Syllabi for 1 and 2 years

M.Sc. Degree

In

Chemistry

under CW+CW and CW+R modes

(as per NEP-2020)

for

2025 onwards

Department of Chemistry,

University of Kashmir,

Hazratbal, Srinagar

Program Objectives

Our postgraduate program in chemistry is aimed to produce quality human resource in chemistry with:

PO1: A strong subject command for educational services and analytical skills for forensic, food, diagnostic, quality control, and environmental analyses.

PO2: Ability to design and develop materials to extend solutions towards real world challenges of energy, environment and health related to local, regional and global concerns.

PO3: Aptitude to evaluate the toxicity, environmental impact, and sustainability of chemicals and chemical processes.

PO4: Demonstrate expertise in the extraction, synthesis, and structural modification of natural products and their analogs to develop innovative solutions for pharmaceutical, agricultural, and industrial applications.

PO5: Ability to apply computational techniques, information technology, and artificial intelligence (AI) tools to model, analyze, and predict the structural, electronic, and physicochemical properties of molecules for a wide range of scientific, industrial, and research applications.

PO6: Capability to develop catalytic materials and catalytic processes to optimize and innovate chemical processes for sustainable and efficient industrial applications.

PO7: Aptitude to design research methodology, interpret results, as independent researcher having necessary communication skill for presentation of scientific information under oration as well as manuscript drafting.

PO8: Ability to collaborate within interdisciplinary teams, integrating chemical knowledge with insights to biological, and other scientific domains to develop innovative and sustainable solutions to complex real-world problems.

PO9: Ability to buildup an entrepreneurial mindset and apply chemical knowledge to develop innovative solutions for chemistry-based startups.

PO10: Capability to provide expert consultancy in chemistry-related domains by applying theoretical knowledge, practical expertise, and problem-solving skills to industrial, environmental, domestic and research-based challenges.

Program Learning Outcomes

Graduates would:

PLO1: demonstrate proficiency in advanced mathematical, chemical analysis and laboratory techniques to address challenges in theoretical science, forensic science, healthcare, food safety, environmental monitoring, and quality assurance.

PLO2: design and develop sustainable chemical materials, mathematical modelling and processes to address real-world problems in energy, environment, and health, integrating principles of green chemistry and catalysis.

PLO3: apply computational tools, artificial intelligence, and modern research methodologies for molecular modeling, data analysis, and the development of innovative solutions, while demonstrating effective scientific communication and entrepreneurial thinking.

PLO4: demonstrate expertise in synthesizing and modifying natural and synthetic compounds for applications in pharmaceuticals, agriculture, and industry.

PLO5: demonstrate hands-on proficiency in operating, maintaining, and interpreting data from modern analytical instruments such as spectroscopy (UV-Vis, IR, NMR, AAS), chromatography (HPLC, GC), electrochemical methods, and thermal analysis tools, enabling accurate chemical analysis and research support.

PLO6: be proficient in designing, synthesizing, and characterizing functional materials such as catalysts, sensors, nanomaterials, and energy-storage materials for targeted applications in industry, environment, and healthcare.

PLO7: apply quantum chemical methods and molecular modeling software to predict, visualize, and interpret molecular structure, reactivity, and spectroscopic properties, supporting experimental design and research in chemical and material sciences.

Department of Chemistry

University of Kashmir, Hazratbal, Srinagar

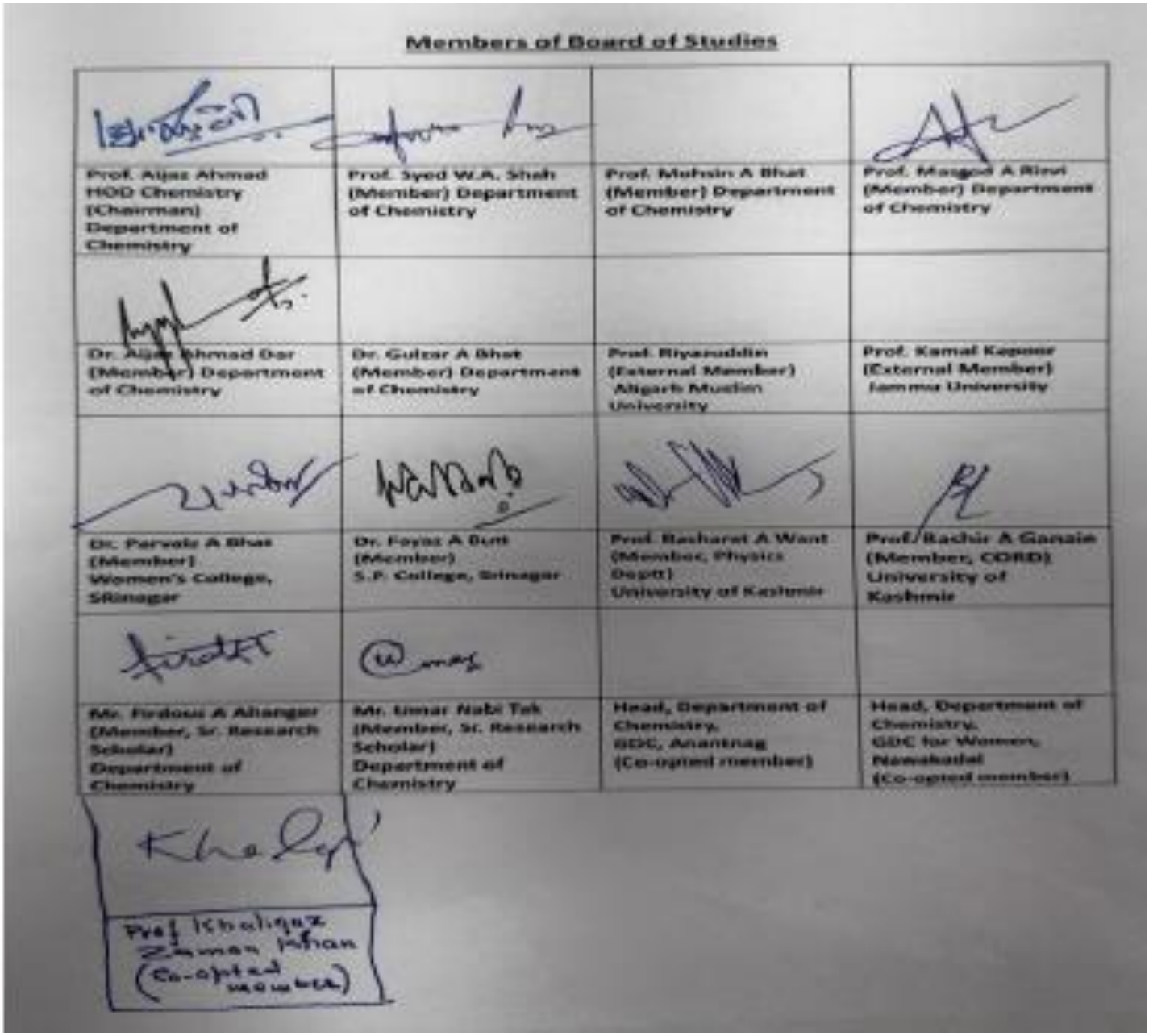
(NAAC Accredited Grade A^{++} University)

Course Structure for 2-year/1-year PG Program in Chemistry under (CW+CW) and (CW+R) modes of NEP-2020

NCrf Credit Level	Semester	Core Paper (Core/Elective) Course Name/Code	Course Level	Credit	Total Credits	Max. Marks			Cr. Dist.	Contact Hour
						Internal	End Sem	Total	L:T:P	
6	Sem-I (CW+R) and (CW+CW)	Physical Chemistry-MCHMCPC125	400	4	20	28	72	100	4:0:0	60
		Inorganic Chemistry-MCHMCIC125	400	4		28	72	100	4:0:0	60
		Organic Chemistry-MCHMCOC125	400	4		28	72	100	4:0:0	60
		Mathematics for Chemists-MCHMCMC125	400	2		14	36	50	2:0:0	30
		Group Theory and Applications-MCHMCGT125	400	2		14	36	50	2:0:0	30
		Laboratory Course in Chemistry-1-MCHMCLC125	500	4		28	72	100	0:0:4	120
	Sem-II (CW+R) and (CW+CW)	Physical Chemistry-MCHMCPC225	400	4	20	28	72	100	4:0:0	60
		Inorganic Chemistry-MCHMCIC225	400	4		28	72	100	4:0:0	60
		Organic Chemistry-MCHMCOC225	400	4		28	72	100	4:0:0	60
		Infrared, Raman and Electronic Spectroscopy - MCHMCSP225	400	2		14	36	50	2:0:0	30
		Organic Photochemistry and Radical Reactions - MCHMCPC225	400	2		14	36	50	2:0:0	30

		Laboratory Course in Chemistry-2-MCHMCLC225	500	4		28	72	100	0:0:4	120
		Total			**40**					**720 Hrs**
Exit option with Post-Graduate Diploma in Chemistry on completion of courses equal to a minimum of 40 credits. 3rd and 4th semesters of 2 year PG program will also be the same as two semesters for 1 year PG program										
6.5	Sem-III (CW+R) and (CW+CW)	Physical Chemistry-MCHMCPC325	500	4		28	72	100	4:0:0	60
		Inorganic Chemistry-MCHMCIC325	500	4		28	72	100	4:0:0	60
		Organic Chemistry-MCHMCOC325	500	4		28	72	100	4:0:0	60
		Designing Organic Synthesis -MCHMCOS325	500	2		14	36	50	2:0:0	30
		NMR and ESR Spectroscopy-MCHMCNE325	500	2		14	36	50	2:0:0	30
		Laboratory Course in Chemistry-3-MCHMCLC2325	500	4		28	72	100	0:0:4	120
	Sem-IV for (CW+R)	Tools and Techniques in Chemical Research - MCHMCCR425	500	4		28	72	100	4:0:0	60
		Research Project: Project Proposal, Lab work, Presentation and Dissertation-MCHMCRP425	500	16		120	280	400		300
	Sem-IV for (CW+CW)	Tools and Techniques in Chemical Research - MCHMCCR425	500	4		28	72	100	4:0:0	60
		Physical Chemistry-MCHMCPC425	500	4		28	72	100	4:0:0	60
		Inorganic Chemistry-MCHMCIC425	500	4		28	72	100	4:0:0	60
		Organic Chemistry-MCHMCOC425	500	4		28	72	100	4:0:0	60

		Advanced Lab Project - MCHMCLP-425	500	4		28	72	100	4:0:0	120
		Total		**40**						**720 Hrs**
Post-Graduate Degree in Chemistry with coursework and Research (CW+R) and Course work and Course Work (CW+CW) on completion of courses equal to a minimum of 80 credits for 2 year PG program and 40 Credits for 1 year PG program										



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Mr. Firdous A Ahanger (Member, Sr. Research Scholar) Department of Chemistry	**Mr. Umar Nabi Tak (Member, Sr. Research Scholar) Department of Chemistry**	**Head, Department of Chemistry, GDC, Anantnag (Co-opted member)**	**Head, Department of Chemistry, GDC for Women, Nawakadal (Co-opted member)**

Execution and Evaluation of 2-year and 1-year M.Sc Program in Chemistry (as per NEP-2020)

The M.Sc. Chemistry program offered by the Department shall be conducted in accordance with the statutes approved by the University. In addition, the following department-specific regulations shall apply:

1. Credit Requirements

- **Total Program Credits**:
  The program shall comprise a minimum of **80 credits**, distributed evenly across four semesters (**20 credits per semester**).
- **Core Course Requirement**:
  A minimum of **50% of the total credits** must be earned through **core courses** offered by the department. We offer **100% core courses** in our PG Program.
- **Credit Hour Definition**:
  - **1 Credit (Theory)** = 15 hours of lectures/tutorials
  - **1 Credit (Practical)** = 30 hours of laboratory work

2. Assessment Structure

- **Internal Assessments**:
  Two internal evaluations shall be conducted during each semester for each 4 credit course:
  - **First Internal Assessment**: After the completion of Units I & II
  - **Second Internal Assessment**: After the completion of Units III & IV

  However, only one internal shall be conducted for each 2 credit course.
- **Eligibility for End-Term Examination**:
  Clearing the internal assessment tests is **mandatory** to qualify for the **End Term Examinations** in each course.
- **Academic Support Provisions**:
  - **Remedial Classes**: Offered to students requiring academic support.
  - **Mentorship & Guidance**: Special academic recommendations and opportunities shall be extended to high-performing students for participation at **national and international platforms**.

3. Attendance & Evaluation Criteria

- **Attendance Requirement**:
  A minimum of **75% attendance** in all registered courses is required to appear for the end-semester examination.

- **Passing Criteria**:
  Students must secure a **minimum of 40% marks** in each paper (theory and practical) to be declared pass.
- **Conduct Requirement**:
  A **satisfactory record of moral and academic conduct** is essential for the final evaluation and award of degree.

4. Semester-wise Academic Structure

The 2 year M.Sc. Chemistry program is structured over **four semesters**, with core courses, and an option for research in the thrust areas of the department in the final semester.

Semesters I–III

Each of the first three semesters shall follow the structure below:

- **Core Papers**: 20 credits

Semester IV: (A) Research mode (CW+R)

We offer research mode in the IV semester of M.Sc Program where in the research work in the thrust areas of research of the department can be chosen by the student depending upon his/her interest. IV semester presents the following:

- **Core Paper**: 4 credits
- **Research Project**: Core Course
  - 16 credits assigned to a department-approved research project
  - Supervision by a designated faculty member
  - Includes submission of a written thesis/dissertation and a viva-voce examination
- **Total Semester Credits**: 20 credits

Semester IV: (B) Course work mode (CW+CW)

We offer course work mode also in the IV semester of M.Sc Program where in the advanced lab project in the thrust areas of research of the department can be chosen by the student depending upon his/her interest as 4 credit Core course. IV semester in CW mode presents the following:

- **Core Papers**: 16 credits
- **Advanced Lab Project**: Core course
  - 4 credits assigned to a department-approved research project
  - Supervision by a designated faculty member
  - Includes submission of a written thesis/dissertation and a viva-voce examination
- **Total Semester Credits**: 20 credits