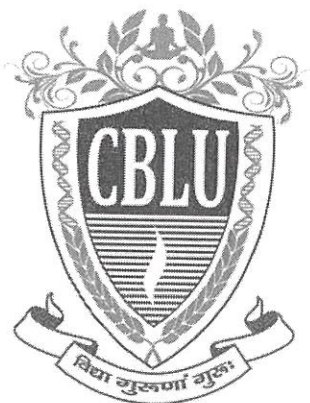


Bansi Lal University, Prem Nagar
(State University established under Haryana Act No. 25 of 2014)



**Scheme of Examination
for
Chemistry Subject
in
Under Graduate Programmes**

as per NEP 2020

**Curriculum and Credit Framework for Undergraduate Programmes
(Multiple Entry-Exit, Internships and Choice based credit system LOCF)**

with effect from the session 2026-27 (in phased manner)

DEPARTMENT OF CHEMISTRY

Ch. Bansi Lal University, Prem Nagar-127031

Bhiwani

HARYANA, INDIA

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1. Scope of the Programme

The 4-year B.Sc. (Hons./Hons. with Research) in Chemistry programme provides students with foundation in Organic, Inorganic, Physical, Analytical, and Applied Chemistry along with practical skills. The programme develops scientific reasoning, problem-solving ability, instrumentation handling research aptitude. Students can pursue higher studies such as M.Sc. Chemistry, Biochemistry, Environmental Science, Pharmaceutical Chemistry and Ph.D. programmes. It also opens opportunities in various government sectors and public sector industries. With growing demand in areas such as green chemistry, nanotechnology, renewable energy, and drug development, the programme offers excellent academic, research, and employment prospects in both public and private sectors.

2. Duration & Nomenclature of the Programme:

(Multiple Entry & Exit as per NEP-2020)

S. No.	Name of Awarding Certificate/Diploma/Degree	Level	Duration	Credits Earned
1.	UG Certificate in Chemistry	4.5	1 year	48 (inclusive of 4 credits of internship)
2.	UG Diploma in Chemistry	5.0	2 year	94 (inclusive of 4 credits of internship)
3.	Bachelor of Science with Major in Chemistry	5.5	3 year	136 (inclusive of 60 credits for Major)
4.	Bachelor of Science (Hons.) in Chemistry	6.0	4 year	184
5.	Bachelor of Science (Hons. with Research) in Chemistry	6.0	4 year	184

Key Terms

- **Academic Year and Semester:** Two consecutive (one odd and one even) semesters will constitute one academic year. A semester will consist of 90 days or 15 weeks in each semester excluding admission and examination days.
- **Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week over the duration of one semester. For calculation of the teaching hours, one credit means one hour of lecture or one hour of tutorial or one hour of seminar or two hours of practicum/laboratory work per week over the duration of a semester.

- **Learning Outcome based Curriculum Framework (LOCF):** The learning outcomes of the programme are mapped against well-defined Course Learning Outcomes (CLOs).
- **Choice Based Credit System (CBCS):** The CBCS provides choices to students to select disciplinary and interdisciplinary courses to fit into their own requirements.
- **Programme:** A programme is made up of courses and leads to the award of a Certificate, Diploma or Degree after completing requisite courses successfully.
- **Course:** A course refers to component of a programme. A course may comprise of lectures/tutorials/practicum or laboratory work/field practice/project work/seminar/community engagement and service/internship/dissertation, etc. or any combination of these.
- **Lecture:** Component of a course which is taught by a teacher through lectures covering the contents of a course.
 - **Tutorial:** Component of a course which involves problem-solving, learning through discussions and remedial teaching related to the contents and periphery of a course with the direct involvement of a teacher.
 - **Practicum:** A course or a component of a course which enables students to learn or to attain skills or to get procedural knowledge for the contents of a course through practical/laboratory activity/project and to apply learnt/studied principles/theory/concepts related to the chosen field of learning, work/vocation, or professional practice in the field of learning, work/vocation under the supervision of a teacher.
 - **Seminar:** A course or a component of a course which makes students to learn a specific topic through in-depth exploration and analysis of facts about the topic in a set-up that involves presentation, interactive discussions and collaborative learning under the supervision of a teacher.
- **Internship:** A course requiring students to participate in professional employment-related activity or work experience or co-operative education activity with an entity external to the educational institution normally under the supervision of an employee of an organization or an individual professional. A key aspect of the internship is induction into actual, formal and organized work situations. Internship involves working with local industry (Government or Private Organizations), business establishments, artists, craft persons, etc. to provide opportunities for students to actively engage in on-site experiential learning.
- **Project Work:** A course or a component of a course which facilitates students to apply their knowledge, skills and critical thinking ability to complete a specific task in a given time frame through conceptualization, exploration and analysis of research-based activities to suggest tangible solutions for a given problem related to the chosen field of learning.
- **Abbreviations for Courses**

➤ **Major and Minor Subject:**

Major subject is a subject of choice in a discipline which equips a student with knowledge, understanding and skills majorly in the chosen field of learning contributing to the core of the programme.





Minor subject helps a student to gain a broader understanding in addition to the Major subject. The courses in Major subjects will be **Core Courses (CC)**, **Discipline Specific Elective (DSE)**, **Discipline Skill Enhancement Course (DSEC)**, **Practicum (PC)**, **Project/Dissertation**, while a Minor subject will include **CC** as well as **Vocational Courses (VOC)**.

- **Core Course (CC):** A compulsory course of a subject aimed to cover the basics of Major/Minor subject.
- **Discipline Specific Elective (DSE) Course:** A Discipline specific elective course is a course aimed to impart options for varied knowledge and skills in the specialized fields of a Discipline/subject.
- **Discipline Skill Enhancement Course (DSEC):** A Discipline skill enhancement course is a course to provide knowledge, skills, training and competencies in a discipline/subject.
- **Vocational Courses (VOC):** A vocational course is focused on practical work, preparing students for a particular skilled profession. Such courses develop capacities for sustenance, work, and economic participation and develop values and sensibilities toward physical work.
- **Multidisciplinary Courses (MDC):** These Courses are based on introductory knowledge in a subject. A student will study MDC in a subject other than the discipline of Major & Minor subjects to gain knowledge across the disciplines.
- **Ability Enhancement Courses (AEC):** These courses aim at enabling the students to achieve competency in the English language or Modern Indian Languages (MIL) with special emphasis on language and communication skills.
- **Skill Enhancement Courses (SEC):** These courses aim at imparting practical skills, hands on training, soft skills, etc. to enhance the employability of students.
- **Value-Added Courses (VAC)/Open Elective:** These courses aim at enabling the students to acquire and demonstrate the acquisition of knowledge and understanding of human values, Indian Knowledge System (IKS), contemporary India, environmental science and education, digital and technical solutions, health and wellness, yoga education, sports and fitness etc.
- **Internship**
 - Every student enrolled for the programme shall be required to undergo 4-credit internship of 4-6 weeks' duration before taking an exit or completing the programme.
 - The Internship will involve working with local industry (Govt. or private organizations/institutions), business establishments, or a professional (individual/organization).
 - A student needs to inform and get approval from the Chairperson of the Department before going for an internship.
 - He/she has to submit a copy of report (a hard copy & a soft copy in pdf) to the Department within 15 days of completion of Internship along with a certificate of attendance and work done.
 - Evaluation will be done on the basis of report & viva voce by an internal examiner.

- **Project/Dissertation**

- A student of fourth-year B.Sc. (**Hons. with Research**) in Chemistry programme will be required to work on the research project or do research during eighth semester of 12 Credits.
- The student has to submit a request to the Chairperson in the seventh semester for allotment of supervisor mentioning his/her research area of interests.
- A full time teacher having Ph.D. of that Department may be assigned as supervisor.
- The student needs to submit synopsis to the supervisor which needs to be approved by Departmental Research Advisory Committee through the recommendation of the supervisor.
- Three copies of project report/dissertation along with soft copy in pdf need to be submitted by the student before 30th June of the concerned year. The late submission can be allowed with late fees as per University rules.
- Report of Anti-Plagiarism policy of the University needs to be annexed with Project report/dissertation.
- Evaluation of Dissertation shall be done by an External Examiner. The dissertation work will be of 12 credits (300 Marks) and evaluation will be done in two components; report of dissertation (8 credits = 200 Marks) and open viva voce examination (4 credits =100 Marks)



Course composition- Theory/ Theory +Practical				
Course Credit	Internal Assessment marks	End term exam marks	Total marks	
2	15	35	50	
3	20	50	70	
4	30	70	100	
Course composition- Theory + Practical				
Course Credit	Theory		Practical	Total marks
Theory +Practical	Internal Assessment marks	End term exam marks	Internal Assessment marks	End term exam marks
1+1	10	20	5	15
2+1	15	35	5	15
2+2	15	35	15	35
3+1	20	50	10	20
0+4	NA	NA	30	70

1. Internal assessment (30%) shall be broadly based on the following defined components of;

- Class participation
- Seminar/Presentation/Assignment/Quiz/class test, etc.
- Mid Term Exam

Total Internal Assessment Marks (Theory)	Class Participation	Seminar/Presentation/Assignment/Quiz/class test, etc.	Mid-Term Exam
10	4	-	6
15	4	4	7
20	5	5	10
30	5	10	15
Total Internal Assessment Marks (Practicum)	Class Participation	Seminar/Demonstration/Viva-Voce/Lab record, etc.	Mid-Term Exam
5	--	5	NA
10	--	10	NA
15	5	10	NA
30	5	10	15

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Ch. Bansi Lal University, Prem Nagar, Bhiwani

Scheme of Examination for B.Sc. Programme (Single Major in Chemistry)
(Certificate, Diploma, Bachelor Degree and Bachelor Degree (Hons.), Bachelor Degree (Hons. with Research))

SEMESTER SYSTEM

Under Learning Outcome Based Curriculum Framework-Choice Based Credit System

(LOCF-CBCS) with Multiple Entry-Exit, Internships as per NEP 2020

(w.e.f. session 2026-27)

Semester-I

Course Type Total Credits	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-1	4	26UG- CHE-101	Chemistry-I	03	03	20	50	70
MCC-1 04 Credits			Practical	01	02	10	20	30
MCC-2 04 Credits	4	26UG- CHE-102	Physical Chemistry - I	03	03	20	50	70
			Practical	01	02	10	20	30
CC-M1 04 Credits	4	From Available CC-1/MCC-1 of 4 credits as per NEP						
MDC-1 03 Credits	3	From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP.						
AEC-1 02 Credits	2	From Available pool of Ability Enhancement Courses as per NEP						
SEC-1 03 Credits	03	From Available pool of Skill Enhancement Courses as per NEP						
VAC-1 02 Credits	02	From Available pool of Value Added Courses as per NEP						

Total Credits: 22

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)

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Semester-II

Course Type Total Credits	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-2 MCC-3	04 Credits	26UG-CHE-201	Chemistry – II	03	03	20	50	70
			Practical	01	02	10	20	30
DSEC-1	04 Credits	26UG-CHE-202	Chemistry Skill - I	03	03	20	50	70
			Practical	01	02	10	20	30
CC-M2	04 Credits		From Available CC-2/MCC-3 of 4 credits as per NEP					
MDC-2	03 Credits		From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP.					
AEC-2	02 Credits		From Available pool of Ability Enhancement Courses as per NEP					
SEC-2	03 Credits		From Available pool of Skill Enhancement Courses as per NEP					
VAC-2	02 Credits		From Available pool of Value Added Courses as per NEP					
Internship 04 Credits	*04 Credits		Internship of 04 Credits of 4-6 weeks duration after 2 nd Semester					

Total Credits: 22 + *4 (Required compulsorily for existing the programme)

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)





Semester-III

Course Type	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-3	04	26UG-CHE-301	Chemistry – III	03	03	20	50	70
MCC-4			Practical	01	02	10	20	30
MCC-5	04	26UG-CHE-302	Inorganic Chemistry – I	03	03	20	50	70
CC-M3			Practical	01	02	10	20	30
	04		From Available CC-3/MCC-4 of 4 credits as per NEP					
MDC-3	03		From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP.					
AEC-3	02		From Available pool of Ability Enhancement Courses as per NEP					
SEC-3	03		From Available pool of Skill Enhancement Courses as per NEP					
VAC-3	02		From Available pool of Value Added Courses as per NEP					

Total Credits: 22

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)

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Semester-IV

Course Type	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-4 MCC-6	04	26UG-CHE-401	Chemistry – IV	03	03	20	50	70
			Practical	01	02	10	20	30
MCC-7	04	26UG-CHE-402	Organic Chemistry – I	03	03	20	50	70
			Practical	01	02	10	20	30
MCC-8	04	26UG-CHE-403	Physical Chemistry - II	03	03	20	50	70
			Practical	01	02	10	20	30
		26UG-CHE-404	Elective Chemistry-I	03	03	20	50	70
			Practical	01	02	10	20	30
DSE-I Select one option	04	26UG-CHE-405	Elective Chemistry-II	03	03	20	50	70
			Practical	01	02	10	20	30
		26UG-CHE-406	Elective Chemistry-III	03	03	20	50	70
			Practical	01	02	10	20	30
		26UG-CHE-407	Elective Chemistry-IV	03	03	20	50	70
			Practical	01	02	10	20	30
CC-M4 (V)	04		From Available pool of Minor (Vocational) Courses VOC-2					
AEC-4	02		From Available pool of Ability Enhancement Courses as per NEP					
VAC-4	02		From Available pool of Value Added Courses as per NEP					

Total Credits: 24 + *4 (Required compulsorily for existing the programme)

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-IH) Practicum Course

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Semester-V

Course Type	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-5 MCC-9	04	26UG-CHE-501	Chemistry – V	03	03	20	50	70
			Practical	01	02	10	20	30
MCC-10	04	26UG-CHE-502	Inorganic Chemistry – II	03	03	20	50	70
			Practical	01	02	10	20	30
		26UG-CHE-503	Elective Chemistry-IV	03	03	20	50	70
			Practical	01	02	10	20	30
OR								
DSE-2 Select one option	04	26UG-CHE-504	Elective Chemistry-V	03	03	20	50	70
			Practical	01	02	10	20	30
OR								
		26UG-CHE-505	Elective Chemistry-VI	03	03	20	50	70
			Practical	01	02	10	20	30
		26UG-CHE-506	Elective Chemistry-VII	03	03	20	50	70
			Practical	01	02	10	20	30
OR								
DSE-3 Select one option	04	26UG-CHE-507	Elective Chemistry-VIII	03	03	20	50	70
			Practical	01	02	10	20	30
OR								

		26UG-CHE-508	Elective Chemistry-IX	03	03	20	50	70
			Practical	01	02	10	20	30
CC-M5 (V)	04		From Available pool of Minor (Vocational) Courses VOC-1					
Internship	*04		Internship of 04 Credits of 4-6 weeks duration after 4 th Semester (if not done after 2 nd & 4 th Semester)					

Total Credits: 24

*Four Credits of Internship of 4-6 weeks of duration, earned by a student after 2nd or 4th Semester will be taken into account in 5th semester of a student who pursue 3 year B.Sc. (Chemistry) without taking exit option.

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)

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Semester-VI

Course Type	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks	Examination Hrs.
CC-6 MCC-11	04	26UG-CHE-601	Chemistry – VI	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
MCC-12	04	26UG-CHE-602	Organic Chemistry – II	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
DSE-4 Select one option	04	26UG-CHE-603	Elective Chemistry-X	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
		OR							
		26UG-CHE-604	Elective Chemistry-XI	03	03	20	50	70	03
Practical	01		02	10	20	30	03		
DSE-5 Select one option	04	26UG-CHE-605	Elective Chemistry-XII	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
		26UG-CHE-606	Elective Chemistry-XIII	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
OR									
DSE-5 Select one option	04	26UG-CHE-607	Elective Chemistry-XIV	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
		OR							
		26UG-CHE-608	Elective Chemistry-XV	03	03	20	50	70	03
Practical	01		02	10	20	30	03		

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CC-M6 (V)	04	From Available pool of Minor (Vocational) Courses VOC-3
SEC-4	02	From Available pool of Skill Enhancement Courses As Per NEP

Total Credits: 24

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)

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Semester-VII
B.Sc. Chemistry (HNS) or B.Sc. Chemistry (HNS) with Research

Course Type	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-H1	04	26UG-CHE-701	Physical Chemistry – III	04	04	30	70	100
CC-H2	04	26UG-CHE-702	Inorganic Chemistry – III	04	04	30	70	100
CC-H3	04	26UG-CHE-703	Organic Chemistry – III	04	04	30	70	100
DSE-6 Select one option	04	26UG-CHE-704	Advanced Chemistry-I	04	04	30	70	100
		OR						
		26UG-CHE-705	Advanced Chemistry-II	04	04	30	70	100
		OR						
PC-H1	04	26UG-CHE-706	Advanced Chemistry-III	04	04	30	70	100
CC-HM1	04	26UG-CHE-707	Practical Chemistry	04	08	30	70	100
From the Available core courses in Minor Subjects of 04 Credits As Per NEP								

Total Credits: 24

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)

Semester-VIII
B.Sc. Chemistry (HNS)

Course Type	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-H4	04	26UG-CHE-801	Physical Chemistry – IV	04	04	30	70	100
CC-H5	04	26UG-CHE-802	Inorganic Chemistry – IV	04	04	30	70	100
CC-H6	04	26UG-CHE-803	Organic Chemistry – IV	04	04	30	70	100
DSE-7 Select one option	04	26UG-CHE-804	Advanced Chemistry-IV	04	04	30	70	100
		OR						
		26UG-CHE-805	Advanced Chemistry-V	04	04	30	70	100
		OR						
PC-H2	04	26UG-CHE-806	Advanced Chemistry-VI	04	04	30	70	100
		26UG-CHE-807	Practical Chemistry	04	08	30	70	100
CC-HM2	04	From the Available core courses in Minor Subjects of 04 Credits As Per NEP						

Total Credits: 24

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)

Semester-VIII
B.Sc. Chemistry (HNS) with Research

Course Type	No. of Credits	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks
CC-H4	04	26UG-CHE-801	Physical Chemistry – IV	04	04	30	70	100
CC-H5	04	26UG-CHE-802	Inorganic Chemistry – IV	04	04	30	70	100
Project / Dissertation	12	26UG-CHE-808	Project / Dissertation in Chemistry	12	--	--	--	300
CC-HM2	04	From the Available core courses in Minor Subjects of 04 Credits As Per NEP						

Total Credits: 24

Core Courses (CC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Value Added Courses (VAC); Multidisciplinary Courses (MDC); Minor Course (CC-M); Minor Course Vocational (CC-M(V)); Core Course in Hons. Discipline (CCH); Discipline Specific Elective Course in Hons. (DSE-H) Practicum Course in Hons. Subject (PC-H); Core Course in Minor Subject of Hons. Programme (CC-HM)

Pool of MDC, VAC, SEC and VOC Courses in the subject of Chemistry to be offered to the University Pool Updated on 28-06-2026

Course Type Total Credits	SEM	Applicable Scheme	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks	Examination Hrs.
MDC-1 03 Credits	I	Scheme A, C & D	24UN-CHE-MDC101	Introductory Chemistry - I	02	02	15	35	50	03
				Practical	01	02	05	15	20	03
MDC-2 03 Credits	II	Scheme A, C & D	24UN-CHE-MDC201	Introductory Chemistry – II	02	02	15	35	50	03
				Practical	01	02	05	15	20	03
MDC-3 03 Credits	III	Scheme A, B, C & D	24UN-CHE-MDC301	Introductory Chemistry – III	02	02	15	35	50	03
				Practical	01	02	05	15	20	03
VAC-3	III	Scheme C	24UN-CHE-VAC301	Chemistry in everyday life	02	02	15	35	50	03
	IV									
VAC-4	IV	Scheme C	24UN-CHE-VAC401	Agriculture Chemistry	02	02	15	35	50	03
SEC-1	I	Scheme A, B, C & D	24UN-CHE-SEC101	Computer for Chemists	02	02	15	35	50	03
				Practical	01	02	05	15	20	03
SEC-2	II	Scheme A, C & D	24UN-CHE-SEC201	Chemistry of Food, Flavors and Colorants	02	02	15	35	50	03
				Practical	01	02	05	15	20	03
SEC-3	III	Scheme A, B, C & D	24UN-CHE-SEC301	Analytical Chemistry - I	02	02	15	35	50	03
				Practical	01	02	05	15	20	03

SEC-4	VI	Scheme C only	24UN-CHE-SEC601	Food Adulteration Testing	02	02	15	35	50	03
				Practical	01	02	05	15	20	03
CC-M3 (V)	III	Scheme B only	24UN-CHE-VOC-1	Chemistry of Fertilizers and Pesticides	03	03	20	50	70	03
CC-M5 (V)	V	Scheme A & C		Practical	01	02	10	20	30	03
CC-M4 (V)	IV	Scheme A, B & C	24UN-CHE-VOC-2	Chemistry of Cosmetics and Perfumes	03	03	20	50	70	03
				Practical	01	02	10	20	30	03
CC-M5 (V)	VI	Scheme B only	24UN-CHE-VOC-3	Green Laboratory Techniques	03	03	20	50	70	03
CC-M6 (V)		Scheme C only								
CC-M7 (V)		Scheme A only								
				Practical	01	02	10	20	30	03

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CC-1/ MCC-1

Session: 2026-27

Part A - Introduction

Subject	Chemistry		
Semester	I		
Name of the Course	Chemistry-I		
Course Code	26UG-CHE-101		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC/MCC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Enable to understand the basis of quantum mechanics and structural idea and relevance in describing shapes of s, p and d orbitals. 2. To learn about role of temperature and pressure to establish the state of gases and describe the concept of critical constants of real gases. 3. Get knowledge about the electrophile/nucleophile and its role in mechanism of preparation of organic compounds. 4. To know the physical properties, morphology and crystalline study of liquid and different type of solids. 5*. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75

Max. Marks:70+30* Internal Assessment Marks:20+10* End Term Exam Marks: 50+20*		Time:03 + 03*
Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.		
Unit	Topics	Contact Hours
I	Atomic Structure Dual behaviour of matter and radiation, de Broglie's relation, Heisenberg's uncertainty principle, concept of atomic orbitals, significance of quantum numbers, radial and angular wave functions, normal and orthogonal wave functions, significance of Ψ and Ψ^2 , shapes of s, p, d, f orbitals, Rules for filling electrons in various orbitals, effective nuclear charge, Slater's rules. Periodic table and atomic properties Classification of periodic table, definition of atomic and ionic radii, ionisation energy, electron affinity and electronegativity, trend in periodic table (in s and p-block elements), Pauling, Mulliken, Allred Rachow and Mulliken Jaffe's electronegativity scale, Sanderson's electron density ratio.	12
II	Gaseous State Kinetic theory of gases, Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity, and most probable velocity. Collision diameter, collision number, collision frequency and mean free path (Derivations excluded), Deviation of Real gases from ideal behaviour, Derivation of Van der Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Concept of Critical temperature, critical pressure, critical volume, relationship between critical constants and Van der Waal's constants (Derivation excluded).	11

III	Liquid State Structure of liquids, Properties of liquids – surface tension, refractive index, viscosity, vapour pressure and optical rotation. Solid State Classification of solids, Law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry and symmetry elements, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of Laue method, rotating crystal method and powder pattern method. Ionic structures (NaCl, CsCl, ZnS (Zinc blende), CaF₂) size effects, radius ratio rule and its limitations,	11
IV	Structure and Bonding Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications, hyperconjugation, inductive effect, Electromeric effect and their comparison. Mechanism of Organic Reactions Curved arrow notation, homolytic and heterolytic bond fission. Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerization and Pericyclic reactions. Reactive intermediates: Carbocations, carbanions, free radicals, carbenes (structure & stability).	11
V*	1. Acid/Base titration: Determination of strength of oxalic acid using NaOH. 2. Redox titrations: Determination of Fe²⁺ ions using KMnO₄. 3. To determine the surface tension of given liquid using Stalagmometer by drop no. methods. 4. Preparation of <i>m</i>-Dinitrobenzene from Nitrobenzene (use 1:2 conc. HNO₃-H₂SO₄ mixture if fuming HNO₃ is not available) 5. Preparation of p-Bromoacetanilide from Acetanilide	30
Suggested Evaluation Methods		

Internal Assessment:20+10* ➤ Theory ● Class Participation: 5 ● Seminar/presentation/assignment/quiz/class test etc.: 5 ● Mid-Term Exam: 10 ➤ Practicum ● Class Participation: NA ● Seminar/Demonstration/Viva-voce/Lab records etc.: 10 ● Mid-Term Exam: NA	End Term Examination: 50+20*
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Lee, J.D.; (2010), Concise Inorganic Chemistry, Wiley India. 2. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 1, 6 th Edition, McGraw Hill Education. 3. Clayden, J.; Greeves, N.; Warren, S. (2012), Organic Chemistry, Oxford. 4. Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). 5. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), Senior Practical Physical Chemistry, R. Chand &Co, New Delhi. 6. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons	

*Applicable for courses having practical component.



MCC-2

Session: 2026-27			
Part A - Introduction			
Subject	Chemistry		
Semester	I		
Name of the Course	Physical Chemistry-I		
Course Code	26UG-CHE-102		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MCC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Get the knowledge of concepts of rates of chemical reactions 2. Its application in determination of order of various reactions. 3. To gain the knowledge of various thermodynamic variables & processes. 4. Concept of entropy and its significance in daily routine life. 5*. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75

Max. Marks:70+30* Internal Assessment Marks:20+10* End Term Exam Marks: 50+20*		Time:03 + 03 hrs
Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.		
Unit	Topics	Contact Hours
I	Chemical Kinetics-I Kinetics Rate of reaction, rate equation and its types, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Order and molecularity of a reaction, integrated rate expression for zero order, first order, second and third order reactions (for equal and unequal concentrations of reactants), methods of determination of order of reaction, Half-life period of a reaction. Effect of temperature on the rate of reaction – Arrhenius equation.	12
II	Chemical Kinetics-II Theories of reaction rate – Simple collision theory for unimolecular collision. Transition state theory of bimolecular reactions. Opposed or reversible elementary reactions, Side or concurrent elementary reactions, Consecutive or sequential reactions.	11
III	Thermodynamics-I Definition of thermodynamics terms: system, surrounding etc. Types of systems, intensive & extensive properties. State and path functions and their differentials. Thermodynamic processes, Thermodynamic equilibrium, Concept of heat & work. First law of Thermodynamics: statement, concept of internal energy and enthalpy. Heat capacity, heat capacities at constant volume, and pressure and their relationship. Joules law, Joule–Thomson coefficient for ideal gas and real gas and inversion temperature. Calculation of w , q , dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible & irreversible processes. Kirchoff's equation.	12

CC-2/MCC-3

Session: 2026-27			
Part A - Introduction			
Subject	Chemistry		
Semester	II		
Name of the Course	Chemistry-II		
Course Code	26UG-CHE-201		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC/MCC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Able to understand the theories which governs the shape, structure and ionic behavior, polarizability, ionic structures and concept of Lattice energy of crystals of molecules. 2. To know the basics of rates of chemical reactions, the laws and solubility behavior of solutes in different compositions of solvents 3. To know about alkanes, alkene, cycloalkanes and their chemical reactions. 4. To understand about weak interactions and bonding in metals. 5*. Hand on practice for estimation and determination of viscosity, specific refractivity properties of some compounds.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75

Internal Assessment Marks	20	10	30
End Term Examination Marks	50	20	70
Examination Time	3 Hours	3 Hours	
Max. Marks:70+30* Internal Assessment Marks:20+10* End Term Exam Marks: 50+20*		Time:03+03*	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.			
Unit	Topics	Contact Hours	
I	Covalent Bond Valence bond theory approach, shapes of simple inorganic molecules and ions based on valence shell electron pair repulsion (VSEPR) theory and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Molecular orbital theory of homonuclear (N ₂ , O ₂) and heteronuclear (CO and NO) diatomic molecules, dipole moment and percentage ionic character in covalent bond. Polarizing power and Polarisability of ions, Fajan's rule. Concept of Lattice energy, Solvation energy and its relationship with solubility of Ionic solids,	11	
II	Chemical Equilibrium Equilibrium constant and free energy, concept of chemical potential, thermodynamic derivation of law of chemical equilibrium, Temperature dependence of equilibrium constant (Van't Hoff equation), Le Chatelier's principle and its applications, Clapeyron equation, Clausius Clapeyron equation and its applications. Distribution Law Nernst distribution law – its thermodynamic derivation, Nernst distribution law after association and dissociation of solute in one of the phases, of distribution law: (i)	12	

	Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride	
III	Alkanes and Cycloalkanes Nomenclature, classification of carbon atoms in alkanes and its structure. Isomerism in alkanes, sources. Methods of formation: Wurtz reaction, Kolbe reaction, Corey- House reaction and decarboxylation of carboxylic acids, physical properties. Mechanism of free radical halogenation of alkanes: reactivity and selectivity. Nomenclature of Cycloalkanes, Baeyer's strain theory and its limitations, theory of strainless rings. Alkenes Nomenclature of alkenes and its structure. Methods of formation: dehydration of alcohols, dehydrohalogenation of alkyl halide, Hofmann elimination and their mechanism. The Saytzeff rule and relative stabilities of alkenes. Chemical reactions: electrophilic and free radical additions, addition of halogens, halogen acids, hydroboration-oxidation, oxymercuration-reduction, ozonolysis and hydration. Markownikoff's rule of addition.	11
IV	Hydrogen Bonding and Van der Waals forces Hydrogen Bonding – Definition, types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Van der Waals forces. Metallic Bond and semiconductors Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators). Semiconductors – Introduction, types, and applications.	11
V*	Complexometric titrations: Determination of Mg^{2+} by EDTA. Paper Chromatography: Qualitative Analysis of any one of the following Inorganic cations and anions by paper chromatography (Pb^{2+}, Cu^{2+}, Ni^{2+}, Cl^-, Br^-, and PO_4^{3-} and NO_3^-). - To determine the viscosity of given liquid using Ostwald's Viscometer. - To determine the specific refractivity of at least two liquids by Refractometer. - Separation of mixture of two Organic Compounds by TLC.	30

DSEC-1

Session: 2026-27			
Part A - Introduction			
Subject	Chemistry		
Semester	II		
Name of the Course	Chemistry Skill-I		
Course Code	26UG-CHE-202		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSEC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Aware about lab handling and handling of hazardous chemicals. 2. Determine percentage purity and knowledge to prepare buffer solutions. 3. To Know preparation of complexometric titration and purification techniques. 4. To get operating knowledge of different instruments. 5*.To get practical knowledge about complexometric titrations and paper chromatography. Also determination some physical properties of some compounds/ solutions.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Internal Assessment Marks	20	10	30
End Term Examination Marks	50	20	70

Examination Time	3Hours	3 Hours	
Max. Marks:70+30* Internal Assessment Marks:20+10* End Term Exam Marks: 50+20*		Time:03+03*	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.			
Unit	Topics	Contact Hours	
I	Familiarization with chemical labeling, Handling of hazardous chemicals, Handling of glassware. Familiarization with chemical concepts related to solution preparation and standardization: Equivalent mass, molar mass, specific gravity, concentration (Normality, Molarity, Molality, %w/v, %w/w, %v/v, ppm, ppb solutions), Basicity, acidity, solutions of oxidizing and reducing agents.	12	
II	Determination of concentration and percentage purity. Standardization of solutions, Knowledge about primary and secondary standards. Knowledge about indicators and preparation of indicator solutions, Knowledge about buffers and preparation of buffer solutions.	11	
III	Management of chemical waste. Sodium metal disposal, Purification of chemicals through distillation, crystallization, sublimation etc. Chromatography its principle and various types including their applications. Cleaning of viscometer, stalagmmometer	11	
IV	Knowledge about different electrodes (e.g., Ag, Pt, SCE, Ag/AgCl) and their upkeep, Operating knowledge including calibration and maintenance of pH-meters and glass electrode, Operating knowledge including calibration, handling and maintenance of Potentiometers and conductometer. Operating knowledge including calibration and maintenance of refractometer, polarimeter, Spectrophotometer	11	

V*	Complexometric titrations: Determination of Zn^{2+} by EDTA. Thin Layer Chromatography: Qualitative Analysis of Inorganic & Organic Compounds - To determine the percentage composition of liquid mixtures using Ostwald's Viscometer. - To determine the composition of liquid mixtures by Refractometer. - Preparation of Dibenzalacetone from Acetone and Benzaldehyde - Preparation of 2,4-DNP derivative of Benzophenone. - Separation of mixture of two Organic Compounds by TLC.	30
Suggested Evaluation Methods		
Internal Assessment:20+10* Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.:5 - Mid-Term Exam: 10 Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.: 10 - Mid-Term Exam: NA		End Term Examination: 50+20*
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), Senior Practical Physical Chemistry, R. Chand & Co, New Delhi. - Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons.		

*Applicable for courses having practical component.

MDC-1			
Part A - Introduction			
Subject	Chemistry		
Semester	I		
Name of the Course	Introductory Chemistry-I		
Course Code	24UN-CHE-MDC-101		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C)	MDC		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)	Higher secondary other than science discipline		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to 1. To get knowledge about structure and bonding. 2. To learn about hydrocarbons and their applications. 3. To get aware about different polymers. 4. To get knowledge about preservative. 5. To get knowledge about experiments related to daily life.		
	Theory	Practical	Total
Credits	2	1	3
Contact Hours/week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	15	50
Examination Time	03 Hours	03 Hours	
Max. Marks: 70 (Theory: 50 & Practical: 20)			
Part B- Contents of the Course			
Instructions for Paper- Setter			
Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non- programmable calculator is allowed.			
Unit	Topics	Contact Hours	
I	Atomic Structure and Bonding	Introduction, Elementary Introduction	
Programme	Introduction to H.C.S. (Hydrocarbons) and atomic structure and chemical bonding, Representation of elements/ atoms, Lewis structure, electronic configurations (1-30)	Introduction to H.C.S. (Hydrocarbons) and atomic structure and chemical bonding, Representation of elements/ atoms, Lewis structure, electronic configurations (1-30)	

35 | 45
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Meeting on LEEDS dated 18-06-2024 Atomic structure and chemical bonding, Representation of elements/ atoms, Lewis structure, electronic configurations (1-30)	Chemistry_NEP-2020_Hons. 8
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II	Carbon and Its Compounds Introduction, Tetravalency of Carbon, allotropes of carbon and their properties, hydrocarbons (1-5), nomenclature (linear compounds), Applications of hydrocarbons.	8
III	Polymers Introduction, elementary idea of synthetic and natural polymers, Homo polymers and copolymers, uses and properties (Natural rubber, Vulcanized rubber, Polyethene, PVC, Styrene, Teflon, PAN, Nylon-66)	7
IV	Food Preservatives Elementary idea of natural and synthetic food preservatives, rancidity, uses and properties, different food preservation processes (pickle, Jam), artificial sweeteners, uses and properties	7
Practicals		
V*	1. Identify the pH of the given samples through pH strip. 2. Experiments related to persevering food items. 3. Preparation of Artificial Silk. 4. To synthesize some polymers as per available resources.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory: 15 - Class Participation: 4 - Seminar/presentation/assignment/quiz/class test etc.: 4 - Mid-Term Exam: 7		End Term Examination: ➤ Theory: 35 Written examination ➤ Practicum: 15
Practicum: 5 Class Participation: NA Seminar/Demonstration/Viva-voce/Lab records etc.: 5 Mid-Term Exam: NA		Lab record, viva-voce, Demonstration of practical
Part C- Learning Resources		
Recommended Books/e-resources/LMS: - Dhawan S.N., Organic Chemistry, Vol 1 Pardeep Publication. - Subbulakshmi G, Food processing and preservation, New Age International Publishers. - Manas Chanda, 2013, Introduction to Polymer Science and Chemistry 2nd Edition, Making Rayon Fiber - Artificial silk, chemical experiment! How to make silk from cotton wool ("Artificial silk" experiment) - Neelam Seedher, Basic Concepts: Physical Chemistry Experiments, Kindley Edition		

MDC-2

Session: 2024-2025			
Part A - Introduction			
Subject	Chemistry		
Semester	II		
Name of the Course	Introductory Chemistry-II		
Course Code	24UN-CHE-MDC-201		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)	Higher secondary other than science discipline		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To learn about role of Indian scientists in the upliftment of research 2.To learn about classification of elements with their properties 3.To learn about three states of matter 4.To get more knowledge about role of fertilizers in fertility of soil 5*.To learn about acid- base reaction in daily life		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours/week	2	2	4
Internal Assesment Marks	15	5	20
End Term Examination Marks	35	15	50

Examination Time	3Hours	3 Hours	
Maximum Marks 70 (Theory: 50 & Practical: 20)			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.			
Unit	Topics	Contact Hours	
I	Renowned Indian Scientists Brief Biography of Renowned Indian Scientists (Hargobind Khurana, Dr. P.C. Ray, Sir C.V. Raman, Dr. A.P.J. Abdul Kalam, C. N. R. Rao, Dr. Vikram Sara Bhai, Dr. Homi Jahangir Bhabha, Dr. J.C. Bose, Dr. S. N. Bose)	8	
II	Metal and Non-Metals Periodic table, classification of elements, physical and chemical aspects of metals and non-metals, Ore and Minerals of Iron, Copper, Aluminium, alloys	8	
III	Physical Properties of Matter Classification of matter, properties, uses, ideal gas equation, real gas equation, some important compounds (baking soda, washing soda, plaster of Paris, gypsum,, glass)	7	
IV	Soil and fertilizers Green revolution, soil: types of soil and their components for fertility, grow condition, pH, irrigation, biofertilizers, chemical fertilizers and their uses, acid rain.	7	
V*	Practicals: 1. To prepare Plaster of Paris 2. To prepare Potash Alum 3. To study the effect of acid on Baking and washing soda 4. To perform the action of water on quick lime and identify the nature of reaction (Exo/Endothermic)	30	
Suggested Evaluation Methods			

Internal Assessment: 15+5* Theory ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.: 4 ● Mid-Term Exam: 7 Practicum ● Class Participation: NA ● Seminar/Demonstration/Viva-voce/Lab records etc.: 5 ● Mid-Term Exam: NA	End Term Examination: 35+15*
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Chemistry In Daily Life : Third Edition by Kirpal Singh , PHI Learning 2. General Chemistry: Principles, Patterns, and Applications, Bruce Averill, Strategic Energy Security Solution, Patricia Eldredge, R.H. Hand, LLC, Copyright Year: 2011 3. The Great Indian Scientists Paperback – 1 January 2017, Cengage Learning India	

*Applicable for courses having practical component.

SEC-1

Session: 2024-25		
Part A – Introduction		
Subject	Chemistry	
Semester	I	
Name of the Course	Computer for Chemist	
Course Code	24UN-CHE-SEC101	
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC	SEC	
Level of the course (As per Annexure-I)	100-199	
Pre-requisite for the course (if any)	4.0	
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the basic fundamentals of computer 2. Becomes aware of the terminology of hardware and software components of a computer system. 3. 4. Use of MS Office 5. Applications of MS office	
Credits	Practical	Total
	1	3
Contact Hours	30	60
Max. Marks: 50+20 = 70 Internal Assessment Marks: 15+5= 20 End Term Exam Marks: 35+15 = 50	Time: Theory: 3 Hours Practicum: 3 Hours	
Part B- Contents of the Course		

Instructions for Paper- Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	
I	Computer Fundamentals: Evolution of Computers through generations, Characteristics of Computers, Strengths and Limitations of Computers, Classification of Computers, Functional Components of a Computer System, Applications of computers in Various Fields; Software, Types of Software: System software, Application software, Utility Software, Shareware, Freeware, Firmware, Free Software.	7 Hrs
II	Storage devices: Hardware components of a computer system - processor, RAM, ROMs, motherboard, power supply etc. Types of Storage devices, Input Devices: Classification and use, keyboard, Pointing devices - mouse, touch pad and track ball, Video digitizer, remote control, joystick, magnetic stripes, scanner, digital camera, microphone, sensor, and MIDI instruments Output Devices: Monitor, , Central Processing Unit (Control Unit and Arithmetic Logic Unit) printers –classification, laser, ink jet, dot-matrix, plotter, and speaker.	7 Hrs
III	Software Products (Origin, Chemdraw and its application with respect to sketch of the molecules, bond length and bond angles) NMR & IR Spectra of alkane, alkenes & alkynes upto C ₁ to C ₄ using Chemdraw software.	8 Hrs
IV	Introduction to MS Excel - a spreadsheet program and its Applications. Description of pH metric and conduct metric titrations of acids vs bases and draw curve using MS Excel.	8 Hrs

V*	• Applications of MS Excel (1) pH titration curve of a strong acid with strong Base. (2) pH titration curve of a Weak acid with strong Base. (3) General treatment of pH titration curve of a mono protic acid. (4) Conductometric Titration curve of a strong acid with strong Base. (5) Conductometric Titration curve of a weak acid with strong Base. • Typed documents (1-2 pages) with some formatting instructions in MS word. • Preparation of a power point on basic topics of science (Chemistry)	30 hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		
Internal Assessment: 15 ➤ Theory • Class Participation: 04 • Seminar/presentation/assignment/quiz/class test etc.: 04 • Mid-Term Exam: 07 ➤ Practicum: 05 • Class Participation: 02 • Seminar/Demonstration/Viva-voce/Lab records etc.: 03 • Mid-Term Exam: NIL		End Term Examination: 35+15
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ✓ Bright Siaw Afriyie, Introduction to Computer fundamentals. ✓ Meth Norton's; Introduction to Computers; Fourth Edition; McGraw Hill, New York. ✓ Computers for Chemists; K.V. Rajoraman; Tata Mcgraw Hill Co. Ltd.; New Delhi; 1993. ✓ A Textbook of Physical Chemistry; K.L. Kapoor Vol. 6, Tata McGrawHill Publications.		

*Applicable for courses having practical component.

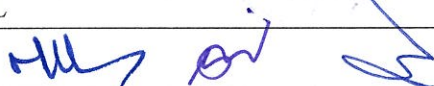
SEC-2

Session: 2024-25			
Part A – Introduction			
Subject	Chemistry		
Semester	II		
Name of the Course	Chemistry of food flavours and colorants		
Course Code	24UN-CHE-SEC-201		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	SEC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1 Know about basic food components; 2 Analyse the food flavors and pigments; 3 Think about the food additives; 4 Understand about food colorants. 5*. Analyse the extraction & reactions of food components.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	30	30	60
Internal Assesment Marks			
Max. Marks: 50+20*= 70 Internal Assessment Marks: 15+5*= 20 End Term Exam Marks: 35+15*=50		Time: Theory: 3 Hours Practicum: 3 Hours	
Part B- Contents of the Course			
Instructions for Paper- Setter			
Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.			
Unit	Topics		Contact Hours

I	Biological molecules in food processing Water: Physical properties: specific heat, latent heat, vapor pressure, boiling point, water as dispersing medium, states of water, Water in food preparation and preservation Starch: Structure, functional properties - Gelatinization, pasting, syneresis, retrogradation, dextrinization. Factors affecting gelatinization and gelation, c) Gums – Functions, sources, applications. d) Pectic substances, pectin gels	8 Hrs
II	Enzymes: a) Biocatalysts, enzyme specificity b) Use of exogenous enzymes in foods – amylases, lipases, proteases c) Endogenous enzymes – phenol oxidases, peroxidases, oxido- reductases, lipoxygenases d) Factors affecting enzyme activity	8 Hrs
III	Flavours & Pigments Flavours: a) Molecular mechanism of flavor perception (sweet, bitter, salty, sour, umami, kokumi, pungent, cooling and astringent) b) Flavours from vegetables, fruits, spices, fats and oils, milk and meat products Pigments: a) Pigments in Animal and Plant tissues (Haeme compounds, Chlorophyll, Carotenoids, Anthocyanins, Betalins) b) Synthetic Food Colors (toxicity and regulatory aspects)	7 Hrs
IV	Food Additives Additives: a) Buffer systems and salts, chelating agents b) Antioxidants c) Antimicrobials d) Fat replacers, sweeteners e) Masticatory substances f) Firming texturizers g) Clarifying agents, bleaching agents h) Flour improvers, anti-caking agents, i) Gases and propellants. Color – Natural and synthetic food colors, their chemical structure, shades imparted, stability, permitted list of colors, usage levels and food application. Food colorants: sunset yellow, orange-B, citrus red No2, yellow No5, green No3.	7 Hrs
V*	1. Gelatinization of starch granules; 2. To study hydrolysis of starch through salivary amylase 3. To study hydrolysis of fatty acids 4. Extraction of chlorophyll from different leaves	30 Hrs

Suggested Evaluation Methods
Short Answer and MCQ Type QUESTIONS

Internal Assessment: ➤ Theory :15 ● Class Participation: 04 ● Seminar/presentation/assignment/quiz/class test etc.: 04 ● Mid-Term Exam: 07 ➤ Practicum: 05 ● Class Participation: 02 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 03 ● Mid-Term Exam: NIL	End Term Examination: 35+15*
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Part C-Learning Resources

Recommended Books/e-resources/LMS:

- ✓ Bright Siaw Afriyie, Introduction to Computer fundamentals.
- ✓ Vacklavick, V. and Christian, E. (2003). Essentials of Food Science. New York: Kluwer Academic/ Plenu Publisher.
- ✓ Damodaran S., Parkin KL., and Fennema OR. Fennema's Food Chemistry (4th Edition), Florida: CRC Press
- ✓ Rick Parker (2003), Introduction to Food Science, New York: Delmar Thomson Learning
- Borvers, J. (1992). Food Theory and Application (2ndEd), New York: Maxwell MacMillan International Edition.
- ✓ Manay, N. S. and Sharaswamy, S. M. (1997). Foods: Facts and Principles New Delhi: New Age International Publishers.
- ✓ McWilliams, M (2007). Foods: Experimental Perspectives 5th Ed, New Jersey: Macmillar Publishing Co. Potter,
- ✓ N. N. and Hutchkiss, J. H. (1997). Food Science, 5th Ed, New Delhi: CBS Publishers and Distributors.
- ✓ Scottsmith and Hui Y.H (Editors) (2004) Food Processing – Principles and Applications London Blackwell
- ✓ Carmen Socaciu, "Food Colorants Chemical and functional properties", CRC Press, 2007
- ✓ Dr. Geetha Swaminathan & Mrs. Mary George, Laboratory chemical methods in food analysis, Margham Publishers, 2002.

*Applicable for courses having practical component

