

Programme Outcomes of B.Sc. programme:

Bajaj College of Science (BCS) offers Bachelor of Science (B.Sc), Master of Science (M.Sc) and Doctor of Philosophy (Ph.D) in two science subjects mainly Chemistry and Botany. The B.Sc degree at BCS is a comprehensive, interdisciplinary academic program that builds on existing strength in nine science departments. The BSc offers courses that integrate the material students learn in disciplinary courses such as chemistry, zoology, botany, physics, electronics, maths, computer science and biotechnology through practical experiences within academic program. The integration occurs through a College - College Alumni- University partnership where academic professional (invited faculty and resource persons) are actively involved in students' education through guest lectures and mentoring experiences and by providing internship opportunities.

Programme outcomes (POs) of B.Sc program will be prepared to:

- Demonstrate general knowledge of basic biological, physical, chemical and mathematical principles.
- Practice professional ethics in conduct of science.
- Develop problem-solving and analytical skills.
- Able to operate and interpret the data from instrumentation.
- Able to use library sources for the academic upbringing of the selected science subjects.
- Demonstrate an ability to understand career opportunities in science and technology industries.

Programme Specific Outcomes (PSOs) of BSc programme

- BCS offers various programs (hereafter referred as 'options') within BSc

| Degree | Section | Option (program specific) |
|--------|---------|---|
| BSc | Maths | Physics, Chemistry and Maths |
| | | Physics, Electronics and Maths |
| | | Physics, Computer Science and Maths |
| | | Electronics, Computer Science and Maths |
| | Biology | Botany, Zoology and Chemistry |
| | | Botany, Microbiology and Chemistry |
| | | Zoology, Microbiology and Chemistry |
| | | Botany, Biotechnology and Chemistry |
| | | Zoology, Biotechnology and Chemistry |
| | | Microbiology, Biotechnology and Chemistry |
| | | |

degree which are as follows.

Programme Specific Outcomes –

1. B.Sc. (Mathematics/Physics/Chemistry)

PSO-1: Capable of analyzing and solving problems using reasoning skills based on concepts of Physics.

PSO-2: Know and demonstrate understanding of the concepts from different branches of Chemistry

PSO-3: Develop the knowledge, skills and attitudes necessary for the studies in Mathematics.

2. B.Sc. (Mathematics/Physics/Electronics)

PSO-1: Understand the diverse applications of various fields of Mathematics and carry the knowledge and applications of Mathematics.

PSO-2: Understand the fundamental theories, concepts and applications in four basic areas of research in Physics.

PSO-3: Understand the fundamental theories, concepts and applications in basic areas of research in Electronics.

3. B.Sc. (Physics, Computer Science and Mathematics)

PSO-1: Understand the fundamental theories, concepts and applications in four basic areas of research in Physics.

PSO-2: Know and demonstrate understanding of the concepts from different branches of Mathematics.

PSO-3: Understand the fundamental theories, concepts and applications in basic areas of research in Computer Science.

4. B.Sc. (Electronics, Computer Science and Mathematics)

PSO-1: Understand the fundamental theories, concepts and applications in basic areas of research in Electronics.

PSO-2: Understand the fundamental theories, concepts and applications in basic areas of research in Computer Science.

PSO-3: Know and demonstrate understanding of the concepts from different branches of Mathematics.

5. B.Sc. (Botany, Zoology and Chemistry)

PSO-1: Emphasizes the diversity in form and function of plants and animals, create an awareness of the impact of Chemistry on the environment, society, appraise role of green chemistry in environment sustainability.

PSO-2: Understand the fundamental theories, concepts and applications in four basic areas of research in Chemistry (Analytical, Inorganic, Physical & Organic).

PSO-3: Develop the ability to explore new areas of research in Chemistry and allied field of Life sciences.

6. B.Sc. (Botany, Microbiology and Chemistry)

PSO-1: Emphasizes the diversity in form and function of microbes, create an awareness of the impact of Chemistry on the environment, society, appraise role of green chemistry in environment sustainability.

PSO-2: Understand the fundamental theories, concepts and applications in four basic areas of research in Chemistry (Analytical, Inorganic, Physical & Organic).

PSO-3: Develop the ability to explore new areas of research in Chemistry and allied field of Life sciences.

7. B.Sc. (Zoology, Microbiology and Chemistry)

PSO-1: Emphasizes the diversity in form and function of microbes and animals, create an awareness of the impact of Chemistry on the environment, society, appraise role of green chemistry in environment sustainability.

PSO-2: Understand the fundamental theories, concepts and applications in four basic areas of research in Chemistry (Analytical, Inorganic, Physical & Organic).

PSO-3: Develop the ability to explore new areas of research in Chemistry and allied field of Life sciences.

8. B.Sc. (Botany, Biotechnology and Chemistry)

PSO-1: Apply the Biotechnological concepts for basic and applied research and get empowered by Biotechnological, and Biochemical skills to serve in Life science related industries.

PSO-2: Emphasizes the diversity in form and function of plants, create an awareness of the impact of Chemistry on the environment, society, appraise role of green chemistry in environment sustainability.

PSO-3: Understand the fundamental theories, concepts and applications in four basic areas of research in Chemistry (Analytical, Inorganic, Physical & Organic).

9. B.Sc. (Zoology, Biotechnology and Chemistry)

PSO-1: Apply the Biotechnological concepts for basic and applied research and get empowered by Biotechnological, and Biochemical skills to serve in Life science related industries.

PSO-2: Emphasizes the diversity in form and function of plants, create an awareness of the impact of Chemistry on the environment, society, appraise role of green chemistry in environment sustainability.

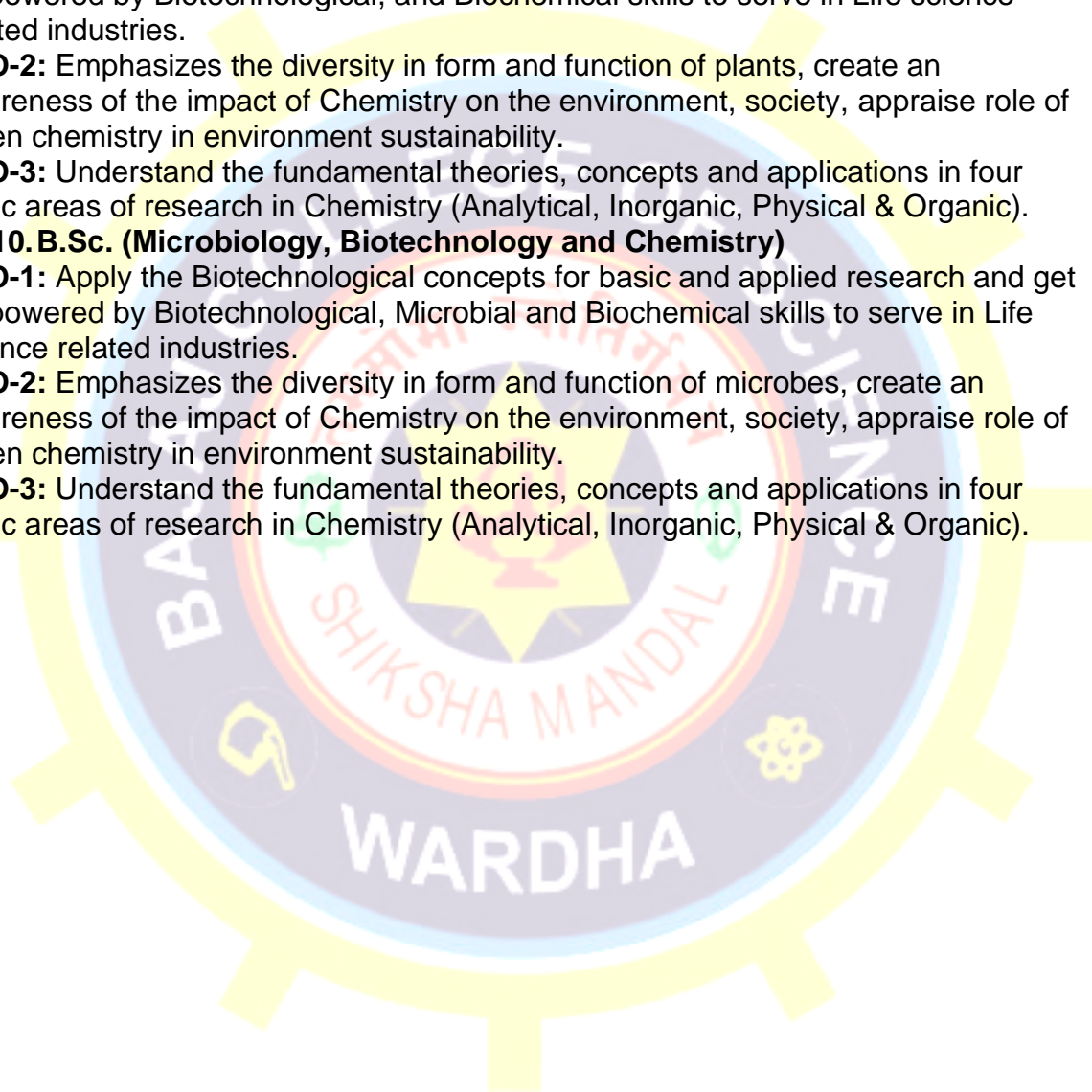
PSO-3: Understand the fundamental theories, concepts and applications in four basic areas of research in Chemistry (Analytical, Inorganic, Physical & Organic).

10. B.Sc. (Microbiology, Biotechnology and Chemistry)

PSO-1: Apply the Biotechnological concepts for basic and applied research and get empowered by Biotechnological, Microbial and Biochemical skills to serve in Life science related industries.

PSO-2: Emphasizes the diversity in form and function of microbes, create an awareness of the impact of Chemistry on the environment, society, appraise role of green chemistry in environment sustainability.

PSO-3: Understand the fundamental theories, concepts and applications in four basic areas of research in Chemistry (Analytical, Inorganic, Physical & Organic).



*Course outcomes (COs) of science and language subjects offered in
BSc programmes :*

Chemistry Department:

| Programme | Branch | | |
|------------------|-------------------------------|---|--------------------------|
| B.Sc | Mathematics Group (MG) | | |
| B.Sc | MG | Science Subjects | Acronym of Option |
| | Option 1 | A) Physics, Chemistry, Mathematics | PCM |
| | Option 2 | B) Physics, Electronics, Mathematics | PEM |
| | Option 3 | C) Physics, Computer Science, Mathematics | PCsM |
| | Option 4 | D) Electronics, Computer Science, Mathematics | ECsM |
| Programme | Branch | | |
| B.Sc | Biology Group (BG) | | |
| B.Sc | BG | Science Subjects | Acronym of Option |
| | Option 5 | E) Chemistry, Botany, Zoology | CBZ |
| | Option 6 | F) Chemistry, Botany, Microbiology | CBMB |
| | Option 7 | G) Chemistry, Zoology, Microbiology | CZMB |
| | Option 8 | H) Chemistry, Botany, Biotechnology | CBBT |
| | Option 9 | I) Chemistry, Zoology, Biotechnology | CZBT |

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|--|-----------|---|-------|
| | Option 10 | J) Chemistry, Microbiology, Biotechnology | CMBBT |
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Course Outcomes:

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|-----------------------|---|
| Title of paper | CY I: (Fundamentals of Inorganic, Organic & Physical Chemistry) |
| Course Code | UG –CHEM(02)-S1-T |

After successful completion of the course, the student is expected to

CO1: Know basics of atomic structure and periodicity which will help them in understanding structure of atom and variations in periodic properties of elements.

CO2: Understand types of bonding which are the basis of variety of compounds.

CO3: Realize the basics of organic chemistry.

CO4: Learn the important aspects of stereochemistry.

CO5: Know the important theories of gaseous state and learn the properties of liquids.

CO6: Understand the fundamentals of chemical thermodynamics.

The topics of this course cover mainly the fundamentals of the subject.

On completion of the practical course students will-

CO1: Understand the calibration of apparatus.

CO2: Learn the basics of volumetric analysis with various concentration units. This will help students to gain skills required for solution preparation that can help them to get jobs at quality control units of industries.

CO3: Be able to compare the acid neutralizing capacities of various antacids available in market and also compare the acetic acid content of commercially available vinegars.

CO4: Understand the basics of organic compound analysis enabling them to detect elements and functional groups in given samples. This will equip them to work at forensic labs.

CO5: Learn to determine thermodynamic parameters of a reaction.

CO6: Know determination of some important properties of liquids.

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|-----------------------|---|
| Title of paper | CY II Concepts of Inorganic, Organic & Physical Chemistry |
| Course Code | UG-CHE(02)-S2-T |

After successful completion of the course, the student is expected to

CO1: Learn the properties of elements belonging to the s and p blocks of periodic table.

CO2: Understand important domestic, industrial, biological applications of s and p block elements.

CO3: Gain knowledge about various aspects of hydrocarbons like alkanes, alkenes, alkynes, dienes and aromatics.

CO4: Learn the important aspects of thermodynamics.

CO5: Know the fundamentals of solid state and structure determination.

CO6: Understand the fundamentals of phase equilibrium with respect to one and two component systems along with liquid-liquid mixtures.

On completion of the practical course students will-

CO1: Understand complexometric titrations including analysis of hardness of water. This enables students to work on water treatment plants etc.

CO2: Learn to identify critical solution temperature and study effect of impurities on them.

CO3: Gain the skills to purify compounds and test their purity. This skill can be useful while working in variety of laboratories and industries.

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|----------------|---|
| Title of paper | Elements of Inorganic, Organic & Physical Chemistry |
| Course Code | UG-CHE(02)-S3-T |

After successful completion of the course, the student is expected to

CO1: Understand the principles and importance of Molecular Orbital theory in understanding of bonding.

CO2: Learn important aspects of compounds like sulfur tetranitride, poly- and interhalogens.

CO3: Gain knowledge about important aspects of transition elements and nonaqueous solvents.

CO4: Acquire the knowledge about synthesis, properties and reactivities of important organic compounds like alkyl and aryl halides, organometallic compounds, alcohols, phenols and amines.

CO5: Know the fundamentals of chemical kinetics and reaction dynamics.

CO6: Understand the principles of ionic equilibrium.

CO7: Grasp the concepts of various colligative properties and their application in molecular weight determination.

On completion of the practical course students will-

CO1: Understand qualitative analysis of inorganic salt mixtures.

CO2: Acquire skill in synthetic organic chemistry. This will also help them understand the concepts of atom economy, percent yield which are important for any synthetic process.

CO3: Gain an understanding of methods to determine kinetic parameters of reactions like rate of reaction, rate constant, energy of activation.

CO4: Learn to determine molecular weights of given compounds from colligative properties.

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| Title of paper | Concise of Inorganic, Organic & Physical Chemistry |
| Course Code | UG-CHE(02)-S4-T |

After successful completion of the course, the student is expected to

CO1: Learn about the position and various physical and chemical properties of lanthanides actinides.

CO2: Gain knowledge about important basics of coordination compounds.

CO3: Understands various aspects about the redox behavior of different compounds.

CO4: Acquire the knowledge about synthesis, properties and reactivities of important carbonyl compounds like aldehydes and ketones.

CO5: Learn structure, preparation and chemical properties of carboxylic acids, unsaturated mono- and disubstituted carboxylic acids and their derivatives.

CO6: Know the fundamentals of adsorption and its applications in catalysis.

CO7: Understand the principles of electrolytic conductance and its applications.

On completion of the practical course students will-

CO1: Understand gravimetric analysis of barium and nickel from given samples..

CO2: Acquire skill in qualitative organic analysis to identify given organic compound. This skill is of great help in analysis of various samples while working in government, industrial or forensic laboratories.

CO3: Know the methods to determine conductance of electrolytic solutions and use the conductance values for different applications.

CO4: Learn to verify Freundlich and Langmuir adsorption isotherms.

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|----------------|---|
| Title of paper | Principles of Inorganic, Organic & Physical Chemistry |
| Course Code | UG-CHE(02)-S5-T |

After successful completion of the course, the student is expected to

CO1: Understand important principles of organometallic chemistry through Li- and Al- alkyls and aryls as well as Wilkinson's catalyst.

CO2: Gain basic knowledge about metal carbonyls and inorganic polymers i.e. silicones and phosphonitrilic halide polymers.

CO3: Understand the importance of inorganic chemistry in biological systems.

CO4: Acquire the knowledge about hard-soft acids and bases.

CO5: Learn structure, preparation and chemical properties of important heterocyclic compounds furan, thiophene, pyrrole and pyridine.

CO6: Know in brief about synthetic dyes, drugs and polymers.

CO7: Understand the basic principles and analytical applications of UV-Visible and Infrared spectroscopy.

CO8: Acquire the knowledge about basic principles and applications of rotational, vibrational and Raman spectroscopy.

CO9: Understand the concept of EMF of cell and its applications.

On completion of the practical course students will-

CO1: Learn the synthesis of some inorganic complexes and understand their VBT structure, magnetic properties and colors.

CO2: Acquire skill in estimation of important organic compounds like glucose, acetamide, glycine, carboxylic acids etc.

CO3: Know the methods to monitor EMF of electrochemical cells and use the EMF values for different applications.

CO4: Apply the optical properties of optical rotation and absorbance for analytical studies of solutions.

CO5: Understand the application of potentiometry in acid-base and redox titrations.

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|----------------|--|
| Title of paper | Advanced Inorganic, Organic & Physical Chemistry |
| Course Code | UG-CHE(02)-S6-T |

After successful completion of the course, the student is expected to

CO1: Understand important structural, spectroscopic, thermodynamic and kinetic aspects of transition metal complexes.

CO2: Gain basic knowledge about principles, instrumentation and application of colorimetry and spectrophotometry.

CO3: Understand the principle, technique and application of important separation techniques chromatography, ion exchange and solvent extraction.

CO4: Acquire the knowledge about theory, instrumentation and application of ^1H NMR spectroscopy.

CO5: Get introduced with bioorganic molecules and study their classification and structures.

CO6: Know in brief about preparation of soaps and detergents. This introduces students to basic reactions in industrial synthesis of soaps and detergents.

CO7: Understand the basic principles and terminologies of quantum mechanics and will learn to apply these basics to study simple systems.

CO8: Acquire the knowledge about basic principles of photochemistry and some photochemical reactions.

CO9: Understand the concept of dipole moment and its applications.

On completion of the practical course students will-

CO1: Learn the quantitative and qualitative colorimetric analysis to determine the strength of a solution and composition of a complex.

CO2: Acquire skill in separation and identification of organic compounds from given binary mixtures.

CO3: Apply the basic physical chemistry principles to learn advanced experimentation.

CO4: The knowledge of instrumentation handling will give students an edge in pursuit of good career.

Mathematics Department

| Programme | Branch | | |
|-----------|------------------------|---|-------------------|
| B.Sc | Mathematics Group (MG) | | |
| B.Sc | MG | Science Subjects | Acronym of Option |
| | Option 1 | A) Physics, Electronics, Mathematics | PEM |
| | Option 2 | B) Physics, Computer Science, Mathematics | PCsM |
| | Option 3 | C) Electronics, Computer Science, Mathematics | ECsM |

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|--|-------------|------------------------------------|-----|
| | Option 4 | D) Physics, Chemistry, Mathematics | PCM |
|--|-------------|------------------------------------|-----|

Course Outcomes:

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|----------------|------------------------|
| Title of paper | Elementary mathematics |
| Course Code | UG-MTH(03)-S1-T1 |

After successful completion of the course, Students will be able to

CO1: Apply complex number to trigonometry. Find complex roots of polynomial equations.

CO2: Apply matrices to solve system of equation. Knowledge of eigen values and eigen vectors.

CO3: Apply theory of equations to solve polynomial equations

CO4: Understand elementary results of number theory and get a flavour of what number theory is

Course Outcomes:

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|----------------|------------------------------------|
| Title of paper | Differential and Integral Calculus |
| Course Code | UG-MTH(03)-S1-T2 |

After successful completion of the course, Students will be able to

CO1: Find the n^{th} derivative of product of two functions, find expansion of function

CO2: Understands homogeneous function and its partial derivatives

CO3: To find maxima minima of function of two variables.

CO4: To integrate irrational functions.

Course Outcomes:

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|----------------|---|
| Title of paper | Geometry, Differential and Difference Equations |
| Course Code | UG-MTH(03)-S2-T1 |

After successful completion of the course, Students will be able to

CO1: understand concepts in solid geometry

CO2: solve first order differential equations

CO3: solve second order differential equations

CO4: understand the difference equations and solve them

Course Outcomes:

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|----------------|------------------|
| Title of paper | Vector Analysis |
| Course Code | UG-MTH(03)-S2-T2 |

After successful completion of the course, students will be able to

CO1: Do vector differentiation and knowledge of divergence and curl

- CO2:** Evaluate double, triple integrals and beta gamma functions
CO3: Evaluate line, surface and volume integrals
CO4: learn Green's, Stokes and divergence theorem

Course Outcomes:

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|----------------|----------------------------------|
| Title of paper | Advanced Calculus & Graph theory |
| Course Code | UG-MTH(03)-S3-T1 |

After successful completion of the course, students will be able to

- CO1:** Apply Taylor's series to function of two variables and learn methods to find Maxima minima for a function of two variables
CO2: Understand convergence of sequences
CO3: Apply various tests to test the convergence of series
CO4: Acquire the knowledge of graph theory

Course Outcomes:

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|----------------|----------------------|
| Title of paper | Mathematical Methods |
| Course Code | UG-MTH(03)-S3-T2 |

After successful completion of the course, students will be able to

- CO1:** Understand the properties of Legendre's and Bessel's functions
CO2: Achieve the knowledge of Laplace transforms
CO3: Apply Laplace transforms to solve differential and integral equations and electrical circuits
CO4: To achieve the knowledge of Fourier transform and its application to PDE

Course Outcomes:

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|----------------|---|
| Title of paper | Partial Differential Equations & Calculus of Variations |
| Course Code | UG-MTH(03)-S4-T1 |

After successful completion of the course, students will be able to

- CO1:** Solve first order linear and nonlinear PDE
CO2: Solve second order linear PDE
CO3: Classify second order PDE and reduction to its canonical form
CO4: Learn extremum of functional and application of Euler's differential equation.

Course Outcomes:

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|----------------|------------------|
| Title of paper | Mechanics |
| Course Code | UG-MTH(03)-S4-T2 |

After successful completion of the course, students will be able to

- CO1:** Get Introduced to statics and gain knowledge of coplanar forces and catenary

CO2: Understand radial, transverse, tangential, normal velocity and acceleration and Simple Harmonic motion

CO3: Learn and apply D'Alembert principle and Lagrangian to problems in mechanics

CO4: Apply Virial theorem to dynamics problems.

Course Outcomes:

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|----------------|------------------|
| Title of paper | Real Analysis |
| Course Code | UG-MTH(03)-S5-T1 |

After successful completion of the course, students will be able to

CO1: Find Fourier series expansion of functions and apply to sum a series

CO2: Learn Riemann-Stieltje's integral and its properties

CO3: Comprehend Metric space and countability

CO4: Understand the sequences in metric spaces, and compact spaces

Course Outcomes:

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|----------------|------------------|
| Title of paper | Complex Analysis |
| Course Code | UG-MTH(03)-S5-T2 |

After successful completion of the course, students will be able to

CO1: Learn differentiability of complex numbers, CR equations and harmonic functions

CO2: Comprehend fixed points and conformal mapping

CO3: To do complex integration and learn Cauchy's formula and inequality

CO4: Understand zeros of a function, singularities and residues

Course Outcomes:

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|----------------|------------------|
| Title of paper | Abstract Algebra |
| Course Code | UG-MTH(03)-S6-T1 |

After successful completion of the course, students will be able to

CO1: Learn group automorphism and conjugacy

CO2: Get the concept of Ring theory

CO3: Understand Vector spaces, linear dependence, independence

CO4: Comprehend Linear transformations and matrix associated with linear map.

Course Outcomes:

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|----------------|------------------------------|
| Title of paper | Special Theory of Relativity |
| Course Code | UG-MTH(03)-S6-T2 |

After successful completion of the course, students will be able to

CO1: Understand Newtonian mechanics and Galilean and Lorentz transformations

CO2: Understand Einstein's relativity, concepts of length contraction and time dilation

CO3: Know and apply tensors, Riemannian metric

CO4: Get the important mass energy equivalence $E = mc^2$, Maxwell's equations of electromagnetic theory.

Course Outcomes:

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| Title of paper | Discrete Mathematics and Elementary Number Theory |
| Course Code | UG-MTH(03)-S6-T2 |

After successful completion of the course, students will be able to

CO1: Understand Lattices and Boolean algebra

CO2: Learn divisibility, prime and congruence properties

CO3: Learn quadratic residues and reciprocity

CO4: Solve Diophantine equations

Course Outcomes:

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|----------------|-----------------------|
| Title of paper | Differential Geometry |
| Course Code | UG-MTH(03)-S6-T2 |

After successful completion of the course, students will be able to

CO1: Learn curves in space, Serret-Frenet formulae

CO2: Solve curvature and torsion problems

CO3: Learn curves on a surface, orthogonal trajectories

CO4: Understand the geodesic, Gaussian curvature

Physics Department:

| Programme | Branch | | |
|-----------|------------------------|---|-------------------|
| B.Sc | Mathematics Group (MG) | | |
| B.Sc | MG | Science Subjects | Acronym of Option |
| | Option 1 | A) Physics, Chemistry, Mathematics | PCM |
| | Option 2 | B) Physics, Electronics, Mathematics | PEM |
| | Option 3 | C) Physics, Computer Science, Mathematics | PCsM |

Course Outcomes:

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|-----------------------|---------------|
| Title of paper | Physics I |
| Course Code | UG-PHY(01)-S1 |

After successful completion of the course, the student is expected to

CO1: Get familiar with physics behind the daily activities happening around them.

CO2: Learn the basic knowledge about the universe and solar system. Also the students learn about necessary tools for observing and evaluating the sky.

CO3: Learn the basics of properties of matter, how Young's modulus and rigidity modulus are evaluated for different shapes of practical relevance.

CO4: Learn the fundamentals of the harmonic oscillator model, including damped and forced oscillators and grasp the significance of terms like quality factor and damping coefficient.

CO5: understand the physics of capacitors.

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| Title of paper | Physics II |
| Course Code | UG-PHY(01)-S2 |

After successful completion of the course, the student is expected to

CO1: Know about the magnetic effects of electric current.

CO2: Know about the magnetism and magnetic materials

CO3: Know about the a.c. circuits, transformers and their applications

CO4: Know about the role of passive components in the electrical circuits

CO5: Understand behaviour of gases at different temperatures and pressures.

CO6: Get acquainted with Carnot cycle & the principle used in automobile industries.

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| Title of paper | Physics III |
| Course Code | UG-PHY(01)-S3 |

After successful completion of the course, the student is expected to

CO1: Know about the production of sound waves and their characteristics

CO2: Get familiarised with general requirements in acoustical design of an auditorium.

CO3: Understand the design and fabrication of the DC power supply of various ratings.

CO4: Learn about the various natural optical phenomena (interference, diffraction, polarization) and their applications in day to day life.

CO5: Learn about the basics of the electromagnetic waves.

CO6: Know about the characteristics of ultrasonic waves and their applications.

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| Title of paper | Physics IV |
| Course Code | UG-PHY(01)-S4 |

After successful completion of the course, the student is expected to

CO1: Get familiarized with various crystallographic structures in solids.

CO2: Get an understanding of X-rays, their properties and uses.

CO3: Understand rotational, vibrational, electronic and Raman spectra for identification of molecular structures.

CO4: Know about different types of LASER and their applications. ,

CO5: Get acquainted with transistor ,the basic building block of many electronics circuit. They can self design electronic circuits.

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| Title of paper | Physics V |
| Course Code | UG-PHY(01)-S5 |

After successful completion of the course, the student is expected to

CO1: Understand the behavior of atoms in externally applied electric and magnetic fields.

CO2: Get acquainted with nuclear processes,concept of production of energy in solar system and reactors.

CO3: Learn origin of Quantum Mechanics, wave-particle duality and its consequences

CO4: Learn the various Concepts Of Relativity and its consequences in nature.

CO5: Get familiarized With nanomaterials and nanotechnology and its uses in daily life.

CO6: Understand different statistical models and how to apply them to various interacting systems of particles.

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| Title of paper | Physics VI |
| Course Code | UG-PHY(01)-S6 |

After successful completion of the course, the student is expected to

CO1: Get Familiarised with the phenomena of radioactivity, its various applications in versatile fields.

CO2: Learn about Op-Amp and its use in various circuits and how it can be put to use in daily life applications.

CO3: Understand the uses of solids for various applications like thermal and electrical conductors.

CO4: Learn about the basics of digital electronics, which forms the basic language of modern instruments and gadgets.

CO5:.Get acquainted with Optical Fibers, which are the fastest and efficient way of data transfer.

CO6: Learn about EM waves ,their transmission- reception and communication systems applicable in working of modern gadgets like Mobile phones, TV, radio, Remotes etc.

Electronics Department:

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|------------------|-------------------------------|---|--------------------------|
| Programme | Branch | | |
| B.Sc | Mathematics Group (MG) | | |
| B.Sc | MG | Science Subjects | Acronym of Option |
| | Option 1 | B) Physics, Electronics, Mathematics | PEM |
| | Option 2 | C) Physics, Computer Science, Mathematics | PCsM |
| | Option 3 | A) Electronics, Computer Science, Mathematics | ECsM |

Course Outcomes:

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|-----------------------|--------------------------------------|
| Title of paper | Analogue and Digital Electronics - I |
| Course Code | UG-ELE(04)-S1-T |

After successful completion of the course, the student is expected to

| Course Objectives | Course Outcomes |
|---|---|
| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To understand operation of basic electronic components and semiconductor devices | 1. Understand the current voltage characteristics of basic electronic components and semiconductor devices, |
| 2. To explain the basic concepts and laws of DC electrical networks and circuits and solve them using mesh, nodal and network theorems analysis techniques. | 2. Assemble and analyze electronic circuits using mesh, nodal and network theorems analysis techniques. |

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| 3. To understand the operation of a transistor, its various parameters of transistor and biasing modes. | 3. Assemble and analyze transistor circuits. |
| 4. To understand number representation and conversion between different representations, various binary codes and logic gates. | 4. Understand various number systems, binary codes and logic gates. |
| 5. To understand Boolean algebra and K-map technique. | 5. Assemble and analyze a digital logic circuit based on Boolean algebra and K-map technique. |
| 6. To analyze logic processes and implement logical operations using combinational logic circuits. | 6. Assemble and analyze various combinational logic circuits. |

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| Title of paper | Analogue and Digital Electronics - II |
| Course Code | UG-ELE(04)-S2-T |

After successful completion of the course, the student is expected to

| Course Objectives | Course Outcomes |
|---|---|
| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To introduce hybrid parameters and their interrelationship and operation of JFET and MOSFET devices. | 1. Learn the various h parameters and their interrelationship, able to solve numerical using two port parameters, Assemble and analyze the basic operations of JFET and MOSFET. |
| 2. To understand the operation and design of various types of power amplifier circuits. | 2. Know about different power amplifier circuits, their design and use in electronics circuits. |
| 3. To understand operation of various power electronics semiconductor devices. | 3. Understand the current voltage characteristics of various power electronics semiconductor devices. |

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| 4. To understand concepts of flip-flops. | 4. Analyze, assemble and verify flip-flop logic circuits. |
| 5. To understand concepts of counters and shift registers. | 5. Analyze assemble and verify counter and shift register logic circuits. |
| 6. To understand characteristics of TTL and CMOS logic family, memory and its expansion and their classification. | 6. Classify different logic families, semiconductor memories, know their characteristics and expand the memory capacity. |

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| Title of paper | Op-Amp, Power Supply, IC 555 and Circuit Maker |
| Course Code | UG-ELE(04)-S3-T |

After successful completion of the course, the student is expected to

| Course Objectives | Course Outcomes |
|---|---|
| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To understand the concepts, working principles and key parameters of an operational amplifier. | 1. Understand the fundamentals and working principles of operational amplifiers. |
| 2. To perform analysis of operational amplifier circuits based on negative and positive feedback applications. | 2. Demonstrate the ability to design practical circuits based on negative and positive feedback applications that perform the desired operations. |
| 3. To understand operation of rectifier, filter, regulator and various parameters associated with power supply. | 3. Understand the concept and operation of rectifier, filter, regulator and various parameters associated with power supply. |
| 4. To understand operation of regulated power supply and apply concepts for the design of regulated power supply. | 4. Analyze and assemble regulated power supply using 78XX and 723 IC. |

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| 5. To understand the operation and use of 555 timer IC. | 5. Analyze and assemble various timer circuits using 555 IC. |
| 6. To study the analysis of circuit design using circuit maker simulation software. | 6. Understand the behavior of the electronic circuits. |

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| Title of paper | OP-AMP Applications & Electronic Instrumentation |
| Course Code | UG-ELE(04)-S4-T |

After successful completion of the course, the student is expected to

| Course Objectives | Course Outcomes |
|---|---|
| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To analyze the different RC and LC oscillator circuits using OPAMP and to determine the frequency of oscillation. | 1. Assemble the different oscillator circuits using OPAMPs for various frequencies. |
| 2. To understand the operation and design of various multivibrators, S/H and IA circuits using OPAMP for a given specification. | 2. Know and assemble multivibrator circuits using OPAMP in various configurations to determine its frequency. |
| 3. To understand A/D and D/A converters and analyze their characteristics and classification. | 3. Classify, analyze and assemble A/D and D/A converters. |
| 4. To provide fundamental concepts of basic electronic and PC based instrumentation systems. | 4. Students will be able to describe various functional blocks of basic electronic and PC based instrumentation systems. |
| 5. To provide basic knowledge about the various transducers, sensors, actuators and instrumentation systems based on these transducers. | 5. Students will be able to explain the principle of operation of various transducers, sensors, actuators and their use in developing electronic instrumentation systems. |

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| 6. To provide fundamental knowledge of biomedical instrumentation systems and its safety codes. | 6. Students will be able to describe functional blocks of biomedical instrumentation systems and its safety codes. |
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| Title of paper | Electronic Communication & Fundamentals of Microprocessor |
| Course Code | UG-ELE(04)-S5-T |

After successful completion of the course, the student is expected to

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To introduce students to electronic communication and various modulation and demodulation techniques of communication. | 1. Use of different modulation and demodulation techniques used in analog communication and Identify and solve basic communication problems. |
| 2. To introduce students the concept and theory of propagation of signals and the various characteristics of different types of antennas. | 2. Understand about various types of propagation signals. Analyze the radiation mechanisms of antennas and demonstrate knowledge of antennas in communication systems. |
| 3. To learn the basic elements of digital, optical fiber system, FAX and cellular communication. | 3. Understand the concept and operation of digital, optical fiber system, FAX and cellular communication. |
| 4. To develop the background and basic knowledge of 8085 microprocessors. | 4. Draw and describe architecture of 8085 microprocessor. |
| 5. To write assembly language programs of 8085 microprocessors for various applications. | 5. Write assembly language program for 8085 microprocessor. |

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| 6. To know the different interfacing methods, DMA and basic knowledge of 8255 PPI and its interfacing to 8085 microprocessors. | 6. Understand various interfacing schemes, DMA. Draw and describe architecture of 8255 PPI and its interfacing to 8085 microprocessor. |
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|----------------|---|
| Title of paper | Programming in 'C' & Microcontroller 8051 |
| Course Code | UG-ELE(01)-S6-T |

After successful completion of the course, the student is expected to

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To understand the different types of programming languages and in particular the basics of 'C'. | 1. Understand the fundamentals of 'C' language. |
| 2. To write and debug simple 'C' programs. | 2. Demonstrate the ability to write and debug 'C' programs for various applications. |
| 3. To undertake small 'C' language projects. | 3. Write algorithms, draw flow charts and 'C' programs for simple applications. |
| 4. To develop background knowledge and core expertise of 8051 microcontroller. | 4. Draw and describe architecture of 8051 microcontroller. |
| 5. To write assembly language programs of 8051 microcontroller for various applications. | 5. Write assembly language program for 8051 microcontroller. |
| 6. To know the importance of different peripheral devices and their interfacing to 8051 microcontrollers. | 6. Interface various peripheral devices to the 8051 microcontroller. |

Computer Science Department:

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|------------------|-------------------------------|---|--------------------------|
| Programme | Branch | | |
| B.Sc | Mathematics Group (MG) | | |
| B.Sc | MG | Science Subjects | Acronym of Option |
| | Option 1 | A) Physics, Computer Science, Mathematics | PCsM |
| | Option 2 | B) Electronics, Computer Science, Mathematics | ECsM |

Course Outcomes

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|-----------------------|---|
| Title of paper | Programming in 'C' and Fundamentals of Information Technology |
| Course Code | UG-CS (05)-S1-T |

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To understand the basics of 'C' programming. Also get knowledge of algorithm and flowcharts. | 1. Learn to make basics programs and also able to draw algorithm and flowcharts of programs. |
| 2. To know the concepts of control and looping structure. Also student get the idea about concepts of arrays and functions. | 2. Perform programs using control and looping structure also understand the basic programs on arrays and functions. |
| 3. To understand the basics of structures, pointers and file handling. | 3. Implementation of structures, pointers and file handling concepts in programming. |
| 4. To understand the concepts of fundamentals of a computer system, number systems, generations of computer languages, and other system tools like translator programs. | 4. Understand various number systems, generations of computer languages and translators. |
| 5. To understand various types of memories, storage devices, input and output devices. | 5. Know various types of memories, storage devices, input and output devices. |
| 6. To get acquainted with concepts of networks and its associated terminologies, topologies, | 6. Learn the concepts of networks, topologies, architecture, |

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| architecture, communication devices and recent technologies like Bluetooth and Wi-Fi. | communication devices and recent technologies. |
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| Title of paper | Object Oriented Programming using 'C++' and System Analysis and Design. |
| Course Code | UG-CS (05)-S2-T |

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To introduce the basics of Object Oriented Programming like classes, objects, abstraction, encapsulation and polymorphism, etc. | 1. Learn to write programs using Object Oriented Programming concepts like class and object. |
| 2. To understand the concepts of constructor and destructor; also familiar with operator overloading and dynamic objects. | 2. Implementation of creation, deletion of objects and to make dynamic objects. |
| 3. To get an idea of inheritance, virtual functions and exception handling. | 3. Understand the implementation of inheritance, virtual functions and exception handling using programming. |
| 4. To know about components of Computerized Information Systems, role of Systems Administrator, various software development models; structured tools and techniques used for data collection and data analysis. | 4. Understand components of Computerized Information Systems, role of Systems Administrator, various software development models; structured tools and techniques. |
| 5. To understand concepts associated with input and output design, form design, activities related to implementation and change strategies related to a computer system. | 5. Know concepts associated with input and output design, form design, implementation activities and change strategies. |
| 6. To understand the principles of testing strategies, conversion methods, planning and scheduling techniques, SCM, ISO, software re-engineering and software maintenance costs. | 6. Get acquainted with the principles of testing strategies, conversion methods, planning and scheduling techniques, and advanced concepts. |

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| Title of paper | Data Structures and Operating Systems |
| Course Code | UG-CS (05)-S3-T |

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To understand the concepts of data structures like Linked List and all possible operations on Linked list. | 1. Understand Linked List and its implementation using programming. |
| 2. Know about the concepts of Stacks and Queues; applications of stack e.g converting infix to postfix and Towers of Hanoi. | 2. Implementation of Stacks and Queues, converting infix to postfix and Towers of Hanoi using programming. |
| 3. To understand the various sorting techniques and hashing techniques. | 3. Implementation of insertion, selection, merge sort and hashing using programming language. |
| 4. To acquire knowledge about fundamental concepts of operating system, process management and different CPU scheduling algorithms. | 4. Grasp the basic concepts of OS, process management and CPU scheduling algorithms. |
| 5. To understand the deadlock and its associated techniques and concepts related to memory management. | 5. Have knowledge of deadlock, its associated techniques and concepts of memory management. |
| 6. To get an idea of I/O management, file management and advanced topics related with system security and privacy. | 6. Aware of I/O management, file management, system security and privacy. |

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| Title of paper | Java Programming and Linux Operating System |
| Course Code | UG-CS (05)-S4-T |

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |

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| 1. Get familiar with the basics of 'Java' programming, applet and applications. | 1. Perform the basic programs of Java. |
| 2. Get an idea of packages, interfaces, threads, applet and exception handling. | 2. Implementations of packages, interfaces, threads, applet, etc. |
| 3. Know about the various AWT components, events and menus in Java. | 3. Understand and implement various AWT components, events, menus in Java. |
| 4. To get acquainted with the Linux system environment, file types, shells in Linux and basic commands. | 4. Used to with Linux environment, file types, shells and basic commands. |
| 5. To provide basic knowledge about performing backup and restoration, printing files, sharing files, and types of processes in Linux. | 5. Absorb knowledge about Linux system administration. |
| 6. To get acquainted with concepts of disk management, communication utilities and various types of GUIs. | 6. Learn concepts of disk management, communication utilities and GUIs. |

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| Title of paper | Visual Basic Programming and Database Management System |
| Course Code | UG-CS (05)-S5-T |

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. Understand the IDE and various component of VB. | 1. Familiar with various GUI components and development of VB programs. |
| 2. Get acquainted with arrays, procedures, function and menu driven programming in VB. | 2. Implementation of arrays, procedures, functions and menu driven programming. |
| 3. Learn to interact with databases and perform DML operations on databases. | 3. Get an idea of databases and perform DML operations using programming. |

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| 4. To learn the basic elements of DBMS, its various users, types of models, etc. | 4. Know basics of DBMS, users and different DBMS models. |
| 5. To know concepts of extended E-R features, Relational model and its associated terminologies. | 5. Understand extended E-R features, Relational model and its associated terminologies. |
| 6. To Understand different types of functional dependencies in databases, Normalization and its features. | 6. Grasp knowledge of functional dependencies, Normalization and various normal forms. |

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|-----------------------|---|
| Title of paper | Compiler Construction, SQL and PL / SQL |
| Course Code | UG-CS (05)-S6-T |

| Course Objectives | Course Outcomes |
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| <i>Students will try to learn:</i> | <i>After successful completion of the course student will be able to</i> |
| 1. To understand the need for a compiler and its basic building blocks. | 1. Get familiarised with the compiler and its fundamental building blocks. |
| 2. To learn about features of HLL with respect to compiler construction and the role of Lexical Analyzer in the compilation process. | 2. Know features of HLL, role of Lexical Analyzer in compilation process. |
| 3. To know the importance of parsers, code optimization and code generation in compiler. | 3. Learn about parsers, code optimization and code generation in compiler. |
| 4. Learn about the various database objects like table, views, sequence and synonym. | 4. Performs DML and DDL operations on database objects. |
| 5. Get acquainted with programming in SQL, and Cursor concept. | 5. Implementation of various PL/SQL programs and Cursor. |
| 6. Get an idea about procedures, functions and trigger. | 6. Programs for procedures, functions and trigger. |

Botany Department

| Programme | Branch | | |
|-----------|--------------------|---|-------------------|
| B.Sc | Biology Group (BG) | | |
| B.Sc | BG | Science Subjects | Acronym of Option |
| | Option 5 | E) Chemistry, Botany, Zoology | CBZ |
| | Option 6 | F) Chemistry, Botany, Microbiology | CBMB |
| | Option 7 | G) Chemistry, Zoology, Microbiology | CZMB |
| | Option 8 | H) Chemistry, Botany, Biotechnology | CBBT |
| | Option 9 | I) Chemistry, Zoology, Biotechnology | CZBT |
| | Option 10 | J) Chemistry, Microbiology, Biotechnology | CMBBT |

Course Outcomes:

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|-----------------------|--|
| Title of paper | Plant Diversity & Applications of Microbes |
| Course Code | UG-BOT(06)-S1-T |

After successful completion of the course

CO1: Students will get familiar with subject Botany in which they learn about Viruses and Bacteria, their ultra-structure, Reproduction, their role in Agriculture, Medicines and in Industry.

CO2: Students learn about types of algae, their classification where they belongs to their class/ groups, what kind of habit, thallus structure, organization, pigmentation, form of reserve food present in them and reproduction and their economic importance in reference to food, Industry, Agriculture and also their harmful aspects.

CO3: They learn about different types of plant pathogen / fungi and lichens, their classification and their economic importance in reference to Industry, Medicines, food and agriculture.

CO4: The students came to know the diseases caused by Viruses and Bacteria, which were the host, types of pathogen and what kind of symptoms occurred on plants, and identifying characters with type or name of disease of plants.

CO5: Learn the type of Bryophytes, their classification where they belong to group or classes, their characteristic features, how life cycles occurred and their economic importance.

CO6: Students can understand types of Bio fertilizers, their concept, and importance. They also came to know the types of nitrogen fixing cyanobacteria and Bacteria which are helpful in making the bio fertilizers the, they also learn about Phosphorus degrading and Potash mobilizing bacteria and VAM. Further they also learn the nutritional, medicinal value, cultivation practices of mushrooms and their economic importance.

Course Outcomes:

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|----------------|---|
| Title of paper | Pteridophyta, Gymnosperms, Morphology of angiosperms & Scientific Report Writing. |
| Course Code | UG-BOT(06)-S2-T |

After successful completion of the course,

CO1: Students get the knowledge of a group of plants from Pteridophyta, their characteristics, classification, life cycles, vascular organization and reproduction.

CO2: Students came to know about the plants of the past which existed at that time and periods, how they were preserved in nature and their fossil types found today, also students came to know the different examples from gymnosperms fossils group.

CO3: They Know about the group of gymnosperms plants, their classification, life cycle of some examples, their similarity and differences with earlier and later groups / classes and economic importance.

CO4: Know the plant habit diversity, types of roots and their modification. Stems shapes, surface, texture, nature, branching and modification, Leaf types, arrangements and their modifications.

CO5: Students will get the knowledge of arrangements of flowers on floral axis/ inflorescence type, their modification, floral insertion on thalamus, structure, arrangements of seed before and after formation, and types of fruits.

CO6: The students will be well acquainted with scientific report writing in which they came to know maintaining laboratory record, tabulation, graph generation, imaging of specimens, application of scale bars and art of field photography. So also they get the knowledge of numbers, abbreviations, nomenclature. How to write the references, making od power point presentation in scientific writing their ethics, academic misconduct or plagiarism.

Course Outcomes:

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|----------------|---|
| Title of paper | Angiosperms Taxonomy, Cell Biology, Plant Breeding and Plant Microtechniques. |
| Course Code | UG-BOT(06)-S3-T |

After successful completion of the course, the student is expected to get knowledge of-They learn about stains, classification, staining equipments and staining procedures and squash and smear preparation.They also get the knowledge about

how to prepare the tissues for microtomy through various process of tissue preparation and techniques in microtome.

After successful completion of the course

CO1: Students get the knowledge of origin of angiosperms and related theories, floras, herbaria, classification/ separation keys, valid publication and modern trends of classification with concept and significance of biodiversity.

CO2: Students get familiarise with general and few examples of plant classification, Characteristics, economic and medicinal value and examples of some mentioned families of plants.

CO3: Students get the knowledge about prokaryotic and eukaryotic plant cell, their typical cell structure and ultrastructure and function of Plant cell wall, Plasma membrane, Nucleus, Endoplasmic reticulum, Golgi complex, Ribosomes, Lysosomes, Peroxisomes, Mitochondria and Chloroplast.

CO4: They know the Morphology, Structure of chromosome, Specialized chromosomes, Sex chromosome in plants with few examples, Mitotic and meiotic division in them and its significance.

CO5: Students will learn about objectives and hybridization techniques of plant breeding, selections and their biostatistics.

CO6: They learn about stains, classification, staining equipment and staining procedures and squash and smear preparation. They also get the knowledge about how to prepare the tissues for microtomy through various processes of tissue preparation and techniques in microtome.

Course Outcomes:

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|----------------|--|
| Title of paper | Anatomy, Embryology, Genetics, Molecular Biology & Plant Analytical techniques |
| Course Code | UG-BOT(06)-S4-T |

After successful completion of the course

CO1: The students will gain the knowledge of various meristems, primary structure of root and stem in dicots and monocots, types of vascular bundles in dicots and monocots, secondary growth and anomalous secondary growth in plants.

CO2: The students will get acquainted with the concepts of Embryology which includes pollination, microsporogenesis, megasporogenesis, double fertilization and triple fusion in plants.

CO3: The students will be illuminated with concepts of genetics, gene interaction, Linkage: types and theories and extra-nuclear genome.

CO4: The students will learn about concepts of genetics, crossing over, structural and numerical aberrations in chromosomes and concept of gene.

CO5: The learner will get to know about the concepts of molecular biology, DNA packaging, Gene expression in prokaryotes, Mutations: types, mutagens and applications and transposable elements (AC-DS system) in plants.

CO6: The pupils will get to know various analytical techniques of drug adulteration and biological testing of herbal drugs, methods of herbal extraction and preparations.

Course Outcomes:

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|----------------|--|
| Title of paper | Biochemistry, Plant Physiology-I, Plant Ecology-I & Instrumentation and Phytochemistry |
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| Course Code | UG-BOT(06)-S5-T |
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After successful completion of the course,

CO1: The students will have the knowledge of definition, properties and roles of Carbohydrates, Lipids and amino acids and will be able to classify them in different classes. They also know the various categories of enzymes and their mechanism of action.

CO2: The students will get acquainted with the concepts of Plant-Water relations, Properties of water like diffusion, osmosis, imbibition and plasmolysis. They also learnt the mechanism and theories of Water conduction, Phloem transport and mineral transport in plants.

CO3: The students will be illuminated with the various aspects involved in the physiological phenomenon of Photosynthesis, Respiration and Nitrogen metabolism. The complete metabolic pathways of the plants will be covered.

CO4: Learners will be familiarized with the various Concepts of Ecology and Environment that will include Climatic factors, edaphic factors, biotic factors and get to know the various Plant adaptations in different environmental conditions.

CO5: The learner will get in-depth information about Ecosystem like Community Characteristics, Autecology, Conservation of resources and plant succession.

CO6: The pupils will know the Principle, Working and Applications of various microscopic techniques, centrifuge and chromatography. Students will also get to learn about various phytochemicals, their structure, distribution in plants and significance.

Course Outcomes:

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|----------------|---|
| Title of paper | Plant Physiology-II, Biochemistry, And Utilization of Plants & Plant Nursery Management |
| Course Code | UG-BOT(06)-S6-T |

After successful completion of the course,

CO1: The students will gain the knowledge of various physiological aspects of growth and development of plants, plant hormones, plant movements, photoperiodism, seed dormancy and stress physiology.

CO2: The students will get acquainted with the concepts and methodology of Plant Tissue Culture and learn about totipotency, sterilization techniques, culture media, callus and organ culture, cybrid production and its applications.

CO3: The students will be illuminated with the various tools and techniques of Genetic engineering which will include recombinant DNA technology, restriction enzymes, cloning vectors, etc.

CO4: Learners will be familiarized with principles and theories of Phytogeography, climatic and phytogeographic regions of India and introduction, definition and importance of Ethnobotany.

CO5: The learner will get to know about morphology, utilization and important chemical constituents of food plants, oil yielding plants, fibre crops, spices, beverages, firewood, timber, essential oils and medicinal plants.

CO6: The pupils will know the concept, types and infrastructure requirements of nursery, seed propagation techniques, various aspects involved in hybrid seed production , harvesting and threshing of some local crops.

Biotechnology Department:

| Programme | Branch | | |
|-----------|--------------------|---|-------------------|
| B.Sc | Biology Group (BG) | | |
| B.Sc | BG | Science Subjects | Acronym of Option |
| | Option 5 | E) Chemistry, Botany, Zoology | CBZ |
| | Option 6 | F) Chemistry, Botany, Microbiology | CBMB |
| | Option 7 | G) Chemistry, Zoology, Microbiology | CZMB |
| | Option 8 | H) Chemistry, Botany, Biotechnology | CBBT |
| | Option 9 | I) Chemistry, Zoology, Biotechnology | CZBT |
| | Option 10 | J) Chemistry, Microbiology, Biotechnology | CMBBT |

Course Outcomes:

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|-----------------------|---|
| Title of paper | Biotechnology- I FUNDAMENTALS OF BIOTECHNOLOGY AND BIOMOLECULES |
| Course Code | UG-BT(09)-S1-T |

After successful completion of the course, the student is expected to

CO1: Students will be able to understand the term biotechnology and its application in various fields.

CO2: Students will be able to understand microbes used in biotechnology and its nutrition requirement .

CO3:Students will be able to understand basic staining techniques used in biotechnology for visualization of microbes.

CO4: Students will be able to understand physical and chemical properties of nucleic acid.

CO5: Students will be able to understand fundamentals of chromosomes, Genes and Nucleosomes

CO6: Students will be able to understand the physical and chemical properties of proteins.

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| Title of paper | Biotechnology- II MICROBIOLOGY, CELL BIOLOGY & ENZYMOLOGY |
| Course Code | UG-BT(09)-S2-T |

After successful completion of the course, the student is expected to

CO1: Students will be able to understand microbial growth and factors affecting microbial growth.

CO2: Students will be able to understand the mechanism of microbial control by chemical and physical agents.

CO3: Students will be able to understand structure and function of various organelles of eukaryotic cells.

CO4: Students will be able to understand basic structure and classification of carbohydrates and lipids.

CO5: Students will be able to understand concept and properties of enzymes.

CO6: Students will be able to understand the principle and mechanism of enzymatic reaction.

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| Title of paper | Biotechnology III METABOLISM AND BIOPHYSICAL TECHNIQUES I |
| Course Code | UG-BT(09)-S3-T |

After successful completion of the course, the student is expected to

CO1: Students will be able to understand the concept of Bioenergetics and various pathways involved in carbohydrate metabolism.

CO2: Students will be able to understand the basic pathway of lipids metabolism.

CO3: Students will be able to understand metabolism of nitrogenous compounds and metabolic disorders associated with urea cycles.

CO4: Students will be able to understand the principle, working and application of spectrophotometry and colorimetry in Biotechnology.

CO5: Students will be able to understand the principle, instrumentation and application of IR, MASS and spectrofluorimetry in Biotechnology.

CO6: Students will be able to understand the principle, working and application of various chromatographic techniques used in Biotechnology.

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| Title of paper | Biotechnology IV |
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| | IMMUNOLOGY AND BIOPHYSICAL TECHNIQUES II |
| Course Code | UG-BT(09)-S4-T |

After successful completion of the course, the student is expected to

CO1: Students will be able to understand the concept of immune system and function of immune organs involved in immune responses.

CO2: Students will be able to understand the structure and functions of immunoglobulins, and concept of hypersensitivity.

CO3: Students will be able to understand the principle, working and applications of immunological techniques.

CO4: Students will be able to understand the principle and working of various electrophoresis based techniques.

CO5: students will be able to understand principle, working and application of various techniques based on SDS-PAGE and Centrifugation in Biotechnology.

CO6: students will be able to understand principle, working and application of isotopic tracer techniques..

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| Title of paper | Biotechnology V MOLECULAR BIOLOGY & rDNA TECHNOLOGY |
| Course Code | UG-BT(09)-S5-T |

After successful completion of the course, the student is expected to

CO1: Students will be able to understand in detail the concept of DNA replication and DNA mutation and its repair mechanism.

CO2: Students will be able to understand the characteristics of genetic codes.

CO3: Students will be able to understand differences between concepts of eukaryotic and prokaryotic transcription.

CO4: Students will be able to understand differences between concepts of eukaryotic and prokaryotic translation.

CO5: Students will be able to understand the basics of gene cloning and application of rDNA technology.

CO6: Students will be able to understand the concept and application of DNA library, Polymerase chain reaction, gene expression.

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| Title of paper | Biotechnology VI |
| Course Code | UG-BT(09)-S6-T |

After successful completion of the course, the student is expected to

CO1: Students will be able to understand the fundamentals of environmental Biotechnology.

CO2: Students will be able to understand the basic structural and functional areas of industrial biotechnology.

CO3: Students will be able to understand working and administration of food biotechnology companies or food production units.

CO4: Students will be able to understand the basics of plant tissue culture laboratory, which helps them to secure a job or encourage them to start their own plant tissue culture laboratory.

CO5: Students will be able to understand fundamentals of animal tissue culture.

CO6: Students will be able to understand manufacturing of various commercial biotechnological products.

Zoology Department:

| Programme | Branch | | |
|--------------------------|--------------------|---|-------------------|
| B.Sc | Biology Group (BG) | | |
| B.Sc Six Semester course | BG | Science Subjects | Acronym of Option |
| | Option 5 | E) Chemistry, Botany, Zoology | CBZ |
| | Option 6 | F) Chemistry, Botany, Microbiology | CBMB |
| | Option 7 | G) Chemistry, Zoology, Microbiology | CZMB |
| | Option 8 | H) Chemistry, Botany, Biotechnology | CBBT |
| | Option 9 | I) Chemistry, Zoology, Biotechnology | CZBT |
| | Option 10 | J) Chemistry, Microbiology, Biotechnology | CMBBT |

Course Outcomes:

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|-----------------------|---|
| Title of paper | Zoology- I Life and Diversity of Animals – Non Chordates |
| Course Code | UG-ZOO(07)-S1-T (Theory), UG-ZOO(07)-S1-P (Practical) |

CO1: Semester 1 of Zoology subject provides the basic knowledge of Animal Kingdom, Animal Diversity, its Classification with Major and Minor Phyla.

CO2: Further the syllabus provides the concept of Invertebrate animals starting from Protozoa (Single Cell Animalcules) to multicellular primitive animals like Porifera and Coelenterates to the higher Invertebrates upto Arthropoda and Hemichordates.

- CO3: Student passing out in semester 1 acquires the knowledge of Phylogenetic Tree of Evolution of Animals from primitive organic particles to higher Invertebrates. Each Phylum starting from Protozoa and ending up with Hemichordata provides the platform for the students to understand how the life of animals have evolved by upgrading and adjusting their internal body systems in relation to external environmental factors and predator pressures.
- CO4: Students acquires the knowledge of Parasitism, the major and minor human parasites, their cognizance and control. Students will be able understand importance of parasites in human life and their role in disease development. Relate biology of vector to the human life and other animal diseases.
- CO5: The practical provides an opportunity to handle the preserved animal specimens that they have studied theoretically. Develop the skill of permanent slide processing that will make them employable in research and environmental firms. The assignment of observing and noting the invertebrate species that will help them to develop their observation and writing skills.

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| Title of paper | Zoology- II Life and Diversity of Animals – Chordates |
| Course Code | UG-ZOO(07)-S2-T(Theory), UG-ZOO(07)-S2-P (Practical) |

- CO1: Semester 2 of Zoology subject provides the basic knowledge of origin of Chordate animals, and their evolutionary theories and geological time scale
- CO2: Syllabus proceeds with underlining the concept of Chordate and Vertebrate animals starting from Primitive Chordates (Protochordates) to Lower Vertebrates i.e. Fishes, Reptiles and Higher Vertebrates including human beings.
- CO3: Student passing out in Semester 2 acquires the knowledge of phylogenetic tree of evolution of animals from Protochordates to higher Vertebrates. Each phylum starting from Protochordates and ending up with Mammals provides the platform for the students to understand how the life of animals have evolved by upgrading and adjusting their internal body systems in relation to external environmental factors, and predator pressures.
- CO4: The practical provides an opportunity to handle the preserved specimens that they have studied theoretically. Permanent stained micropreparation aspect helps to hone their skill of staining and slide processing that will make them employable in research and environmental firms. The assignment of observing and noting the Chordate and Vertebrate species that will help them to develop their observation and writing skills.

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| Title of paper | Zoology- III Cell Biology& Environmental Biology |
| Course Code | UG-ZOO(07)-S3-T(Theory), UG-ZOO(07)-S3-P (Practical) |

- CO1: Semester 3 of Zoology Subject is all about the basic knowledge of types of cells, cell structure, its organelles and functions and brief introduction about ecosystem and biodiversity.
- CO2: The syllabus proceeds with origin, structure and function of primitive cell; its evolution and formation of advanced cell, reproduction of cell and abnormal

cell division, uncontrolled cell division and cell culture technique. In this syllabus information about ecosystem biodiversity, food chain and food web is also provided.

CO3: Student passing out in semester 3 acquires the knowledge of evolution of cell division of work of cell cycle at organelle level, specialization of cell. In addition to this evolution of ecosystem, types of ecosystem around us, food chain, food web and biodiversity is studied.

CO4: The practical of semester 3 provides an opportunity to handle instruments like microscope centrifuge, micropipette, oculometer, stage micrometer. They are skilled in cell size counting and techniques related with cell culture. At the same time they are also studying oxygen and carbon dioxide in water as well as study pond ecosystem as an example. In field diary they have to observe and study biodiversity and ecosystem around them. By this their observation as well as writing skill is developed.

CO5: Finally the student acquires the knowledge that make them capable of cell biology techniques and environmental assessment.

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| Title of paper | Zoology- IV Genetics and Molecular Biology |
| Course Code | UG-ZOO(07)-S4-T(Theory), UG-ZOO(07)-S4-P (Practical) |

CO1: Semester IV of Zoology subject is about genetics & molecular biology.

CO2: Course will let inclusive, detailed understanding of the basis of heredity, classical, advance and applied concepts of genetics and molecular biology.

CO3: Course will let inclusive, detailed understanding of the principles of molecular biology experiments. Basics calculations and errors during experiment of molecular biology.

CO4: Students will have comprehensive understanding of process to construct karyogram and its analysis (analysis of normal and syndrome).

CO4 : Students will learn practical morphology, handling, culturing, life cycle and identification of mutants in Fruit fly *Drosophila*.

CO5: After completion of this course student will skilled in understanding of molecular biology methodology of DNA Isolation and quantification, working and applications of UV -Vis spectroscopy, thin layer chromatography and working of PCR.

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| Title of paper | Zoology- V Developmental biology |
| Course Code | UG-ZOO(07)-S5-T(Theory), UG-ZOO(07)-S5-P (Practical) |

CO1: Semester V of Zoology subject is about basic principles and applications of developmental biology

CO2: In this course student will be able to understand the basic principle and mechanism of animal reproduction.

CO3: Students will get acquainted with the various hierarchial events involved in developmental biology.

CO3: Students will be able to understand various aspect of development like molecular, cellular, hormonal ,dimensional etc.

- CO4: Students will understand basic genetics involved in development as well as importance of differential gene expression.
- CO5: Students will understand various extensions in reproductive biology like assisted reproductive techniques.
- CO6: Students can understand the principle of making new variety of genetically modified organism for human welfare
- CO7: Practical of developmental biology will help students to visualize and better understanding of developmental process in animals.

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| Title of paper | Zoology- VI Animal Physiology, Bioinformatics and Biostatistics |
| Course Code | UG-ZOO(07)-S6-T (Theory), UG-ZOO(07)-S6-P (Practical) |

- CO1: Semester VI of Zoology provides fundamental knowledge of animal physiology, Bioinformatics & Biostatistics.
- CO2: Students will be understand the electrophysiology of neuromuscular system and its regulation.
- CO3: The students will have basic understanding physiology of digestion.
- CO4: Students will also be able to understand how endocrine system works for entire homeostasis.
- CO5: Students will also know about reproductive physiology.
- CO6: Students will be familiarized with importance of biostatistics in biological research.
- CO7: Students will be explored with power of bioinformatics to understand and conclude complex data.
- CO8: Practical of animal physiology will help students to measure and understand different physiological parameters as well as biostatistical problems and bioinformatics methods.

Microbiology Department:

| Programme | Branch | | |
|------------------|---------------------------|-------------------------------------|--------------------------|
| B.Sc | Biology Group (BG) | | |
| B.Sc | BG | Science Subjects | Acronym of Option |
| | Option 5 | E) Chemistry, Botany, Zoology | CBZ |
| | Option 6 | F) Chemistry, Botany, Microbiology | CBMB |
| | Option 7 | G) Chemistry, Zoology, Microbiology | CZMB |

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| | Option 8 | H) Chemistry, Botany, Biotechnology | CBBT |
| | Option 9 | I) Chemistry, Zoology, Biotechnology | CZBT |
| | Option 10 | J) Chemistry, Microbiology, Biotechnology | CMBBT |

Course Outcomes:

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| Title of paper | Microbiology- I History and Microbial Morphology |
| Course Code | UG-MB(08)-S1-T |

After successful completion of the course, the student is expected to

CO1: Students will get detailed knowledge on the basic concept of microbiology. They will learn about the history of microbiology & contribution of various scientists in the development of Microbiology.

CO2: Students will learn in great detail about the scope of Microbiology in various fields like Food industry, Dairy industry, Pharmaceutical industry etc. This learning will help them as far as their future in Microbiology is concerned.

CO3: In this course students will also learn about various classes of bacteria & also about bacterial identification which is very important for practical point of view.

CO4: The course includes detailed study on prokaryotic & eukaryotic microbes, therefore students will learn in detail about it.

CO5: Students will come to know about nutritional requirements of microorganisms & also about different types of culture media. This will help them in the laboratory & also in research to select appropriate media for particular bacteria.

CO6: In this course students will also learn about structure & classification of viruses. They will also learn the methods of cultivation of viruses.

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| Title of paper | Microbiology- II Microbial Techniques |
| Course Code | UG-MB(08)-S2-T |

After successful completion of the course, the student is expected to

CO1: Know about the principles & applications of various microscopes..

CO2: Learn about various staining techniques used in Microbiology.

CO3: Learn in detail about microbial reproduction & microbial growth

CO4: Students will learn standard terminologies used in Microbial control.

CO5: Students will learn about physical & chemical methods used for microbial control.

CO6: The students will understand different types of microbial interactions with plants, animals & with other microbes. This knowledge will help them to understand the significance of microbes in the ecosystem.

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| Title of paper | Microbiology- III Chemistry of Organic Constituents, Enzymology and Metabolism |
| Course Code | UG-MB(08)-S3-T |

After successful completion of the course, the student is expected to

CO1: The biochemistry and metabolic pathway of carbohydrates will be understood.

CO2: Familiarise with amino acids and proteins chemistry and its metabolism.

CO3: Students can understand the lipids and fats with its biochemistry and metabolism.

CO4: Students can understand hereditary units of life, the replication process mechanism. Students get knowledge of nucleotide metabolism with purines and pyrimidines biosynthesis.

CO5: Students will learn about the enzymes and enzyme kinetics.

CO6: The concept of vitamins synthesis, structure and function will be understood.

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| Title of paper | Microbiology- IV Industrial and Applied Microbiology |
| Course Code | UG-MB(08)-S4-T |

After successful completion of the course, the student is expected to

CO1: The general concepts of fermentation, types of bioreactor, strain development will be emphasized.

CO2: Scale up process, inoculum development, control and maintenance of physical factors and downstream processing will be understood.

CO3: The industrial production, biochemistry, recovery and uses of important fermentative products will be understood.

CO4: Students will be familiarized with water microbiology and water treatment methods.

CO5: Students can understand the concept of sewage, its characteristics and various sewage treatment methods.

CO6: This will give an overview of air, soil and food microbiology to students to increase the understanding of biofertilizer, biopesticides, pasteurization, and food intoxication.

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| Title of paper | Microbiology- V MEDICAL MICROBIOLOGY AND IMMUNOLOGY |
| Course Code | UG-MB(08)-S5-T |

After successful completion of the course, the student is expected to

CO1: They will learn Epidemiology of disease, Dynamics of disease transmission, Causative agents Sources of reservoir, Portal of exit, Portal of entry, Susceptibility of host. How to Control of communicable diseases.

CO2: Learn infectious Microbiology, Mechanism of Pathogenicity and virulence, Invasiveness, Normal flora of healthy human host, Germ free and Gnotobiotic life. Outline of Microbial diseases of skin, eye, digestive, respiratory, cardiovascular, lymphatic, urinary, reproductive and nervous systems.

CO3: Learn the Study of pathogenic organisms, their morphology, cultural characteristics, biochemical characteristics, pathogenesis, serology, lab diagnosis and disease control, Salmonella typhi and paratyphi A & B., Treponema pallidum, HIV, Plasmodium. Basic mechanism of action of drugs.

CO4: Learn Immunity: Definition and General concept, Haematopoiesis and cells of the immune system, B and T cells, Monocytes and macrophages, Neutrophils, Eosinophils and basophiles. Mast cells Dendritic cells, Natural Killer cells, Non specific defenses of the host, Mechanism of non-specific defenses: First line of defense, Second line of defense, Phagocytosis

CO5: Learn Antigen, concepts and factors affecting immunogenicity, Antigenic determinants, haptens Carriers, Adjuvants, Types of antigens, Immunoglobulins, Structure, chemical and biological properties, functions of light and heavy chain domains, Primary lymphoid organs, Secondary lymphoid organs

CO6: Understand Adaptive / Acquired Immunity (Third line of defense): Cell Mediated Immune Response, T-cell biology, Major Histocompatibility Complex, Cytokines, Types- colony stimulating factor, Interleukins, Tumor necrosis factor

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| Title of paper | Microbiology- VI Molecular biology, Bioinstrumentation & Biotechnology |
| Course Code | UG-MB(08)-S6-T |

After successful completion of the course, the student is expected to

CO1: Get Familiarised with the concept of gene, gene mutation, gene regulation & processes of genetic recombination.

CO2: Students will learn in detail about different characteristics of genetic code & also about transcription & translation processes ie. central dogma of molecular biology.

CO3: Students are benefited with the knowledge of various tools & techniques involved in genetic engineering. Ex. PCR, DNA Fingerprinting etc. This knowledge will help students to deal with experiments related with gene isolation, Plasmid isolation, Polymerase chain reaction etc.

CO4: Students will learn about applications of genetic engineering in industry as well as ethics & hazards of biotechnology.

CO5: They will learn various techniques like Spectroscopy, Centrifugation, analytical and differential centrifugation, Electrophoresis: gel electrophoresis and SDS-PAGE, Chromatography, gel filtration Isotope tracer technique, Mass spectrometry

CO6: The students will learn different bioinstrumentation techniques like UV-Visible spectroscopy, Centrifugation, SDS-PAGE, Chromatography, Mass spectroscopy etc. which will help them to apply these techniques in their project work or research.



Department of Language Studies

| Programme | Branch | |
|-----------|-----------------------|-------------------|
| B.Sc | Language Subjects | Acronym of Option |
| | Compulsory English | CE |
| | Supplementary English | SE |
| | Marathi | Ma |
| | Hindi | Hi |

Course Outcomes:

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| Title of paper | Compulsory English |
| Course Code | UG-ENG(10)-S1-T and UG-ENG(10)-S2-T |

After successful completion of the course

CO1: Students will be able to review the grammatical forms of English and the use of these forms in specific communicative contexts, which include: class activities, homework assignments, reading of texts and writing.

CO2: Students will be able to attain and enhance competence in the four modes of literacy: writing, speaking, reading and listening.

CO3: Students will be able to understand prose section of curriculum which are 'The House', 'The boy who broke the Bank', 'Parveen' and 'Selfish Giant'. This is based on the recommended book-'Life and Language' written by editor Dr. S. Navin, Dr. K. Panicker, Dr. N. Akhuj, Dr. R. Dwivedi, Dr.G. Bhagmar. Dr. R. Dipte, Dr. A.A. Khan and Dr. R. P. Singh, Oxford University Press.

CO4: Students will be able to understand poem section of curriculum which are 'Eyes Immortal', 'Elegy Written in a Country Churchyard', 'Ulysses' and 'Ecology'. This is based on the recommended book-'Life and Language' written by editor Dr. S. Navin, Dr. K. Panicker, Dr. N. Akhuj, Dr. R. Dwivedi, Dr. G. Bhagmar, Dr. R. Dipte, Dr. A.A. Khan and Dr. R. P. Singh, Oxford University Press.

CO5: Students will be able to practice using grammar in the form of tenses, voices, and prepositions.

CO6: Students will be able to write various types of letters, practice comprehensions, and use appropriate synonyms and antonyms whenever needed in sentence constructions.

Course Outcomes: UG-BOT(06)-S2

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| Title of paper | Supplementary English |
| Course Code | UG-S.E.(11)-S1-T and UG-S.E.(11)-S2-T |

After successful completion of the course,

CO1: Students will be able to review the grammatical forms of English and the use of these forms in specific communicative contexts, which include: precise writing, word forming rules, and vocabulary expansion.

CO2: Students will be able to understand prescribes text of curriculum in the form of essays which are 'Brother Abdul Rahman', 'Gandhi and the Western World', 'The Cow of the Barricades' and 'The smaller Gandhis'. This is based on the recommended book-'Understanding India' written by editor Dr. Keralavarma, Macmillan Press.

CO3: Students will be able to understand prescribes text of curriculum which is 'the old man and the sea by Ernest Hemmingway. This is based on the recommended book-'Understanding India' written by editor Dr. Keralavarma, Macmillan Press.

CO4: Students will be able to practice and prepare idioms and phrases for vocabulary expansion.

CO5: Students will be to practice and prepare ideas and prepare text to expand those ideas in text form.

CO6: This is based on the recommended book-'Understanding India' written by editor Dr. Keralavarma, Macmillan Press.

Course Outcomes:

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|----------------|---------------------------------|
| Title of paper | Hindi |
| Course Code | UG-H(12)-S1-T and UG-H(12)-S2-T |

After successful completion of the course

CO1: Students will be able to enrich linguistic competence and interest for Hindi language literature among the students.

CO2: Students will be able to understand composition of various important topics such as 'Eidgah, 'Parinda', 'Me har gayi' and various other topics suggested in comprehension part of curriculum. This is based on the recommended book-'Sahitya Sarita' written by editor Dr. Jogendrasingh Bisen.

CO3: Students will be able to understand prose section of curriculum which are 'Kalidas se', 'Todati patthar', 'mare jao ge'. This is based on the recommended book-'Sahitya Sarita' written by editor Dr. Jogendrasingh Bisen.

CO4: Students will be able to write and synthesise different types of letters- official letter, business letters, Order letters, job related letters and request letters in Hindi script.

CO5: Students will be able to prepare and how to use and quote 'idioms' in Hindi script. This is based on the recommended book-'Sahitya Sarita' written by editor Dr. Jogendrasingh Bisen.

CO6: Students will be able to write and synthesise essays and short communications on various important topics of environment and other topics in Hindi script. This is based on the recommended book-'Sahitya Sarita' written by editor Dr. Jogendrasingh Bisen.

Course Outcomes:

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| Title of paper | Marathi |
| Course Code | UG-M(13)-S1-T and UG-M(13)-S2-T |

After successful completion of the course

CO1: Students will be able to enrich linguistic competence and interest for literature among the students.

CO2: Students will be able to understand composition of various important topics such as 'about farmers', 'Science: curse or blessings', 'knowledge' and various other topics suggested in comprehension part of curriculum. This is based on the recommended book-'Shabdagandha' written by editor Dr. Sheshraj Jude.

CO3: Students will be able to understand prose section of curriculum which were written and prepared by Kesavsut, B.C. Mardhekar and other famous Marathi writers. This is based on the recommended book-'Shabdagandha' written by editor Dr. Sheshraj Jude.

CO4: Students will be able to write and synthesise essays and short communications on various important topics of environment in Marathi script. This is based on the recommended book-'Shabdagandha' written by editor Dr. Sheshraj Jude.

CO5: Students will be able to write summary on various compositions which were suggested in their curriculum. This is based on the recommended book-'Shabdagandha' written by editor Dr. Sheshraj Jude.

CO6: Students will be able to write summary on various prose sections which were suggested in their curriculum. This is based on the recommended book-'Shabdagandha' written by editor Dr. Sheshraj Jude.