

M.M. ENGINEERING COLLEGE
w.e.f. Aug.,2023 (Batches 2023-2027 onwards)
Branch/Course: Common to all Branches

Bachelor of Technology-1st year (Semester –1st) Group-II

Sr. No.	Category	Code	Course Title	Hours per week			Total Hours per week	Credit
				L	T	P		
1	Basic Science Course	BCHE-001	Chemistry-I	3	1	0	4	4.0
2	Basic Science Courses	BCHE-002	Chemistry-I Lab	0	0	2	2	1.0

Dr. Bhawna Pareek

Dr. Praveen K Gupta

Dr. Gunjan Chauhan

Dr. Amalendu Pal

Dr. Joginder Singh

Dr. Ashutosh Singh

Dr. Ramnik Sharma

Dr. Nivedita Agnihotri

Dr. Harish K Sharma

Dr. Samarjeet Singh Siwal

BTech. Ist/2nd sem

Semester Ist/IInd

BTech. Chemistry-I Basic Science Course Concepts in Chemistry for Engineering

BCHE- 001

Total Marks: 100

Theory: 60

Sessional: 40

Course Outcomes

L	T	P	Cr
3	1	0	4

Time: 3 Hours

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise bulk properties and processes using thermodynamic considerations.
3. Analysis of various aspects of stereochemistry and their applications.
4. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.

NOTE: The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

UNIT-I

Atomic and molecular structure Molecular orbitals of diatomic molecules (N_2 , O_2 , CO). Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level

diagrams of $[Co(NH_3)_6]^{3+}$, $[Ni(CO)_4]$, $[PtCl_2(NH_3)_2]$ and magnetic properties of metal complexes. Band structure of solids and the role of doping on band structures.

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UNIT-II

Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries [H₂O, NH₃, PCl₅, SF₆, CCl₄, Pt(NH₃)₂Cl₂.]

UNIT-III

Use of free energy in chemical equilibria

Ist and IInd law of Thermodynamic, Thermodynamic functions: energy, entropy and free energy, estimations of entropy and free energies, Free energy and emf, Cell potentials, the Nernst equation and applications, Gibb's helmoltze equation clausious clayperon equation.

Spectroscopy:- Basic principal of UV/VIS & IR spectroscopy.

UNIT-IV

Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Synthesis of a commonly used drug molecule (Paracetamol and Aspirin).

Suggested Text Books

- (i) University chemistry, by B. H. Mahan
- (ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. plane
- (iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- (iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M.S.Krishnan
- (v) Physical Chemistry, by P. W. Atkins
- (vi) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition <http://bcs.whfreeman.com/vollhardtschore5e/default.asp>

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BTech. Chemistry-I Lab
Practicals:- Basic Science Course
Concepts in Chemistry for Engineering

BCHE-002

Total Marks: 100
Sessionals: 60
Practical Viva-Voce: 40

L	T	P	Cr
0	0	2	1

Time: 3 Hours

Laboratory Outcomes

The Chemistry laboratory course will consist of experiments illustrating the principles of Chemistry relevant to the study of science and engineering. The students will learn to:

1. Estimate the different parameters like chloride content, hardness and alkalinity in water sample
2. Measure molecular/system properties such as surface tension, viscosity.
3. Measure the Conductance and pH of the solutions.
4. To Synthesize a small drug molecule.

LIST OF EXPERIMENTS

1. To determine the surface tension of given liquid.
2. To determine the relative viscosity of a given liquid by using Ostwald's Viscometer.
3. To identify the number of components present in a given organic mixture by Thin layer chromatography.
4. To determine the alkalinity of a given water sample.
5. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using conductometer.
6. Synthesis of a drug (paracetamol/Aspirin).
7. Determination of chloride content of a given water sample.
8. To determine the calcium & magnesium or temporary & permanent hardness of a given water sample by EDTA method.
9. To determine the total iron content present in a given iron ore solution by redox titration.
10. Determination of the partition coefficient of a substance between two immiscible liquids.
11. To find out the flash point and fire point of the given oil sample by Pensky Martin apparatus.
12. To determine the amount of dissolved oxygen present in a given water sample.
13. To find out the pour point and cloud point of a lubricating oil.
14. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using pH meter.
15. Using Redwood Viscometer find out the viscosity of an oil sample.

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