk proteins.	H	M	M	M	M	M	M	M	L
CO9	**To evaluate** Silkworm rearing, cocoon harvesting and seed production.	H	M	M	M	M	M	M	M	L
CO10	**Gain knowledge** about the bacterial and viral diseases in silkworm.	H	H	M	M	M	M	M	M	L
CO11	To **understand** Lac insect-biology, lac cultivation and economic importance.	H	M	M	M	M	M	M	M	L
CO12	To **understand** Eri sericulture includes life cycle, host plant rearing and silk production.	H	M	M	H	M	M	M	M	L
CO13	To **understand** types of honey bee, life cycle, colony formation and apiary products.	H	M	M	M	M	M	M	M	L
	Sense organs, social life and Agriculture pests									
CO1&2	To **understand** the Compound eyes Ocelli structure and functions.	H	M	M	H	M	M	M	M	L
CO3&4	**To evaluate** light producing & Sound producing organs	H	M	M	M	M	M	M	M	L
CO5	**To evaluate** Mechanoreceptors	H	M	M	H	M	M	M	M	L
CO6	To interpret Tympanal organs, Johnson's organ, Chemoreceptors- sensillatrichoidea, sensillabasiconica.	H	M	M	M	M	M	M	M	L
CO7	The students will understandabout the pigments and mechanism of colour change, mimicry and camouflage.	H	M	M	H	M	M	M	M	L
CO8	**To evaluate** Immunity in insect	H	M	M	M	M	M	M	M	L
CO9	**To evaluate**Social life, Polymorphism, nest building and social behaviour in Isoptera and ants.	H	M	M	M	M	M	M	M	L
CO10	**To evaluate**Parasitic Hymenoptera its types and **Significance** .	H	M	M	M	M	M	M	M	L
CO11	**To understand** Locust migration and swarming.	H	M	M	M	M	M	M	M	L
CO12	**To evaluate**Pest of major crops: Rice, Cotton and Sugarcane-classification, life history, damage and control.	H	M	M	M	M	M	M	M	L

CO13	To evaluate the Pest of vegetables, fruits its classification, life history, damage and control.	H	M	M	M	M	M	M	M	L
CO14	To interpret the classification of Stored grain pests its classification, life history, damage and control measures.	H	M	M	M	M	M	M	M	L
	Pest control measures and Insects vectors									
CO1	**To evaluate** inorganic insecticides.	H	M	M	M	M	M	M	M	L
CO2	**To evaluate** Chlorinated Hydrocarbons and organophosphates it's Properties, mode of action and use.	H	M	M	M	M	M	M	M	L
CO3	**To evaluate** Natural organic compound and pyrethroids: Properties, and its mode of action and use.	H	M	M	M	M	M	M	M	L
CO4	**To evaluate the** Historical and theoretical basis of biological control.	H	M	M	M	M	M	M	M	L
CO5	To **understand** Desirable attributes of natural enemies of pests.	H	M	M	M	M	M	M	M	L
CO6	**To evaluate** Parasitoids and predators used in biological control programmes and its life cycle and biological relationship.	H	M	M	M	M	M	M	M	L
CO7	**To evaluate** Insect pathogenic bacteria and used in biological control programmes, biological relationship, mass production and examples.	H	M	M	M	M	M	M	M	L
CO8	To **understand** the use of radiation, chemosterilants, hormones and pheromones in pest control programmes.	H	M	M	M	M	M	M	M	L
CO9	To **understand** Integrated pest managements its principles, modelling, application and examples.	H	M	M	M	M	M	M	M	L
CO10	**To evaluate the** Pest of horse and cattle it's Nature of damage, life cycle and control measures.	H	M	M	M	M	M	M	M	L
CO11	To **understand** life cycle of Mosquitoes, mode of transmission of pathogen and control measures.	H	M	M	M	M	M	M	M	L
CO12	To **understand** life cycle of flies, mode of transmission of pathogen and control measures.	H	M	M	M	M	M	M	M	L
CO13	**To evaluate the** life cycle of lice and fleas causing disease in man, mode of transmission of pathogen and control measures.	H	M	M	M	M	M	M	M	L

	Animal Physiology									
	Physiology of Digestion and Excretion									
CO1	To **understand** the specialized functions of the organs involved in processing food in the body.	H	M	M	M	M	M	M	M	L
CO2	To **understand** the structure and function of digestive glands, salivary gland and stomach in the digestion and its regulation of secretion.	H	M	M	M	M	M	M	M	L
CO3	To have a comprehensive **knowledge** about structure, function of liver, its role in detoxification and structure, function pancreas and its role in the regulation of glucose level and indigestion.	H		H	H	M	M	M	M	L
CO4	To **understand** the ways in which organs work together to digest food and absorb nutrients.	H	M	M	H	M	M	M	M	L
CO5&6	To **understand** the processes of digestion and absorption and role of the intestine.	H	M	M	H	M	M	M	M	L
CO7	To **understand** the neural and chemical regulation of secretion GIT secretion and movement.	H	M	M		M	M	M	M	L
CO8	To **understand** the structure, function of kidney and its role in the urine formation.	H	M	M	H	M	M	M	M	L
CO9	To **understand** the mechanism of concentration and dilution of urine in addition to normal and abnormal constituents of urine this will help to **understand** the physiology of kidney in normal and pathological conditions.	H	M	M	H	M	M	M	M	L
CO10	To **understand** the physiology of Regulation of urine and body fluid concentration and volume and its hormonal control.	H	M	M	H	M	M	M	M	L
CO11	To **understand** the physiology of Regulation of water, electrolytes and acid base and renal clearance	H	M	M	H	M	M	M	M	L
CO12	To **understand** physiology of nitrogen excretion and causes of Renal failure, its complication and treatments.	H	M	M	H	M	M	M	M	L
	Physiology of Circulation									
CO1	To **understand** the types (Myogenic and Neurogenic),	H	M	M	H	M	M	M	M	L

	anatomy, histology and nerve innervations of the heart, heart valves.									
CO2	To **understand** the different types of Pace maker and specialized conducting fibres.	H	M	M	H	M	M	M	M	L
CO3	To **understand** the physiology of Blood pressure and factors affecting blood pressure, Cardiac cycle, Electrocardiogram (ECG).	H	M	M	H	M	M	M	M	L
CO4	To **understand** the Cardiac output, heart sound, Haemodynamics, Cardiac Failure.	H	M	M	H	M	M	M	M	L
CO5	To **understand** the physiology Cellular composition and functions of blood, Blood groups and Blood transfusion Causes and control of hypoglycaemia and hyperglycaemia.	H	M	M	H	M	M	M	M	L
CO6	To **understand** the causes and control of hypolipidimia and hyperlipidemia, Plasma proteins, Haemostasis.	H	M	M	H	M	M	M	M	L
CO7	To **understand** Cascade of biochemical reactions involved in coagulation of blood, transport of O2 & CO2 by blood and composition, formation and functions of lymph.	H	M	M	H	M	M	M	M	L
	Physiology of Brain, Nerve and Muscle									
CO1	To **understand** morphological differentiation of mammalian brain, Brain stem, Cerebellum	H	M	M	H	M	M	M	M	L
CO2	To **understand** the physiology of learning, memory and sleep	H	M	M	H	M	M	M	M	L
CO3	To **understand** the types and functional properties of neurons, Ultrastructure of neuron.	H	M	M	H	M	M	M	M	L
CO4	To **understand** the ultrastructure of synapse and molecular mechanism of synaptic transmission, bioelectrical properties of neurons.	H	M	M	H	M	M	M	M	L
CO5	To **understand** the physiology of Biosynthesis, storage and release of various neurotransmitters and neuropeptides.	H	M	M	H	M	M	H	M	L
CO6	To **understand** the Receptor physiology- Mechanoreception, photoreception, phonoreception, chemoreception	H	M	M	H	M	M	M	M	L
CO7	To **understand** Disorders of nervous system: Alzheimer's	H	M	M	H	M	M	H	M	L

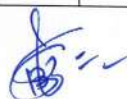|										
	disease, Parkinson's disease.									
CO8	To **understand** the Ultrastructure of skeletal muscle, Molecular mechanism of muscle contraction and chemistry and role of ATP in muscle contraction.	H	M	M	H	M	M	M	M	L
CO9	To **understand** the Properties of muscle (twitch, tetanus, summation, tonus, all or none principle fatigue), muscular disorders and Ultrastructure of Neuromuscular Junction.	H	M	M	H	M	M	M	M	L
	Physiology of Respiration and Reproduction									
CO1	To **understand** the Physiological anatomy of respiratory system and Mechanism of respiration	H	M	M	H	M	M	M	M	L
CO2	To **understand** the Transport of respiratory gases by blood and Lung volumes and capacities, partial pressure of gases.	H	M	M	H	M	M	M	M	L
CO3	To **understand** the Oxygen dissociation curve, Carbon -dioxide dissociation curve. To **understand** the physiology of Neural and chemical regulation of respiration and Hypoxia, Cyanosis.	H	M	M	H	M	M	M	M	L
CO4	To **understand** the endocrine control of spermatogenesis and oogenesis	H	M	M	H	M	M	H	M	L
CO5	To **understand** the physiology of Leydig cells, sertoli cells and their hormones. To **understand** the structure and functions of Follicular and luteal cells and their hormones.	H	M	M	H	M	M	H	M	L
CO6	To **understand** the physiology of corpus luteum and Placenta.	H	M	M	H	M	M	H	M	L
CO7	To **understand** the physiology of lactation and Role of hormones and pheromones in reproduction.	H	M	M	H	M	M	H	M	L
CO8	To **understand** the Causes of infertility in male and female and In vitro fertilization (IVF) and Test Tube Baby.	H	M	M	M	H	M	M	M	L
	Mammalian Reproductive Physiology									
	-Mammalian Reproductive Physiology (MRP)-I Reproductive Process in Male									
CO1	**Gain knowledge** and **understand** the detail structure of male reproductive gonad –testes in mammals.	H	M	M	H	M	M	M	M	L
CO2	To **understand** the process and mechanism of development and	H	M	M	H	M	M	M	M	L

	descent of testes.									
CO3	To **understand** the process of formation of spermatozoa with respect to its molecular events and regulation of hormones required for this process.	H	M	M	H	M	M	M	M	L
CO4	**Gain knowledge** and **understand** the structure and function of specific cells (Sertoli cells) of the testes and to know the precise regulation of endocrine factors.	H	M	M	H	M	M	M	M	L
CO5	**Gain knowledge** and **understand** the structure and function of specific cells (Leydig cells) of the testes	H	M	M	H	M	M	M	M	L
CO6	**Gain knowledge** and **understand** the detail structure and function of male reproductive organ –Epididymis.	H	M	M	H	M	M	M	M	L
CO7	**Gain knowledge** and **understand** the normal morphological structure of spermatozoa. **To evaluate the** reasons behind their anomalies and **to differentiate** between normal and abnormal spermatozoa.	H	M	M	H	M	M	M	M	L
CO8	**Gain knowledge** and **understand** the mechanism of molecular and biochemical events that take place in the spermatozoa in the process of fertilization.	H	M	M	H	M	M	M	M	L
CO9	**Gain knowledge** and **understand** the detail structure and function of male reproductive accessory organ- Vas deferens.	H	M	M	H	M	M	M	M	L
CO10	**Gain knowledge** and **understand** the detail structure and function of male reproductive accessory organ-Seminal Vesicle and **To evaluate** its hormonal regulation.	H	M	M	H	M	M	M	M	L
CO11	**Gain knowledge** and **understand** the detail structure and function of important male reproductive gland-Prostate	H	M	M	H	M	M	M	M	L
CO12	**Gain knowledge** and **understand** the detail structure and function of another important male reproductive gland-Cowpers and to know the causes of their anomalies.	H	M	M	H	M	M	M	M	L
CO13	**Gain knowledge** and **understand** the detail structure and function of penis and to know the mechanism of its errection	H	M	M	H	M	M	M	M	L
CO14	To **understand** the comparative behavioral pattern of reproduction in males.	H	M	M	M	M	M	H	M	L

CO15	To **understand** the different mating systems with respect to neural and hormonal regulation.	H	M	M	M	M	M	H	M	L
CO16	**Gain knowledge** and **understand** the different types, structure and function of Pheromones.	H	M	M	M	M	M	H	M	L
CO17	To **understand** the different probable causes of infertility and to know the possible treatment over it.	H	M	M	M	M	M	H	M	L
CO18	**To evaluate and understand** the different types of diseases in ageing males caused due to imbalance of male hormones.	H	M	M	M	M	M	H	M	L
	Mammalian Reproductive Physiology-II **Reproductive Process in Female**									
CO1	**Gain knowledge** and **understand** the process of development of ovary and female genital tract at cellular level.	H	M	M	H	M	M	M	M	L
CO2	To **understand** the detailed process of formation of follicles in the ovary.	H	M	M	H	M	M	H	M	L
CO3	**Gain knowledge** and **understand** the role of hormones in the process of follicle formation.	H	M	M	M	M	M	H	M	L
CO4	To **understand** the detail mechanism of the process of ovulation.	H	M	M	M	M	M	H	M	L
CO5	**Gain knowledge** and **understand** cellular mechanism of the journey of primary, secondary and tertiary follicles to reach their maturity and involvement in the process of ovulation.	H	M	M	M	M	M	H/2	M	L
CO6	**Gain knowledge** and **understand** the process of formation and differentiation of cells of ovarian follicles.	H	M	M	M	M	M	H	M	L
CO7	**Gain knowledge** the mechanism of biosynthesis of steroidal hormones with respect to 2-gonadotropin and 2- cell concept.	H	M	M	M	M	M	H	M	L
CO8	**To evaluate and understand** the comparative process of estrus cycle with respect to physiological and hormonal changes in the uterus of mammals.	H	M	M	M	M	M	H	M	L
CO9	To **understand** the mechanism of uterine cycle with their respective physiological and hormonal changes.	H	M	M	M	M	M	H	M	L
CO10	**Gain knowledge** and **understand** the processes of cessation of	H	M	M	M	M	M	H	M	L

	menstrual cycle its causes and hormonal regulation.									
CO11	**Gain knowledge** and **understand** the detailed mechanism of hormonal regulation of ovulation.	H	M	M	M	M	M	H	M	L
CO12	**Gain knowledge** and **understand** the mechanism of formation of corpus luteum after ovulation.	H	M	M	M	M	M	H	M	L
CO13	**To evaluate the** structure and function of corpus luteum, its maintenance in pregnancy and hormonal regulation.	H	M	M	H	M	M	H	M	L
CO14	**To evaluate and understand** structure and function of oviduct and their cellular and physiological changes.	H	M	M	H	M	M	H	M	L
CO15	**To evaluate and understand** the comparative account of mammalian uterus, types and their abnormalities.	H	M	M	H	M	M	M	M	L
CO16	**Gain knowledge** and **understand** the structure and function of cervix.	H	M	M	H	M	M	M	M	L
CO17	**To evaluate and understand** the structure and function of vagina.	H	M	M	H	M	M	M	M	L
CO18	To **understand** the physiology and cytology of vagina to detect the various stages of oestrous cycle.	H	M	M	M	M	M	H	M	L
CO19	**Gain knowledge** and **understand** the process of puberty, causes of onset of puberty and their related physiological problems.	H	M	M	M	M	M	H	M	L
CO20	**To evaluate the** causes of delayed puberty.	H	M	M	M	M	M	M	M	L
CO21	**To evaluate** in detail the structure and mechanism of biosynthesis of prostaglandins and their major role in reproduction.	H	M	M	H	M	M	H	M	L
CO22	**To evaluate the** developmental process anatomy and growth of mammary glands with respect to hormonal regulation.	H	M	M	H	M	M	H	M	L
CO23	**Gain knowledge** and **understand** the physiological process of lactation and its maintenance with respect to its hormonal control.	H	M	M	M	M	M	H	M	L
CO24	**To evaluate the** factors affecting lactation and **To evaluate the** composition of milk.	H	M	M	M	M	M	H	M	L

	Mammalian Reproductive Physiology-III Reproductive Endocrinology									
CO1	Gain knowledge and understand the development, structure and function of hypothalamus.	H	M	M	H	M	M	H	M	L
CO2	To understand the mechanism of action of releasing and release inhibiting hormones.	H	M	M	M	M	M	H	M	L
CO3	To understand the mechanism of release of neurotransmitters and their physiology of targeting the target organs.	H	M	M	M	M	M	H	M	L
CO4	Gain knowledge and understand the regulation of feedback mechanism of hormones.	H	M	M	M	M	M	H	M	L
CO5	Gain knowledge and understand the development, structure and function of adenohypophysis.	H	M	M	H	M	M	H	M	L
CO6	Gain knowledge and understand the development, structure and function of neurohypophysis.	H	M	M	H	M	M	H	M	L
CO7	Gain knowledge and understand the structure and function of gonadotrophic hormones their mechanism of secretion.	H	M	M	H	M	M	H	M	L
CO8	Gain knowledge and understand the development, structure and function of pars intermedia.	H	M	M	H	M	M	H	M	L
CO9	Gain knowledge and understand the mechanism of release of gonadotropic releasing hormones from hypothalamus targeting hypophysis and ultimately the male gonad – Testes	H	M	M	M	M	M	H	M	L
CO10	Gain knowledge and understand mechanism of biosynthesis, mode of action, transport and functions of testosterone.	H	M	M	M	M	M	H	M	L
CO11	Gain knowledge and understand the mechanism of biosynthesis, physiology, mode of action and functions of inhibin in reproduction.	H	M	M	M	M	M	H	M	L
CO12	Gain knowledge and understand the role of thyroid hormones in reproduction.	H	M	M	M	M	M	H	M	L
CO13	Gain knowledge and understand the mechanism and mode of action of neurohormones and hypophyseal hormones on female gonad - ovaries.	H	M	M	M	M	M	H	M	L

CO14	Gain knowledge and understand mechanism of biosynthesis, mode of action, transport and functions of oestrogen.	H	M	M	M	M	M	H	M	L
CO15	To evaluate in detail the structure and mechanism of biosynthesis, mode of action, transport and function of progesterone.	H	M	M	M	M	M	H	M	L
CO16	To evaluate and understand the hormonal relationship between hypothalamus, hypophysis, adrenal gland and gonads.	H	M	M	M	M	M	H	M	L
	Mammalian Reproductive Physiology-IV **Reproductive Toxicology, Embryology and Fertility**									
CO1	To evaluate and understand the effect of chemical toxicants on testes and testicular toxicity.	H	M	M	M	M	M	H	M	L
CO2	To evaluate and understand the effect of various environmental factors on reproductive health.	H	M	M	M	M	M	H	M	L
CO3	To understand the induction of ovarian toxicity.	H	M	M	M	M	M	H	M	L
CO4	To evaluate the effect of pesticides on pregnancy.	H	M	M	M	M	M	H	M	L
CO5	Gain knowledge and understand the process of implantation of mammalian blastocyst.	H	M	M	M	M	M	H	M	L
CO6	To evaluate and understand the process of development of chorio-allantoic type of placenta.	H	M	M	M	M	M	H	M	L
CO7	To evaluate and understand the process of development, structure and function of Foetal membranes.	H	M	M	M	M	M	H	M	L
CO8	Gain knowledge and understand the mechanism of onset parturition and its hormonal regulation.	H	M	M	M	M	M	H	M	L
CO9	To evaluate and understand the different methods of female contraception, mode of action, advantages and disadvantages.	H	M	M	M		M	H	M	L
CO10	To evaluate and understand the process of surgical sterilization and medical termination of pregnancy, its advantages and disadvantages.	H	M	M	M	H	M		M	L
CO11	To evaluate and understand the mechanism of mode of action of pregnancy vaccines, its advantages and disadvantages.	H	M	M	M	H	M	H	M	L
CO12	Gain knowledge and understand the usage, mode of action,	H	M	M	M		M	H	M	L

CO	Description									
	advantages and disadvantages of advances in female contraception.									
CO13	**To evaluate and understand** the methods of male contraception- vasectomy and reversible vas occlusion	H	M	M	M		M	H	M	L
CO14	**To evaluate and understand** the use of hormonal contraceptive methods.	H	M	M	M		M	H	M	L
CO15	**To evaluate and understand** application of Anti-androgen and anti-spermiogenic compounds (LDH-Cy and Sp-10), Inhibin	H	M	M	M		M	H	M	L
CO16	**To evaluate and understand** the effect of antibodies for acrosomal enzymes and sperm surface proteins.	H			H		M	H	M	L
	Fish and Fisheries									
	Fish and Fisheries-I **General studies**									
CO1	To **understand** the Origin and Evolution of fishes.	H		M	M	M	H		M	L
CO2	To **understand** the development of jaws and limbs in fishes.			M	M	M	H		M	L
CO3	To **understand** Classification and General characters and affinities of Placoderm and fossil record.	H	H	M	M	M	H		M	L
CO4	To **understand** Classification and general characters along with Affinities and specialized characters of Elasmobranchs.	H	H	M	M	M	H		M	L
CO5	To interpret Classification and general characters with affinities of Actinopterygiians.	H	H	M	M	M	H		M	L
CO6	To **understand** general characters, classification, origin, fossil Dipnoian, distribution and specialized characters and affinities of Dipnoians and blood vascular system of Protopterus.	H	H	M	M	M	H		M	L
CO7	To **understand** the respiratory system.	H			H					L
CO8	To **understand** blood supply and mode of respiratory gaseous exchange in teleost.	H	M	M	H	M	M	M	M	L
CO9	To **understand** accessory respiratory organs.		M	M		M	M	M	M	L
CO10	**To evaluate** mechanism of air breathing, function of accessory respiratory organ.	H	M	M	H	M	M	M	M	L

CO	Description									
CO11&12	To **understand** Air Bladder and **gain knowledge** blood supply to air bladder and function of air bladder.	H	M	M	H	M	M	M	M	L
	Fish and Fisheries- II **Applied fisheries**									
CO1	To **understand** fresh water fisheries of India, riverine and reservoir fisheries.	H	M	M		M	M	M	M	L
CO2	To **understand** Esturine and Marine fisheries of India.	H	M	M		M	M	M	M	L
CO3&4	**To evaluate** breeding of Indian Major carps To **understand** neuroendocrine control of carp reproduction.	H	M	M				H		L
CO5	To **understand** culture of Exotic fishes.	H	M	M	M	M	M	M	M	L
CO6	To interpret monoculture and monosex culture.	H	M	M	M	M	M	M	M	L
CO7	To **understand** integrated fish farming.	H	M	M	M	M	M	M	M	L
CO8&9	To **understand** Catfish culture and Trout culture	H	M	M	M	M	M	M	M	L
CO10	To **understand** Ornamental fish culture.	H	M	M	M	M	M	M	M	L
CO11	To **understand** Culture of sea weeds and Spirulina.	H	M	M					H	L
CO12	To **understand** pearl culture, *Oyster* culture, prawn culture, Frog culture.	H	M	M		M	M	M	M	L
	Fish and Fisheries- I **General studies**									
CO1	To **understand** Structure of alimentary canal in teleosts.	H	M	M	H	M	M	M	M	L
CO2	**To evaluate** modification of alimentary canal in relation to feeding habits, digestion and absorption of food.	H	M	M	H	M	M	M	M	L
CO3	To **understand** Structure of kidney in teleosts.	H	M	M	H	M	M	M	M	L
CO4	To interpret osmoregulation in fresh water forms, marine forms, Rays and Skates, Diadromous fishes. To **understand** mechanism of spermatogenesis and its hormonal control.	H	M	M	H	M	M	M	M	L
CO5	To **understand** chemoresceptors.	H	M	M	H	M	M	M	M	L
CO6	To **understand** Structure and function of taste buds.	H	M	M	H	M	M	M	M	L
CO7	**To evaluate the** migration in fishes.	H	M	M		M	M	M	M	L
CO8	**To evaluate** role of hormones in migration, orientation and navigation during migration.	H	M	M				H		L

CO	Description									
CO9&10	To **understand** Structure of male reproductive system and mechanism of spermatogenesis and its hormonal control	H	M	M	M	M	M	H		L
CO11&12	To **understand** female reproductive system and oogenesis, egg development, hormonal control of oogenesis.	H	M	M	M	M	M	H		L
CO13	**To evaluate the** structure, hormone and function of pituitary gland and other endocrine gland in fishes.	H	M	M	M	M	M	H		L
CO14	**To evaluate** hypothalamo-hypophysial system in fishes.	H	M	M	M	M	M	H		L
CO15	To **understand** neurohormones and their functions.	H	M	M	M	M	M	H		L
	Fish and Fisheries- II **Fishery technology and fish pathology**									
CO1	To **understand** Pond management	H	M	M	M	M	M			L
CO2	**To evaluate** gear and craft in inland water.	H	M	M	M	M	M	M	M	L
CO3	To **understand** Conservation of fish, Fish legislation and their importance.	H	M	M	M	M	M	M	M	L
CO4	**To evaluate** water pollution and inland fisheries.	H	M	M	M	M	M	M	M	L
CO5	To **understand** Plankton in relation to fish production.	H	M	M	M	M	M	M	M	L
CO6	**To evaluate** Culture of phytoplankton and zooplankton.	H	M	M	M	M	M	M	M	L
CO7	To **understand** Manufacture and maintenance of Aquarium.	H	M	M	M	M	M	M	M	L
CO8	**To evaluate** Hybridization and transgenic fish.	H	M	M	M	M	M		H	L
CO9&10	**Gain knowledge** the Fish marketing; Domestic and export marketing.	H	M	M	M	M	M			L
CO11	To **understand** Sex control and sex reversal under condition and chromosome set manipulation in fish.	H	M	M	M	M	M	M	H	L
CO12	**To evaluate** Gamete preservation.	H	M			H	M	M	M	L
CO13	**To evaluate** Methods of curing and preservation of fish.	H	M	M	M	M	M	M	M	L
CO14	To **understand** Fish products and by-products.	H	M	M	M	M	M	M	M	L
CO15	To **understand** Fish pathology	H	M	M	M	M	M	M	M	L
CO16	**To evaluate** Fish diseases and its control	H	M	M	M	M	M	M	M	L

(DR. S. B. ZADE)
Co-ordinator, B.O.S. Zoology
RTM Nagpur University, Nagpur

Program Outcomes

Name of Program: <u>M.Sc. Computer Science</u>

No. Of Courses: 30

Targeted Graduate Attributes: Disciplinary Knowledge, Critical Thinking, Problem Solving, Analytical Reasoning, Communication Skills, Teamwork, Moral and Ethical Awareness

	Program Outcomes
PSO1	The students will be able to develop aptitude to manifest a wide and extensive knowledge in the field of computer science.
PSO2	Ability to think critically for solving various problems and recent trends in computer softwares.
PSO3	The students will be capable of working effectively in diverse conditions as a team.
PSO4	The students will be able to develop skills in software design and its implementation.
PSO5	The students will be able to apply knowledge of computer science in academic and corporate sectors.
PSO6	The students will be able to develop self sustainability as well as competitiveness and employability.
PSO7	The students will be able to plan and write a research paper or proposal and assignment in computer science.

(S.R. Pande)
Chairman
BOS in Computer Science

Program Matrix

Name of Program: M.Sc. (Computer Science)

(Low Correlation = L/1 ; Moderate Correlation = M/2 ; High Correlation = H/3)

Course Outcomes (COs)		Program Outcomes (POs)						
		Domain Specific (PSO)				Domain Independent (PO)		
	Course Name: M.Sc.(Computer Science) - Semester I	1	2	3	4	5	6	7
	DISCRETE MATHEMATICAL STRUCTURE							
CO1	To able to specify and manipulate basic mathematical object	M	M	L	M	M	M	H
CO2	Very important to develop logic for the problem solving in the field of computer science.	H	H	M	H	M	M	H
CO3	Understand the basics of probability and number theory which is very important in problem solving.	M	H	M	H	M	M	H
CO4	Use effectively algebraic techniques to analyse basic discrete structures and algorithms	M	M	L	H	H	M	H
	PROGRAMMING IN JAVA							
CO1	Facilitates in understanding the concepts of object oriented programming	M	H	M	M	M	M	H
CO2	Effective to implement platform independence	H	H	H	H	H	H	H
CO3	Design Programs for RMI and JAVA Beans and Swings	H	M	M	M	H	H	H
CO4	Skill Enhancing through concepts like multithreading, abstraction , platform independence	H	H	H	H	H	H	H
	DIGITAL ELECTRONICS AND MICROPROCESSOR							
CO1	Learning to design various applications based on digital electronics	M	M	H	M	H	M	H
CO2	Developing assembly language programming skills	M	H	H	H	H	H	H
CO3	Learning to design various applications based on digital electronics	M	H	H	H	H	H	H

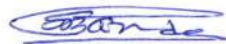|								
CO4	Developing assembly language programming skills	M	M	M	H	H	H	H
ADVANCED DBMS & ADMINISTRATION								
CO1	Can explore efficient method for handling multiple types of data	M	M	H	H	H	H	M
CO2	Have a detailed view of handling parallel and distributed database	M	M	M	H	H	H	H
CO3	Ability to normalize the database & understand the internal data structure	M	H	H	M	H	H	H
CO4	Deep visualization of realistic data into physical structure	M	H	H	H	H	H	H
PRACTICAL I								
CO1	Solve problems in theoretical computer science as it relies heavily on graphs and logic	M	H	H	H	M	M	H
C02	The students can imbibe the idea of proving programs correct through the use of discrete mathematic structure	M	H	M	M.	M	M	H
C03	Useful in designing web and desktop applications	H	H	H	H	M	M	H
CO4	Design and program stand-alone Java Applications	H	H	M	H	M	M	H
PRACTICAL II								
CO1	Learning to design various applications based on digital electronics	M	H	H	M	H	H	H
CO2	Developing assembly language programming skills	H	H	H	H	H	H	H
CO3	Facilitates in creation of Data Structures and effective management of Database	H	H	H	H	H	H	H
CO4	Ability to normalize the database & understand the internal data structure	H	H	H	H	H	M	H
Course Name: M.Sc.(Computer Science) - Semester II								
WINDOWS PROGRAMMING USING VC++								
CO1	Provides many tools for coding and debugging visual codes	M	H	H	M	M	M	H
CO2	Facilitates as a lightweight tool to edit your C++ files	H	M	H	M	M	M	H
CO3	Provides add-on features such as smart pointers, New Container, Polymorphism, Exception Handling etc	H	H	M	M	M	M	H
CO4	Encapsulates multiple applications and hence can make use of the package with installing it once	H	H	H	M	M	M	H
THEORY OF COMPUTATION AND COMPILER CONSTRUCTION								

CO1	Analyze the behaviour of machines and how they solve a problem	M	H	H	H	M	H	H
CO2	Problems solving in many fields beside computer science such as physics, economy, biology etc	M	H	H	H	M	H	H
CO3	Would know program execution using lexical and syntactical analysis	M	H	H	H	H	H	H
CO4	Can correlate the working of compiler in program execution	M	H	H	H	H	H	H
	COMPUTER ARCHITECTURE AND ORGANIZATION							
CO1	To explore the fundamentals of Computer Architecture and Organization	H	H	M	H	H	H	H
CO2	To understand the design of control unit	M	H	M	H	H	M	H
CO3	To study the concepts of memory organization and to understand various memory technologies	H	M	M	H	H	M	H
CO4	To understand the concepts of input output processing to interface various I/O devices	H	M	M	H	H	H	H
	COMPUTER GRAPHICS							
CO1	Provides user interfaces, data visualization, television commercials, motion pictures	H	M	H	H	H	H	H
CO2	Hardware devices and algorithms which are necessary for improving the effectiveness, realism, and speed of picture generation	H	M	H	H	H	H	H
CO3	Three dimensional graphic algorithm are incorporated in various streams to better simulate complex interactions	H	H	H	H	M	H	H
CO4	3-d transformations, b-spline surfaces, curves, and hidden surfaces can be explored	H	H	H	H	H	M	H
	Practical I							
CO1	Helps to understand the nature of efficient computation	H	H	H	H	M	H	H
CO2	Facilitates in efficient problem solving	H	H	H	H	M	H	H
CO3	To understand the nature of efficient computation	H	M	M	H	H	M	H
CO4	Apply and redistribute runtime packages mostly installed for standard libraries that many applications use	M	M	M	H	H	H	M
	Practical II							
CO1	Would gain the knowledge about inside of computer	H	M	M	M	M	H	H
CO2	Develop the design concepts of latest processors	M	M	M	M	M	M	M

CO3	Study the common elements in user interfaces, data visualization, television commercials, motion pictures, and many other applications	H	H	H	H	H	H	H
CO4	Explore the algorithms necessary for basic transformation with respect to computer graphics	H	M	M	M	M	H	H

COURSE NAME: M.SC.(COMPUTER SCIENCE) - SEMESTER III

	DATA COMMUNICATION AND NETWORK							
CO1	To understand and master the fundamentals of data communications through the knowledge of data transmission concepts, media used for data communication	H	M	M	M	H	H	H
CO2	To compress the data, different compression algorithms used to optimize data transfer even if the network is congested	H	M	M	H	H	H	H
CO3	Various network routing algorithms, data link layer protocols are necessary to be understood while working on networking concepts	H	H	H	H	H	H	H
CO4	Exploring frequency and time division multiplexing techniques to share network bandwidth among multiple users are very necessary to be learnt	M	M	H	H	H	H	H
	SOFTWARE ENGINEERING							
CO1	To Get detailed knowledge of role of software in daily basis	H	H	H	H	H	H	H
CO2	Student will be identifying different models and find out the best	H	H	H	H	H	H	H
CO3	Test the developed software for high performance and maintainability	M	H	H	H	H	H	H
CO4	Study the software measure parameters for software quality	M	H	H	H	H	H	H
	CE1-1(ELECTIVE 1) NEURAL NETWORK							
CO1	Provides an understanding of underlying geometry of foundation Neural Network models	H	H	H	H	H	H	H
CO2	Helps in Neural Network algorithm along with an approach to neuro-science findings	H	H	H	H	H	H	H
CO3	Necessary for the research community around the world to realize the biological fidelity	H	H	H	H	H	H	H
CO4	Develop powerful computational models that has applications to vast number of disciplines	H	M	L	H	H	H	H
	CE1-2(ELECTIVE -2)MOBILE COMPUTING							
CO1	Helps to understand the fundamental requirements for initiating an online business	M	M	M	M	M	H	H

CO2	Helps in process of initiating and funding a start-up, e-Business or large e-projects	H	H	H	M	H	H	H
CO3	Necessary to describe the issue and methods of transforming an organization into an e-business	H	H	H	H	H	H	H
CO4	Provides deeper knowledge of mobile handheld devices, wireless mediums, palm OS, MANNET	H	M	M	H	H	H	H
CE1-3 MULTIMEDIA TECHNOLOGIES								
CO1	Define multimedia to potential clients	M	M	M	M	M	H	H
CO2	Identify the basic components of a multimedia project	M	H	H	H	H	H	H
CO3	Identify the basic hardware and software requirements for multimedia development and playback	H	H	M	H	H	H	H
CO4	Identify and describe the function of the general skill sets in the multimedia industry	M	M	M	M	M	M	H
CE1-4 ASP.NET								
CO1	Helps to create web form with server control	H	M	M	M	M	M	H
CO2	Separate page code from content by using code-behind pages, page controls, and Components	M	H	H	H	H	H	H
CO3	Display dynamic data from a data source by using Microsoft ADO.NET	M	M	M	M	M	H	H
CO4	Debug ASP.NET Pages by using trace	M	M	H	H	H	H	H
CE1-5 DIGITAL AND CYBER FORENSICS								
CO1	Cite and adhere to the highest professional and ethical standards of conduct, including impartiality and the protection of personal privacy	M	M	H	M	H	H	H
CO2	Identify and document potential security breaches of computer data that suggest violations of legal, ethical, moral, policy	M	M	H	M	H	H	H
CO3	Work collaboratively with law enforcement to advance digital investigations or protect the security of digital resources	M	M	H	M	H	H	H
CO4	Access and critically evaluate relevant technical and legal information and emerging industry trends	H	M	H	M	H	H	H
PRACTICAL V								
CO1	Analyse And Setup Protocol Designing Issues For Communication Networks	H	M	M	H	H	H	H

CO2	Estimate The congestion Control Mechanism to improve Quality Of Service of Networks	M	M	H	H	H	H	H
CO3	To implement Software prototyping for better software development	H	M	M	H	H	H	H
CO4	To acquire skills to think about problems and solution using appropriate method	H	H	H	H	H	H	H
	Practical VI							
CO1	To design neuro-biologically oriented models	H	M	M	H	H	H	H
CO2	To implement deep learning for solving real world problems	M	M	H	H	H	H	H
CO3	To train through hands-on on m-computing for ease of use	H	M	M	H	H	H	H
CO4	To secure digital documents through data hiding, water marks etc	H	H	H	H	H	H	H
	Course Name: M.Sc.(Computer Science) - Semester IV							
	DATA MINING							
CO1	Necessary to deal with explosive growth of the stored and transient data	H	M	H	M	H	H	H
CO2	Introduces new techniques and automated tools useful in transforming data into knowledge	H	M	H	H	H	H	H
CO3	Provides basic Techniques for OLAP & Data generalization	H	M	H	H	H	H	H
CO4	Helps to identify different cluster analysis techniques and advanced data mining techniques	H	M	H	H	H	H	H
	ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM							
CO1	Explore AI problem solving techniques	H	M	H	M	H	H	H
CO2	Explore techniques knowledge representation in Machine	H	M	H	H	H	H	H
CO3	Helps in a deeper knowledge towards natural language processing, robotics	H	M	H	H	H	H	H
CO4	Necessary in decision making, problem solving, perception and understanding human communication	H	M	H	H	H	H	H
	CE2-1 DESIGN & ANALYSIS OF ALGORITHM							
CO1	Ability to analyze performance of algorithms	M	H	H	M	H	H	H
CO2	Choose appropriate algorithm for problem solving	M	H	H	M	H	H	H
CO3	Analyze worst-case running times of algorithms using asymptotic analysis	M	H	H	M	H	H	H
CO4	Analyze greedy algorithm and its applications, divide and conquer strategy	M	H	H	M	H	H	H
	CE2-2 EMBEDDED SYSTEM							
CO1	Helps to addresses the issue of the response time constrain of various tasks	M	H	H	H	H	H	H

CO2	Necessary for designing high performance response time constrained sophisticated systems	H	H	H	H	H	H	H
CO3	Helps to develop the systems that make optimum use of the available system resources: processor, memory	H	H	H	H	H	H	H
CO4	Employ the key concepts of embedded systems like sensors and actuators	M	H	H	H	H	H	H
	CE2-3 PATTERN RECOGNITION							
CO1	Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature	H	M	H	M	H	H	H
CO2	Apply pattern recognition techniques to real-world problems such as document analysis and recognition	H	M	H	H	H	H	H
CO3	Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers	H	M	M	M	H	H	H
CO4	Summarize, analyze, and relate research in the pattern recognition area verbally and in writing	M	L	M	M	M	M	H
	CE2-4 PARALLEL COMPUTING							
CO1	Introduces to various models of parallelism such as shared and distributed memory	H	H	H	M	M	H	H
CO2	Develop parallel computing solutions with respect to different mapping techniques	M	M	H	M	H	H	H
CO3	Helps in developing and implementing various routing mechanism necessary for parallel computing	M	M	H	M	H	H	H
CO4	Contribute as driving force in development of faster computers	H	M	H	M	H	H	H
	CE2-5 MOBILE & CYBER FORENSICS							
CO1	Introduces to Computer Forensics Fundamentals	H	H	H	H	H	H	H
CO2	Helps to analyze and explore different forensic technologies	H	M	H	H	M	H	H
CO3	Helps to identify methods of digital evidence preservation	H	M	H	H	M	H	H
CO4	Helps in exploring data recovery in mobile forensics	H	M	H	H	M	H	H
	PRACTICAL VII							
CO1	To implement standard data mining techniques and methods such as association rules, clustering techniques	H	H	H	H	H	H	H
CO2	To apply data mining techniques on datasets for realistic sizes using	H	H	H	H	H	M	h

	modern data analysis frameworks							
CO3	Implement microcontroller interfacing	H	H	M	M	M	H	H
CO4	To implement real time operating system using embedded	H	M	M	M	M	H	H
	PROJECT							
CO1	To display the working knowledge and skills to the industry	H	H	H	H	H	H	H
CO2	Deeper knowledge of methods in major field of study	H	H	H	H	H	H	H
CO3	To gain a consciousness of ethical aspects of research and development work	H	H	H	H	H	H	H
CO4	Capability to plan and use adequate methods to conduct qualified tasks in given frameworks and evaluate the work	H	H	H	H	H	H	H

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