



Department of Chemistry

Manipal Academy of Higher Education, Manipal

Outcomes Based Education (OBE) Framework

Two Year full time Postgraduate Program

M.Sc. (Chemistry)

1. PROGRAM EDUCATION OBJECTIVE (PEO)

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for **M.Sc. Chemistry program** are as follows.

PEO No	Education Objective
PEO 1	To prepare the post graduates in applying the knowledge in the field of chemistry to pursue higher studies and careers in chemical industries, consultancies and research institutions.
PEO 2	To enable the post graduate to exhibit critical thinking ability towards different aspects of chemistry.
PEO 3	To provide experience in planning and conducting the experiments in modern chemical laboratories with state-of-the-art facilities.
PEO 4	To instill professional attitude with ethical responsibility, effective communication skills, team work, multidisciplinary approach and train the students to apply their scientific expertise to social issues.
PEO 5	To engage in lifelong learning with knowledge of contemporary issues related to chemistry by using lab skills and techniques.



2. GRADUATE ATTRIBUTES:

S No.	Attribute	Description
1	Disciplinary Knowledge	Knowledge of theory and practical aspects in Organic, analytical, physical and inorganic chemistry.
2	Understanding different subsets of chemistry	Stereochemistry, photochemistry, catalysis, spectroscopy, solid-state chemistry, organometallics, retrosynthesis, natural product chemistry.
3	Measurable Skills and Industry-ready Professionals	Strengthen the abilities of a learner by skills, gaining knowledge of the present scenario of pharmaceutical industry in specific and chemistry in general.
4	Effective and Influencing communication	Effective and Influencing communication ability to share thoughts, ideas and applied skills of communication in its various perspectives like written communication, speech communication etc.
5	Leadership readiness/ Qualities	To make learners fluent in multiple facets of leadership. Creating the ability & enhancing the qualities to be an efficient leader. Cultivating key characteristics in learners, to be visionary leaders who can inspire the team to greatness.
6	Critical/ Reflective thinking & language efficiency	Critical/ Reflective thinking ability to employ critical and reflective thinking along with the ability to create the sense of awareness of oneself and society.
7	Technologically Efficient Professional	Capability to use various communication technologies and ability to use various tools and techniques required for chemical industry.
8	Ethical Awareness	As a chemistry learner, one has to understand the importance of ethical values and its application in professional life.
9	Lifelong Learning	Every graduate to be converted into lifelong learner and consistently update himself or herself with current knowledge, skills and technologies. Acquiring Knowledge and creating the understanding in learners that learning will continue throughout life.
10	Research-related Skills	A sense of inquiry and investigation for raising relevant and contemporary questions, synthesizing and articulating.
11	Cooperation/ Team work	Building a team, motivating and inspiring the team members to work up with cooperation to their utmost efficiency.

PROGRAM OUTCOMES: After successful completion of M.Sc (Chemistry) program, Students will be able to:

PO No	Attribute	Competency
PO 1	Domain knowledge	Apply the knowledge Organic, Physical, Inorganic and Analytical chemistry to solve the scientific problems.
PO 2	Problem analysis	Demonstrate the laboratory skills to enable them to perform both qualitative and quantitative analysis of given samples.
PO 3	Design and development of the solution using modern techniques	Execute the designed experiment document, interpret and report the data using advanced tools and techniques.
PO 4	Environment and sustainability	Understand the importance of scientific solutions in an environmental and societal context and apply the knowledge of chemistry for sustainable development.
PO 5	Ethics	Apply ethical principle and commit to professional ethics and responsibilities of scientific practice.
PO 6	Individual and teamwork	Perform effectively as an individual or as a team.
PO 7	Communication	Adopt critical thinking and communicate effectively on scientific activities.
PO 8	Life- long learning	To participate through self-paced and self-directed learning for personal development.
PO 9	Scientific reasoning and research skills	To inculcate the scientific temperament to recognize, analyze and formulate a solution for cause and effect relationship.
PO 10	Digital literacy	Employ information and communication technology in various learning situations.



FIRST YEAR:

Semester: 1

Semester: 2

Subject Code	Subject Title	L	T	P	C	Subject Code	Subject Title	L	T	P	C
CHM 5151	Inorganic Chemistry I	4	0	0	4	CHM 5201	Inorganic Chemistry II	4	0	0	4
CHM 5152	Organic Chemistry I	4	0	0	4	CHM 5202	Organic Chemistry II	4	0	0	4
CHM 5153	Physical Chemistry I	4	0	0	4	CHM 5203	Physical Chemistry II	4	0	0	4
CHM 5154	Spectroscopy I	4	0	0	4	CHM 5204	Inorganic Chemistry Practical II	0	0	4	2
CHM 5155	Inorganic Chemistry Practical I	0	0	4	2	CHM 5205	Organic Chemistry Practical II	0	0	4	2
CHM 5156	Organic Chemistry Practical I	0	0	4	2	CHM 5206	Physical Chemistry Practical II	0	0	4	2
CHM 5157	Physical Chemistry Practical I	0	0	4	2	CHM 5207	Research Methodology and Technical communication	3	0	0	3
	Total				22		Total				21

SECOND YEAR (FINAL YEAR):

Semester: 3

Semester: 4

Subject Code	Subject Title	L	T	P	C	Subject Code	Subject Title	L	T	P	C
CHM 6101	Spectroscopy II	4	0	0	4	CHM 6201	Advanced Organic Chemistry II	4	0	0	4
CHM 6102	Advanced Organic Chemistry I	4	0	0	4	CHM 6202	Project				6
CHM 6103	Seminar	1	0	0	1	CHM 60XX	Elective II	3	0	0	3
CHM 6104	Organic Chemistry Practical III	0	0	6	3	CHM 60XX	Elective III	3	0	0	3
CHM 6105	Multistep Organic Synthesis	0	0	6	3						
CHM 60XX	Elective I	3	0	0	3						
CHM 6051	Open elective	3	0	0	3						
	Total				21		Total				16

List of electives (for Elective 1, 2 and 3)

- CHM 6001: Materials Chemistry
- CHM 6002: Industrial process and Industrial management
- CHM 6003: Chemistry of Dyes and Pesticides
- CHM 6004: Chemistry of Petrochemicals
- CHM 6005: Applied Electrochemistry and Industrial Catalysis
- CHM 6006: Green Chemistry
- CHM 6007: Organometallic Cluster Chemistry
- CHM 6008: Principles and Practice of Analytical Chemistry
- CHM 6009: Polymer Chemistry
- CHM 6010: Supra molecular chemistry
- CHM 6011: Solid State Chemistry and Applications
- CHM 6012: Chemical Process Industries
- CHM 6013: Bioorganic and Medicinal Chemistry
- CHM 6014: Computational Chemistry



S.No.	Course Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	CHM 5151	Inorganic Chemistry I	4	CO1 CO2 CO3 CO4				CO3					
2	CHM 5152	Organic Chemistry I	4	CO1 CO2 CO3 CO4									
3	CHM 5153	Physical Chemistry I	4	CO1 CO2 CO3		CO3							
4	CHM 5154	Spectroscopy I	4	CO1 CO2 CO3		CO3							
5	CHM 5155	Inorganic Chemistry Practical I	3	CO1 CO4	CO3		CO1		CO1 CO3		CO1 CO2 CO3	CO1 CO2	
6	CHM 5156	Organic Chemistry Practical I	3	CO1	CO1		CO1		CO1	CO2	CO1 CO2	CO1 CO2	
7	CHM 5157	Physical Chemistry Practical I	3	CO1	CO3				CO1 CO2 CO3		CO1 CO2	CO2 CO3	
8	CHM 5201	Inorganic Chemistry II	4	CO1 CO2 CO3						CO1 CO3			
9	CHM 5202	Organic Chemistry II	4	CO1 CO2 CO3 CO4			CO2		CO1 CO4	CO2 CO3 CO4	CO4		
10	CHM 5203	Physical Chemistry II	4	CO1 CO2 CO3					CO1 CO3	CO2			
11	CHM 5204	Inorganic Chemistry Practical II	3	CO1	CO2				CO1 CO2			CO1 CO2	
12	CHM 5205	Organic Chemistry Practical II	3		CO1			CO1	CO1			CO1 CO2	
13	CHM 5206	Physical Chemistry Practical II	3		CO1 CO2				CO1 CO2	CO2		CO1	
14	CHM 5207	Research Methodology and Technical communication	3	CO1 CO2 CO3				CO1 CO3		CO1	CO3	CO1 CO3	CO3
15	CHM 6101	Spectroscopy II	4	CO1 CO2 CO3 CO4	CO1 CO2 CO3 CO4	CO1					CO4		
16	CHM 6102	Advanced Organic Chemistry I	4	CO1 CO2 CO3 CO4 CO5					CO3 CO4	CO1 CO3 CO4	CO3	CO2 CO3 CO4	



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(Deemed to be University under Section 3 of the UGC Act, 1956)

17	CHM 6103	Seminar	1										
	CHM 6104	Organic Chemistry Practical III	3	CO1 CO2 CO3	CO1	CO1		CO1 CO2 CO3	CO1 CO3	CO1 CO2 CO3	CO1 CO2	CO2	
	CHM 6105	Multistep Organic Synthesis	3	CO1 CO2	CO1 CO2		CO1 CO2		CO1			CO1 CO2	
	CHM 6201	Advanced Organic Chemistry II	4	CO1 CO2 CO3 CO4	CO1 CO2 CO3 CO4				CO1	CO1 CO2 CO3			
	CHM 6202	Project	6										