## DEPARTEMENT OF MATHEMATICS

**PROGRAM OUTCOMES:**

1. **Disciplinary Knowledge:** Bachelor degree in Mathematics is the culmination of in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of pure and applied mathematics. This also leads to study the related areas such as computer science and other allied subjects.
2. **Communication Skills:** Ability to communicate various mathematical concepts effectively using examples and their geometrical visualization. The skills and knowledge gained in this program will lead to the proficiency in analytical reasoning which can be used for modelling and solving of real-life problems.
3. **Critical thinking and analytical reasoning:** The students undergoing this programme acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real life problems.
4. **Problem Solving:** The Mathematical knowledge gained by the students through this programme develop an ability to analyze the problems, identify and define appropriate computing requirements for its solutions. This programme enhances students overall development and also equip them with mathematical modelling ability, problem solving skills.
5. **Research related skills**: The completing this programme develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.
6. Information/digital Literacy: The completion of this programme will enable the learner to use appropriate software's to solve system of algebraic equation and differential equations.
7. **Self-directed learning:** The student completing this program will develop an ability of working independently and to make an in-depth study of various notions of Mathematics.
8. Moral and ethical awareness/reasoning: The student completing this program will develop an ability to identify unethical behavior such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions in all aspects of life in general and Mathematical studies in particular.
9. **Lifelong learning:** This programme provides self-directed learning and lifelong learning skills. This programme helps the learner to think independently and develop algorithms and computational skills for solving real word problems.
10. Ability to peruse advanced studies and research in pure and applied Mathematical sciences.

**Course Outcomes :**

**Course Learning Outcomes**: This course will enable the students to

1. Solve the Partial Differential Equations of the first order and second order
2. Formulate, classify and transform partial differential equations into canonical form.
3. Solve linear and non-linear partial differential equations using various methods; and apply these methods to solving some physical problems.
4. Able to take more courses on wave equation, heat equation, and Laplace equation.
5. Solve PDE by Laplace Transforms and Fourier Transforms


## Program Outcome:

Students enrolled in B.Sc. (Hons.) degree program in Zoology will study and acquire complete knowledge of disciplinary as well as allied biological sciences. At the end of graduation, they should possess expertise which will provide them competitive advantage in pursuing higher studies from India or abroad; and seek jobs in academia, research or industries.

Students should be able to identify, classify and differentiate diverse chordates and non-chordates based on their morphological, anatomical and systemic organization. They will also be able to describe economic, ecological and medical significance of various animals in human life. This will create a curiosity and awareness among them to explore the animal diversity and take up wild life photography or wild life expioration as a career option. The procedural knowledge about identifying and classifying animals will provide students professional advantages in teaching, research and taxonomist jobs in various government organizations; including Zoological Survey of India and National Parks/Sanctuaries.

Acquired practical skills in biotechnology, biostatistics, bioinformatics and molecular biology can be used to pursue career as a scientist in drug development industry in India or abroad. Our students will be acquiring basic experimental skills in various techniques in the fields of genetics; molecular biology; biotechnology; qualitative and quantitative microscopy; enzymology and analytical biochemistry. These methodologies will provide extra edge to our students, who wish to undertake higher studies. In-depth knowledge and understanding about comparative anatomy and developmental biology of various biological systems.

**Course Outcomes :**

1. Acquaint knowledge on versatile tools and techniques employed in genetic engineering and recombinant DNA technology.
2. An understanding on application of genetic engineering techniques in basic and applied experimental biology.
3. To acquire a fundamental working knowledge of the basic principles of immunology.
4. To understand how these principles, apply to the process of immune function.
5. Use, and interpret results of, the principal methods of statistical inference and design; helps to communicate the results of statistical analyses accurately and effectively; helps in usage of appropriate tool of statistical software.

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# DEPARTMENT OF ENGLISH

## PROGRAM OUTCOMES

**By the end of the program the students will be able to:**

1. Communicate effectively and appropriately.
2. Use English effectively for the purpose of study across the curriculum.
3. Develop interest in the appreciation of Literature.
4. Acquaint with communication skills.
5. Inculcate life skills and human values
6. Think creatively and critically
7. Expand emotional intelligence

The curriculum tries to align with the latest knowledge requirements. It also tries to meet specified learning outcomes. High-quality pedagogy is necessary to successfully impart the curricular material to support students. The teachers of English need to develop technological skills to impart quality education. Pedagogy involves Lecture (L) + Tutorial (T) model. Generally, the subjects without practical involve L+T model wherever necessary. The pedagogical practices determine the learning experiences and their outcomes that are provided to students– thus directly influencing learning outcomes. The assessment methods shall be scientific and will test the application of knowledge. At the end of the course, the students will be well-versed both in oral and written communication. They study cutting edge issues related to language and literature in all the respective courses prescribed by the expert committee. The wide range of topics and components help students to gain the learning outcomes effectively. The entire course structure tries to fulfill the needs of NEP 2020 having contemporary relevance and develop critical and creative thinking. Course outcomes promote a holistic approach towards value-based language learning which equips the learner with receptive as well as productive skills.

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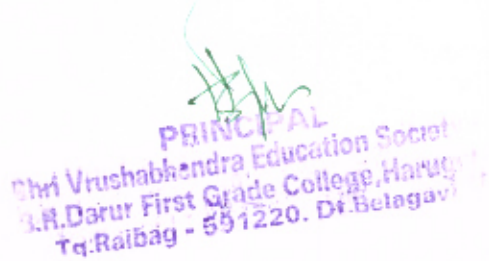
# DEPARTMENT OF ENGLISH

## Course Outcomes

**At the end of the course the student should be able to:**

1. Acquire the LSRW (Listening, Speaking, Reading, and Writing) skills.
2. Learn to appreciate literary texts.
3. Obtain the knowledge of literary devices and genres.
4. Acquire the skills of creativity to express one's experiences.
5. Know how to use digital learning tools.
6. Be aware of their social responsibilities.
7. Develop critical thinking skills.
8. Develop gender sensitivity
9. Increase reading speed, analytical skills and develop presentation skills.
10. Become employable with requisite professional skills, ethics and values

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## Course Outcomes (Cos)the year 2022-2023

## Department:History

Course Outcomes (Cos):

At the end of the course the students should be able to: (Write 3-7 course outcomes. Course outcomes are statements of observable student's actions that serve as evidence of knowledge, skills and values acquired in this course) Understand the history and culture of Political History of Indiaregion

.• Analyse the importance of causes for backwardness of this region.

• Understand the influence of political influence on the people and culture

• of this region. Understand the political, Social, Religious and Cultural history of the

• region. Appreciate the divergent cultural and communal harmony of this region

.• Course Articulation Matrix: Mapping of Course Outcomes (OCs) with Program Outcomes (Pos 1-12). Course Outcomes (Cos)/Progra m Outcomes (Pos)

DSC 1 DSC 2 DSC 3 DSC 4 DSC 5 DSC 6

OE 1 OE 2 SEC 1 SEC 2 Disciplinary knowledge X X X X X X X X

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## DEPARTEMENT OF PHYSICS

### PROGRAM OUTCOMES

1. **Discipline Knowledge:** Knowledge of basics of science and research, and ability to apply the understanding of fundamentals of specialized discipline in solving complex scientific problems.
2. **Conduct investigations:** Conduct investigations of issues using research methods and research-based discipline knowledge including design of experiments, data collection, interpretation and analysis to arrive at valid conclusions.
3. **Problem analysis:** Identify, formulate and analyze complex scientific problems using first principles of respective discipline.
4. **Design and Development of solutions:** Design solutions for complex scientific problems and execute them by considering the environmental, societal and public safety aspects appropriately.
5. **Modern tool usage:** Identify, select and use a modern scientific, engineering and IT tool or technique for 2odeling, prediction, data analysis and solving problems in the areas of their discipline.
6. **Environment and Society:** Evaluate the impact of scientific solutions on society and environment and design sustainable solutions.
7. **Ethics:** Demonstrate professional ethics, responsibilities and norms in respectiveprofession.
8. **Individual and teamwork:** Work effectively as an individual as a team member and as a leader in a multidisciplinary team.
9. **Communication:** Communicate effectively with the stakeholders with emphasis on communicating with scientific community, comprehend scientific reports, write research papers and projects proposals and reports, deliver effective presentations, andgive and receive clear instructions.
10. **Project Management and Finance:** Apply the knowledge of scientific and technological principles to one's own work to manage projects in multidisciplinary settings.
11. **Lifelong Learning:** Identify knowledge gaps and engage in lifelong learning in the context of changing trends in respective discipline.

## Course Outcomes :

1. Apply the laws of thermodynamics and analyze the thermal system.
2. Apply the laws of kinetic theory and radiation laws to the ideal and practical thermodynamics systems through derived thermodynamic relations.
3. Use the concepts of semiconductors to describe different Semiconductor devices such asdiode transistors, BJT, FET etc and explain their functioning
4. Explain the functioning of OP-AMPS and use them as the building blocks of logic gates.
5. Give the use of logic gates using different theorems of Boolean Algebra followed by logic circuits.

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## PROGRAMME OUTCOME from B.Sc (Hons.) Chemistry

The B.Sc (Hons) programme in Chemistry is designed to develop in students in depth knowledge of thecore concepts and principles that are central to the understanding of this core science discipline. Undergraduates pursuing this programme of study go through laboratory work that specifically develop their quantitative and qualitative skills, provides opportunities for critical thinking and team work, and exposes them to techniques useful for applied areas of scientific study.

- **Knowledge: Width and depth:**

  Students acquire theoretical knowledge and understanding of the fundamental concepts, principles and processes in main branches of chemistry, namely, organic, inorganic, physical, spectroscopy, analytical and biochemistry. In depth understanding is the outcome of transactional effectiveness and treatment of specialized course contents. Width results from the choice of electives that students are offered.

- **Laboratory Skills: Quantitative, analytical and instrument based:**

  A much valued learning outcome of this programme is the laboratory skills that students develop during the course. Quantitative techniques gained through hands on methods opens choice of joining the industrial laboratory work force early on. The programme also provides ample training in handling basic chemical laboratory instruments and their use in analytical and biochemical determinations. Undergraduates on completion of this programme can cross branches to join analytical, pharmaceutical, material testing and biochemical labs besides standard chemical laboratories.

- **Communication:**

  Communication is a highly desirable attribute to possess. Opportunities to enhance students' ability to write methodical, logical and precise reports are inherent to the structure of the programme. Techniques that effectively communicate scientific chemical content to large audiences are acquired through oral and poster presentations and regular laboratory report writing.

- **Capacity Enhancement:**

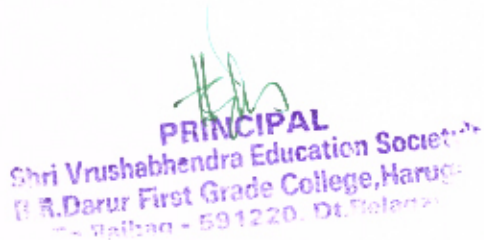
  Modern day scientific environment requires students to possess ability to think independently as well as be able to work productively in groups. This requires some degree of balancing. The chemistry honours programme course is designed to take care of this important aspect of student development through effective teaching learning process.

- **Portable Skills:**

  Besides communication skills, the programme develops a range of portable or transferable skills in students that they can carry with them to their new work environment after completion of chemistry honours programme. These are problem solving, numeracy and mathematical skills- error analysis, units and conversions, information retrieval skills, IT skills and organizational skills. These are valued across work environments.

**Structure of the Programme in B.Sc (Hons.) Chemistry**

The programme includes Core Courses and Elective Courses. The Core Courses are all compulsory courses (DSC).There are three types of Elective Courses – Discipline Specific Elective (DSE), Open Elective (OE), and Skill Enhancement Courses (SEC), have sub skill based and value based. In addition there are two compulsory Ability Enhancement Courses (AECC). The Core, DSE and GE Courses are six credit courses; the SEC, AEC are four credit courses.

## LEARNING OUTCOMES / COURSE OUTCOMES:

### Chemistry as Discipline Specific Course (DSC)

### B.Sc. Semester –I; CHEMISTRY-1

After successful completion of three year degree program in Chemistry a student should be able to;

1. Describe the dual nature of radiation and matter; dual behaviour of matter and radiation, de Broglie's equations, Heisenberg Uncertainty principle and their related problems.
2. Electronic configurations of the atoms.
3. Define periodicity, explain the cause of periodicity in properties, and classify the elements into four categories according to their electronic configuration.
4. Define atomic radii, ionisation energy, electron affinity and electronegativity, discuss the factors affecting atomic radii, describe the relationship of atomic radii with ionisation energy and electron affinity, describe the periodicity in atomic radii, ionization energy, electron affinity and electronegativity.
5. Explain bond properties, electron displacement effects (inductive effect, electrometric effect, resonance effect and Hyper conjugation effect). Steric effect and their applications in explaining acidic strength of carboxylic acids, basicity of amines.
6. Understand basic concept of organic reaction mechanism, types of organic reactions, structure, stability and reactivity of reactive intermediates.
7. Describe important characteristics of configurationally and conformational isomers. Practice and write conformational isomers of ethane, butane and cyclohexane.
8. Understand the various concepts of geometrical isomerism and optical isomerism. Describe CIP rules to assign E,Z notations and R& S notations. Explain D and L configuration and *threo* and *erythro* nomenclature.
9. Explain racemic mixture and racemisation, resolution of racemic mixture through mechanical separation, formation of diastereomers, and biochemical methods, biological significance of chirality.
10. Explain the existence of different states of matter in terms of balance between intermolecular forces and thermal energy of the particles. Explain the laws governing behavior of ideal gases and real gases. Understand cooling effect of gas on adiabatic expansion.
11. Describe the conditions required for liquefaction of gases. Realise that there is continuity in gaseous and liquid state.
12. Explain properties of liquids in terms of intermolecular attractions.
13. Understand principles of titrimetric analysis.
14. Understand principles of different type's titrations. Titration curves for all types of acids – base titrations.
15. Gain knowledge about balancing redox equations, titration curves, theory of redox indicators and applications.
16. Understand titration curves, indicators for precipitation titrations involving silver nitrate-Volhard's and Mohr's methods and their differences.
17. Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water.

## Course Specific Outcomes

After the completion of this course, the student would be able to

1. Understand the importance of fundamental law and validation parameters in chemical analysis
2. Know how different analytes in different matrices (water and real samples) can be determined by spectrophotometric nephelometric and turbidometric methods.
3. Understand the requirement for chemical analysis by paper, thin layer and column chromatography.
4. Apply solvent extraction method for quantitative determination of metal ions in different samples
5. Utilize the ion-exchange chromatography for domestic and industrial applications
6. Explain mechanism for a given reaction.
7. Predict the probable mechanism for a reaction. explain the importance of reaction intermediates, its role and techniques of generating such intermediates
8. Explain the importance of Stereochemistry in predicting the structure and property of organic molecules.
9. Predict the configuration of an organic molecule and able to designate it.
10. Identify the chiral molecules and predict its actual configuration

## Course Specific outcomes

After the completion of this course, the student would be able to

1) Understand the importance of instrumental methods for quantitative applications Apply colorimetric methods for accurate determination of metal ions and anions in water or real samples
2) Understand how functional groups in a compound is responsible for its characteristic property
3) Learn the importance of qualitative tests in identifying functional groups.
4) Learn how to prepare a derivative for particular functional groups and how to purify it.

**Course outcomes:** After the completion of this course, the student would be able to

1. Predict the nature of the bond formed between different elements
2. Identify the possible type of arrangements of ions in ionic compounds
3. Write Born-Haber cycle for different ionic compounds
4. Relate different energy parameters like, lattice energy, entropy, enthalpy and solvation energy in the dissolution of ionic solids
5. Explain covalent nature in ionic compounds
6. Write the M.O. energy diagrams for simple molecules
7. Differentiate bonding in metals from their compounds
8. Learn important laws of thermodynamics and their applications to various thermodynamic systems
9. Understand adsorption processes and their mechanisms and the function and purpose of a catalyst.
10. Apply adsorption as a versatile method for waste water purification.
11. Understand the concept of rate of a chemical reaction, integrated rate equations, energy of activation and determination of order of a reaction based on experimental data
12. Know different types of electrolytes, usefulness of conductance and ionic mobility measurements
13. Determine the transport numbers

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# Department of Botany

## Program Outcomes:

PO1: Skill development for the proper description using botanical terms, identification, naming and classification of life forms especially plants and microbes.

PO2: Acquisition of knowledge on structure, life cycle and life processes that exist among plant and microbial diversity through certain model organism studies.

PO3: Understanding of various interactions that exist among plants and microbes; to develop the curiosity on the dynamicity of nature.

PO4: Understanding of the major elements of variation that exist in the living world through comparative morphological and anatomical study.

PO5: Ability to explain the diversity and evolution based on the empirical evidences in morphology, anatomy, embryology, physiology, biochemistry, molecular biology and life history.

PO6: Skill development for the collection, preservation and recording of information after observation and analysis- from simple illustration to molecular database development.

PO7: Making aware of the scientific and technological advancements- Information and Communication, Biotechnology and Molecular Biology for further learning and research in all branches of Botany.

PO8: Internalization of the concept of conservation and evolution through the channel of spirit of inquiry.

PO 9: To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC, KPSC etc.

PO10: To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.

PO 11: The graduates should be knowledgeable and competent enough to appropriately deliver on aspects of global importance like climate change, SDGs, green technologies etc at the right opportunity.

PO 12: The graduate should be able to demonstrate sufficient proficiency in the hands-on experimental techniques for their area of specialization within biology during research and in the professional career.

**Learning outcomes:**

- ☐ Conceptualize flower arrangement and bio-aesthetic planning
- ☐ Design various types of gardens according to the culture and art of bonsai
- ☐ Distinguish between formal, informal and free style gardens
- ☐ Establish and maintain several types of gardens for outdoor and indoor

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