



Iligan Institute of Technology
of the Mindanao State University
Quality Education for a better Mindanao

MASTER OF SCIENCE IN CHEMISTRY

Introduction

The Iligan Institute of Technology of the Mindanao State University (MSU-IIT) is mandated to develop the scientific manpower and technical capability of the Mindanao region in order to achieve a speedy economic development of the country. As an academic institution, it must offer and support programs that will bring about the effective fulfillment of its goals. The Commission on Higher Education (CHED) identified it as a Graduate Center for Chemistry under its Mindanao Advanced Education Project (MAEP). As such, it is tasked to help produce the critical mass of scientists in the field of chemistry that will catalyze the development of Mindanao. Recently, it was identified by CHED as a Center of Excellence (COE) in Chemistry. The Department of Chemistry of MSU-IIT, being one of the academic divisions of the institute, must strive towards the realization of this mandate. One way of achieving this is to offer graduate programs in Chemistry, specifically Doctor of Philosophy Program in Chemistry and Master of Science in Chemistry, in addition to its specific tasks of undertaking basic, applied, and mission-oriented researches.

The graduate program leading to the degree of Master of Science in Chemistry aims to increase knowledge and competence in research and teaching in the various fields of chemistry. The areas of specialization include Analytical, Inorganic, Organic, Physical, Environmental, and Biochemistry.

Objectives

1. To increase the absolute and relative numbers of highly trained manpower in chemistry research especially for the Mindanao and Visayas regions.
2. To upgrade college and university chemistry teaching in content and in methodology.
3. To provide chemical industries with highly trained manpower in chemistry to man analytical and quality control laboratories.

Admission Requirements

All applicants must:

1. Have a B.S. in Chemistry degree, or have completed the following undergraduate courses for non-B.S. Chemistry graduates:

General Chemistry	10 units
Inorganic Chemistry	3 units
Organic Chemistry	10 units
Physical Chemistry	10 units
Analytical Chemistry	10 units
Biochemistry	4 units
2. Have a grade-point average (GPA) of 2.50 or its equivalent in undergraduate courses in Chemistry, Physics, and Mathematics.
3. Submit two (2) letters of recommendation from former undergraduate chemistry instructors/professors attesting to the student's intellectual capacity for graduate studies in chemistry.

Degree Requirements

1. Courses: Must have successfully completed at least 36 units of the course work (including 6 units of Thesis) specified in his/her program of study.
2. GPA: A student enrolled in the M.S. in Chemistry Program must obtain an overall Grade Point Average (GPA) Grade of 2.0 or better after each semester for all courses taken. A student who fails to satisfy this requirement may be put on probation in the following semester upon recommendation of the Chemistry Graduate Committee. Failure to maintain the required GPA after the probation period of one semester shall automatically disqualify the student from the program.
3. Comprehensive Examination: Must have passed a comprehensive examination in her/his chosen area of specialization.
4. Defense: The student must have successfully defended his/her dissertation.

MASTER OF SCIENCE IN CHEMISTRY (MS CHEM)
(LIST OF COURSES BY SEMESTER)

First Year, First Semester

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)	Co-requisite(s)
			Lec	Lab	Total		
Chem 220/ 220N	Spectrochemical Methods of Analysis	3	3	0	3	None	None
Chem 230	Organic Reactions and Mechanisms	3	3	0	3	None	None
Chem 250	Inorganic Structures and Reaction Mechanisms	3	3	0	3	None	None
Chem 270/ 272	Chemical Thermodynamics/ Chemical Kinetics	3	3	0	3	None	None
	Total	12	12	0	12		

First Year, Second Semester

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)	Co-requisite(s)
			Lec	Lab	Total		
Chem 221.2	Instrumental Methods of Analysis	2	0	6	6	Chem 220 or CGC's approval	None
Cognate 1	Elective on the field of specialization	3	3	0	3	9 units core courses and CGC's approval	None
Cognate 2	Elective on the field of specialization	3	3	0	3	9 units core courses or CGC's approval	None
Cognate 3	Elective on the field of specialization	3	3	0	3	9 units core courses or CGC's approval	None
Chem 291	Seminar I	1	1	0	1	9 units core courses	None
	Total	12	10	6	16		

Second Year, Summer

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)	Co-requisite(s)
			Lec	Lab	Total		
	Written Comprehensive Examination					14 units of Chemistry core courses, GPA of 2.00 with no INC grade	
Chem 299	MS Thesis	2	0	0	2	CGC's approval	
	Total	2	0	0	2		

Second Year, First Semester

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)	Co-requisite(s)
			Lec	Lab	Total		
Cognate 4	Elective on the field of specialization	3	3	0	3	9 units core courses and CGC's approval	None
Cognate 5	Elective on the field of specialization	2	2	0	2	9 units core courses and CGC' approval	None
Chem 299	MS Thesis	2			2		
	Total	7	4	0	7		

Second Year, Second Semester

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)	Co-requisite(s)
			Lec	Lab	Total		
Chem 292	Thesis Seminar	1	1	0	1	None	Chem 299
Chem 299	MS Thesis	2	0	0	2	Passed the Comprehensive Exam	None
	Total	3	1	0	3		

CATALOGUE OF COURSES

CHEM 220/220N SPECTROCHEMICAL METHODS OF ANALYSIS

Spectroscopic methods, theory, structure elucidation and analysis.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : Chemistry Graduate Committee's (CGC's) Approval

CHEM 221.2 INSTRUMENTAL METHODS OF ANALYSIS

Laboratory work in instrumental methods of analysis.

Credit : 2 units (6 hrs lab)

Prerequisite(s) : Chem 220 (Spectrochemical Methods of Analysis)
or CGC's Approval

CHEM 230 ORGANIC REACTIONS AND MECHANISMS

Study of structure including stereochemistry, reactivity, and reaction mechanisms of organic compounds.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : CGC's Approval

CHEM 250 INORGANIC STRUCTURES AND REACTION MECHANISMS

Structural concepts and reaction mechanisms of inorganic compounds and transition metal ions.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : CGC's Approval

CHEM 270 CHEMICAL THERMODYNAMICS

Theory and applications of classical thermodynamics.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : CGC's Approval

CHEM 272 CHEMICAL KINETICS

Principles of kinetics, transport processes, reaction kinetics, theories of reaction rates.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : CGC's Approval

CHEM 275 QUANTUM CHEMISTRY

Theorems of quantum mechanics, variational methods, perturbation theory, many- electron atoms, electronic structure of polyatomic molecules.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : CGC's Approval

CHEM 291 SEMINAR I

A seminar presentation of a research paper from current library scientific journals in any area of specialization.

Credit : 1 unit (1hr lec)
Prerequisite(s) : 9 units of core courses

CHEM 292 THESIS SEMINAR

Presentation of the Thesis in a seminar.

Credit : 1 unit (1 hr lec)
Corequisite(s) : Chem 299 (M. S. Thesis)

CHEM 299 M.S. THESIS

May be enrolled three times at 2 units each time. A grade of "passed" or "failed" will be given only after the student has enrolled 6 units of M. S. Thesis. A student receives a grade of "in Progress" for satisfactory performance each term the M. S. Thesis is enrolled until defended.

Credit : 6 units (12 hrs lab)
Prerequisite(s) : CGC's Approval

CHEMISTRY COGNATES

ANALYTICAL CHEMISTRY

CHEM 321 ELECTROANALYTICAL CHEMISTRY

Theory and analytical applications of electrochemistry.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 322 CHROMATOGRAPHIC METHODS OF ANALYSIS

Principles and applications of chromatographic methods of analysis.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 323 RADIOCHEMICAL METHODS OF ANALYSIS

Theory and analytical application of radiochemistry.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 329 CURRENT TOPICS IN ANALYTICAL CHEMISTRY* (*May be enrolled three times for a maximum of 3 units.)

Advances and current researches in analytical chemistry.

Credit : 1 unit (1 hr lec)
Prerequisite(s) : None

ORGANIC CHEMISTRY-BIOCHEMISTRY

CHEM 331 CHEMISTRY OF NATURAL PRODUCTS

Advances in the chemistry and biosynthesis, isolation techniques, and structure elucidation of natural products.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 332 POLYMER CHEMISTRY

Reactions, reaction mechanisms and synthesis of polymers.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 333 PHOTOCHEMISTRY

Theory of photochemistry and photoreactions.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 334 ORGANIC MEDICINAL CHEMISTRY

Study of organic compounds that are used as drugs or medicinal agents, their activity, applications, limitations, stability, forms and uses.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 335 ORGANOMETALLICS

Reaction mechanisms of organometallic compounds and their role in homogeneous catalysis and biochemical processes.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 339 CURRENT TOPICS IN ORGANIC CHEMISTRY* (*May be enrolled three times for a maximum of 3 units)

Advances and current researches in organic chemistry.

Credit : 1 unit (1 hr lec)
Prerequisite(s) : None

CHEM 340 STRUCTURES AND FUNCTION OF BIOMOLECULES

Structure and function of biochemical systems, their regulation, biosynthesis and coordinated metabolic pathways.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 342 LIPIDS, PROTEINS, AND CARBOHYDRATES

Advances in lipids, proteins, and carbohydrates chemistry. Extraction and separation methods in lipids, proteins and carbohydrate analyses.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 343 ENZYMES

Enzyme structure and function; allosterism. Equilibrium and kinetic aspects of enzyme reactions. Coenzymes, functions and structure. Biochemical reaction mechanisms and their regulation.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 344 NUCLEOSIDES AND NUCLEIC ACIDS

The replication of living organism's mutation. Repair mechanisms. Recent development in the biochemistry of nucleosides and nucleic acids.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 349 CURRENT TOPICS IN BIOCHEMISTRY*
(*May be enrolled three times for a maximum of 3 units.)

Advances and current researches in biochemistry.

Credit : 1 unit (1 hr lec)
Prerequisite(s) : None

INORGANIC CHEMISTRY

CHEM 351 COORDINATION CHEMISTRY

The chemistry of complexes formulated by a central atom or ion surrounded by a set of other atoms, ions, or small molecules. Symmetry groups and molecular symmetry are the main concern of this study.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 352 MACROCYCLIC CHEMISTRY

The study of characteristically interesting and unusual macrocyclic ligand systems. Areas of study include the structures and properties of macrocyclic compounds; synthesis; polyether crown and related systems; host-guest chemistry, kinetics; thermodynamics and electrochemical aspects of a range of macrocyclic system.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 353 SUPRAMOLECULAR CHEMISTRY

The chemistry of intermolecular bond that is concerned with the structure and function of entities formed by the association of two or more molecular or ionic species.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : None

CHEM 354 BIOINORGANIC CHEMISTRY

Explores the variety of function of metal ions in specific steps that they play in biology. This study includes areas on ion pumps and transport proteins and the biochemical catalysts, metalloenzymes.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : None

CHEM 355 SOLID STATE CHEMISTRY

The current enthusiasm for "material chemistry" has greatly increased the synthesis and study of new inorganic solids. The study covers areas on basic concept of prototypical solid structures, lattice enthalpies, ionic and covalent bonding, intercalation compounds, crystal structures, electronic band structures, x-ray and neutron diffraction structures.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : None

CHEM 359 CURRENT TOPICS IN INORGANIC CHEMISTRY*

(*May be enrolled three times for a maximum of 3 units.)

Advances and current researches in inorganic chemistry.

Credit : 1 unit (1 hr lec)

Prerequisite(s) : None

PHYSICAL CHEMISTRY

CHEM 371 QUANTUM CHEMISTRY**

(**Or equivalent course in other departments as approved by the Chemistry Graduate Committee.)

Theorems of quantum mechanics, variational methods, perturbation theory, many-electron atoms, electronic structure of polyatomic molecules.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : None

CHEM 373 METHODS OF COMPUTATIONAL CHEMISTRY

Semi-empirical method, molecular mechanics, ab-initio methods, density functional theory.

Credit : 3 units (3 hrs lec)

Prerequisite(s) : None

CHEM 375 MOLECULAR DYNAMICS**
(*Or equivalent course in other departments as approved by the
Chemistry Graduate Committee.)

MD simulations of small systems, equilibrium and dynamical properties, time-dependent phenomena.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 376 CHEMICAL APPLICATION OF GROUP THEORY

Symmetry, matrix representation of groups, electronic structure of polyatomic molecules, molecular vibrations, molecular orbitals.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 377 STATISTICAL THERMODYNAMICS

Ensembles, partition functions, application to thermodynamics.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 379 CURRENT TOPICS IN PHYSICAL CHEMISTRY*
(*May be enrolled three times for a maximum of 3 units.)

Advances and current researches in physical chemistry.

Credit : 1 unit (1 hr lec)
Prerequisite(s) : None

ALLIED CHEMISTRY

CHEM 381 ADVANCED ENVIRONMENTAL CHEMISTRY

Advanced study of the sources, reactions, transport, effects, and fate of chemical species in water, soil, and air environments, and the effects of technology thereon.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 382 AQUATIC CHEMISTRY

Advanced treatment of the chemistry of natural waters.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 383 ATMOSPHERIC CHEMISTRY

Advanced treatment of the chemistry of the air environment. Gaseous inorganic and organic pollutants and their reactions. Photochemical smog chemistry.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 384 FATES OF POLLUTANTS IN THE ENVIRONMENT

Advanced treatment of the study of the fate of pollutants in air, water, and soil/sediment environments. Literature readings. Modeling.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 385 PRINCIPLES OF WATER QUALITY CONTROL

Standard methods of chemical analysis to determine the quality of water and wastewater.

Credit : 1 unit (1 hr lec)
Prerequisite(s) : None
Corequisite(s) : Chem 485.2 (Principles of Water Quality Control Laboratory)

CHEM 385.2 PRINCIPLES OF WATER QUALITY CONTROL LABORATORY

Laboratory experiments covering standard methods of chemical analysis to determine the quality of water and wastewater.

Credit : 2 units (6 hrs lab)
Prerequisite(s) : None
Corequisite(s) : Chem 485 (Principles of Water Quality Control)

CHEM 386 ADVANCED ENVIRONMENTAL CHEMICAL ANALYSIS

Sampling methods, extraction methods, method validation techniques, advanced instrumental analysis of environmental contaminants in air, water, soil and sediment environments.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : None

CHEM 387.2 ADVANCED ENVIRONMENTAL CHEMICAL ANALYSIS LAB I

Advanced instrumental analysis of environmental contaminants in water and wastewater environments. Liquid-liquid extraction, liquid-solid extraction, closed-loop stripping, etc.

Credit : 2 units (6 hrs lab)
Prerequisite(s) : None

CHEM 388.2 ADVANCED ENVIRONMENTAL CHEMICAL ANALYSIS LAB II

Advanced instrumental analysis of environmental contaminants in air and soil/sediment environments. Supercritical fluid extraction, ultrasonic extraction, microwave extraction, etc.

Credit : 2 units (6 hrs lab)
Prerequisite(s) : None

CHEM 389 CURRENT TOPICS IN ENVIRONMENTAL CHEMISTRY

(*May be enrolled three times for a maximum of 3 units.)

Advances and current researches in environmental chemistry.

Credit : 1 unit (1 hr lec)
Prerequisite(s) : None