

Course Structure for Under-Graduate Programme in Chemistry, 2025

Semester	Course Type	Courses	Course Code	Credits (T+P)	Marks	Internal Assessment	End Semester	
							Theory	Practical
First Semester	DSC-A1	Inorganic Chemistry-I	CHEM-111	3+1	100	30	50	20
	DSC-B1	To be chosen from (Phys/Maths/Botany/Zoology)		3+1	100	30	50	20
	MC-1	To be chosen from (Phys/Maths/Botany/Zoology)		3+1	100	30	50	20
	MDC 1	Introductory Chemistry-I	CHEM-112	3+0	75	25	50	00
	SEC 1	Basic Analytical Chemistry-I	CHEM-113	3+0	75	25	50	00
	AEC1	To be chosen from language course		2+0	50	15	35	00
Second Semester	DSC-A2	Organic Chemistry-I	CHEM-121	3+1	100	30	50	20
	DSC-B2	To be chosen from (Phys/Maths/Botany/Zoology)		3+1	100	30	50	20
	MC-2	To be chosen from (Phys/Maths/Botany/Zoology)		3+1	100	30	50	20
	MDC 2	Introductory Chemistry-II	CHEM-122	3+0	75	25	50	00
	SEC 2	Basic Analytical Chemistry-II	CHEM-123	3+0	75	25	50	00
	I/A/P/C	Internship/Apprenticeship/Project /Community Outreach	-	4+0	100	-	-	-
	Value Added Course (VAC)	As proposed by Department of Environmental Science	-	2+0	50	15	35	00

DSC offered by the Chemistry discipline will be treated Minor course for other disciplines

**MULTIDISCIPLINARY COURSE (MDC)
SEMESTER I
CHEM-MDC-112
Introductory Chemistry-I**

Max. Marks: 50

Time Allowed: 2 Hours

Credits: 3

Note for Examiners and Students:

<ul style="list-style-type: none">• There shall be three Sections/Blocks (I, II, III) in each course• Each Sections/Blocks preferably, may have 3 units.	<ul style="list-style-type: none">• There shall be Continuous and Comprehensive Evaluation (CCE).• Each Paper in a Course shall be of 75 marks and divided as follows: Internal Assessment -25 Marks End-Semester Exam -50 Marks• Internal Assessment: Attendance -05 Marks Class Test -10 Marks Assignments & Presentations -10 Marks	<p>There will be 4 Parts (A,B,C,D) and examiner shall set 7 questions in total from all the Sections/Blocks (I,II,III) of the syllabus in total.</p> <ul style="list-style-type: none">• Part A will have 2 questions of 12 Marks each from Section/Block I of the syllabus and students have to attempt any one.• Part B will have 2 questions of 12 Marks each from Section/Block II of the syllabus and students have to attempt any one.• Part C will have 2 questions of 12 Marks each from Section/Block III of the syllabus and students have to attempt any one.• Part D will have 10 short answer questions of 2 Marks each from all the three Sections/Blocks (I, II, III) of the syllabus and student have to attempt 7 in total.
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NOTE: Pass marks of each subject: 40% Aggregate and minimum 35% in each individual component (term end exams, practical, IA, etc.) of a subject.

Course Objectives

- To understand various atomic models, the concept of atomic and molecular mass, mole concept, empirical and molecular formula.
- To have a comprehensive review of three states of matter with special emphasis on various gas laws, critical temperature, vapour pressure, viscosity and surface tension.
- To have an overview of carbon and its compounds, nomenclature of carbon compounds, some basic reactions of hydrocarbons and their derivatives

Learning Outcomes: Upon completing the course, students will be able to:

- Apply the knowledge of the different atomic models, atomic and molecular mass, and mole concept.
- To have a fundamental knowledge of three states of matter including the overview of various gas laws, vapour pressure, viscosity and surface tension.
- Understand the basic concepts of carbon compounds including their nomenclature, a few fundamental reactions of organic compounds.

SECTION –A

Atoms and Molecules

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thompson's model and its limitations, Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, Avogadro's hypothesis, atoms and molecules, atomic mass, molecular mass, Mole concept (including numerical problems), Empirical and molecular formula (including numerical problems).

SECTION –B

States of Matter

Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles's law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro number, ideal gas equation. Kinetic energy and molecular speeds (elementary idea), deviation from ideal behaviour, liquefaction of gases, critical temperature. Liquid State – Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

SECTION –C

Carbon and its Compounds

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses)

Reference Books:

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
3. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
4. Atkins' Physical Chemistry, Atkins, P., Paula, J. d., Keeler, J., by OUP Oxford.
5. Bruce, P.Y., Organic Chemistry, by Pearson.

**MULTIDISCIPLINARY COURSE (MDC)
SEMESTER II
CHEM-MDC-122
Introductory Chemistry-II**

Max. Marks: 50

Time Allowed: 2 Hours

Credits: 3

Note for Examiners and Students:

<ul style="list-style-type: none"> • There shall be three Sections/Blocks (I, II, III) in each course • Each Sections/Blocks preferably, may have 3 units. 	<ul style="list-style-type: none"> • There shall be Continuous and Comprehensive Evaluation (CCE). • Each Paper in a Course shall be of 75 marks and divided as follows: Internal Assessment-25 Marks End-Semester Exam-50 Marks <p>Internal Assessment:</p> <p>Attendance -05 Marks Class Test -10 Marks Assignments & Presentations -10 Marks</p>	<p>There will be 4 Parts (A, B, C, D) and examiner shall set 7 questions in total from all the Sections/Blocks (I, II, III) of the syllabus in total.</p> <ul style="list-style-type: none"> • Part A will have 2 questions of 12 Marks each from Section/Block I of the syllabus and students have to attempt any one. • Part B will have 2 questions of 12 Marks each from Section/Block II of the syllabus and students have to attempt any one. • Part C will have 2 questions of 12 Marks each from Section/Block III of the syllabus and students have to attempt any one. • Part D will have 10 short answer questions of 2 Marks each from all the three Sections/Blocks (I, II, III) of the syllabus and student have to attempt 7 in total.
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NOTE: Pass marks of each subject: 40% Aggregate and minimum 35% in each individual component (term end exams, practical, IA, etc.) of a subject.

Course Objectives

- Understand the concept of water conservation, techniques of purification of water, and wastewater management.
- To have basic knowledge of pesticides and fertilizers along with benefits and adverse effects of some of them.
- Get acquainted with the basics of various types of renewable and non-renewable energies.

Learning Outcomes: Upon completing the course, students will be able to:

- Understand the basics of water conservation, water purification, and wastewater management.
- Apply the knowledge of biological and chemical control using natural and synthetic pesticides along with benefits and adverse effects of some of the pesticides and fertilizers
- To have an overview of various types of renewable and non-renewable energies.

SECTION –A

Water:

Sources of drinking water and uses, water conservation, Permissible TDS, Techniques of purification of water, R.O. water purification process (Osmosis and Reverse Osmosis), wastewater management

SECTION –B

Pesticides and fertilizers

General introduction and definition, biological control and chemical control: natural and synthetic pesticides, benefits and adverse effects of DDT, BHC, malathion, biofertilizers, chemical fertilizers and their uses, acid rain.

SECTION –C

Energy

Energy sources, renewable energy (solar, wind, hydro) and non-renewable sources, cells and batteries, fuel cell, solar cell, capacitors and super capacitors

Reference Books

1. Water Treatment, How To Make Water Safe To Drink, David Holman
2. Energy, A Beginner's Guide, Vaclav Smil, 2017
3. Goyal, P K, Water Pollution Causes, Effects and Control New age International Publishers
4. Pesticide Chemistry and Toxicology, D.K. Singh Volume 1, Bentham Books Sharjah, U.A.E