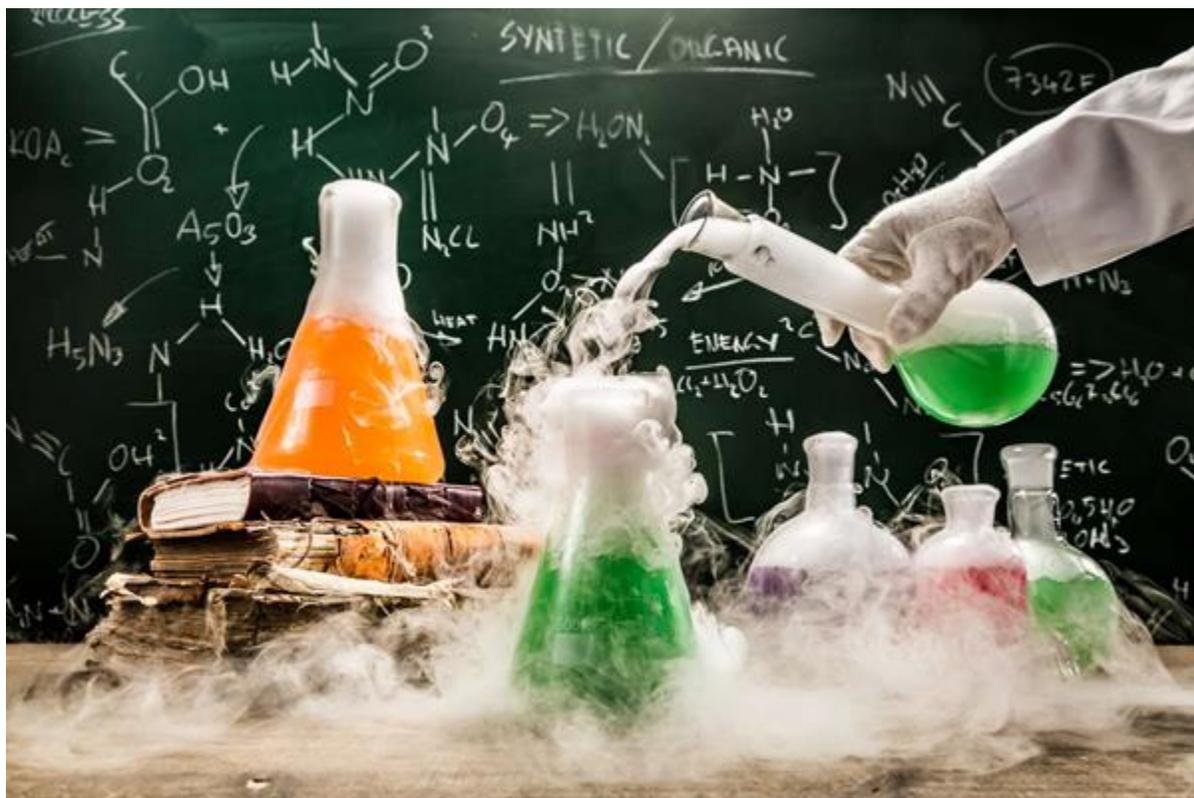




Department of Chemistry Maharshi Dayanand University, Rohtak



Strategic Plan (2025-2030)

About the Department

The Department of Chemistry was established in 1970 as a wing of the Regional Centre, Punjab University, Chandigarh, and later on, it became part of the Regional Centre of the Kurukshetra University in 1974. Maharshi Dayanand University was established in 1976, and the Department of Chemistry was integrated into the university.

The Department of Chemistry offers M.Sc. program in chemistry with three specializations, i.e. inorganic, physical, and organic chemistry. The department also provides good opportunities for research at doctoral and post-doctoral levels on a variety of topics in conventional as well as interdisciplinary areas of chemistry through collaborative research with other departments and institutions. Several seminars, symposia, and workshops are regularly organized in the department as a part of its academic activities. The University Grants Commission had given special grants to the department to organize a variety of Refresher Courses in Chemistry.

The Department of Chemistry admits over 100 students at entry level in M.Sc. course every year through an entrance examination strictly on a merit basis. In the second year of the M.Sc. program, the students opt for specializations in inorganic, physical, and organic chemistry. At present, about 35 students are actively engaged in research work for the Ph.D. program in the department. In addition, several research scholars from the allied departments and Pt. Bhagwat Dayal Sharma University of Health Science, Rohtak, are also associated with the Department of Chemistry via collaborative research. The Department of Chemistry collaborates with several reputed national and foreign institutes, such as the Korea Institute of Energy Research (KIER) Daejeon, South Korea, National Physical Laboratory (NPL), New Delhi, Central Electronic Engineering Research Institute (CEERI), Pilani, and University of Polytechnica, Valencia, Spain. A grant of Rs. 1.18 crore had been awarded to the department by UGC, New Delhi under SAP programme. The FIST grant (2025-2030) of Rs. 1.92 crore has been sanctioned to the Chemistry department by The Department of Science & Technology (DST), New Delhi to strengthen the infrastructure for Research & Development (R&D).

Vision

The Department of Chemistry is committed to academic excellence, pioneering research, and impactful industrial collaboration. Our strategic plan focuses on advancing innovation, fostering interdisciplinary learning, and aligning with the National Education Policy (NEP) to boost academic and professional growth. By integrating modern pedagogy, cutting-edge technology, and global partnerships, we aim to develop skilled professionals who contribute to scientific advancements for the nation's progress.

Mission

The Department of Chemistry will promote interdisciplinary and international collaborations for quality research and excellence in teaching and innovation. Sustainability, technological progress, and real-world problem-solving capabilities are the main focus of our mission.

Key Strategies for Advancement in Learning and Research

To achieve its Vision and Mission, the Department of Chemistry will strive hard for:

- 1. Quality research publications**
- 2. Securing ample research funding**
- 3. Consultancy projects**
- 4. National and international collaborations**
- 5. Patent filing for innovations**
- 6. Enhancement in infrastructure facilities**
- 7. Complete implementation of NEP 2020**

1. Quality research publications

The Department of Chemistry, Maharshi Dayanand University, Rohtak, has a rich legacy of quality research publications. Our first research article, published in **1979** by **P.P. Singh and B.R. Sharma** in *Thermochimica Acta* (**Impact Factor: 3.1**), marked the beginning of a strong research foundation.

Since its inception, the Department of Chemistry has significantly contributed to scientific research, publishing **over 2,000** research articles in esteemed journals across various disciplines. The prominent journals in the research areas include the **Journal of Photochemistry and Photobiology A: Chemistry**, **RSC Advances**, **Coordination Chemistry Reviews**, **Inorganic Chemistry Communications**, and **Bioorganic Chemistry**. Additionally, research in organometallic chemistry, fluorescence, heterocyclic and medicinal chemistry is reflected in publications such as **Applied Organometallic Chemistry**, **Journal of Fluorescence**, **Future Medicinal Chemistry**, **Green Chemistry Letters and Reviews**, **European Journal of Medicinal Chemistry Reports**, **Medicinal Chemistry Research**, **Journal of Iranian Chemical Society**, **Chemistry & Biodiversity** and **Bioorganic and Medicinal Chemistry Letters**.

The Department of Chemistry has also advanced research in environmental and sustainable sciences, with publications in **Environmental Research**, **Sustainable Materials and Technologies**, **Materials Today Sustainability**, and **Chemosphere**. Its contributions to chemical engineering and catalysis are evident in journals such as the **Journal of the Taiwan Institute of Chemical Engineers**, **Journal of Industrial and Engineering Chemistry**, **Catalysts**, **Energy & Fuels**, and **International Journal of Hydrogen Energy**.

In the field of materials science, the department has notable publications in the leading international journals such as **Journal of Alloys and Compounds**, **Journal of Saudi Chemical Society**, **Materials Science in Semiconductor Processing**, **Materials Research Bulletin**, **Ceramics International**, and **Journal of Molecular Structure**.

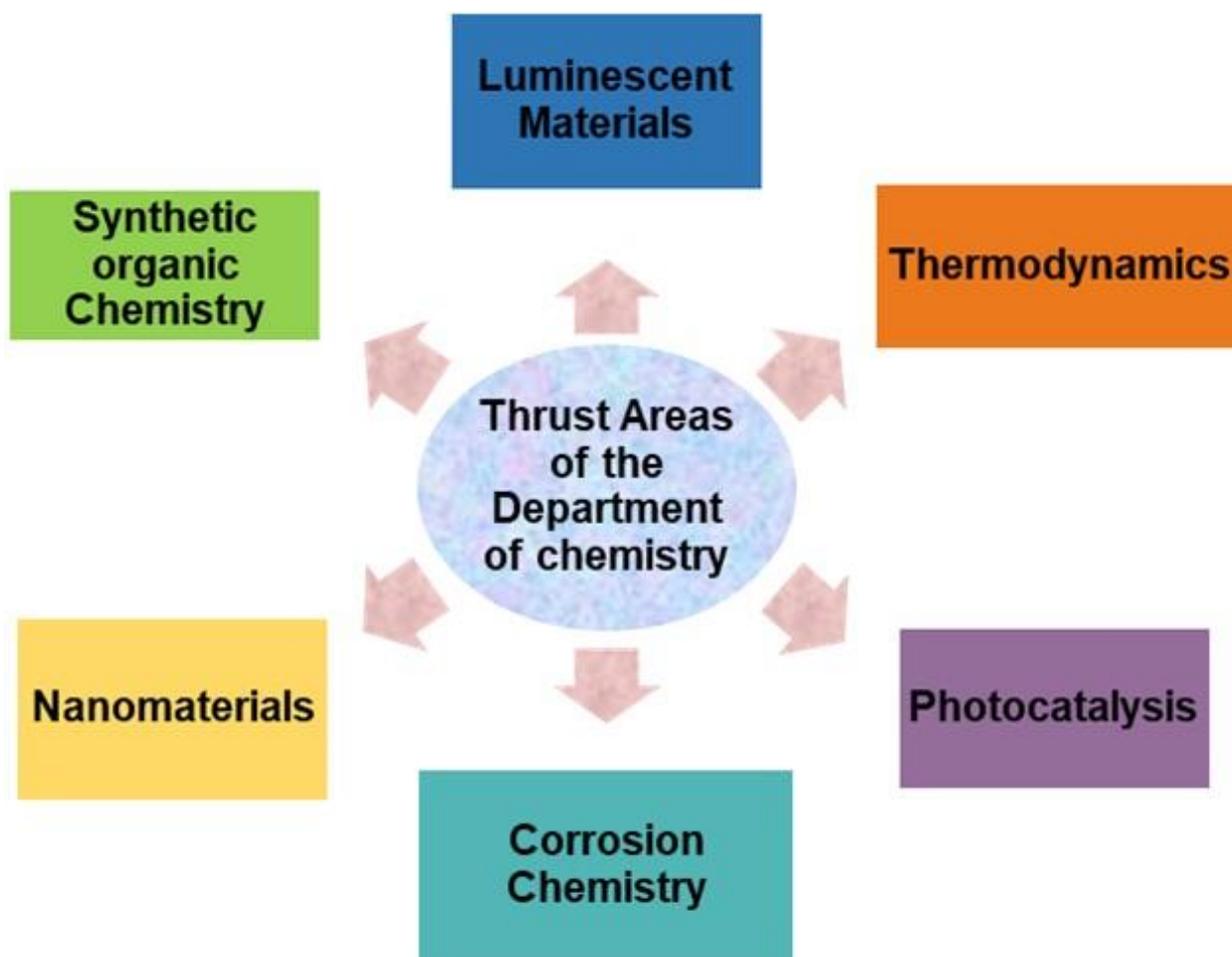
Furthermore, the department's expertise in thermodynamics is reflected in publications in **Fluid Phase Equilibria**, **Journal of Chemical Thermodynamics**, **Journal of Molecular Liquids**, **Thermochimica Acta**, and **Colloids and Surfaces A: Physicochemical and Engineering Aspects**. Through these extensive publications, the department continues to make a profound impact in the fields of **thermochemistry**, **electrochemistry**, **nanotechnology**, **heterocyclic chemistry**, **green chemistry**, and **materials science**, reinforcing its commitment to pioneering research and innovation.

1.1 Significant growth in research publications: Department of Chemistry vs. Maharshi Dayanand University (Last Five Years*):

Year	Research publications of the Department of Chemistry	Total research publications of the M. D. University	% Contribution of the Department of Chemistry in the total research publications of the university
2020	56	537	10.40
2021	73	533	13.69
2022	155	822	18.85
2023	159	910	17.47
2024	175	994	17.60
Feb, 2025	35	170	20.58

*As per the record fetched from SCOPUS database

Over the past five years, the Department of Chemistry has demonstrated remarkable growth in research output. The department's contribution to the university's total research publications has remarkably increased, rising from **10 % to 20 %** in the last five years. This substantial progress reflects the department's commitment to high-quality research, faculty engagement, and valuable research collaborations. The consistent growth also highlights the department's pivotal role in strengthening the university's overall research ecosystem, reinforcing its prominence in the academic and scientific community.



MAJOR RESEARCH AREAS OF THE DEPARTMENT OF CHEMISTRY

1.2 Future targets and vision

Building on this success, the department strives to enhance its research impact, aiming for the highest possible contribution to the overall research excellence of the university with the main focus on:

- Increasing research funding and grant acquisition.
- Strengthening interdisciplinary research collaborations.
- Encouraging high-impact publications in reputed journals.
- Enhancing student and faculty participation in national and international research projects.
- Expanding infrastructure and laboratory facilities to support advanced scientific studies.

With these strategic initiatives, the Department of Chemistry is committed to advancing scientific research and reinforcing its position as a leading contributor to the academic excellence of Maharshi Dayanand University.

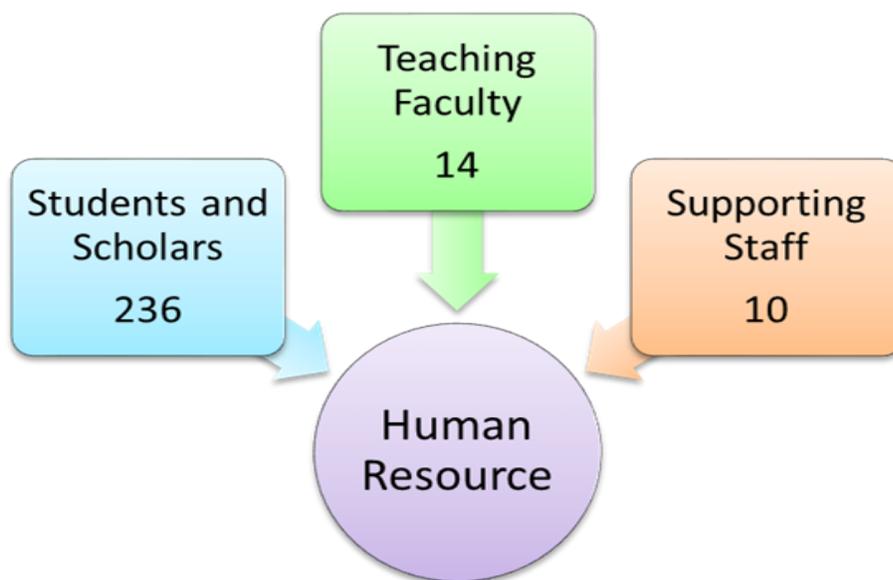
1.3 Faculty Achievements and recognitions

- **03** Faculty members (**Prof. Devender Singh, Prof. V.B. Taxak, and Dr. Naveen Kumar**) and **06 Scholars** are ranked **in the top 2%** of the world's leading Scientists database released by **Stanford University USA and Elsevier [Sept. 2024 and Oct. 2023]**.
- **Prof. S.P. Khatkar** is ranked in **the top 2% of the world's leading scientists**, according to the database released by **Stanford University, USA, and Elsevier in 2023**.
- **Prof. Ishwar Singh, Prof. S.P. Khatkar, and Prof. K.C. Singh** were awarded the **prestigious Brain Pool fellowship** by Korean Federation of Science & Technology, South Korea, to work with **Prof. S.D. Han, Korea Institute of Energy Research, Daejon, South Korea**.
- Prof. Devender Singh was awarded the **M.D.U. Best Researcher Award (2023)**.
- Prof. Devender Singh was awarded the **M.D.U. Research Excellence Award (2022)**.
- Dr. Rajesh Kumar Malik was awarded the **M.D.U. Best Researcher Award (2022)**.
- **The Indian Science Congress Association awarded Prof. S.P. Khatkar the J.C. Bose Memorial Award** for his outstanding contributions to scientific research for the year 2019-2020.
- **Dr. Devender Singh, Dr. Hariom, and Dr. Naveen Kumar:** Selected for FP7 Marie Curie International Research Staff Exchange Scheme in March-April 2014.
- **Dr. Devender Singh, Dr. Hariom, and Dr. Naveen Kumar:** Selected for FP7 Marie Curie International Research Staff Exchange Scheme in March-April 2013.
- **The NACE International India Section awarded Prof. R.S. Chaudhary for his Distinguished Contribution in Corrosion Control.** He received this most prestigious award in Corrosion Science and Engineering in India for his significant work in the field of corrosion science in 2003.
- **Prof. R.S. Chaudhary** was awarded the **M.D.U. Research Excellence Award (1999)**.
- **Prof. R.S. Chaudhary** was a fellow of the Royal Society of Chemistry, UK.
- **Prof. R.S. Chaudhary** was a fellow of the Max-Planck Society, Germany in 1978.

These prestigious awards highlight the department's commitment to excellence in research and innovation.



ACHIEVEMENTS OF THE DEPARTMENT IN THE LAST FIVE YEARS



HUMAN RESOURCE OF THE DEPARTMENT

2. Securing ample research funding

The Department of Chemistry has consistently advanced research by securing competitive funding and fostering meaningful collaborations at both national and international levels. The department actively engages in collaborative projects with global partnerships addressing critical scientific and societal issues.

2.1 International project

The Department of Chemistry strives for international collaborations vital for inculcating global footprints and addressing worldwide challenges.

Name	Title of Project	Amount	Funding Agency
Prof. K.C. Singh	Nano CIGS based Solar Cells	287 Lakhs	European Union, Spain

2.2. National projects

The Department of Chemistry has successfully completed several national projects across various fields of chemistry. These projects have spanned several critical areas, including sustainable chemistry, materials science, and environmental protection.

To further strengthen the research ecosystem, the Department of Chemistry is committed to:

- **Collaborate with government agencies** and research councils to explore the issues of national priority related to energy, environment, and public health.
- **Strengthen collaborations** with leading academic institutes and industries to foster research and innovation.

Projects awarded to the Department of Chemistry

Funding Agency	Year	Amount
DST-FIST	2025-2030	1.92 Crores
UGC-SAP (DRS 1) F-540/17/DRS1/2016	2016-2021	1.18 Crores
DST-FIST	2010-2015	1.09 Crores
DST-FIST	2005-2010	0.20 Crores

Individual projects completed

S. No	Name	Title of Project	Amount	Funding Agency
1	Prof. Devender Singh	Fluorescence characteristics of conjugated lathamide metallopolymers for light emitting applications	3431890/-	SERB-DST, Delhi
2	Dr. Vinod Bala	Metal complexes for organic light emitting devices, 2012	1200000/-	UGC, New Delhi
3	Dr. Naveen Kumar	Anodic oxide films on metals and alloys, 2011	897500/-	UGC, New Delhi
4	Prof. Devender Singh	Growth and optoelectronic characterization of phosphor materials, 2011	827300/-	UGC, New Delhi
5	Prof. P.S. Kadyan	Newer metal complexes for organic light emitting devices, 2011	848000/-	UGC, New Delhi
6	Prof. V.K. Sharma	Topological and thermodynamic studies of Liquid Mixture containing ionic liquids, 2010	959600/-	UGC, New Delhi
7	Prof. S.P. Khatkar	Organic metal complexes as light emitting materials	8000000/-	UGC, New Delhi
8	Prof. Ishwar Singh	Synthesis and characterisation of phosphorescent and electroluminescent materials	370560/-	UGC, New Delhi
9	Prof. K.C. Singh	Thermodynamics of binary mixtures of non-electrolytes	201300/-	UGC, New Delhi
10	Prof. R.S. Chaudhary	A study of antiscalants and corrosion inhibitors for industrial cooling water system	280500/-	UGC, New Delhi

2.3. Foreign visits

The Department of Chemistry has also facilitated the international research trips of faculty members to various countries viz. Singapore, USA, UK, Spain, Portugal, Germany, and South Korea for exploring viable research collaborations.

3. Consultancy research

The Department of Chemistry is committed to expanding its consultancy portfolio by collaborating with government agencies and industry partners to facilitate the application of laboratory research to real-world challenges, particularly in the fields of sustainable energy, healthcare, and materials science.

The Department of Chemistry will focus on fostering interdisciplinary projects bridging chemical sciences with environmental and medicinal sciences. We aim to establish new research centers dedicated for solving critical national and global issues.

4. National and international collaborations

4.1. National collaborations

The Department of Chemistry has formalized an agreement with A. Kamlasanan, N. P. L., India through the signing of an MOU. The department has a national partnership with the Central Electronics Engineering Research Institute (CEERI) for collaborative research.

4.2. International collaborations

International collaborations are vital for enhancing our global footprint and ensuring that our research addresses worldwide challenges. The Department of Chemistry has formed a collaborative partnership with South Korea, with the active participation of faculty members: **Prof. Ishwar Singh (visited twice), Prof. K.C. Singh, Prof. S.P. Khatkar (visited twice), Prof. R.S. Chaudhary, and Prof. Vinod Bala.** In addition, three research scholars, Dr. Ravi Rana, Dr. Devender Singh, and Dr. Dinesh Kumar, have completed their Ph.D. thesis in collaboration with KIER South Korea. The department was also involved in a European Union project, where eight faculty members participated in the research project.

5. Patents filing for innovations

The Department of Chemistry made significant contributions through patents and innovations in the field of:

- **Thermochemistry & Electrochemistry:** Advanced materials for energy efficiency, batteries, and corrosion prevention.
- **Solid-State & Material Science:** Functional nanomaterials for industrial, pharmaceutical, and environmental use.
- **Organic Chemistry:** Green synthesis of bioactive compounds and drugs.
- **Organic Electronics & OLEDs:** Lithium metal quinolates for electronic devices and improved electron injection layers for OLED efficiency.

Name	Patent Title	Awarding Agency	Authors
Prof. Ishwar Singh	Lithium metal quinolates and process for preparation thereof as good emitting, interface materials as well as N-type dopants or organic electronic devices.	US 2013/0015431 A1	Prof. S.K. Dhawan, Prof. M.N. Kamlasanan, Prof. Ritu Shrivastava, Prof. Amit Kumar, Prof. Ishwar Singh and Prof. S.S. Bawa
Prof. Ishwar Singh	Process for growing an electron injection layer to improve the efficiency of organic light emitting diodes.	US 2013/ 8491820	Prof. S.K. Dhawan, Prof. M.N. Kamlasanan, Prof. Ritu Shrivastava, Prof. Amit Kumar, Prof. Ishwar Singh and Prof. S.S. Bawa

6. Enhancement in infrastructure facilities

The Department of Chemistry is striving hard for infrastructure enhancement, including the installation of advanced, sophisticated research instruments, well-equipped ventilated laboratories, high-tech smart classrooms, a multipurpose seminar hall (capacity of more than 300 people), and fully functional computer labs to facilitate advanced learning and innovation for M.Sc. students and research scholars.

7. Implementation of NEP 2020

To achieve the highest academic standards and credibility of the offered courses, the syllabus is precisely designed and regularly updated as per the academic and industrial requirements. The Department of Chemistry has successfully implemented the **National Education Policy (NEP) 2020** for both undergraduate and postgraduate programs by **July 2024**. This transformation enhances cognitive learning using Bloom's Taxonomy and incorporates modern pedagogical approaches to ensure effective teaching, research, and practical applications. The curriculum integrates theoretical knowledge with hands-on training through various laboratory experiments, multidisciplinary courses, skill enhancement courses, and real-world applications.

Key initiatives in curriculum as per Bloom's Taxonomy & Pedagogy

7.1. *Multidisciplinary and holistic education (Understanding & Applying):*

- To integrate chemistry with allied sciences.
- To adopt constructivist pedagogy, encouraging students to relate concepts across disciplines.

7.2. *Skill-based and research-oriented learning (Applying & Analyzing):*

- To conduct hands-on experiments, project-based learning, and industry-driven research.
- To strengthen laboratory-based learning with modern equipment and innovative experiments.
- To foster application-based learning to explore scientific experiments such as:
 - Synthesis of industrially important simple dyes.
 - Checking adulteration in food materials and analyzing the reactivity of aldehydes through Silver Mirror and Fehling's solution tests.
 - Solvent-free synthesis of organic compounds under the principle of green chemistry.
 - EDTA titrations are used to check the hardness of water along with selective metal ion estimation using masking/demasking techniques.
 - Ultrasonic Interferometry & Spectrocolorimetry for measuring sound velocity in liquids and verifying Lambert-Beer's Law.

7.3. *Chemistry in daily life (Understanding & Applying):*

- To incorporate real-world applications of chemistry for environmental sustainability, healthcare, and material sciences.
- To Use contextual learning pedagogy, helping students to connect theoretical knowledge with everyday experiences focusing on:

- Green chemistry approaches in synthesizing metal acetylacetonates and nanoparticles.
- Soap preparation via saponification.
- Alcohol detection tests and their industrial significance in pharmaceuticals, cosmetics, and food industries.
- Application of surface tension and conductometry to investigate molecular interactions and electrolyte behavior.
- Application of refractometry and thermochemistry to study atomic/molecular refractivities and heat of solution/hydration.

7. 4. Flexible curriculum and credit system (Evaluating & Creating):

- To design modular course structure with multiple entry/exit options for both U.G./P.G. students.
- To award credit scores for industrial, research, and skill-based experience to foster innovation.

7. 5. Industry-academia collaboration (Applying & integrating):

- To strengthen industry partnerships through internships, consultancy projects, and industrial visits.
- To develop problem-based learning to solve real-world industrial challenges by applying:
 - Principles of green chemistry for sustainable industrial growth.
 - Safer and more efficient chemical separation, purification and chemical waste management practices.

7. 6. Research and Innovation Ecosystem (Creating & Evaluating):

- To encourage high-impact research and technology-driven advancements.
- To promote collaborative learning models in research and industry-driven solutions.

7.7 Student-Centric Education for Ethical and Responsible Citizenship:

The Department of Chemistry is committed to the holistic education of students with:

- **Moral and Ethical Development** – To integrate value-based education to instill integrity, empathy and social responsibility in students.
- **Civic Awareness and Nation-Building** – To educate students about their roles as responsible citizens, fostering patriotism, social justice, and community engagement.
- **Holistic Personality Growth** – To encourage critical thinking, leadership, and ethical decision-making through academic and extracurricular activities.

By implementing NEP 2020 through Bloom's Taxonomy-driven learning objectives and pedagogical best practices, the Department of Chemistry has created a dynamic, research-intensive, and industry-aligned academic environment. With a focus on practical knowledge, hands-on experimentation, and real-world applications, students gain valuable expertise in chemical analysis, quality control, environmental assessment, and industrial processes, equipping them with critical thinking, problem-solving, and innovation-driven skills to excel in the global scientific and industrial landscape.

GENERAL ACTION PLAN

- ✓ In the academics syllabus framework, the critical learning modes play a prominent role in the skill development and quality improvement. Keeping this in view, the syllabus will be enriched regularly as per the local and global requirements. As per the growing demand of the skilled chemistry professional in the academic and industrial sector, the syllabus will be revised to meet the requirements of competitive examinations like GATE, CSIR UGC NET etc. to enhance the vocational competence of the students.
- ✓ The efforts will be made to strengthen the department through faculty enrichment programs and through recruitment of new faculties in the department.
- ✓ Induction and welcome programmes for the newly admitted students will be organized every year at the start of the academic session.
- ✓ Expert extension lectures will be organized from distinguished faculties over diverse topics in the field of chemical sciences to expand the global horizons of chemistry students.
- ✓ One educational tour will be programmed every year to boost the extra-curricular capabilities of the students.
- ✓ National and international conferences will be organized in the month of November or December to explore the recent trends in chemical sciences.
- ✓ National Science Day will be celebrated every year on 28th February to inculcate the scientific spirit in P.G. students.
- ✓ Annual sports meet will be organized every year to inculcate the team spirit in students.
- ✓ Career and placement oriented workshops will be organized every year to enhance the soft skills and employability potential of M.Sc. students.
- ✓ A green and clean drive will be organized every year to foster the spirit of environmental protection and sustainable development in the students.

- ✓ Research and class laboratory will be strengthened by the introduction of advanced laboratory materials and practices.
- ✓ Efforts will be made to submit more research proposals to various funding agencies by the faculty members.
- ✓ Efforts will be made to collaborate with national and international academic institutes and laboratories.
- ✓ Student will be encouraged by consultation programs for towards various international fellowships.

SWOC Analysis

Strength

- The department has highly qualified and dedicated faculty with work experience of international research institutes.
- The department is equipped with highly sophisticated instruments such as XRD, SEM, Differential Scanning Calorimeter, Densimeter, UV Visible, Spectrofluorimeter, FT-IR, and TGA/DTA for research and well-equipped laboratories for P.G. program.
- On average, more than 30 research scholars are enrolled in the department with research fellowships from national-level funding agencies like CSIR, UGC, DST, etc.
- The department has a high-quality research output and has published over 653 research papers in high-repute national and international journals in the last five years.
- The department has notable international research collaborations in India and abroad with countries like South Korea, Spain, Portugal, and Poland.
- The department has received grants under DST -FIST, UGC-SAP and many other individual major research projects from CSIR, UGC and DST.
- The department received highly reputed PURSE Grant by DST.
- Lease high-speed internet connectivity and access to global online research database and resources.
- The syllabi are updated on a regular basis.
- The theory and practical classes are conducted regularly with almost 90 % student attendance.

Weakness

- At present, the department is facing crises of regular teaching faculties.
- With the increasing number of Ph.D. scholars and the requirements of materials and equipment, the department is facing a scarcity of funds.
- The department is in great need of a seminar hall having a capacity of more than 300 persons as there is an annual intake of the 90 students of M.Sc. Previous and 90 students of M.Sc. Final, along with more than 35 research scholars.

Opportunities

- Chemistry as a subject has countless applications and extensive demand in teaching and applied sciences.
- Chemistry has a profound role in uplifting human life and is closely related to the biological and physical sciences with significant applications in pharmaceutical, agricultural, chemical industries, forensic sciences, and material sciences.

Challenges

- To meet the growing demand for the subject, our department needs better infrastructure facilities and more funding. The appointment of highly qualified permanent faculties against the sanctioned vacant posts will strengthen the department's academic and research ecosystem and establish it as a Centre of Excellence.

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