

B.Sc.CHEMISTRY

Course Outcome

Chemistry is the study of composition and transformation of matter. A science that is central to energy production, healthcare, new material development for electronics and other applied fields and environmental protection. Bachelor's degree in Chemistry is the culmination of in-depth knowledge of Inorganic, Organic and Physical chemistry and specialized courses such as Pharmaceutical Chemistry, Spectroscopy, Nanoscience, Forensic Science, Cosmetics & Personal Grooming, Food chemistry, Dairy Chemistry and soon. Thus, this programme helps learners in building a solid foundation for higher studies in Chemistry. The hands-on experience the students gain in Practical's enable them to apply theory to solve problems in everyday life, think critically and innovatively. An aptitude for research is instilled through project work and industrial internship. Students completing this programme will be able to present the concepts of Chemistry clearly and precisely. They can find solutions to pressing problems that mankind is facing today. They can interpret data and present their findings to both scientific community and laymen ability to work as a team and evolve to become an entrepreneur and have Completion of this programme will also enable the learners to join teaching profession, conducting research in Industry and Government run research labs. A B.Sc chemistry student has the option to diversify to other branches such as Biochemistry, Biotechnology, Forensic Science etc. They have employability opportunities in public and private sector jobs in energy, Pharmaceutical, Food, Cosmetic industries etc...

Programme outcome:

PO1 :Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study

PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups

PO3 :Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development

PO 4 : Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO 5 : Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO 6 : Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and

draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO 8 : Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO 9 : Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society PO 10 : Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 11 :Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 :Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO 13 :Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

PO 14 : Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO 15 : Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn“, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

Programme Specific Outcomes

On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to:

PSO1: Disciplinary Knowledge: Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.

PSO2: Critical Thinking: Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively

PSO3: Problem Solving: Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.

PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.

PSO5: Research related skills: Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.

PSO6: Self-directed & Lifelong Learning: Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.

Methods of Assessment	
Recall(K1)	Simple definitions, MCQ, Recall steps, Concept definitions
Understand/Comprehend(K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or Overview
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain
Analyze(K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge
Evaluate(K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons
Create(K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

CO1: Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.

CO2: Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects inorganic compounds, types of reagents.

CO3: Apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx , Δp electro negativity, percentage ionic character and bond order.

CO4: Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects

CO5: Construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	S
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	M	S	S	S	S	S	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

SEMESTER I

Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to

CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.

CO2: compare the methodologies of different titrimetric analysis.

CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.

CO4: assess the yield of different inorganic preparations and identify the endpoint of various titrations.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	M	S	S
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	M	S	S	M
CO4	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

ALLIED CHEMISTRY FOR PHYSICAL SCIENCES I (FOR MATHEMATICS & PHYSICS STUDENTS)

Generic Elective I

<p>Course Learning Outcomes (for Mapping with POs and PSOs)</p> <p>On completion of the course the students should be able to</p> <p>CO1: gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.</p> <p>CO2: evaluate the efficiencies and uses of various fuels and fertilizers</p> <p>CO3: explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.</p> <p>CO4: apply various thermodynamic principles, systems and phase rule.</p> <p>CO5: explain various methods to identify an appropriate method for the separation of chemical components</p>
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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	S
CO3	S	S	S	M	S	S	S	S	S	M
CO4	S	S	M	S	S	S	S	M	M	S
CO5	S	M	S	S	S	M	S	S	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

ALLIED CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES I (For Mathematics and Physics–I Year /I Semester)

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of

the course the students should be able to

CO1: gain an understanding of the use of standard flask and volumetric pipettes, burette.

CO2: design, carry out, record and interpret the results of volumetric titration.

CO3: apply their skill in the analysis of water/hardness.

CO4: analyze the chemical constituents in allied chemical products

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	M	S	S	M	S	M
CO4	S	S	S	M	S	M	M	S	S	M

CO-PO Mapping (Course Articulation Matrix)

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

SKILL ENHANCEMENT COURSE I : FOOD CHEMISTRY

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

FOUNDATION COURSE: Higher secondary chemistry

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

CO1: learn about atom structure and periodic properties.

CO2: gain knowledge on types of chemical bonding

CO3: explain different states of matter

CO4: discussion on nomenclature and isomerism in organic compounds

CO5: knowledge on electromagnetic radiation and its interaction with matter

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	S	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	M	S	S	M	S	M
CO5	S	M	S	S	S	S	S	S	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

SEMESTER II

Core III : GENERAL CHEMISTRY-II

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons

CO2: discuss the periodic properties of s and p-block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids

CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties of s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons

CO4: explain the theories of acids, bases and indicators, buffer action and important compounds of s and p-block elements

CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p-block elements and hydrocarbons

CO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	M	S	S	S	M
CO2	M	S	S	S	M	S	S	M	M	S
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	S	M	M
CO5	S	M	S	S	M	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Core IV : QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	S
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	M	S	S	M
CO4	S	S	M	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

ALLIED CHEMISTRY FOR PHYSICAL SCIENCES II (FOR MATHEMATICS & PHYSICS STUDENTS)

Generic Elective III

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to										
CO1: write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology										
CO2: explain the preparation and property of carbohydrate, amino acids and nucleic acids.										
CO3: apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.										
CO4: identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst.										
CO5: outline the various types of photochemical process.										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	S	S	S
CO2	S	M	S	S	M	S	M	S	M	S
CO3	S	S	S	S	S	S	M	S	M	
CO4	S	M	S	S	S	M	S	S	S	
CO5	S	M	M	S	M	S	M	S	S	

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES (For Mathematics and Physics– IYear /II Semester)

Generic Elective IV

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to										
CO1: gain an understanding of the use of standard flask and volumetric pipettes, burette.										
CO2: design, carry out, record and interpret the results of volumetric titration.										
CO3: apply their skill in the analysis of water/hardness.										
CO4: analyze the chemical constituents in allied chemical products										
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	S	S	S
CO2	S	S	S	S	M	S	S	S	M	S
CO3	S	S	S	M	S	M	S	M	S	M
CO4	S	S	S	M	S	S	M	S	S	M

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

SKILL ENHANCEMENT COURSE II : DAIRY CHEMISTRY

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

CO1: understand about general composition of milk – constituents and its physical properties.

CO2: acquire knowledge about pasteurization of Milk and various types of pasteurization –
Bottle, Batch and HTST Ultra High Temperature Pasteurization.

CO3: learn about Cream and Butter their composition and how to estimate fat in cream and Ghee

CO4: explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.

CO5: have an idea about how to make milk powder and its drying process – types of drying

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	S	M	S	M
CO2	M	S	S	S	M	S	S	S	M	M
CO3	S	S	S	M	S	S	S	M	S	S
CO4	S	S	M	S	S	S	S	M	S	M
CO5	S	M	S	S	S	S	S	S	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

SKILL ENHANCEMENT COURSE-III (Discipline Specific): COSMETICS AND PERSONAL GROOMING

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

- **CO1:** know about the composition of various cosmetic products
- **CO2** understand chemical aspects and application of hair care and dental care and skin care products.
- **CO3** understand chemical aspects and application of perfumes and skin care products.
- **CO4** to understand the methods of beauty treatments their advantages and disadvantage
- **CO5** understand the hazards of cosmetic products.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	S	M	S
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	M	S	S	S	S	M	M	S
CO5	S	M	S	S	M	S	S	S	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's