

# **UNDERGRADUATE SCHEME OF STUDIES**

**(NEW POLICY-2023)**



**Department of Chemistry,  
Shaheed Benazir Bhutto University,  
Sheringal, Dir (Upper), KP.**

### Name of the BS Programs:

- 1)-ASSOCIATE DEGREE IN CHEMISTRY (AD, 2-Year)  
2)- BACHELOR OF STUDIES IN CHEMISTRY (BS, 4-YEARS)

#### SCHEME OF STUDIES FOR BS (2-YEAR) ASSOCIATE DEGREE (AD)

| <b>Semester-I</b>      |                    |   |                |
|------------------------|--------------------|---|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>                                     | <b>Credits</b> |
| General Education.     | ENG- 311           | Functional English                                      | 03             |
| General Education.     | ISL-312            | Islamic Studies / Ethics (only for Non-Muslims)         | 02             |
| General Education.     | MCC-311            | Exploring Quantitative Skill (Quantitative reasoning-I) | 03             |
| General Education.     | BSC-323            | ICT   | 3(2+1)         |
| Allied                 | ZOO-316            | Zoology-I (Invertebrate zoology)                        | 3(2+1)         |
| Major                  | CHEM-151           | Inorganic chemistry                                     | 4(3+1)         |
|                        |                    | Total Credits   | 18             |

| <b>Semester-II</b>     |                    |  |                |
|------------------------|--------------------|--|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>  | <b>Credits</b> |
| General Education.     | ENG- 321           | Expository writing   | 03             |
| General Education.     | PS-322             | Ideology and Constitution of Pakistan                        | 02             |
| General Education.     | MCC-321            | Tools for quantitative reasoning (Quantitative reasoning-II) | 03             |
| Allied                 | ZOO-326            | Zoology-II (chordate zoology)                                | 3(2+1)         |
| Major                  | CHEM-121           | Applied chemistry  | 3(2+1)         |
| Major                  | CHEM-161           | Organic chemistry  | 4(3+1)         |
|                        |                    | Total Credits  | 18             |

| <b>Semester III</b>    |                    |  |                |
|------------------------|--------------------|--|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>                      | <b>Credits</b> |
| General Education.     |                    | Natural Sciences (Physics)               | 3(2+1)         |
| General Education.     | SOC 114            | Civics and Community Engagement          | 02             |
| General Education.     |                    | Islamic History                          | 02             |
| Allied                 | ZOO-436            | Zoology-III (Animal form and function-I) | 3(2+1)         |
| Major                  | CHEM-141           | Environmental chemistry                  | 4(3+1)         |
| Major                  | CHEM-171           | Physical chemistry                       | 4(3+1)         |
|                        |                    | Total Credits                            | 18             |

| <b>Semester-IV</b>     |                    |  |                |
|------------------------|--------------------|--|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>                      | <b>Credits</b> |
| General Education.     |                    | Entrepreneurship                         | 02             |
| General Education.     |                    | Social Anthropology                      | 02             |
| Allied.                | ZOO- 445           | Zoology-IV (Animal form and function-II) | 3(2+1)         |
| Major                  | CHEM-131           | Biochemistry                             | 4(3+1)         |
| Major                  | CHEM-111           | Analytical Chemistry                     | 4(3+1)         |
| Major                  |                    | Research methodology                     | 3(3+0)         |
| General Education.     |                    | Pakistan Studies                         | 02             |
|                        |                    | Total Credits                            | 20             |

## SCHEME OF STUDIES FOR BS (4-YEAR) IN CHEMISTRY

| <b>Semester-I</b>      |                    |   |                |
|------------------------|--------------------|---|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>                                     | <b>Credits</b> |
| General Education.     | ENG- 311           | Functional English                                      | 03             |
| General Education.     | ISL-312            | Islamic Studies / Ethics (only for Non-Muslims)         | 02             |
| General Education.     | MCC-311            | Exploring Quantitative Skill (Quantitative reasoning-I) | 03             |
| General Education.     | BSC-323            | ICT   | 3(2+1)         |
| Allied                 | ZOO-316            | Zoology-I (Invertebrate zoology)                        | 3(2+1)         |
| Major                  | CHEM-151           | Inorganic chemistry                                     | 4(3+1)         |
|                        |                    | Total Credits   | 18             |

| <b>Semester-II</b>     |                    |  |                |
|------------------------|--------------------|--|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>  | <b>Credits</b> |
| General Education.     | ENG- 321           | Expository writing   | 03             |
| General Education.     | PS-322             | Ideology and Constitution of Pakistan                        | 02             |
| General Education.     | MCC-321            | Tools for quantitative reasoning (Quantitative reasoning-II) | 03             |
| Allied                 | ZOO-326            | Zoology-II (chordate zoology)                                | 3(2+1)         |
| Major                  | CHEM-121           | Applied chemistry  | 3(2+1)         |
| Major                  | CHEM-161           | Organic chemistry  | 4(3+1)         |
|                        |                    | Total Credits  | 18             |

| <b>Semester III</b>    |                    |  |                |
|------------------------|--------------------|--|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>                      | <b>Credits</b> |
| General Education.     |                    | Natural Sciences (Physics)               | 3(2+1)         |
| General Education.     | SOC 114            | Civics and Community Engagement          | 02             |
| General Education.     |                    | Arts                                     | 02             |
| Allied                 | ZOO-436            | Zoology-III (Animal form and function-I) | 3(2+1)         |
| Major                  | CHEM-141           | Environmental chemistry                  | 4(3+1)         |
| Major                  | CHEM-171           | Physical chemistry                       | 4(3+1)         |
|                        |                    | Total Credits                            | 18             |

| <b>Semester-IV</b>     |                    |  |                |
|------------------------|--------------------|--|----------------|
| <b>Course Category</b> | <b>Course Code</b> | <b>Course Title</b>                      | <b>Credits</b> |
| General Education.     |                    | Entrepreneurship                         | 02             |
| General Education.     |                    | Social Anthropology                      | 02             |
| Allied.                | ZOO- 445           | Zoology-IV (Animal form and function-II) | 3(2+1)         |
| Major                  | CHEM-131           | Biochemistry                             | 4(3+1)         |
| Major                  | CHEM-111           | Analytical Chemistry                     | 4(3+1)         |
| Major                  |                    | Research methodology                     | 3(3+0)         |
| General Education.     |                    | Pakistan Studies                         | 02             |
|                        |                    | Total Credits                            | 20             |

| <b>Semester-V</b>         |                    |                      |                |
|---------------------------|--------------------|----------------------|----------------|
| <b>S.NO</b>               | <b>Course Code</b> | <b>Course Title</b>  | <b>Credits</b> |
| 1                         | CHEM-251           | Inorganic Chemistry  | 3+1            |
| 2                         | CHEM-261           | Organic Chemistry    | 3+1            |
| 3                         | CHEM-271           | Physical Chemistry   | 3+1            |
| 4                         | CHEM-211           | Analytical Chemistry | 3+1            |
| <b>Total Credit Hours</b> |                    |                      | 16             |

| <b>Semester VI</b>        |                    |                                |                |
|---------------------------|--------------------|--------------------------------|----------------|
| <b>S.NO</b>               | <b>Course Code</b> | <b>Course Title</b>            | <b>Credits</b> |
| 1                         | CHEM-351           | Inorganic Chemistry            | 3+1            |
| 2                         | CHEM-361           | Organic Chemistry              | 3+1            |
| 3                         | CHEM-371           | Physical Chemistry             | 3+1            |
| 4                         | CHEM-321/231       | Applied Chemistry/Biochemistry | 3+1            |
| <b>Total Credit Hours</b> |                    |                                | 16             |

| <b>Semester VII (Analytical Specialization)</b> |                                    |   |                |
|---|------------------------------------|---|----------------|
| <b>S.NO</b>                                     | <b>Course Code</b>                 | <b>Course Title</b>   | <b>Credits</b> |
| 1   | CHEM-311                           | Atomic Spectroscopy   | 3+1            |
| 2   | CHEM-313                           | Electro Analytical Techniques   | 3+0            |
| 3   | CHEM-312                           | Advance Separation Techniques   | 3+0            |
| 4   | CHEM-321/<br>CHEM-231/<br>CHEM-141 | Applied Chemistry/Biochemistry/Fuel Chemistry/<br>(any other than the field of<br>specialization) | 3+0            |
| 5   | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-I/<br>Special Practical-I                   | 3              |
| <b>Total Credit Hours</b>                       |                                    |   | 16             |

| <b>Semester VII (Applied Specialization)</b> |                                    |  |                |
|--|------------------------------------|--|----------------|
| <b>S.NO</b>                                  | <b>Course Code</b>                 | <b>Course Title</b>  | <b>Credits</b> |
| 1  | CHEM-322                           | Common Industries-I  | 3+1            |
| 2  | CHEM-321                           | Agro Based Industries & Pollution Control  | 3+0            |
| 3  | CHEM-323                           | Agro Based Industries & Pollution  | 3+0            |
| 4  | CHEM-311/<br>CHEM-231/<br>CHEM-141 | Analytical Chemistry/Biochemistry/Fuel Chemistry<br><br>/<br>(any other than the field of<br>specialization) | 3+0            |
| 5  | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-I/<br>Special Practical-I                              | 3              |
| <b>Total Credit Hours</b>                    |                                    |  | 16             |

| <b>Semester VII (Biochemistry Specialization)</b> |                                    |   |                |
|---|------------------------------------|---|----------------|
| <b>S.NO</b>                                       | <b>Course Code</b>                 | <b>Course Title</b>   | <b>Credits</b> |
| 1   | CHEM-231                           | Biomedical Chemistry  | 3+1            |
| 2   | CHEM-232                           | Molecular Biology   | 3+0            |
| 3   | CHEM-233                           | Physical Techniques in Biochemistry   | 3+0            |
| 4   | CHEM-311/<br>CHEM-321/<br>CHEM-141 | Analytical Chemistry/ Fuel Chemistry/ Applied Chemistry/<br>(any other than the field of<br>specialization) | 3+0            |
| 5   | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-I/<br>Special Practical-I                             | 3              |
| <b>Total Credit Hours</b>                         |                                    |   | 16             |

| <b>Semester VII (Fuel Chemistry Specialization)</b> |                                    |   |                |
|---|------------------------------------|---|----------------|
| <b>S.NO</b>   | <b>Course Code</b>                 | <b>Course Title</b>   | <b>Credits</b> |
| 1   | CHEM-141                           | Chemistry of Coal Conversion Process-I  | 3+1            |
| 2   | CHEM-143                           | Petroleum & Petrochemicals-I  | 3+0            |
| 3   | CHEM-142                           | Characterization of fossil fuels  | 3+0            |
| 4   | CHEM-311/<br>CHEM-321/<br>CHEM-231 | Analytical Chemistry/Applied Chemistry/Biochemistry/<br>(any other than the field of<br>specialization) | 3+0            |
| 5   | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-I/<br>Special Practical-I                         | 3              |
| <b>Total Credit Hours</b>                           |                                    |   | 16             |

| <b>Semester VII (Inorganic Chemistry Specialization)</b> |   |   |                |
|--|---|---|----------------|
| <b>S.NO</b>  | <b>Course Code</b>                              | <b>Course Title</b>   | <b>Credits</b> |
| 1  | CHEM-452  | Inorganic Reaction Mechanism  | 3+1            |
| 2  | CHEM-451  | II- Aceptor Ligands And Inorganic<br>Polymers   | 3+0            |
| 3  | CHEM-453  | Inorganic Spectroscopy  | 3+0            |
| 4  | CHEM-311/<br>CHEM/321/<br>CHEM-231/<br>CHEM-141 | Analytical Chemistry/Applied Chemistry/Biochemistry/Fuel<br>Chemistry/<br>(any other than the field of<br>specialization) | 3+0            |
| 5  | CHEM-690  | Research Thesis /Group Research Project/Special Paper-I/<br>Special Practical-I   | 3              |
| <b>Total Credit Hours</b>                                |   |   | 16             |

| <b>Semester VII (Organic Chemistry Specialization)</b> |   |  |                |
|--|---|--|----------------|
| <b>S.NO</b>  | <b>Course Code</b>                              | <b>Course Title</b>  | <b>Credits</b> |
| 1  | CHEM-461  | Heterocyclic & Organometallic Compounds  | 3+1            |
| 2  | CHEM-464  | Organic Spectroscopy   | 3+0            |
| 3  | CHEM-466  | Reactive Intermediates   | 3+0            |
| 4  | CHEM-311/<br>CHEM-321/<br>CHEM-231/<br>CHEM-141 | Analytical Chemistry/Applied Chemistry/Biochemistry/ Fuel Chemistry/<br>(any other than the field of specialization) | 3+0            |
| 5  | CHEM-690  | Research Thesis /Group Research Project/Special Paper-I/<br>Special Practical-I                                      | 3+0            |
| <b>Total Credit Hours</b>                              |   |  | 16             |

| <b>Semester VII (Physical Chemistry Specialization)</b> |   |  |                |
|---|---|--|----------------|
| <b>S.NO</b>   | <b>Course Code</b>                              | <b>Course Title</b>  | <b>Credits</b> |
| 1   | CHEM-471  | Electrochemistry & Statistical Thermodynamics  | 3+1            |
| 2   | CHEM-472  | Polymer Chemistry  | 3+0            |
| 3   | CHEM-473  | Quantum Chemistry & Molecular Spectroscopy   | 3+0            |
| 4   | CHEM-311/<br>CHEM-321/<br>CHEM-231/<br>CHEM-141 | Analytical Chemistry/Applied Chemistry/Biochemistry/ Fuel Chemistry/<br>(any other than the field of specialization) | 3+0            |
| 5   | CHEM-690  | Research Thesis /Group Research Project/Special Paper-I/<br>Special Practical-I                                      | 3              |
| <b>Total Credit Hours</b>                               |   |  | 16             |

| <b>Semester VIII (Analytical Chemistry Specialization)</b> |                                    |  |                |
|--|------------------------------------|--|----------------|
| <b>S.NO</b>  | <b>Course Code</b>                 | <b>Course Title</b>  | <b>Credits</b> |
| 1  | CHEM-414                           | Luminescence Spectroscopy & Thermal Analysis   | 3+1            |
| 2  | CHEM-416                           | Nuclear Analytical Techniques  | 3+0            |
| 3  | CHEM-415                           | Food & Drug Analysis   | 3+0            |
| 4  | CHEM-424/<br>CHEM-334/<br>CHEM-244 | Applied Chemistry/Biochemistry/Fuel Chemistry/<br>(any other than the field of specialization) | 3+0            |
| 5  | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-II/<br>Special Practical-II              | 3              |
| <b>Total Credit Hours</b>                                  |                                    |  | 16             |

| <b>Semester VIII (Applied Chemistry Specialization)</b> |                    |                          |                |
|---|--------------------|--------------------------|----------------|
| <b>S.NO</b>   | <b>Course Code</b> | <b>Course Title</b>      | <b>Credits</b> |
| 1   | CHEM-424           | Organic Based Industries | 3+1            |
| 2   | CHEM-425           | Industrial Processes     | 3+0            |
| 3   | CHEM-426           | Metallurgy & Explosives  | 3+0            |

|                           |                                    |  |     |
|---------------------------|------------------------------------|--|-----|
| 4                         | CHEM-414/<br>CHEM-334/<br>CHEM-244 | Analytical Chemistry/Biochemistry/Fuel Chemistry/<br>(any other than the field of<br>specialization) | 3+0 |
| 5                         | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-II/<br>Special Practical-II                    | 3   |
| <b>Total Credit Hours</b> |                                    |  | 16  |

| <b>Semester VIII (Biochemistry Specialization)</b> |                                    |  |                |
|--|------------------------------------|--|----------------|
| <b>S.NO</b>  | <b>Course Code</b>                 | <b>Course Title</b>  | <b>Credits</b> |
| 1  | CHEM-335                           | Microbiology & Immunology  | 3+1            |
| 2  | CHEM-334                           | Biotechnology  | 3+0            |
| 3  | CHEM-336                           | Nutritional Chemistry  | 3+0            |
| 4  | CHEM-414/<br>CHEM-424/<br>CHEM-244 | Analytical Chemistry/Applied Chemistry/ Fuel Chemistry/<br>(any other than the field of<br>specialization) | 3+0            |
| 5  | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-II/<br>Special Practical-II                          | 3              |
| <b>Total Credit Hours</b>                          |                                    |  | 16             |

| <b>Semester VIII (Fuel chemistry Specialization)</b> |                                    |   |                |
|--|------------------------------------|---|----------------|
| <b>S.NO</b>  | <b>Course Code</b>                 | <b>Course Title</b>   | <b>Credits</b> |
| 1  | CHEM-245                           | Chemistry of Coal Conversion Processes-II   | 3+1            |
| 2  | CHEM-246                           | Petroleum & Petrochemicals-II   | 3+0            |
| 3  | CHEM-244                           | Alternate Energy Sources  | 3+0            |
| 4  | CHEM-414/<br>CHEM-424/<br>CHEM-334 | Analytical Chemistry/Applied Chemistry/Biochemistry/<br>(any other than the field of<br>specialization) | 3+0            |
| 5  | CHEM-690                           | Research Thesis /Group Research Project/Special Paper-II/<br>Special Practical-II                       | 3              |
| <b>Total Credit Hours</b>                            |                                    |   | 16             |

| <b>Semester VIII (Inorganic chemistry Specialization)</b> |   |  |                |
|---|---|--|----------------|
| <b>S.NO</b>   | <b>Course Code</b>                              | <b>Course Title</b>  | <b>Credits</b> |
| 1   | CHEM-554  | Organometallics  | 3+1            |
| 2   | CHEM-556  | Symmetry & Magnetochemistry  | 3+0            |
| 3   | CHEM-555  | Radio & Nuclear Chemistry  | 3+0            |
| 4   | CHEM-414/<br>CHEM-424/<br>CHEM-334/<br>CHEM-244 | Analytical Chemistry/Applied Chemistry/Biochemistry/ Fuel<br>Chemistry/<br>(any other than the field of<br>specialization) | 3+0            |
| 5   | CHEM-690  | Research Thesis /Group Research Project/Special Paper-II/<br>Special Practical-II  | 3              |

|                           |    |
|---------------------------|----|
| <b>Total Credit Hours</b> | 16 |
|---------------------------|----|

| <b>Semester VIII (Organic chemistry Specialization)</b> |   |  |                |
|---|---|--|----------------|
| <b>S.NO</b>   | <b>Course Code</b>                              | <b>Course Title</b>  | <b>Credits</b> |
| 1   | CHEM-563  | Natural Products   | 3+1            |
| 2   | CHEM-565  | Organic Synthesis  | 3+0            |
| 3   | CHEM-562  | Medicinal Chemistry  | 3+0            |
| 4   | CHEM-414/<br>CHEM-424/<br>CHEM-334/<br>CHEM-244 | Analytical Chemistry/Applied Chemistry/Biochemistry/ Fuel Chemistry/<br>(any other than the field of specialization) | 3+0            |
| 5   | CHEM-690  | Research Thesis /Group Research Project/Special Paper-II/<br>Special Practical-II                                    | 3              |
| <b>Total Credit Hours</b>                               |   |  | 16             |

| <b>Semester VIII (Physical chemistry Specialization)</b> |   |  |                |
|--|---|--|----------------|
| <b>S.NO</b>  | <b>Course Code</b>                              | <b>Course Title</b>  | <b>Credits</b> |
| 1  | CHEM-575  | Reaction Dynamics  | 3+1            |
| 2  | CHEM-576  | Radiation & Photochemistry   | 3+0            |
| 3  | CHEM-574  | Colloid & Surface Chemistry  | 3+0            |
| 4  | CHEM-414/<br>CHEM-424/<br>CHEM-334/<br>CHEM-244 | Analytical Chemistry/Applied Chemistry/Biochemistry/ Fuel Chemistry/<br>(any other than the field of specialization) | 3+0            |
| 5  | CHEM-690  | Research Thesis /Group Research Project/Special Paper-II/<br>Special Practical-II                                    | 3              |
| <b>Total Credit Hours</b>                                |   |  | 16             |