

# **Chaudhary Bansi Lal University, Prem Nagar**

(A State University established under Haryana Act No. 25 of 2014)



## **Scheme of Examination for Chemistry Subject in Undergraduate Programmes**

as per NEP 2020

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

**With the effect from the session 2024-25 (in phased manner)**

**DEPARTMENT OF CHEMISTRY**

**Ch. Bansi Lal University, Prem Nagar-127031**

Bhiwani  
HARYANA, INDIA

**There are four different schemes under which students can start his/her course as mentioned in the Ordinance**

**Scheme A-** It is applicable to Undergraduate Programmes (Multidisciplinary) of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

**Scheme B-** It is applicable to Undergraduate Programmes with Single Major after first year of UG Programme (Multidisciplinary) of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

**Scheme C-** It is applicable to Undergraduate Programmes with Single Major of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

**Scheme D-** It is applicable to Undergraduate Programmes (Interdisciplinary) of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

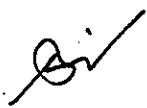
**Key Terms**

1. **Academic Year and Semester:** Two consecutive (one odd and one even) semesters will constitute one academic year. A semester will consist of 90 days of academic work.
2. **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.
3. **Learning Outcome based Curriculum Framework (LOCF):** The learning outcomes of the programme are mapped against well-defined Course Learning Outcomes (CLOs).
4. **Choice Based Credit System (CBCS):** The CBCS provides choices to students to select disciplinary and interdisciplinary courses to fit into their own requirements and to learn at their own pace within the framework.
5. **Programme:** A programme is made up of courses and leads to the award of a Certificate, Diploma or Degree after completing requisite courses successfully.

6. **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.
7. **Lecture:** Component of a course which is taught by a teacher through lectures covering the contents of a course.
8. **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.
9. **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.
10. **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.
11. **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.

**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), 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

**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 and dignity of labour.

**Nomenclature of the Programme:**

| S. No. | Name of Awarding Certificate/Diploma/Degree            | Level | Duration | Credits Earned                               |
|--------|--------------------------------------------------------|-------|----------|----------------------------------------------|
| 1.     | UG Certificate in Chemistry                            | 4.5   | 1 year   | 48<br>(inclusive of 4 credits of internship) |
| 2.     | UG Diploma in Chemistry                                | 5.0   | 2 year   | 94<br>(inclusive of 4 credits of internship) |
| 3.     | Bachelor of Science with Major in Chemistry            | 5.5   | 3 year   | 136<br>(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                                          |

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# Ch. Bansilal University, Prem Nagar, Bhiwani

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 LCOF) with effect from session 2024-25 (in a phased manner)

## Semester-I

| Course Type<br>Total Credits | Applicable Scheme | Course Code                                                                                         | Nomenclature of the<br>Course | Credits | Contact<br>hours<br>per<br>week | Internal<br>Assessment<br>Marks | End term<br>Examination<br>Marks | Total<br>Marks | Examination<br>Hrs. |
|------------------------------|-------------------|-----------------------------------------------------------------------------------------------------|-------------------------------|---------|---------------------------------|---------------------------------|----------------------------------|----------------|---------------------|
| CC-1<br>MCC-1<br>04 Credits  | Scheme A, B & C   | 24UN-CHE-101                                                                                        | Chemistry-I                   | 03      | 03                              | 20                              | 50                               | 70             | 03                  |
|                              |                   |                                                                                                     | Practical                     | 01      | 02                              | 10                              | 20                               | 30             | 03                  |
| MCC-2<br>04 Credits          | Scheme C Only     | 24UN-CHE-102                                                                                        | Physical Chemistry - I        | 03      | 03                              | 20                              | 50                               | 70             | 03                  |
|                              |                   |                                                                                                     | Practical                     | 01      | 02                              | 10                              | 20                               | 30             | 03                  |
| *CC-M1<br>02 Credits         | Scheme A, B & D   | 24UN-CHE-103                                                                                        | Minor Chemistry - I           | 01      | 01                              | 10                              | 20                               | 30             | 03                  |
|                              |                   |                                                                                                     | Practical                     | 01      | 02                              | 5                               | 15                               | 20             | 03                  |
| CC-M1<br>04 Credits          | Scheme C          | From Available CC-1/MCC-1 of 4 credits as per NEP                                                   |                               |         |                                 |                                 |                                  |                |                     |
| MDC-1<br>03 Credits          | Scheme A,B & C    | From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP. |                               |         |                                 |                                 |                                  |                |                     |
| AEC-1<br>02 Credits          | A, B & C          | From Available pool of Ability Enhancement Courses as per NEP                                       |                               |         |                                 |                                 |                                  |                |                     |
| SEC-1<br>03 Credits          | A,B & C           | From Available pool of Skill Enhancement Courses as per NEP                                         |                               |         |                                 |                                 |                                  |                |                     |
| VAC-1<br>02 Credits          | A,B & C           | From Available pool of Value Added Courses as per NEP                                               |                               |         |                                 |                                 |                                  |                |                     |

\*For students who opt Chemistry as a minor subject.

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## Semester-II

| Course Type<br>Total Credits | Applicable Scheme  | Course Code  | Nomenclature of the<br>Course                                                                       | Credit<br>s | Contact<br>hours<br>per<br>week | Internal<br>Assessment<br>Marks | End term<br>Examination<br>Marks | Total<br>Marks | Examination<br>Hrs. |
|------------------------------|--------------------|--------------|-----------------------------------------------------------------------------------------------------|-------------|---------------------------------|---------------------------------|----------------------------------|----------------|---------------------|
| CC-2<br>MCC-3<br>04 Credits  | Scheme A, B & C    | 24UN-CHE-201 | Chemistry – II<br>Practical                                                                         | 03<br>01    | 03<br>02                        | 20<br>10                        | 50<br>20                         | 70<br>30       | 03<br>03            |
| DSEC-1<br>04 Credits         | Scheme C Only      | 24UN-CHE-202 | Physical Chemistry Skill<br>- I<br>Practical                                                        | 03<br>01    | 03<br>02                        | 20<br>10                        | 50<br>20                         | 70<br>30       | 03<br>03            |
| *CC-M2<br>02 Credits         | Scheme A, B & D    | 24UN-CHE-203 | Minor Chemistry - II<br>Practical                                                                   | 01<br>01    | 01<br>02                        | 10<br>5                         | 20<br>15                         | 30<br>20       | 03<br>03            |
| CC-M2<br>04 Credits          | Scheme C Only      |              | From Available CC-2/MCC-3 of 4 credits as per NEP                                                   |             |                                 |                                 |                                  |                |                     |
| MDC-2<br>03 Credits          | Scheme A, B, C & D |              | From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP. |             |                                 |                                 |                                  |                |                     |
| AEC-2<br>02 Credits          | Scheme A, B & C    |              | From Available pool of Ability Enhancement Courses as per NEP                                       |             |                                 |                                 |                                  |                |                     |
| SEC-2<br>03 Credits          | Scheme A, B, C & D |              | From Available pool of Skill Enhancement Courses as per NEP                                         |             |                                 |                                 |                                  |                |                     |
| VAC-2<br>02 Credits          | Scheme A & C       |              | From Available pool of Value Added Courses as per NEP                                               |             |                                 |                                 |                                  |                |                     |
| Internship<br>04 Credits     | Scheme A & C       |              | Internship of 04 Credits of 4-6 weeks duration after 2 <sup>nd</sup> Semester                       |             |                                 |                                 |                                  |                |                     |

\*For students who opt Chemistry as a minor subject.

### Semester-III

| Course Type<br>Total Credits | Applicable Scheme  | Course Code                                                                                         | Nomenclature of the<br>Course | Credits | Contact<br>hours<br>per<br>week | Internal<br>Assessment<br>Marks | End term<br>Examination<br>Marks | Total<br>Marks | Examination<br>Hrs. |
|------------------------------|--------------------|-----------------------------------------------------------------------------------------------------|-------------------------------|---------|---------------------------------|---------------------------------|----------------------------------|----------------|---------------------|
| CC-3<br>MCC-4<br>04 Credits  | Scheme A, B & C    | 24UN-CHE-301                                                                                        | Chemistry – III               | 03      | 03                              | 20                              | 50                               | 70             | 03                  |
|                              |                    |                                                                                                     | Practical                     | 01      | 02                              | 10                              | 20                               | 30             | 03                  |
| MCC-5<br>04 Credits          | Scheme B & C       | 24UN-CHE-302                                                                                        | Inorganic Chemistry – I       | 03      | 03                              | 20                              | 50                               | 70             | 03                  |
|                              |                    |                                                                                                     | Practical                     | 01      | 02                              | 10                              | 20                               | 30             | 03                  |
| MCC-2<br>04 Credits          | Scheme B only      | 24UN-CHE-102                                                                                        | Physical Chemistry - I        | 03      | 03                              | 20                              | 50                               | 70             | 03                  |
|                              |                    |                                                                                                     | Practical                     | 01      | 02                              | 10                              | 20                               | 30             | 03                  |
| CC-M3<br>04 Credits          | Scheme A, C & D    | From Available CC-3/MCC-4 of 4 credits as per NEP                                                   |                               |         |                                 |                                 |                                  |                |                     |
| CC-M3 (V)<br>04 Credits      | Scheme B only      | From Available pool of Minor (Vocational) Courses VOC-1                                             |                               |         |                                 |                                 |                                  |                |                     |
| MDC-3<br>03 Credits          | Scheme A, B, C & D | From Available pool of Multidisciplinary Courses from a subject of different discipline as per NEP. |                               |         |                                 |                                 |                                  |                |                     |
| AEC-3<br>02 Credits          | Scheme A, B & C    | From Available pool of Ability Enhancement Courses as per NEP                                       |                               |         |                                 |                                 |                                  |                |                     |
| SEC-3<br>03 Credits          | Scheme A, B, C & D | From Available pool of Skill Enhancement Courses as per NEP                                         |                               |         |                                 |                                 |                                  |                |                     |
| VAC-3<br>02 Credits          | Scheme C only      | From Available pool of Value Added Courses as per NEP                                               |                               |         |                                 |                                 |                                  |                |                     |

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## Semester-IV

| Course Type<br>Total Credits             | Applicable Scheme | Course Code                                                                                                                | Nomenclature of the<br>Course | Credits                                                       | Contact<br>hours<br>per week | Internal<br>Assessment<br>Marks | End term<br>Examination<br>Marks | Total<br>Marks | Examination<br>Hrs. |  |
|------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------|------------------------------|---------------------------------|----------------------------------|----------------|---------------------|--|
| CC-4                                     | Scheme A, B & F C | 24UN-CHE-401                                                                                                               | Chemistry – IV                | 03                                                            | 03                           | 20                              | 50                               | 70             | 03                  |  |
| MCC-6<br>04 Credits                      |                   |                                                                                                                            | Practical                     | 01                                                            | 02                           | 10                              | 20                               | 30             | 03                  |  |
| MCC-7<br>04 Credits                      | Scheme B & C      | 24UN-CHE-402                                                                                                               | Organic Chemistry – I         | 03                                                            | 03                           | 20                              | 50                               | 70             | 03                  |  |
|                                          |                   |                                                                                                                            | Practical                     | 01                                                            | 02                           | 10                              | 20                               | 30             | 03                  |  |
| MCC-8<br>04 Credits                      | Scheme B & C      | 24UN-CHE-403                                                                                                               | Physical Chemistry - II       | 03                                                            | 03                           | 20                              | 50                               | 70             | 03                  |  |
|                                          |                   |                                                                                                                            | Practical                     | 01                                                            | 02                           | 10                              | 20                               | 30             | 03                  |  |
| DSE-1<br>04 Credits<br>Select one option | Scheme B & C      | 24UN-CHE-404                                                                                                               | Elective Chemistry-I          | 03                                                            | 03                           | 20                              | 50                               | 70             | 03                  |  |
|                                          |                   |                                                                                                                            | Practical                     | 01                                                            | 02                           | 10                              | 20                               | 30             | 03                  |  |
|                                          |                   | OR                                                                                                                         |                               |                                                               |                              |                                 |                                  |                |                     |  |
|                                          |                   | 24UN-CHE-405                                                                                                               | Elective Chemistry-II         | 03                                                            | 03                           | 20                              | 50                               | 70             | 03                  |  |
|                                          |                   |                                                                                                                            | Practical                     | 01                                                            | 02                           | 10                              | 20                               | 30             | 03                  |  |
|                                          |                   | OR                                                                                                                         |                               |                                                               |                              |                                 |                                  |                |                     |  |
|                                          |                   | 24UN-CHE-406                                                                                                               | Elective Chemistry-III        | 03                                                            | 03                           | 20                              | 50                               | 70             | 03                  |  |
|                                          |                   |                                                                                                                            | Practical                     | 01                                                            | 02                           | 10                              | 20                               | 30             | 03                  |  |
|                                          |                   | CC-M4 (V)<br>04 Credits                                                                                                    | Scheme A, B & C               | From Available pool of Minor (Vocational) Courses VOC-2       |                              |                                 |                                  |                |                     |  |
|                                          |                   | AEC-4<br>02 Credits                                                                                                        | Scheme A, B & C               | From Available pool of Ability Enhancement Courses as per NEP |                              |                                 |                                  |                |                     |  |
| VAC-3<br>02 Credits                      | Scheme A, B & D   | From Available pool of Value Added Courses as per NEP                                                                      |                               |                                                               |                              |                                 |                                  |                |                     |  |
| VAC-4<br>02 Credits                      | Scheme C only     | From Available pool of Value Added Courses as per NEP                                                                      |                               |                                                               |                              |                                 |                                  |                |                     |  |
| Internship<br>04 Credits                 | Scheme A, B & C   | Internship of 04 Credits of 4-6 weeks duration after 4 <sup>th</sup> Semester (If not done after 2 <sup>nd</sup> Semester) |                               |                                                               |                              |                                 |                                  |                |                     |  |

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## Semester-V

| Course Type<br>Total Credits             | Applicable Scheme | Course Code  | Nomenclature of the<br>Course | Credits | Contact<br>hours<br>per week | Internal<br>Assessment<br>Marks | End term<br>Examination<br>Marks | Total<br>Marks | Examination<br>Hrs. |
|------------------------------------------|-------------------|--------------|-------------------------------|---------|------------------------------|---------------------------------|----------------------------------|----------------|---------------------|
| CC-5<br>MCC-9<br>04 Credits              | Scheme A, B & C   | 24UN-CHE-501 | Chemistry – V                 | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | Inorganic Chemistry – II      | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
| MCC-10<br>04 Credits                     | Scheme B & C      | 24UN-CHE-502 | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | Elective Chemistry-<br>IV     | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
| DSE-2<br>04 Credits<br>Select one option | Scheme B & C      | 24UN-CHE-503 | OR                            |         |                              |                                 |                                  |                |                     |
|                                          |                   |              | Elective Chemistry-<br>V      | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | OR                            |         |                              |                                 |                                  |                |                     |
|                                          |                   |              | Elective Chemistry-<br>VI     | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | Elective Chemistry-<br>VII    | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | OR                            |         |                              |                                 |                                  |                |                     |
|                                          |                   |              | Elective Chemistry-<br>VIII   | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | OR                            |         |                              |                                 |                                  |                |                     |
| DSE-3<br>04 Credits<br>Select one option | Scheme B & C      | 24UN-CHE-504 | Elective Chemistry-<br>IX     | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | OR                            |         |                              |                                 |                                  |                |                     |
|                                          |                   | 24UN-CHE-505 | Elective Chemistry-<br>X      | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   |              | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | Elective Chemistry-<br>XI     | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   | 24UN-CHE-506 | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | OR                            |         |                              |                                 |                                  |                |                     |
|                                          |                   |              | Elective Chemistry-<br>XII    | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   | 24UN-CHE-507 | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | OR                            |         |                              |                                 |                                  |                |                     |
|                                          |                   |              | Elective Chemistry-<br>XIII   | 03      | 03                           | 20                              | 50                               | 70             | 03                  |
|                                          |                   | 24UN-CHE-508 | Practical                     | 01      | 02                           | 10                              | 20                               | 30             | 03                  |
|                                          |                   |              | OR                            |         |                              |                                 |                                  |                |                     |
|                                          |                   |              | Elective Chemistry-<br>XIV    | 03      | 03                           | 20                              | 50                               | 70             | 03                  |

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|---------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|----|----|----|----|----|
|                                 |                 |                                                                                                                                              | Practical | 01 | 02 | 10 | 20 | 30 | 03 |
| CC-M5 (V)<br><b>04 Credits</b>  | Scheme A & C    | From Available pool of Minor (Vocational) Courses VOC-1                                                                                      |           |    |    |    |    |    |    |
| Internship<br><b>04 Credits</b> | Scheme A, B & C | Internship of 04 Credits of 4-6 weeks duration after 4 <sup>th</sup> Semester (If not done after 2 <sup>nd</sup> & 4 <sup>th</sup> Semester) |           |    |    |    |    |    |    |

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# Semester-VI

| Course Type<br>Total Credits                | Applicable<br>Scheme       | Course Code                                 | Nomenclature of<br>the Course | Credits                                                                                  | Contact<br>hours<br>per<br>week | Internal<br>Assessm<br>ent<br>Marks | End term<br>Examinat<br>ion<br>Marks | Total<br>Marks | Examination<br>Hrs. |
|---------------------------------------------|----------------------------|---------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------|--------------------------------------|----------------|---------------------|
| CC-6<br>MCC-11<br>04 Credits                | Scheme A, B & C            | 24UN-CHE-<br>601                            | Chemistry – VI                | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
|                                             |                            |                                             | Practical                     | 01                                                                                       | 02                              | 10                                  | 20                                   | 30             | 03                  |
| MCC-12<br>04 Credits                        | Scheme B & C               | 24UN-CHE-<br>502                            | Organic Chemistry –<br>II     | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
|                                             |                            |                                             | Practical                     | 01                                                                                       | 02                              | 10                                  | 20                                   | 30             | 03                  |
|                                             |                            |                                             | Elective Chemistry-<br>X      | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
|                                             |                            |                                             | Practical                     | 01                                                                                       | 02                              | 10                                  | 20                                   | 30             | 03                  |
| DSE-4<br>04 Credits<br>Select one<br>option | Scheme B & C               | 24UN-CHE-<br>603                            | OR                            |                                                                                          |                                 |                                     |                                      |                |                     |
|                                             |                            |                                             | Elective Chemistry-<br>XI     | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
|                                             |                            | Practical                                   | 01                            | 02                                                                                       | 10                              | 20                                  | 30                                   | 03             |                     |
|                                             |                            | 24UN-CHE-<br>604                            | OR                            |                                                                                          |                                 |                                     |                                      |                |                     |
|                                             |                            |                                             | Elective Chemistry-<br>XII    | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
|                                             |                            | Practical                                   | 01                            | 02                                                                                       | 10                              | 20                                  | 30                                   | 03             |                     |
|                                             |                            | 24UN-CHE-<br>605                            | OR                            |                                                                                          |                                 |                                     |                                      |                |                     |
|                                             |                            |                                             | Elective Chemistry-<br>XIII   | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
|                                             |                            | Practical                                   | 01                            | 02                                                                                       | 10                              | 20                                  | 30                                   | 03             |                     |
|                                             |                            | DSE-5<br>04 Credits<br>Select one<br>option | Scheme B & C                  | 24UN-CHE-<br>606                                                                         | OR                              |                                     |                                      |                |                     |
| Elective Chemistry-<br>XIV                  | 03                         |                                             |                               |                                                                                          | 03                              | 20                                  | 50                                   | 70             | 03                  |
| Practical                                   | 01                         |                                             |                               | 02                                                                                       | 10                              | 20                                  | 30                                   | 03             |                     |
| 24UN-CHE-<br>607                            | OR                         |                                             |                               |                                                                                          |                                 |                                     |                                      |                |                     |
|                                             | Elective Chemistry-<br>XV  |                                             |                               | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
| Practical                                   | 01                         |                                             |                               | 02                                                                                       | 10                              | 20                                  | 30                                   | 03             |                     |
| 24UN-CHE-<br>608                            | OR                         |                                             |                               |                                                                                          |                                 |                                     |                                      |                |                     |
|                                             | Elective Chemistry-<br>XVI |                                             |                               | 03                                                                                       | 03                              | 20                                  | 50                                   | 70             | 03                  |
| Practical                                   | 01                         |                                             |                               | 02                                                                                       | 10                              | 20                                  | 30                                   | 03             |                     |
| CC-M6                                       | Scheme A only              |                                             |                               | From Available CC-6/MCC-11 of 4 credits as per NEP (Only for Minor subject as Chemistry) |                                 |                                     |                                      |                |                     |

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|------------|---------------|-------------------------------------------------------------|
| 04 Credits |               |                                                             |
| CC-M5 (V)  | Scheme B only | From Available pool of Minor (Vocational) Courses VOC-3     |
| CC-M6 (V)  | Scheme C only |                                                             |
| CC-M7 (V)  | Scheme A only |                                                             |
| SEC-4      | Scheme C only |                                                             |
|            |               | From Available pool of Skill Enhancement Courses As Per NEP |




# Semester-VII (For Honours/Honours with Research in Chemistry)

| Course Type<br>Total Credits             | Applicable Scheme | Course Code                                                                | Nomenclature of the<br>Course | Credits | Contact<br>hours<br>per<br>week | Internal<br>Assessment<br>Marks | End term<br>Examination<br>Marks | Total<br>Marks | Examination<br>Hrs. |
|------------------------------------------|-------------------|----------------------------------------------------------------------------|-------------------------------|---------|---------------------------------|---------------------------------|----------------------------------|----------------|---------------------|
| CC-H1<br>04 Credits                      | Scheme B & C      | 24UN-CHE-701                                                               | Physical Chemistry – III      | 04      | 04                              | 30                              | 70                               | 100            | 03                  |
| CC-H2<br>04 Credits                      | Scheme B & C      | 24UN-CHE-702                                                               | Inorganic Chemistry – III     | 04      | 04                              | 30                              | 70                               | 100            | 03                  |
| CC-H3<br>04 Credits                      | Scheme B & C      | 24UN-CHE-703                                                               | Organic Chemistry – III       | 04      | 04                              | 30                              | 70                               | 100            | 03                  |
| DSE-6<br>04 Credits<br>Select one option | Scheme B & C      | 24UN-CHE-704                                                               | Advanced Chemistry-I          | 04      | 04                              | 30                              | 70                               | 100            | 03                  |
|                                          |                   | OR                                                                         |                               |         |                                 |                                 |                                  |                |                     |
|                                          |                   | 24UN-CHE-705                                                               | Advanced Chemistry-II         | 04      | 04                              | 30                              | 70                               | 100            | 03                  |
|                                          |                   | OR                                                                         |                               |         |                                 |                                 |                                  |                |                     |
| PC-H1                                    | Scheme B & C      | 24UN-CHE-706                                                               | Advanced Chemistry-III        | 04      | 04                              | 30                              | 70                               | 100            | 03                  |
|                                          |                   | 24UN-CHE-707                                                               | Practical Chemistry           | 04      | 08                              | 30                              | 70                               | 100            | 08                  |
| CC-HM1                                   | Scheme B & C      | From the Available core courses in Minor Subjects of 04 Credits as Per NEP |                               |         |                                 |                                 |                                  |                |                     |

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### Semester-VIII (For Honours in Chemistry)

| Course Type<br>Total Credits             | Applicable Scheme | Course Code                                                                | Nomenclature of the<br>Course | Credits<br>per week | Internal<br>Assessment<br>Marks | End term<br>Examination<br>Marks | Total<br>Marks | Examination<br>Hrs. |
|------------------------------------------|-------------------|----------------------------------------------------------------------------|-------------------------------|---------------------|---------------------------------|----------------------------------|----------------|---------------------|
| CC-H4<br>04 Credits                      | Scheme B & C      | 24UN-CHE-801                                                               | Physical Chemistry – IV       | 04                  | 30                              | 70                               | 100            | 03                  |
| CC-H5<br>04 Credits                      | Scheme B & C      | 24UN-CHE-802                                                               | Inorganic Chemistry – IV      | 04                  | 30                              | 70                               | 100            | 03                  |
| CC-H6<br>04 Credits                      | Scheme B & C      | 24UN-CHE-803                                                               | Organic Chemistry – IV        | 04                  | 30                              | 70                               | 100            | 03                  |
| DSE-7<br>04 Credits<br>Select one option | Scheme B & C      | 24UN-CHE-804                                                               | Advanced Chemistry-<br>IV     | 04                  | 30                              | 70                               | 100            | 03                  |
|                                          |                   | OR                                                                         |                               |                     |                                 |                                  |                |                     |
|                                          |                   | 24UN-CHE-805                                                               | Advanced Chemistry-<br>V      | 04                  | 30                              | 70                               | 100            | 03                  |
|                                          |                   | OR                                                                         |                               |                     |                                 |                                  |                |                     |
|                                          |                   | 24UN-CHE-806                                                               | Advanced Chemistry-<br>VI     | 04                  | 30                              | 70                               | 100            | 03                  |
| PC-H2<br>04 Credits                      | Scheme B & C      | 24UN-CHE-807                                                               | Practical Chemistry           | 08                  | 30                              | 70                               | 100            | 08                  |
| CC-HM2<br>04 Credits                     | Scheme B & C      | From the Available core courses in Minor Subjects of 04 Credits As Per NEP |                               |                     |                                 |                                  |                |                     |

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### Semester-VIII (For Honours with Research in Chemistry)

| Course Type<br>Total Credits            | Applicable Scheme | Course Code                                                                | Nomenclature of the<br>Course          | Credit<br>s | Contact<br>hours<br>per<br>week | Internal<br>Assessmen<br>t Marks | End term<br>Examinati<br>on Marks | Total<br>Mark<br>s | Examinatio<br>n Hrs. |
|-----------------------------------------|-------------------|----------------------------------------------------------------------------|----------------------------------------|-------------|---------------------------------|----------------------------------|-----------------------------------|--------------------|----------------------|
| CC-H4<br>04 Credits                     | Scheme B & C      | 24UN-CHE-801                                                               | Physical Chemistry – IV                | 04          | 04                              | 30                               | 70                                | 100                | 03                   |
| CC-H5<br>04 Credits                     | Scheme B & C      | 24UN-CHE-802                                                               | Inorganic Chemistry –<br>IV            | 04          | 04                              | 30                               | 70                                | 100                | 03                   |
| Project /<br>Dissertation<br>12 Credits | Scheme B & C      | 24UN-CHE-808                                                               | Project / Dissertation<br>in Chemistry | 12          | --                              | --                               | --                                | 300                | --                   |
| CC-HM2<br>04 Credits                    | Scheme B & C      | From the Available core courses in Minor Subjects of 04 Credits As Per NEP |                                        |             |                                 |                                  |                                   |                    |                      |

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## Pool of MDC, VAC, SEC and VOC Courses in the subject of Chemistry to be offered to the University Pool

| Course Type<br>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<br>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<br>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<br>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  | Scheme A, B & D    |                 |                                          |         |                        |                           |                            |             |                  |
| 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 Chemist                     | 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-SEC401 | Food Adulteration Testing                | 02      | 02                     | 15                        | 35                         | 50          | 03               |

|           |     |                 |                       |  |                                         |    |    |    |    |    |    |
|-----------|-----|-----------------|-----------------------|--|-----------------------------------------|----|----|----|----|----|----|
|           |     |                 | <b>SECC601</b>        |  | Practical                               | 01 | 02 | 05 | 15 | 20 | 03 |
| CC-M3 (V) | III | Scheme B only   | <b>24UN-CHE-VOC-1</b> |  | 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 |                       |  | Chemistry of Cosmetics and Perfumes     | 03 | 03 | 20 | 50 | 70 | 03 |
|           |     |                 | <b>24UN-CHE-VOC-2</b> |  | Practical                               | 01 | 02 | 10 | 20 | 30 | 03 |
| CC-M5 (V) | VI  | Scheme B only   |                       |  | Green Laboratory Techniques             | 03 | 03 | 20 | 50 | 70 | 03 |
| CC-M6 (V) |     | Scheme C only   |                       |  |                                         |    |    |    |    |    |    |
| CC-M7 (V) |     | Scheme A only   | <b>24UN-CHE-VOC-3</b> |  | Practical                               | 01 | 02 | 10 | 20 | 30 | 03 |

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| 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                 |                     |
| 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                  |
|                                               |                           |                     |                           | 100                 |

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            |

## CC-1/ MCC-1

Session: 2024-25

## Part A - Introduction

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |       |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|
| Subject                                                 | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |       |
| Semester                                                | I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |       |
| Name of the Course                                      | Chemistry-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |       |
| Course Code                                             | 24UN-CHE-101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |       |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C) | CC/MCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |       |
| Level of the course                                     | 100-199                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |       |
| Pre-requisite for the course (if any)                   | Chemistry as a subject at 4.0 Level (Class-XII)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |       |
| Course Learning Outcomes (CLO):                         | <p><b>After completing this course, the learner will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Enable to understand the basis of quantum mechanics and structural idea and relevance in describing shapes of s, p and d orbitals.</li> <li>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.</li> <li>3. Get knowledge about the electrophile/nucleophile and its role in mechanism of preparation of organic compounds.</li> <li>4. To know the physical properties, morphology and crystalline study of liquid and different type of solids.</li> <li>5. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds</li> </ol> |           |       |
|                                                         | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Practical | Total |
| Credits                                                 | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 01        | 04    |
| Contact Hours/week                                      | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 02        | 05    |

|                                                 |          |          |     |
|-------------------------------------------------|----------|----------|-----|
| Internal Assessment Marks                       | 20       | 10       | 30  |
| End Term Exam Marks                             | 50       | 20       | 70  |
| Examination Time                                | 03 Hours | 03 Hours | --- |
| Maximum Marks: 100 (Theory :70 & Practical: 30) |          |          |     |





## 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Content<br>Hours |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| I    | <b>Atomic Structure</b><br>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 $\psi$ and $\psi^2$ , shapes of s, p, d, f orbitals, Rules for filling electrons in various orbitals, effective nuclear charge, Slater's rules.<br><b>Periodic table and atomic properties</b><br>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, Alfred Rachow and Mulliken Jaffe's electronegativity scale, Sanderson's electron density ratio. | 12               |
| II   | <b>Gaseous State</b><br>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)<br><b>Critical Phenomenon</b><br>Concept of Critical temperature, critical pressure, critical volume, relationship between critical constants and Van der Waal's constants (Derivation excluded).                                                                                              | 11               |
| III  | <b>Structure and Bonding</b><br>Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications, hyperconjugation, inductive effect, Electromeric effect and their comparison.<br><b>Mechanism of Organic Reactions</b><br>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               |

|                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| IV                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Liquid State</b><br>Structure of liquids, Properties of liquids – surface tension, refractive index, viscosity, vapour pressure and optical rotation.<br><b>Solid State</b><br>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.         | 11                                                                                                                                                        |
| <b>Practical</b>                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                           | 1. <b>Acid/Base titration:</b> Determination of strength of oxalic acid using NaOH.<br>2. <b>Redox titrations:</b> Determination of Fe <sup>2+</sup> ions using KMnO <sub>4</sub> .<br>3. To determine the surface tension of given liquid using Stalagmometer by drop no. methods.<br>4. Preparation of <i>m</i> -Dinitrobenzene from Nitrobenzene (use 1:2 conc. HNO <sub>3</sub> -H <sub>2</sub> SO <sub>4</sub> mixture if fuming HNO <sub>3</sub> is not available)<br>5. Preparation of p-Bromoacetanilide from Acetanilide | 30                                                                                                                                                        |
| <b>Suggested Evaluation Methods</b>                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |
| <b>Internal Assessment:</b><br>➤ <b>Theory: 20</b> <ul style="list-style-type: none"><li>• Class Participation: 5</li><li>• Seminar/presentation/assignment/quiz/class test etc.: 5</li><li>• Mid-Term Exam: 10</li></ul> ➤ <b>Practicum: 10</b> <ul style="list-style-type: none"><li>• Class Participation: NA</li><li>• Seminar/Demonstration/ Viva - voce/ Lab records etc.: 10</li><li>• Mid-Term Exam: NA</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>End Term Examination:</b><br>➤ <b>Theory: 50</b><br>Written examination<br>➤ <b>Practicum: 20</b><br>Lab record, viva-voce, Demonstration of practical |
| <b>Part C- Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |

1. Lee, J.D.; (2010), **Concise Inorganic Chemistry**, Wiley India.
2. Kapoor, K.L. (2015), **A Textbook of Physical Chemistry**, Vol 1, 6th 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.

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# MCC-2

| Session: 2024-25                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |       |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|
| Part A - Introduction                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |       |
| Subject                                                 | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |       |
| Semester                                                | I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |       |
| Name of the Course                                      | Physical Chemistry-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |       |
| Course Code                                             | 24UN-CHE-102                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |       |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C) | MCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |       |
| Level of the course (As per Annexure-I)                 | 100-199                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |       |
| Pre-requisite for the course (if any)                   | Chemistry as a subject at 4.0 Level (Class-XII)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |       |
| Course Learning Outcomes (CLO):                         | After completing this course, the learner will be able to:<br>1. Get the knowledge of concepts of rates of chemical reactions and its application in determination of order of various reactions.<br>2. Get the knowledge of various thermodynamic variables and properties.<br>3. To learn about the concepts of physical and thermodynamic functions in different reversible reactions and get the knowledge of molecular structure.<br>4. To learn about the various properties of molecules related to its magnetic behavior.<br>5. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds. |           |       |
|                                                         | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Practical | Total |
| Credits                                                 | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1         | 4     |
| Contact Hours/week                                      | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 02        | 05    |
| Internal Assessment Marks                               | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 10        | 30    |
| End Term Exam Marks                                     | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 20        | 70    |
| Examination hrs                                         | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 03        | ---   |

Max. Marks: 100 (Theory:70 & Practical: 30)

**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                | <b>Chemical Kinetics:</b> 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               | <b>Chemical Kinetics &amp; Thermodynamics:</b><br>Theories of reaction rate – Simple collision theory for unimolecular collision. Transition state theory of bimolecular reactions.<br>Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Thermodynamic equilibrium, Concept of heat and work. First law of thermodynamics: statement, concepts of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. | 11            |
| III              | <b>Thermodynamics, Physical Properties and Molecular Structure-I:</b><br>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 process. Optical activity, polarization – (Clausius – Mossotti equation- derivation excluded). Orientation of dipoles in an electric field, dipole moment, induced dipole moment.                                                                                                                                     | 11            |
| IV               | <b>Physical Properties and Molecular Structure-II:</b> Measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetism.                                                                                                                                                                                                                                                   | 11            |
| <b>Practical</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1. <b>Acid/Base titration:</b> Determination of strength of HCl using NaOH.<br>2. <b>Redox titrations:</b> Determination of $\text{C}_2\text{O}_4^{2-}$ ions using $\text{KMnO}_4$ .<br>3. To determine the surface tension of given liquid using Stalagmometer by drop weight methods.<br>4. To study the effect of surfactant on surface tension of water.<br>5. To study the process of sublimation of Camphor and Phthalic acid. | 30                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Suggested Evaluation Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |
| <b>Internal Assessment</b><br>> <b>Theory: 20</b> <ul style="list-style-type: none"> <li>• Class Participation: 5</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 5</li> <li>• Mid-Term Exam: 10</li> </ul> > <b>Practicum: 10</b> <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/ Viva -voce/ Lab records etc.: 10</li> <li>• Mid-Term Exam: NA</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>End Term Examination:</b><br>> <b>Theory: 50</b><br>Written examination<br>> <b>Practicum: 20</b><br>Lab record, viva-voce, Demonstration of practical |
| <b>Part C- Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                           |
| <b>Recommended Books/e-resources/LMS:</b> <ol style="list-style-type: none"> <li>1. Atkins, P.W.; Paula, J.de. (2014), <b>Atkin's Physical Chemistry</b> Ed., 10th Edition, Oxford University Press.</li> <li>2. Ball, D. W. (2017), <b>Physical Chemistry</b>, 2 nd Edition, Cengage Learning, India.</li> <li>3. Castellan, G. W. (2004), <b>Physical Chemistry</b>, 4 th Edition, Narosa.</li> <li>4. Kapoor, K.L. (2015), <b>A Textbook of Physical Chemistry</b>, Vol 1, 6 th Edition, McGraw Hill Education.</li> <li>5. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), <b>Senior Practical Physical Chemistry</b>, R. Chand &amp;Co, New Delhi.</li> <li>6. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. (2003), <b>Experiments in Physical Chemistry</b>, 8 th Edition, McGraw-Hill, New York.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                           |

# CC-M1

Session: 2024-25

## Part A - Introduction

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |       |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|
| Subject                                                 | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |       |
| Semester                                                | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |       |
| Name of the Course                                      | Minor Chemistry-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |       |
| Course Code                                             | 24UN-CHE-103                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |       |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C) | CC-M                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |       |
| Level of the course (As per Annexure-I)                 | 100-199                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |       |
| Pre-requisite for the course (if any)                   | Chemistry as a subject at 4.0 Level (Class-XII)                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |       |
| Course Learning Outcomes (CLO):                         | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> <li>1. To understand the basics of Covalent bonding in simple molecules.</li> <li>2. To get the basics of rates of chemical reactions and factors affecting it.</li> <li>3. To learn about the nomenclature, classification and methods of preparation of alkenes.</li> <li>4. To learn about qualitative knowledge of conductors, semiconductors and insulates.</li> </ol> |           |       |
|                                                         | <p>5*. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds.</p>                                                                                                                                                                                                                                                                                                                                       |           |       |
|                                                         | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Practical | Total |
| Credits                                                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1         | 2     |
| Contact Hours/week                                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2         | 3     |
| Internal Assessment Marks                               | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5         | 15    |
| End Term Exam Marks                                     | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 15        | 35    |

|                                              |    |    |
|----------------------------------------------|----|----|
| Examination hrs                              | 03 | 03 |
| Max. Marks: 50 (Theory: 30 & Practical : 20) |    |    |





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## 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                                   | <b>Covalent Bond</b><br>of simple inorganic molecules and ions based on valence shell electron pair repulsion (VSEPR) theory and hybridization<br>suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.                                                             | 4             |
| II                                  | <b>Chemical Kinetics</b><br>Rate of reaction rates, factors influencing the rate of reaction, Order and molecularity of a reaction, integrated rate expression for first order reactions.                                                                                                                                                 | 4             |
| III                                 | <b>Alkanes (upto 5 carbon atoms)</b><br>Alkanes, nomenclature, classification of carbon atoms in alkanes. Isomerism in alkanes, methods of formation: Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids.                                                                                       | 4             |
| IV                                  | <b>Metallic Bond and semiconductors</b><br>Metallic bond – Qualitative idea of Band theory of metallic bond (conductors, semiconductors, insulators).                                                                                                                                                                                     | 3             |
| V*                                  | 1. To determine the melting point of given organic compound.<br>2. To prepare a pure sample of dibenzalacetone from benzaldehyde.<br>3. Acid/Base Titration: Determination of strength of HCl using NaOH.<br>4. To determine the refractive index of given liquid.<br>5. To study the process of sublimation of camphor or phthalic acid. | 30            |
| <b>Suggested Evaluation Methods</b> |                                                                                                                                                                                                                                                                                                                                           |               |

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| <p><b>Internal Assessment: 10 + 05*</b></p> <p>➤ Theory</p> <ul style="list-style-type: none"> <li>● Class Participation: 3</li> <li>● Seminar/presentation/assignment/quiz/class test etc.: 3</li> <li>● Mid-Term Exam: 4</li> </ul> <p>➤ Practicum</p> <ul style="list-style-type: none"> <li>● Class Participation: NA</li> <li>● Seminar/Demonstration/Viva-voce/Lab records etc.: 05</li> <li>● Mid-Term Exam: NA</li> </ul>                                                                                                                      | <p><b>End Term Examination:</b></p> <p><b>20 + 15*</b></p> |
| <p><b>Part C- Learning Resources</b></p> <p><b>Recommended Books/e-resources/LMS:</b></p> <ol style="list-style-type: none"> <li>1. Dhawan S.N., Organic Chemistry, Vol 1 Pardeep Publication.</li> <li>2. Kapoor, K.L. (2015), <i>A Textbook of Physical Chemistry</i>, Vol 1, 6<sup>th</sup> Edition, McGrawHill Education.</li> <li>3. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), <i>Senior Practical Physical Chemistry</i>, R. Chand &amp; Co, New Delhi.</li> </ol> <p>Lee, J.D.; (2010), <i>Concise Inorganic Chemistry</i>, Wiley India.</p> |                                                            |

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# MDC-1

Session: 2024-25

## 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):                         | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> <li>1. To get knowledge about structure and bonding.</li> <li>2. To learn about hydrocarbons and their applications.</li> <li>3. To get aware about different polymers.</li> <li>4. To get knowledge about preservative.</li> <li>5. To get knowledge about experiments related to daily life.</li> </ol> |           |       |
|                                                         | 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                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                              |               |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--|
| <p><b>Note:</b> 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.</p> |                                                                                                                                                                                                                              |               |  |
| Instructions for Paper- Setter                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                              |               |  |
| Unit                                                                                                                                                                                                                                                                                                                                                                                                                              | Topics                                                                                                                                                                                                                       | Contact Hours |  |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Atomic Structure and Bonding</b><br>Introduction, Elementary introduction of atomic structure and chemical bonding, Representation of elements/ atoms, Lewis structure, electronic configurations (1-30)                  | 8             |  |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Carbon and Its Compounds</b><br>Introduction, Tetravalency of Carbon, allotropes of carbon and their properties, hydrocarbons (1-5), nomenclature (linear compounds), Applications of hydrocarbons.                       | 8             |  |
| III                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Polymers</b><br>Introduction, elementary idea of synthetic and natural polymers, Homo polymers and copolymers, uses and properties (Natural rubber, Vulcanized rubber, Polyethylene, PVC, Styrene, Teflon, PAN, Nylon-66) | 7             |  |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Food Preservatives</b><br>Elementary idea of natural and synthetic food preservatives, rancidity, uses and properties, different food preservation processes (pickle, Jam), artificial sweeteners, uses and properties    | 7             |  |
| <b>Practicals</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                              |               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1. Identify the pH of the given samples through pH strip.<br>2. Experiments related to preserving food items.<br>3. Preparation of Artificial Silk.<br>4. To synthesize some polymers as per available resources.            | 30            |  |
| <b>Suggested Evaluation Methods</b>                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                              |               |  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Internal Assessment:</b></p> <p>➤ <b>Theory: 15</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 4</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 4</li> <li>• Mid-Term Exam: 7</li> </ul> <p><b>Practicum: 5</b></p> <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 5</li> <li>• Mid-Term Exam: NA</li> </ul>                                                                                                                                          | <p><b>End Term Examination:</b></p> <p>➤ <b>Theory: 35</b></p> <p>Written examination</p> <p>➤ <b>Practicum: 15</b></p> <p>Lab record, viva-voce, Demonstration of practical</p> |
| <p><b>Part C- Learning Resources</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                  |
| <p><b>Recommended Books/e-resources/LMS:</b></p> <ol style="list-style-type: none"> <li>1. Dhawan S.N., Organic Chemistry, Vol 1 Pardeep Publication.</li> <li>2. Subbulakshmi G, Food processing and preservation, New Age International Publishers.</li> <li>3. 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)</li> <li>4. Neelam Seedher, Basic Concepts: Physical Chemistry Experiments, Kindley Edition</li> </ol> |                                                                                                                                                                                  |





# CC-2/ MCC-3

Session: 2024-25

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |           |       |    |    |    |    |    |    |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------|-------|----|----|----|----|----|----|
| Session: 2024-25                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |           |       |    |    |    |    |    |    |
| Part A - Introduction                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |           |       |    |    |    |    |    |    |
| Subject                                                 | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |           |       |    |    |    |    |    |    |
| Semester                                                | II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |           |       |    |    |    |    |    |    |
| Name of the Course                                      | Chemistry-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |        |           |       |    |    |    |    |    |    |
| Course Code                                             | 24UN-CHE-201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |        |           |       |    |    |    |    |    |    |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C) | CC/MCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |           |       |    |    |    |    |    |    |
| Level of the course (As per Annexure-I)                 | 100-199                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |           |       |    |    |    |    |    |    |
| Pre-requisite for the course (if any)                   | Chemistry as a subject at 4.0 Level (Class-XII)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |           |       |    |    |    |    |    |    |
| Course Learning Outcomes (CLO):                         | After completing this course, the learner will be able to:<br>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.<br>2. To know the basics of rates of chemical reactions, the laws and solubility behavior of solutes in different compositions of solvents<br>3. To know about alkanes, alkene, cycloalkanes and their chemical reactions.<br>4. To understand about weak interactions and bonding in metals.<br>5. Hand on practice for estimation and determination of viscosity, specific refractivity properties of some compounds. |        |           |       |    |    |    |    |    |    |
|                                                         | <table><tr><td>Theory</td><td>Practical</td><td>Total</td></tr><tr><td>03</td><td>01</td><td>04</td></tr><tr><td>03</td><td>02</td><td>05</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Theory | Practical | Total | 03 | 01 | 04 | 03 | 02 | 05 |
| Theory                                                  | Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Total  |           |       |    |    |    |    |    |    |
| 03                                                      | 01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 04     |           |       |    |    |    |    |    |    |
| 03                                                      | 02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 05     |           |       |    |    |    |    |    |    |
| Credits                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |           |       |    |    |    |    |    |    |
| Contact Hours/week                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |           |       |    |    |    |    |    |    |

*Handwritten signatures and initials in blue ink.*

|                                              |          |          |    |
|----------------------------------------------|----------|----------|----|
| <b>Internal Assessment Marks</b>             | 20       | 10       | 30 |
| <b>End Term Exam Marks</b>                   | 50       | 20       | 70 |
| <b>Examination Time</b>                      | 03 Hours | 03 Hours | -  |
| Max. Marks: 100 (Theory: 70 & Practical: 30) |          |          |    |

**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.

| <b>Unit</b> | <b>Topics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Contact Hours</b> |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>I</b>    | <p><b>Covalent Bond</b></p> <p>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 (<math>N_2</math>, <math>O_2</math>) and heteronuclear (CO and NO) diatomic molecules, dipole moment and percentage ionic character in covalent bond.</p> <p><b>Ionic Solids</b></p> <p>Ionic structures (NaCl, CsCl, ZnS (Zinc blende), <math>CaF_2</math>) size effects, radius ratio rule and its limitations, Concept of Lattice energy, Born- Haber cycle, Solvation energy and its relationship with solubility of Ionic solids, Polarizing power and Polarizability of ions, Fajan's rule.</p> | <b>11</b>            |
| <b>II</b>   | <p><b>Chemical Kinetics</b></p> <p>Concept of reaction rates, rate equation, factors influencing the rate of reaction, Order and molecularity of a reaction, integrated rate expression for zero, first, Half-life period of a reaction, Arrhenius equation.</p> <p><b>Distribution Law</b></p> <p>Nernst distribution law – its thermodynamic derivation, Nernst distribution law after association and dissociation of solute in one of the phases, of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride</p>                                                                                                                                                                                                                                                                                                 | <b>12</b>            |

*M. B.* *HA*

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| III | <p><b>Alkanes and Cycloalkanes</b><br/>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.<br/>Nomenclature of Cycloalkanes, Baeyer's strain theory and its limitations, theory of strainless rings.</p> <p><b>Hydrogen Bonding and Van der Waals forces</b> Hydrogen Bonding – Definition, types, effects of hydrogen bonding on properties of substances, application<br/>Brief discussion of various types of Van der Waals forces.</p> <p><b>Reshuffled as desired.</b></p>                            | 11 |
| IV  | <p><b>Alkenes</b><br/>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.<br/>Markownikoff's rule of addition.</p> <p><b>Reshuffled as desired.</b></p> <p><b>Metallic Bond and semiconductors</b><br/>Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators).<br/>Semiconductors – Introduction, types, and applications.</p> <p><b>Practicals</b></p> | 11 |
|     | <p>1. <b>Complexometric titrations:</b> Determination of <math>Mg^{2+}</math> by EDTA.<br/>2. <b>Paper Chromatography:</b> Qualitative Analysis of any one of the following Inorganic cations and anions by paper chromatography (<math>Pb^{2+}</math>, <math>Cu^{2+}</math>, <math>Ni^{2+}</math>, <math>Cl^-</math>, <math>Br^-</math>, and <math>PO_4^{3-}</math> and <math>NO_3^-</math>).<br/>3. To determine the viscosity of given liquid using Ostwald's Viscometer.<br/>4. To determine the specific refractivity of at least two liquids by Refractometer.</p>                                                                                                                                                                                                                 | 30 |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 5. Separation of mixture of two Organic Compounds by TLC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                             |
| Suggested Evaluation Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                             |
| <b>Internal Assessment:</b><br>> Theory: 20 <ul style="list-style-type: none"> <li>• Class Participation: 5</li> <li>• Seminar/presentation/ assignment/ quiz/ class test etc.: 5</li> <li>• Mid-Term Exam: 10</li> </ul> > Practicum: 10 <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/ Demonstration/ Viva - voce/ Lab records etc.: 10</li> <li>• Mid-Term Exam: NA</li> </ul>                                                                                                                                                                                                                             | <b>End Term Examination:</b><br>> Theory: 50<br>Written examination<br>> Practicum: 20<br>Lab record, viva-voce, Demonstration of practical |
| Part C- Learning Resources                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                             |
| <b>Recommended Books/e-resources/LMS:</b> <ol style="list-style-type: none"> <li>1. Lee, J.D.; (2010), <i>Concise Inorganic Chemistry</i>, Wiley India.</li> <li>2. Kapoor, K.L. (2015), <i>A Textbook of Physical Chemistry</i>, Vol 1, 6 th Edition, McGraw Hill Education.</li> <li>3. Clayden, J.; Greeves, N.; Warren, S. (2012), <i>Organic Chemistry</i>, Oxford.</li> <li>4. Morrison, R. N.; Boyd, R. N. <i>Organic Chemistry</i>, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).</li> <li>5. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), <i>Senior Practical Physical Chemistry</i>, R. Chand &amp; Co, New Delhi.</li> </ol> |                                                                                                                                             |

6. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), *Vogel's Textbook of Quantitative Chemical Analysis*, John Wiley and Sons.

Dr. M. G.

**DSEC-1**

Session 2023-24

**Part A - Introduction**

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |       |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|
| Subject                                                 | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |       |
| Semester                                                | II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |       |
| Name of the Course                                      | Physical Chemistry Skill-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |       |
| Course Code                                             | 24UN-CHE-202                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |       |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C) | DSEC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |       |
| Level of the course (As per Annexure-I)                 | 100-199                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |       |
| Pre-requisite for the course (if any)                   | Chemistry as a subject at 4.0 Level (Class-XII)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |       |
| Course Learning Outcomes (CLO):                         | After completing this course, the learner will be able to:<br>1. Aware about lab handling and handling of hazardous chemicals.<br>2. Determine percentage purity and knowledge to prepare buffer solutions.<br>3. To Know preparation of complexometric titration and purification techniques.<br>4. To get operating knowledge of different instruments.<br>5. To get practical knowledge about complexometric titrations and paper chromatography. Also determination some physical properties of some compounds/ solutions. |           |       |
|                                                         | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Practical | Total |
| Credits                                                 | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 01        | 04    |
| Contact Hours/week                                      | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 02        | 05    |
| Internal Assessment Marks                               | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10        | 30    |
| End Term Exam Marks                                     | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 20        | 70    |
| Examination Time                                        | 03 Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 03 Hours  | ---   |
| Max. Marks: 100 (Theory: 70 & Practical: 30)            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |       |

| Part B- Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Instructions for Paper- Setter</b><br><b>Note:</b> 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. Sodium metal disposal, 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Preparation of complexometric solutions (e.g. EDTA solutions) and titrations, Management of chemical waste. Purification of chemicals through distillation, crystallization, sublimation etc. Operating knowledge including calibration, handling and maintenance of Potentiometers and conductometer.                                                                                                                                                                                                                               | 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 and maintenance of refractometer, polarimeter, Flame-photometer, Spectrophotometer, Interferometer and Dipole meter                                                                                                                                                                                        | 11            |
| <b>Practicals</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1. <b>Complexometric titrations:</b> Determination of $Zn^{2+}$ by EDTA.<br>2. <b>Thin Layer Chromatography:</b> Qualitative Analysis of Inorganic & Organic Compounds<br>3. To determine the percentage composition of liquid mixtures using Ostwald's Viscometer.<br>4. To determine the composition of liquid mixtures by Refractometer.<br>5. Preparation of Dibenzalacetone from Acetone and Benzaldehyde<br>6. Preparation of 2,4-DNP derivative of Benzophenone.<br>7. Separation of mixture of two Organic Compounds by TLC. | 30            |

| Suggested Evaluation Methods                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Internal Assessment:</b><br>> Theory:20 <ul style="list-style-type: none"> <li>• Class Participation: 5</li> <li>• Seminar/ presentation/ assignment/ quiz/ class test etc.: 5</li> <li>• Mid-Term Exam: 10</li> </ul> > Practicum:10 <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/ Demonstration/ Viva - voce/ Lab records etc.: 10</li> <li>• Mid-Term Exam: NA</li> </ul> | <b>End Term Examination:</b><br>> Theory: 50<br>Written examination<br>> Practicum: 20<br>Lab record, viva-voce, Demonstration of practical |
| Part C- Learning Resources                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                             |
| <b>Recommended Books/e-resources/LMS:</b><br>1. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), Senior Practical Physical Chemistry, R. Chand &amp; Co, New Delhi.<br>2. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons.                                                                                                           |                                                                                                                                             |





# CC-M2

| Session: 2024-25                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |       |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|
| Part A - Introduction                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |       |
| Subject                                                 | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |       |
| Semester                                                | II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |       |
| Name of the Course                                      | Minor Chemistry-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |       |
| Course Code                                             | 24UN-CHE-203                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |       |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C) | CC-M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |       |
| Level of the course (As per Annexure-I)                 | 100-199                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |       |
| Pre-requisite for the course (if any)                   | Chemistry as a subject at 4.0 Level (Class-XII)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |       |
| Course Learning Outcomes (CLO):                         | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"><li>1. To understand the basics of Covalent bonding in simple molecules.</li><li>2. To get the basics of rates of chemical reactions and factors affecting it.</li><li>3. To learn about the nomenclature, classification and methods of preparation of alkenes.</li><li>4. To learn about qualitative knowledge of conductors, semiconductors and insulators.</li></ol> <hr/> <p>5*. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds.</p> |           |       |
|                                                         | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Practical | Total |
| Credits                                                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1         | 2     |
| Contact Hours/week                                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2         | 3     |

|                                             |          |          |    |
|---------------------------------------------|----------|----------|----|
| Internal Assessment Marks                   | 10       | 5        | 15 |
| End Term Exam Marks                         | 20       | 15       | 35 |
| Examination Time                            | 03 Hours | 03 Hours |    |
| Max. Marks: 50 (Theory =30; Practical = 20) |          |          |    |

81

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84

| Part B- Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                  |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <p><b>Instructions for Paper- Setter</b></p> <p><b>Note:</b> 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.</p> |                                                                                                                                                                                                                                                                                                                                                                  |               |
| Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Topics                                                                                                                                                                                                                                                                                                                                                           | Contact Hours |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><b>Covalent Bond</b></p> <p>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.</p>                                                                | 4             |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p><b>Chemical Kinetics</b></p> <p>Concept of reaction rates, factors influencing the rate of reaction, Order and molecularity of a reaction, integrated rate expression for zero and first order reactions.</p>                                                                                                                                                 | 4             |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p><b>Alkanes (upto 5 carbon atoms)</b></p> <p>Alkanes, nomenclature, classification of carbon atoms in alkanes. Isomerism in alkanes, methods of formation: Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids.</p>                                                                                                   | 4             |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p><b>Metallic Bond and semiconductors</b></p> <p>Metallic bond – Qualitative idea of Band theory of metallic bond (conductors, semiconductors, insulators).</p>                                                                                                                                                                                                 | 3             |
| V                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>1. To determine the melting point of given organic compound.</p> <p>2. To prepare a pure sample of dibenzalacetone from benzaldehyde.</p> <p>3. Acid/Base Titration: Determination of strength of HCl using NaOH.</p> <p>4. To determine the refractive index of given liquid.</p> <p>5. To study the process of sublimation of camphor or phthalic acid.</p> | 30            |

## Suggested Evaluation Methods

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Internal Assessment: 10 + 05*</b>                                                                                                                                                                                                                                                                                                                                                                                                                              |                              |
| ➤ <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>End Term Examination:</b> |
| <ul style="list-style-type: none"> <li>• Class Participation: 3</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 3</li> <li>• Mid-Term Exam: 4</li> </ul>                                                                                                                                                                                                                                                                                         | <b>20 + 15*</b>              |
| ➤ <b>Practicum</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                              |
| <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 05</li> <li>• Mid-Term Exam: NA</li> </ul>                                                                                                                                                                                                                                                                                          |                              |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                              |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |
| <ol style="list-style-type: none"> <li>4. Dhawan S.N., Organic Chemistry, Vol 1 Pardeep Publication.</li> <li>5. Kapoor, K.L. (2015), <i>A Textbook of Physical Chemistry</i>, Vol 1, 6<sup>th</sup> Edition, McGrawHill Education.</li> <li>6. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), <i>Senior Practical Physical Chemistry</i>, R. Chand &amp; Co, New Delhi.</li> <li>7. Lee, J.D.; (2010), <i>Concise Inorganic Chemistry</i>, Wiley India.</li> </ol> |                              |

\*Applicable for courses having practical component.

*Handwritten signatures:*

## MDC-2

| Session: 2024-25                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |       |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|
| 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/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):                         | <b>After completing this course, the learner will be able to:</b> <ol style="list-style-type: none"> <li>1. To learn about role of Indian scientists in the upliftment of research</li> <li>2. To learn about classification of elements with their properties</li> <li>3. To learn about three states of matter</li> <li>4. To get more knowledge about role of fertilizers in fertility of soil</li> <li>5. To learn about acid- base reaction in daily life</li> </ol> |           |       |
|                                                         | 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 hrs                                         | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 03        |       |
| 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                                   | <b>Renowned Indian Scientists</b><br>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                                  | <b>Metal and Non-Metals</b><br>Periodic table, classification of elements, physical and chemical aspects of metals and non-metals, Ore and Minerals of Iron, Copper, Aluminium, alloys                                                                    | 8             |
| III                                 | <b>Physical Properties of Matter</b><br>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                                  | <b>Soil and fertilizers</b><br>Green revolution, soil: types of soil and their components for fertility, grow condition, pH, irrigation, biofertilizers, chemical fertilizers and their uses, acid rain.                                                  | 7             |
| <b>Practicals</b>                   |                                                                                                                                                                                                                                                           |               |
|                                     | 1. To prepare Plaster of Paris<br>2. To prepare Potash Alum<br>3. To study the effect of acid on Baking and washing soda<br>4. To perform the action of water on quick lime and identify the nature of reaction (Exo/Endothermic)                         | 30            |
| <b>Suggested Evaluation Methods</b> |                                                                                                                                                                                                                                                           |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Internal Assessment:</b></p> <p>➤ <b>Theory:15</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 4</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 4</li> <li>• Mid-Term Exam: 7</li> </ul> <p><b>Practicum:5</b></p> <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 5</li> <li>• Mid-Term Exam: NA</li> </ul>                                                                                     | <p><b>End Term Examination:</b></p> <p>➤ <b>Theory: 35</b><br/>Written examination</p> <p>➤ <b>Practicum: 15</b><br/>Lab record, viva-voce, Demonstration of practical</p> |
| <p style="text-align: center;"><b>Part C- Learning Resources</b></p> <p><b>Recommended Books/e-resources/LMS:</b></p> <ol style="list-style-type: none"> <li>1. Chemistry In Daily Life: Third Edition by Kirpal Singh, PHI Learning</li> <li>2. General Chemistry: Principles, Patterns, and Applications, Bruce Averill, Strategic Energy Security Solution, Patricia Eldredge, R.H. Hand, LLC, Copyright Year: 2011</li> <li>3. The Great Indian Scientists Paperback – 1 January 2017, Cengage Learning India</li> </ol> |                                                                                                                                                                            |

## 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:<br>(CC/MCC/MDC/CC-<br>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: <ol style="list-style-type: none"> <li>1. Understand the basic fundamentals of computer</li> <li>2. Becomes aware of the terminology of hardware and software components of a computer system.</li> <li>3.</li> <li>4. Use of MS Office</li> <li>5. Applications of MS office</li> </ol> |       |  |
| Credits                                                      | Practical                                                                                                                                                                                                                                                                                                                                           | Total |  |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----|----|
|                                                                                                                                                                                                                                                                                                                                                                                                           |                                                 |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                                           |                                                 | 1  | 3  |
| Contact Hours                                                                                                                                                                                                                                                                                                                                                                                             |                                                 | 30 | 60 |
| <b>Max. Marks: 50+20 = 70</b><br><b>Internal Assessment</b><br><b>Marks: 15+5= 20</b><br><b>End Term Exam</b><br><b>Marks: 35+15 = 50</b>                                                                                                                                                                                                                                                                 | <b>Time: Theory: 3 Hours Practicum: 3 Hours</b> |    |    |
| <b>Part B- Contents of the Course</b>                                                                                                                                                                                                                                                                                                                                                                     |                                                 |    |    |
| <b><u>Instructions for Paper- Setter</u></b>                                                                                                                                                                                                                                                                                                                                                              |                                                 |    |    |
| 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.                                                                                                                                                                                              |                                                 |    |    |
| <b>Topics</b>                                                                                                                                                                                                                                                                                                                                                                                             | <b>ContactHours</b>                             |    |    |
| <b>Computer Fundamentals:</b> 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                                               |    |    |
| <b>Storage devices:</b> Hardware components of a computer system - processor, RAM, ROMs, motherboard, power supply etc. Types of Storage devices,                                                                                                                                                                                                                                                         | 7                                               |    |    |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 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<br>Output Devices: Monitor, Central Processing Unit (Control Unit and Arithmetic Logic Unit) printers –classification, laser, ink jet, dot-matrix, plotter, and speaker.                                                                                                                                                                                                                 |        |
| Software Products (Origin, Chemdraw and its application with respect to sketch of the molecules, bond length and bond angles)<br><br>NMR & IR Spectra of alkane, alkenes & alkynes upto C <sub>1</sub> to C <sub>4</sub> using Chemdraw software.                                                                                                                                                                                                                                                                                                                                                                            | 8      |
| Introduction to MS Excel - a spreadsheet program and its Applications.<br><br>Description of pH metric and conduct metric titrations of acids vs bases and draw curve using MS Excel.                                                                                                                                                                                                                                                                                                                                                                                                                                        | 8      |
| <ul style="list-style-type: none"> <li>• Applications of MS Excel</li> <li>(1) pH titration curve of a strong acid with strong Base.</li> <li>(2) pH titration curve of a Weak acid with strong Base.</li> <li>(3) General treatment of pH titration curve of a mono protic acid.</li> <li>(4) Conductometric Titration curve of a strong acid with strong Base.</li> <li>(5) Conductometric Titration curve of a weak acid with strong Base.</li> <li>• Typed documents (1-2 pages) with some formatting instructions in MS word.</li> <li>• Preparation of a power point on basic topics of science (Chemistry)</li> </ul> | 30 hrs |

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| Suggested Evaluation Methods<br>Short Answer and MCQ Type QUESTIONS                                                                                                                                                                                                                                                                                                                                                                                 |                                    |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--|
| <b>Internal Assessment: 15</b><br>> <b>Theory</b> <ul style="list-style-type: none"> <li>• Class Participation: 04</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 04</li> <li>• Mid-Term Exam: 07</li> </ul> > <b>Practicum: 05</b> <ul style="list-style-type: none"> <li>• Class Participation: 02</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 03</li> <li>• Mid-Term Exam: NIL</li> </ul>                     | <b>End Term Examination: 35+15</b> |  |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |  |
| <b>Recommended Books/e-resources/LMS:</b> <ul style="list-style-type: none"> <li>✓ Bright Siaw Afriyie, Introduction to Computer fundamentals.</li> <li>✓ Meth Norton's; Introduction to Computers; Fourth Edition; McGraw Hill, New York.</li> <li>✓ Computers for Chemists; K.V. Rajoraman; Tata McGraw Hill Co. Ltd.; New Delhi; 1993.</li> <li>✓ A Textbook of Physical Chemistry; K.L. Kapoor Vol. 6, Tata McGrawHill Publications.</li> </ul> |                                    |  |

\*Applicable for courses having practical component.

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## SEC-2

**Session: 2024-25**

### Part A – Introduction

| Session: 2024-25                                                                               |                                                                                                                                                                                                                                                                     |           |       |  |
|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|--|
| Part A – Introduction                                                                          |                                                                                                                                                                                                                                                                     |           |       |  |
| Subject                                                                                        | Chemistry                                                                                                                                                                                                                                                           |           |       |  |
| Semester                                                                                       | II                                                                                                                                                                                                                                                                  |           |       |  |
| Name of the Course                                                                             | Chemistry of food flavours and colorants                                                                                                                                                                                                                            |           |       |  |
| Course Code                                                                                    | 24UN-CHE-SEC201                                                                                                                                                                                                                                                     |           |       |  |
| Course Type:<br>(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:<br><div><div>1 Know about basic food components;</div><div>2 Analyse the food flavors and pigments;</div><div>3 Think about the food additives;</div><div>4 Understand about food colorants.</div></div> |           |       |  |
| Credits                                                                                        | 5*. Analyse the extraction & reactions of food components.                                                                                                                                                                                                          |           |       |  |
|                                                                                                | Theory                                                                                                                                                                                                                                                              | Practical | Total |  |
|                                                                                                | 2                                                                                                                                                                                                                                                                   | 1         | 3     |  |
|                                                                                                | 30                                                                                                                                                                                                                                                                  | 30        | 60    |  |
| Contact Hours                                                                                  |                                                                                                                                                                                                                                                                     |           |       |  |
| Max. Marks: 50+20*= 70<br>Internal Assessment Marks: 15+5= 20<br>End Term Exam Marks: 35+15=50 |                                                                                                                                                                                                                                                                     |           |       |  |
| Time: Theory: 3 Hours<br>Practicum: 3 Hours                                                    |                                                                                                                                                                                                                                                                     |           |       |  |

Max. Marks: 100 (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.

| Unit | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Contact Hours |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I    | <b>Biological molecules in food processing</b><br>Water: Physical properties: specific heat, latent heat, vapor pressure, boiling point, water as dispersing medium, states of water, Water in food preparation and preservation<br>Starch: Structure, functional properties - Gelatinization, pasting, syneresis, retrogradation, dextrinization.<br>Factors affecting gelatinization and gelation, c) Gums – Functions, sources, applications. d) Pectic substances, pectin gels | 8 Hrs         |
| II   | <b>Enzymes:</b> a) Biocatalysts, enzyme specificity b) Use of exogenous enzymes in foods – amylases, lipases, proteases c) Endogenous enzymes – phenol oxidases, peroxidases, oxido- reductases, lipoxigenases d) Factors affecting enzyme activity                                                                                                                                                                                                                                | 8 Hrs         |
| III  | <b>Flavours &amp; Pigments</b><br>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<br>Pigments: a) Pigments in Animal and Plant tissues (Haeme compounds, Chlorophyll, Carotenoids, Anthocyanins, Betalins)<br>b) Synthetic Food Colors (toxicity and regulatory aspects)                                     | 7 Hrs         |

|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Food Additives</b><br>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.<br>Food colorants: sunset yellow, orange-B, citrus red No <sub>2</sub> , yellow No <sub>5</sub> , green No <sub>3</sub> . | 7 Hrs  |
| V*                                                                                                                                                                                                                                                                                                                                                                                                                | 1. Gelatinization of starch granules;<br>2. To study hydrolysis of starch through salivary amylase<br>3. To study hydrolysis of fatty acids<br>4. Extraction of chlorophyll from different leaves;                                                                                                                                                                                                                                                                                                                                                                                                 | 30 Hrs |
| <b>Internal Assessment: 15</b><br>> Theory <ul style="list-style-type: none"> <li>• Class Participation: 04</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 04</li> <li>• Mid-Term Exam: 07</li> </ul> > Practicum: 05 <ul style="list-style-type: none"> <li>• Class Participation: 02</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 03</li> <li>• Mid-Term Exam: NIL</li> </ul> | <b>End Term Examination: 35+15</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |

**Recommended Books/e-resources/LMS:**

- ✓ Bright Siaw Afriye, 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.

**Suggested Evaluation Methods**  
Short Answer and MCQ Type QUESTIONS

\*Applicable for courses having practical component