B.Tech. I Year Chemistry
Semester- A & B
CH10516: CHEMISTRY

Period/week			Credits			Maximum marks				
T	P	Tu	T	P	Tu	Theory		Practical		Total Marks
						CW	End Sem	SW	End Sem	
3	-	-	3	-	-	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, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering 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 and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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 and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and 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	Describe the basics of Organic, Inorganic and Physical Chemistry.
CO2	Apply Specifications, testing and treatment of water for industrial and domestic use.
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	Understand the Ethics behind applying Chemical Methods in Industries and day-to-day use.

Pre-requisite: Knowledge of basics of Chemistry studied in Class XI and 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:

- Basics of Organic, Inorganic and Physical Chemistry.
- Specifications, testing and treatment of water for industrial and domestic use.
- Concepts, manufacturing and applications of different types of industrially important materials and their maintenance.
- Applications of spectral and analytical techniques in qualitative and quantitative analyses.
- The students will understand the Ethics behind applying Chemical Methods in Industries and day-to-day use.

Contents:
UNIT I

Basics of Chemistry:

Organic Chemistry: Concept of Hybridization, Configuration (including R/S and E/Z nomenclature of isomers) and Conformation (Newman and Sawhorse Projection Formulae, with nomenclature)

Physical Chemistry: Rate Law, Molecularity and Order of Reaction, First Order Kinetics

Inorganic Chemistry: Theories of Chemical Bonding (VBT and MOT)

Green Chemistry: An overview

UNIT II

Water:

Source, Types of impurities and their effects, Hardness, its expression and determination, Boiler troubles and their causes, Analyses and treatment of water for industrial and domestic purposes, Alkalinity and its determination, IS Specifications for Water, Methods for disposal of waste water.

UNIT III

(a)Lubricants

Types of lubricants and principles of lubrications, properties (test) of lubricants, greases, graphite, cooling liquids and cutting fluids and their applications., Ethics code and Ethics management in the oil and lubricant industries.

(b) Corrosion

Principle of corrosion, types of corrosion, factors affecting (FOUR) and methods of protection (FOUR: Proper designing, use of inhibitors, use of pure metal, use of alloys). Ethics for corrosion prevention.

UNIT IV

Materials Chemistry

(a) Polymers and Polymerization

Introduction, Classification, Types, mechanism, methods of polymerization. Structure-property Relationships, compounding, general applications of polymer materials of industrial importance (Nylon66, Kevlar, PVC, Polytetrafluoroethylene (PTFE) or Teflon, Polystyrene). Concept of Biodegradable polymers, Environmental regulations for polymer based packaging materials.

(b) Nanomaterials

Introduction, synthesis, properties, nano-structured materials and their applications. Introduction to Smart materials and their applications.

UNIT V

Spectroscopic Techniques and Applications

Introduction to Spectroscopy, Principal, Instrumentation and Applications of UV and IR. Introduction to Chromatographic Techniques (Column), Use of non destructive method.

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
CH10652: 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:

LO1 Develop abilities to perform various types of qualitative and quantitative analyses .

LO2 Determine properties of lubricants and oil samples.

LO3 Analyse water samples for in terms of hardness, chloride content, alkalinity and other dissolved/undissolved impurities.

LO4 Ability to understand, explain and use instrumental techniques for elucidating properties of lubricants oil samples ,chemical materials etc.

LO5 Follow to good laboratory practices during performance.

Group A

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

10. Determination of acid value of an oil sample
11. To study the chemical oscillations (Iodine Clock reaction)
12. Potentiometric estimation of Ferrous Ammonium Sulphate using standard Potassium Dichromate Solution
13. Determination of the partition coefficient of a substance between two immiscible liquids.
14. Synthesis of polymer and nanomaterials
15. Verification of Beer-Lambert's law by visible spectroscopy

Group B

1. Determination of hardness of water sample by EDTA method
2. Determination of carbonates, bicarbonates and total alkalinity of a water sample
3. Determination of percentage purity of iron alloy by internal indicator method
4. Determination of percentage purity of iron alloy by external indicator method
5. Determination of chloride content of water

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

CO PO Attainment Sheet for BTech First Year Chemistry Theory (CH10516)

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

Table 13: CO PO Attainment Sheet for Dept. of Chemistry

BTech First Year, Chemistry
Program Outcomes (POs)

PO-1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO-2	Problem analysis: Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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PO-4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
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