**School of Engineering & Sciences**

MIT UNIVERSITY
ART, DESIGN & TECHNOLOGY

**MIT-ADT UNIVERSITY**
PUNE, INDIA
A Leap Towards World Class Education

**Programme Curriculum**

## MASTER OF SCIENCE

**PATTERN 2023**

# Chemistry

## Faculty of Engineering & Sciences

**MIT-ADT UNIVERSITY**
PUNE, INDIA
A Leap Towards World Class Education

# SCHOOL OF ENGINEERING AND SCIENCES PUNE

## STRUCTURE & SYLLABUS

### FOR

## M. Sc. Chemistry

**UNDER FACULTY OF ENGINEERING AND SCIENCES**

**2 Year Postgraduate Course sanctioned by AC & BoS**

**(Pattern 2023 w.e.f. 2023-2024)**

# Department of Applied Science and Humanities

# MIT Art, Design and Technology University
## School of Engineering and Sciences
### Department of Applied Science and Humanities

## VISION

Laying a solid scientific and technological foundation while adopting a proactive multidisciplinary approach and upholding ethical principles for the holistic development of the students as torchbearers for advancement.

## MISSION

Facilitating all-around development of students in a conducive environment through a scientific attitude, technical skills and design thinking for solution-based approach.

# Program Outcomes

**After completing M.Sc. Chemistry program, students will be able to:**

PO1 : Demonstrate and apply the fundamental knowledge of the basic principles in various fields of Chemistry

PO2 : Apply knowledge to build up small scale industry for developing endogenous product.

PO3 : Communicate scientific information in a clear and concise manner both orally and in Writing.

PO4 : Inculcate logical thinking to address a problem and become result oriented with a positive attitude

PO5 : Enhance the scientific temper among the students so as to develop a research culture and implementation of the policies to tackle the burning issues at global and local level.

PO6 : Provide the professional services to industry, Research organization, institutes.

PO7 : Provide the professional consultancy and research support for the relevant organization in the domain of super specialization.

PO8 : Opt for higher education, disciplinary & multi-disciplinary research and to be a life-long learner.

PO9 : Provide, value based and ethical leadership in the professional and social life.

# Program Educational Objectives (PEO's)

**The program is expected to enable the students:**

PEO 1 : To achieve good academic and research skills to meet the professional challenges in multidisciplinary environments.

PEO 2 : To inculcate the sense of ethics, professionalism and effective communication skills within realistic constraints of society and environment for sustainable development.

**PEO 3** : To adapt to rapidly changing technologies and develop innovative applications in chemical sciences.

**PEO 4** : To pursue higher studies in related fields of research or management.

**PEO 5** : To successfully compete in competitive examinations and pursue career in academics, research or entrepreneurship.

# Program Specific Outcomes (PSO)

The program is expected to deliver at the time of graduation:

**PSO 1.**  : Demonstrate basic and advanced knowledge in the field of analytical, inorganic, organic and physical and industrial chemistry.

**PSO 2.**  : Enhanced practical exposure leads to career opportunities in pharmaceutical, semiconductor and other industries.

**PSO 3.**  : Enhanced employability to work as analytical chemist, production chemist, Research & Development Manager, Industrial Research Scientist and Material Technologist.

**PSO 4.**  : Lifelong learning leads to opportunities related to pursue higher studies and become eligible for working in R&D and QC labs.

**PSO 5.**  : Inculcate scientific knowledge about advanced writing; documentation, designing and computational, mathematical skills along with enhanced communication skills.

**PSO 6.**  : Analyze and apply specialized knowledge of industrial chemicals, processing and properties in problems related to industry and environment of society.

**PSO 7.**  : Develop presentation skills and confidence required to work individually and in a team in any organization.

**PSO 8.**  : Appraise about the principle and working of Spectroscopic, analytical and physical instruments for matter analysis and characterization.

**PSO 9.**  : Enhance experimental skills and learn to organize data.

**PSO 10.**  : Enhance all round personality by dissertation, presentation, industrial visits and training programs for lifelong learning with moral values.

# Course Structure

## M.Sc Chemistry-Medicinal Chemistry / M.Sc Chemistry-Advanced Organic Chemistry

**Semester I**

| Sr. No. | Course code | Type of Course | Course | L | T | P | Credits | Scheme of Examination | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CA | FE | |
| 1 | 23MSCH101 | C | Physical Chemistry-I | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 2 | 23MSCH102 | C | Inorganic Chemistry | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 3 | 23MSCH103 | C | Organic Reaction Mechanism | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 4 | 23MSCH111 | C | Separation & Purification of Organic Compounds | 0 | 0 | 8 | 4 | 50 | 50 | 100 |
| 5 | 23MSCH112 | C | Synthesis, Analysis in Inorganic and Physical Chemistry | 0 | 0 | 8 | 4 | 50 | 50 | 100 |
| 6 | 22MSEC001 | AEC* | Communicative English | 1 | 1 | 0 | 2 | 50 | - | 50 |
| | | | **Total** | 13 | 1 | 16 | **22** | 300 | 250 | 550 |

**\* Non-CGPA mandatory course**

| Total Credits | C | GE | DSE | AEC | SEC | UC |
|---|---|---|---|---|---|---|
| **22** | 20 | - | - | 2 | - | - |

**Semester II:**

| Sr. No. | Course code | Type of Course | Course | L | T | P | Credits | Scheme of Examination CA | Scheme of Examination FE | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23MSCH201 | C | Physical Chemistry-II | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 2 | 23MSCH202 | C | Biochemistry | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 3 | 23MSCH203 | C | Synthetic Organic Chemistry | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 4 | 23MSCH204 | C | Supramolecular Chemistry | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 5 | 23MSCH211 | C | Organic Synthesis | 0 | 0 | 8 | 4 | 50 | 50 | 100 |
| 6 | 23MSCH205 | SEC* | Software in Chemistry | 1 | 0 | 2 | 2 | 50 | 00 | 50 |
| 7 | 20APT0202 | UC* | Professional and Aptitude Skills Training | 1 | 0 | 2 | 2 | 50 | 00 | 50 |
| | | | **Total** | 18 | 0 | 12 | **24** | 350 | 250 | **600** |

**\* Non-CGPA mandatory course**

| Total Credits | C | GE | DSE | AEC | SEC | UC |
|---|---|---|---|---|---|---|
| **24** | 20 | - | - | - | 2 | 2 |

**Semester III**

| Sr. No. | Course code | Type of Course | Course | L | T | P | Credits | Scheme of Examination CA | Scheme of Examination FE | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23MSCH301 | C | Advanced Separation and Hyphenated Techniques in Analytical Chemistry | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 2 | 23MSCH302 | C | Stereochemistry | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 3 | 23MSCH303 | C | Structural Characterization of Organic Molecules | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| 4 | 23MSCH331 | GE | Elective I | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 5 | 23MSCH333 | DSE | Elective II | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 6 | 23MSCH321 | C | Technical Seminar | 0 | 0 | 4 | 2 | 50 | - | 50 |
| 7 | 23MSCH311 | C | Advanced Synthesis I | 0 | 0 | 8 | 4 | 50 | 50 | 100 |
| | | | **Total** | **19** | **1** | **12** | **26** | **350** | **300** | **650** |

| Total Credits | C | GE | DSE | AEC | SEC | UC |
|---|---|---|---|---|---|---|
| **26** | 18 | 4 | 4 | - | - | - |

**Semester IV**

| Sr. No. | Course code | Type of Course | Course | L | T | P | Credits | Scheme of Examination CA | Scheme of Examination FE | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23MSCH401 | C | Designing of Organic Molecules | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| 2 | 23MSCH431 | GE | Elective III | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 3 | 23MSCH433 | DSE | Elective IV | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| 4 | 23MSCH421 | DSE | Practical Elective | - | - | - | 6 | 75 | 75 | 150 |
| 5 | 23MSCH411 | C | Advanced Synthesis II | 0 | 0 | 8 | 4 | 50 | 50 | 100 |
| | | | **Total** | **11** | **1** | **8** | **22** | **275** | **275** | **550** |

| Total Credits | C | GE | DSE | AEC | SEC | UC |
|---|---|---|---|---|---|---|
| **26** | 8 | 4 | 10 | - | - | - |

**CA = Continuous Assessment, FE= Final Examination,**

**\*\*Final Lab exam will be conducted with viva-voce of the respective practical (50 exam +10 viva = 60)**
**Coding for course/ subject: 23MSCH101,** Where; **21** = Year of BOS, **MSCH** = Programme Code (MS for Master of Science, CH for Chemistry), **1**= Semester No.,
**01 to N** = Sequence No of Subject: (01-10 for Theory, 11-20 for practical, 21-30 for Technical Seminar/ Mini Project/ Major Project, 31-40 for Electives with/ without Practical).

**LIST OF ELECTIVES**

| Elective | Course Code | Course Name |
|---|---|---|
| Elective I *(Students can chose any one of the two electives)* | 23MSCH331 | ➤ Heterocyclic and Organometallic Chemistry |
| | 23MSCH332 | ➤ Free radical and pericyclic reactions |
| | 23MSCH333 | ➤ Nanochemistry |
| | | |
| Elective II *(Students can chose any one of the two electives)* | 23MSCH334 | ➤ Medicinal Chemistry |
| | 23MSCH335 | ➤ Natural Products and Organic synthesis |
| | 23MSCH336 | ➤ Quantum Chemistry |
| | | |
| Elective III *(Students can chose any one of the two electives)* | 23MSCH431 | ➤ Drug Discovery and Development |
| | 23MSCH432 | ➤ Catalytic Processes in Organic Synthesis |
| | 23MSCH433 | ➤ Material Chemistry |
| | | |