

AKAL UNIVERSITY

TALWANDI SABO

(Established under Punjab State Act No. 25 of 2015)

Bachelor of Science Chemistry

Or

Bachelor of Science (Hons.) Chemistry (Major)
and Discipline-2 (Minor)

Or

Bachelor of Science (Hons.) Chemistry
with Research (Major) and Discipline-2 (Minor)

(Based on NEP – 2020)



Talwandi Sabo

FACULTY OF PHYSICAL SCIENCES

DEPARTMENT OF CHEMISTRY

1. CURRICULUM AND CREDIT FRAMEWORK FOR UNDERGRADUATE PROGRAMME

| Sem. | Major Courses | | Minor Courses (MI) (4 credit) | Multi-disciplinary courses (MDC) (4 credit) | Ability Enhancement Courses (AEC) (2 credit) | Skill Enhancement Courses (SEC) (3 credit) | Value-Added Courses VAC (2 credit) | Total Credit |
|--|---|--|----------------------------------|--|---|---|---------------------------------------|--------------|
| | DSC | DSE | | | | | | |
| I | DSC-1 [4] DSC-2 [4] | - | MI-1 | MDC-1 | AEC-1 | SEC-1 | VAC-1 | 23 |
| II | DSC-3 [4] DSC-4 [4] | - | MI-2 | MDC-2 | AEC-2 | SEC-2 | VAC-2 | 23 |
| Students exiting the programme after securing 46 credits will be awarded UG Certificate in Chemistry provided they secure 4 credits in work based vocational courses offered during summer term or internship /Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester. | | | | | | | | 46 |
| III | DSC-5 [5] | DSE-1 [3] or DSE-2 [3] or DSE-3 [3] | MI-3 | MDC-3 | AEC-3 | SEC-3 | - | 21 |
| IV | DSC-6 [5] DSC-7 [5] | DSE-4 [3] or DSE-5 [3] or DSE-6 [3] | MI-4 | - | AEC-4 | | VAC-3 | 20 |
| Students exiting the programme after securing 87 credits will be awarded UG Diploma in Chemistry provided they secure additional 4 credit in skill based vocational courses offered during first year or second year summer term. | | | | | | | | 87 |
| V | DSC-8 [5] DSC-9 [4] DSC-10 [4] | DSE-7 [3] or DSE-8 [3] or DSE-9 [3] | MI-5 | - | | | | 20 |
| VI | DSC-11 [4] DSC-12 [4] Internship[4] | DSE-10 [3] or DSE-11 [3] or DSE-12[3] | MI-6 | - | | | | 20 |
| Students who want to undertake 3-year UG programme will be awarded UG Degree in Chemistry upon securing 127 credits | | | | | | | | 127 |
| VII | DSC-13 [5] DSC-14 [4] DSC-15 [4] | DSE-13 [3] or DSE-14 [3] or DSE-15[3] | MI-7 | - | | | | 20 |
| VIII | DSC-16 [5] DSC-17 [4] DSC-18 [4] | DSE-16 [3] or DSE-17 [3] or DSE-18[3] | MI-8 | - | | | | 20 |
| Students will be awarded Bachelor of Science (Hons.) Chemistry (Major) and Discipline-2 (Minor) provided they secure 167 credits | | | | | | | | 167 |
| VII | DSC-13 [4] DSC-14 [4] DSC-D [4] | DSE-13 [4] or DSE-14 [4] or DSE-1 5[4] | MI-7 | - | | | | 20 |
| VIII | DSC-16 [4] DSC-D [8] | DSE-16 [4] or DSE-17[4] or DSE-18[4] | MI-8 | - | | | | 20 |
| Students will be awarded Bachelor of Science (Hons.) Chemistry with Research (Major) and Discipline-2 (Minor) provided they successfully completed the dissertation work and secure 167 credits | | | | | | | | 167 |

2. SEMESTER-WISE DISTRIBUTION OF MAJOR COURSES

A student will have to study compulsory Discipline Specific Core Courses in each Semester. The semester-wise distribution and credit details of DSC courses over eight semesters are listed below:

2.1. Discipline Specific Core (DSC)

| Semester | Course Code | Title of the Course | Schedule of Teaching (Credits-wise) | | | Total Credits |
|--|-------------|---|-------------------------------------|----------|-----------|---------------|
| | | | Theory | Tutorial | Practical | |
| I | CHMS05C101 | Foundation Course for Chemistry | 3 | 0 | 1 | 4 |
| | CHMS05C102 | States of Matter and Ionic Equilibrium | 3 | 0 | 1 | 4 |
| II | CHMS05C201 | Atomic Structure and Chemical Bonding | 3 | 1 | 0 | 4 |
| | CHMS05C202 | Hydrocarbon and Stereochemistry | 3 | 0 | 1 | 4 |
| III | CHMS05C301 | Chemistry of s and p Block | 3 | 0 | 2 | 5 |
| IV | CHMS05C401 | Chemical Thermodynamics | 3 | 0 | 2 | 5 |
| | CHMS05C402 | Coordination Chemistry | 3 | 0 | 2 | 5 |
| V | CHMS05C501 | Biomolecules | 3 | 0 | 2 | 5 |
| | CHMS05C502 | Chemical Kinetics | 3 | 0 | 1 | 4 |
| | CHMS05C503 | Organometallic Chemistry | 3 | 1 | 0 | 4 |
| VI | CHMS05C601 | Molecular Spectroscopy | 3 | 1 | 0 | 4 |
| | CHMS05C602 | Instrumental Methods of Chemical Analysis | 3 | 0 | 1 | 4 |
| VII | CHMS05C701 | Organic Reaction Mechanism | 3 | 0 | 2 | 5 |
| | CHMS05C702 | Organic Spectroscopy | 3 | 1 | 0 | 4 |
| | CHMS05C703 | Group Theory and Solid-State Chemistry | 3 | 1 | 0 | 4 |
| VIII | CHMS05C801 | Organic Reactions and Rearrangement | 3 | 0 | 2 | 5 |
| | CHMS05C802 | Electrochemistry | 3 | 0 | 1 | 4 |
| | CHMS05C803 | Food Chemistry | 3 | 0 | 1 | 4 |
| B.Sc. (Hons.) Chemistry with Research | | | | | | |
| VII | CHMS05C701 | Organic Spectroscopy | 3 | 1 | 0 | 4 |
| | CHMS05C702 | Group Theory and Solid-State Chemistry | 3 | 1 | 0 | 4 |
| | CHMS05D703 | Dissertation (Synopsis) | 0 | 0 | 0 | 4 |
| VIII | CHMS05C801 | Organic Reactions and Rearrangement | 4 | 0 | 1 | 4 |
| | CHMS05D801 | Dissertation (Submission) | 0 | 0 | 0 | 8 |

2.2. Discipline Specific Elective (DSE)

The Discipline Specific Electives (DSEs) are a pool of credit courses in Chemistry from which a student will choose to study based on his/ her interest. A student of Bachelor of Science (Hons.) Chemistry will have to study one DSE each III to VI. The semester wise distribution of DSE courses over six semesters.

| Semester | Course Code | Title of the Course | Schedule of Teaching (Credits-wise) | | | Total Credits |
|----------|-------------|--|-------------------------------------|----------|-----------|---------------|
| | | | Theory | Tutorial | Practical | |
| III | CHMS05E301 | Organic Chemistry of Oxygen Containing Compounds | 3 | 0 | 0 | 3 |
| | CHMS05E302 | Industrial Chemicals and Environment | 3 | 0 | 0 | 3 |

| | | | | | | |
|------|------------|---|---|---|---|---|
| | CHMS05E303 | Inorganic Materials of Industrial Importance | 3 | 0 | 0 | 3 |
| IV | CHMS05E401 | Heterocyclic and Polynuclear Chemistry | 3 | 0 | 0 | 3 |
| | CHMS05E402 | Molecular Modelling and Drug Design | 3 | 0 | 0 | 3 |
| | CHMS05E403 | Novel Inorganic Solids | 3 | 0 | 0 | 3 |
| V | CHMS05E501 | Quantum Chemistry | 3 | 0 | 0 | 3 |
| | CHMS05E502 | Analytical Methods in Chemistry | 3 | 0 | 0 | 3 |
| | CHMS05E503 | Molecules of Life | 3 | 0 | 0 | 3 |
| VI | CHMS05E601 | Green and Sustainable Chemistry | 3 | 0 | 0 | 3 |
| | CHMS05E602 | Medicinal Chemistry | 3 | 0 | 0 | 3 |
| | CHMS05E603 | Supramolecular chemistry | 3 | 0 | 0 | 3 |
| VII | CHMS05E701 | Polymer Chemistry | 3 | 0 | 0 | 3 |
| | CHMS05E702 | Nuclear Chemistry Inorganic Spectroscopy | 3 | 0 | 0 | 3 |
| | CHMS05E703 | Nanochemistry | 3 | 0 | 0 | 3 |
| VIII | CHMS05E801 | Coordination Chemistry: Spectra, Magnetism and Reaction Mechanism | 3 | 0 | 0 | 3 |
| | CHMS05E802 | Research Methodology for Chemistry | 3 | 0 | 0 | 3 |
| | CHMS05E803 | Chemistry of refinery processes | 3 | 0 | 0 | 3 |

2.3. List of Courses Offered as Minors or Generic Elective

All UG students are required to undergo eight minor courses of 04 credits each from the minor discipline which helps them to gain a broader understanding beyond the major discipline. These courses will be offered as generic electives for Multi-disciplinary programmes.

| Semester | Course Code | Course Title | Schedule of Teaching (Credit-wise) | | | Total Credits |
|----------|-------------|----------------------------------|------------------------------------|----------|-----------|---------------|
| | | | Theory | Tutorial | Practical | |
| I | CHM05MI101 | Fundamentals of Chemistry-I | 3 | 0 | 1 | 4 |
| II | CHM05MI201 | Fundamentals of Chemistry-II | 3 | 0 | 1 | 4 |
| III | CHM05MI301 | Inorganic and Physical Chemistry | 4 | 0 | 0 | 4 |
| IV | CHM05MI401 | Chemical Thermodynamics | 3 | 0 | 1 | 4 |
| V | CHM05MI501 | Organic Chemistry | 4 | 0 | 0 | 4 |
| VI | CHM05MI601 | Inorganic and Organic Chemistry | 4 | 0 | 0 | 4 |
| VII | CHM05MI701 | Fundamentals of Spectroscopy | 3 | 0 | 1 | 4 |
| VIII | CHM05MI801 | Chemical Kinetics | 4 | 0 | 0 | 4 |

2.4 List of Courses Offered as Multi-disciplinary Course

All UG students are required to undergo 3 introductory-level multi-disciplinary courses relating to any of the broad disciplines other than the chosen major.

| Semester | Course Code | Course Title | Schedule of Teaching (Credit-wise) | | | Total Credits |
|----------|-------------|--|---------------------------------------|----------|-----------|---------------|
| | | | Theory | Tutorial | Practical | |
| Sem-I | CHMS05M101 | Chemistry in Daily Life | 4 | 0 | 0 | 4 |
| | CHMS05M102 | Organic Chemistry in Biology and Drug Development (Online: 3 credit) | 4 | 0 | 0 | 4 |
| Sem-II | CHMS05M201 | Hazardous Waste and its Treatment | 4 | 0 | 0 | 4 |
| | CHMS05M104 | Nutritional & Clinical Biochemistry (Online: 4 Credit). | 4 | 0 | 0 | 4 |
| Sem-III | CHMS05M301 | Environmental Chemistry | 4 | 0 | 0 | 4 |
| | CHMS05M106 | Bio-physical Chemistry | 4 | 0 | 0 | 4 |

2.5 List of Courses Offered as Skill Enhancement Courses

To improve the skills essential for advanced studies, research, and employability, students will be offered a variety of Skill Enhancement as listed in the Table below:

| Semester | Course Code | Course Title | Schedule of Teaching (Credit-wise) | | | Total Credits |
|----------|-------------|---|---------------------------------------|----------|-----------|---------------|
| | | | Theory | Tutorial | Practical | |
| Sem-I | CHMS05S101 | Basic Analytical Chemistry | 2 | 0 | 1 | 3 |
| | CHMS05S102 | Adsorption Science and Technology: Fundamentals and Applications (Online: 2 Credit) | 2 | 0 | 1 | 3 |
| Sem-II | CHMS05S201 | Analytical Chemistry: Separation Methods | 2 | 0 | 1 | 3 |
| | CHMS05S201 | Chemistry lab operations and safety measures | 2 | 0 | 1 | 3 |
| Sem-III | CHMS05S301 | Chemistry and Physics of Surfaces and Interfaces (online: 2 credit) | 2 | 0 | 1 | 3 |
| | CHMS05S302 | Fuel Chemistry | 2 | 0 | 1 | 3 |

Note: Additionally, students can select Skill Enhancement Courses, Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the pool of courses provided by university.

3. CREDIT DISTRIBUTION OF DIFFERENT TYPE OF COURSES

| Subjects | B.Sc. in Chemistry | B.Sc. (Hons.) Chemistry (Major) and Discipline-2 (Minor) | B.Sc. (Hons.) Chemistry with Research (Major) and Discipline-2 (Minor) |
|----------------------------|--------------------|--|--|
| Major [DSC + DSE] | 64 | 96 | 84 |
| Minor | 24 | 32 | 32 |
| Multi-disciplinary Course | 12 | 12 | 12 |
| Ability Enhancement Course | 8 | 8 | 8 |
| Skill Enhancement Course | 9 | 9 | 9 |
| Internship | 4 | 4 | 4 |
| Value Added Course | 6 | 6 | 6 |
| Dissertation in Major | - | - | 12 |

| | | | |
|---------------|-----|-----|-----|
| Total Credits | 127 | 167 | 167 |
|---------------|-----|-----|-----|