

Syllabus

B.Tech. First Year

Semester A & B

Subject: Chemistry (CH10010)

Adopted form Session 2025 -26(July 2025)



Department of Chemistry

Shri G S. Institute of Technology and Science, Indore (MP)

B.Tech. I Year Chemistry
Semester- A & B
CH10010: CHEMISTRY

Period/week			Credits			Maximum marks				
T	P	Tu	T	P	Tu	Theory		Practical		Total Marks
						CW	End Sem	SW	End Sem	
1	-	-	1	-	-	30	70	-	-	100

Program Outcomes (POs):

POs describe what students should know and be able to do at the end of the programme. POs are to be in line with the graduate attributes as specified in the Washington Accord. POs are to be specific, measurable and achievable. NBA has defined 12 POs.

Graduates will be able to achieve:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, & an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, & analyze complex engineering problems reaching substantiated conclusions using 1st principles of math., natural sciences,& eng, sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge & research methods including design of experiments, analysis & interpretation of data, & synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select,& apply appropriate techniques, resources,& modern engineering & IT tools including prediction & modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment & sustainability:** Understand the impact of the professional engineering solutions in societal & environmental contexts,& demonstrate the knowledge of, & need for sustainable development.
8. **Ethics:** Apply ethical principles & commit to professional ethics & responsibilities and norms of the engineering practice.

9. **Individual & team work:** Function effectively as an individual, & as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community & with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give & receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge & understanding of the engineering & management principles & apply these to one's own work, as a member & leader in a team, to manage projects & in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs): For Theory Course

Course outcomes are the statements of what a student should know, understand and/or be able to demonstrate after completion of a course.

The course will enable student to:

- CO1** Identify and appreciate the contributions of Indian scientists in the field of chemistry.
- CO2** Apply Specifications, testing and treatment of water for industrial and domestic use.
- CO3** Implement appropriate lubrication strategies in the design and maintenance of engineering systems
- CO4** Describe the characteristics of fuels and the fundamentals of combustion processes.

Pre-requisite: Knowledge of basics of Chemistry studied in Class XI & XII.

Course Objectives: This course aims at imparting knowledge of the subject to the students for making them understand the role of chemistry in the field of engineering. The focus is on developing capabilities of students to use various analytical techniques, their applications in characterization of various materials used in different fields of engineering.

Course Outcomes: The course will enable student to understand:

- To deliver a comprehensive understanding of fundamental, applied, and advanced concepts in chemistry.
- To recognize, design, analyze, and resolve engineering challenges using applied knowledge of chemistry.

- To Build student's proficiency to effectively use analytical techniques for material characterization across multiple engineering applications.
- To upgrade knowledge of chemistry-related techniques, ensuring adherence to human values and safety standards.

Contents:

UNIT-I

Foundations of Chemistry: Indian Scientific Contributions and Water Chemistry

(a) Development of Chemistry in Ancient India, Contribution of Indian scientist in chemistry- Prafulla Chandra Ray, Chintamani Nagesa Ramachandra Rao, Har Govind Khorana, Santi Swarup Bhatnagar, Raghu Nath Anant Mashelkar and Vankataraman Ramakrishnan.

Water

(b) Introduction, Source, Types of impurities and their effects, Hardness, its expression and determination, BIS specifications for Industrial and domestic water, overview of Boiler troubles and softening methods, Numericals.

Unit-II

Introduction to lubricants , fuels & Combustion

(a) **Lubricants:** Introduction, Types of lubricants and principles of lubrication's, properties (test) of lubricants, numericals.

(b) **Fuel and combustion:** Fundamentals of fuel and combustion and numerical based on calorific value.

Assessment (Theory): Attendance, class test, class assignments and end semester theory exam

Books & References Recommended:

Text Books

1. Palanna O.G, Engineering Chemistry(Mc Graw Hill)
2. Dara S.S.,Engineering Chemistry (S. Chand publishing)
3. Stereochemistry: Conformation and Mechanism by PS Kalsi, New Age International Publisher
4. PC Jain and M Jain, Engineering Chemistry, 15th Edition, Dhanpat Rai publishing Co.

5. Chemistry in Engineering and Technology, JC Kuriacose and J Rajaram, Vol-I & II, Tata Mcgrow Hill Education Pvt. Limited.

Reference Books

1. D. Braun, Polymer Synthesis: Theory and Practice: Fundamentals, Methods, Experiments (Springer).
2. Ambasta B.K., Chemistry for Engineers(University Science Press)

B.Tech. I Year Chemistry
Semester- A & B
CH10010: CHEMISTRY Laboratory

Period/week			Credits			Maximum marks				
T	P	Tu	T	P	Tu	Theory		Practical		Total Marks
						CW	End Sem	SW	End Sem	
-	2	-	-	1	-	-	-	20	30	50

List of Experiments for B.Tech. I year, Chemistry

Course Outcomes (COs): For Laboratory Course:

This laboratory course will illustrate the principles of chemistry relevant to the study of science and engineering. The students will learn to:

- CO1** apply specifications, testing, and treatment of water for industrial and domestic use.
- CO2** Explain and compute different types of classical and alternative fuels.
- CO3** Illustrate concepts, manufacturing, and applications of different types of industrially important materials and their maintenance.
- CO4** Explain the applications of spectral and analytical techniques in qualitative and quantitative analyses.
- CO5** Relate the ethics behind applying chemical methods in industries and day-to-day use.

List of Experiments for B.Tech. I year, Applied Chemistry

1. Determination of the viscosity of lubricating oil by Redwood Viscometer No.1/ Redwood Viscometer No.2 (at five different temperatures).
2. Determination of flash point of given oil by Abel's apparatus/ Pensky Martin's apparatus.
3. Determination of percentage of moisture in a coal sample/ Total Solids in a water sample (Gravimetric analysis).
4. Determination of Steam Emulsification number (SEN) of a given lubricating oil sample.
5. Determination of Aniline Point of a given oil sample.
6. Determination of Drop Point/Penetration no. of a given semi-solid lubricant.
7. Determination of acid value of an oil sample.

8. Determination of hardness of water sample by EDTA method.
9. Determination of percentage purity of iron alloy by internal indicator method.
10. Determination of carbonates, bicarbonates and total alkalinity of a water sample.

Text Book

1. A Textbook of Quantitative Inorganic Analysis. AI Vogel, 3rd Edition, Longmans, London.
2. A Textbook On Experiments And Calculations In Engineering Chemistry, SS Dara, S. Chand Publisher

Reference book

1. Vogel's Text Book of Quantitative Analysis, Ed. GH Jeffery, J Bassett, J. Mendham and RC Denny, Longmans, London
2. Download the chemistry theory and practical related study materials: Shri G. S. Institute of Technology and Science, Indore - Downloads

CO PO Mapping Sheet for B.Tech. First Year Chemistry Theory (CH10010)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	-	-	2	-	-	1	1	0	2
CO2	2	2	1	2	1	1	1	1	1	-	-	1
CO3	2	2	1	1	-	1	-	1	-	-	-	1
CO4	2	1	-	1	-	2	2	1	1	-	-	1
Average	-	-	-	-	-	-	-	-	-	-	-	-

CO PO Mapping Sheet for B.Tech. First Year Chemistry Practical (CH10010)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	1	3	2	1	3	1	-	1
CO2	3	3	1	2	1	1	1	1	3	1	-	2
CO3	2	2	2	3	1	3	2	1	3	1	-	2
CO4	3	3	1	3	3	2	1	1	3	1	-	2
CO5	-	-	-	-	-	2	1	3	3	-	-	3
Average	-	-	-	-	-	-	-	-	-	-	-	-