Academic Programs Booklet

College of Science

2021

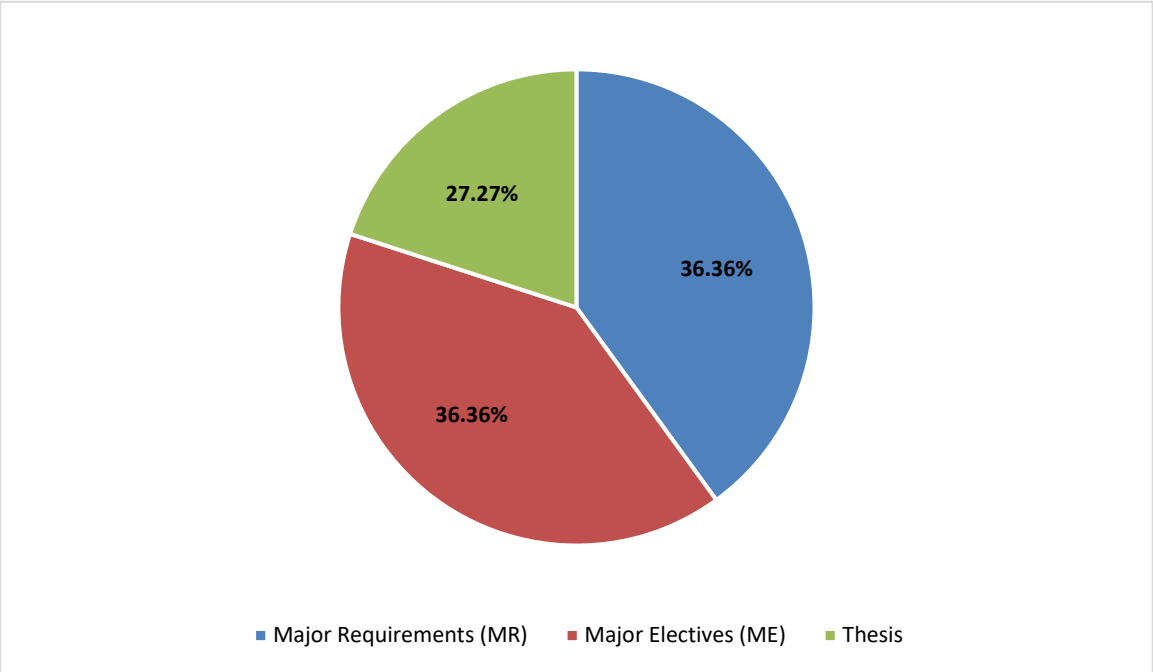
Prepared By: VP For Academic Programs and Graduate Studies Office

College of Science

Table of Contents

M.Sc. in Environmental Chemistry

Program Components



Major Requirements (MR)	**12**
Major Electives (ME)[1]	**12**
Thesis	**9**
Total Credit (CRD)	**33**

[1] Student must select four elective courses.

Detailed Study Plan

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 610	Research Methodology and Seminars	3	0	3	MR	------	Yes
CHEMY 611	Introduction to Environmental Chemistry	3	0	3	MR	------	Yes
CHEMY 612	Environmental Benign Techniques	3	2	3	MR	------	Yes

Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 613	Environmentally Analytical Technology	3	0	3	MR	------	Yes
CHEMY xxx	Elective 1	3	0	3	ME	------	Yes
CHEMY xxx	Elective 2	3	0	3	ME	------	Yes

Year 2 – Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY xxx	Elective 3	3	0	3	ME	------	Yes
CHEMY xxx	Elective 4	3	0	3	ME	------	Yes
Chemy 622	Thesis	0	27	9	Thesis	Department Approval	No

Year 2 – Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
Chemy 622	Thesis	0	27	9	Thesis	Department Approval	No

Major Elective Courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
Chemy 614	Solid Waste Management	3	0	3	ME	-----	Yes
Chemy 615	Physicochemical Wastewater Treatment	3	0	3	ME	-----	Yes
Chemy 616	Atmospheric Chemistry	3	0	3	ME	-----	Yes
Chemy 617	Organic Contaminants in the Environment	3	0	3	ME	-----	Yes
Chemy 618	Corrosion and Environment	3	2	3	ME	-----	Yes
Chemy 619	Environmental Impacts of Energy	3	0	3	ME	-----	Yes
Chemy 620	Nanomaterials for Environmental Remediation	3	0	3	ME	-----	Yes
Chemy 621	Industrial Effluents and Emission Analysis	3	0	3	ME	-----	Yes

Course Description

Course Code: CHEMY 610 Course Title: Research Methodology and Seminars (3-0-3)
Research methods; art of scientific investigation; identification of problems; scientific background of the proposed plan, online information collection, digital library search; research design; data collection; data analysis; analyzing quantitative data; analyzing qualitative data; statistical analysis and interpretation of data; writing research report; Ontological and underpinning of research methods; quantitative and epistemological qualitative research methods; collection, analysis and interpretation of data; use of secondary data; problem-based research; research ethics.

Course Code: CHEMY 611 Course Title: Introduction to Environmental Chemistry (3-0-3)
Introduction to the traditional environmental segments; endogenic and exogenic cycles; cycles of matter (carbon, nitrogen, sulfur, oxygen, water) earths hydrosphere; water distribution; remote sensing of earth hydrosphere; characteristics of water bodies; types of water pollution; sources, abatement and control; atmospheric segments; major air pollutants; tropospheric chemistry; greenhouse gases; soil chemistry; major chemical pollutants in pedosphere; National Environmental Quality Standards (NEQS) for water, air and soil pollution.

Course Code: CHEMY 612 Course Title: Environmentally Benign Technology (3-0-3)
Principles industrial pollution prevention; introduction to environmentally friendly techniques; photochemical degradation principles; homogeneous and heterogeneous photocatalysis; photo-oxidation and photo-degradation, biodegradation process and mechanism; phyto-remediation; natural adsorbents for the removal of pollutants; ultrasonic chemistry for cleaner production; designing greener process.

Course Code: CHEMY 613 Course Title: Environmental Analytical Techniques (3-2-3)
Introduction to sampling procedure for air, soil, and water; separation techniques; classical and modern analytical methods; instrumental method of chemical analysis; advanced spectroscopic and electrochemical techniques; chromatography and hyphenated chromatographic techniques; sensors technology and applications; electron probe microanalysis; imaging and elemental analysis of solid materials, instrument selection; recognizing and evaluating controlling hazards; quality control (documentation, calibration, and sample management); data handling using advanced statistical tools. Related practical work.

Course Code: CHEMY 614 Course Title: Solid Waste Management (3-0-3)
Introduction to solid waste management; types of solid waste (industrial, hazardous waste, electronic waste, radioactive waste and biomedical wastes); generation and characteristics of solid waste; current practices of solid waste collection and transport; solid waste processing techniques; disposal of solid Waste; reuse and recycling of waste; health hazards associated with poor management of solid wastes; legislative and economic aspects of waste management; quality control and understanding of National Environmental Quality Standards (NEQs).

Course Code: CHEMY 615 Course Title: Physicochemical Wastewater Treatment (3-0-3)
Overview to water and wastewater composition; physicochemical wastewater treatment; disinfection; oxidation; coagulation; sedimentation; filtration; membrane filtration; separation of suspended solids; ion-exchange; activated carbon and hydrogels based adsorption; chemical precipitation; water desalination; reverse osmosis; wet oxidation; hydrolysis; electrodialysis; electrochemical precipitation.

Course Code: CHEMY 616 Course Title: Atmospheric Chemistry (3-0-3)
Environmental segments; atmospheric classification; tropospheric oxidation chemistry; water in atmosphere; chemistry of the major air pollutants; ambient atmosphere and air pollution; climate change; their behavior; health impacts; air burden and sources; USEPA standards for ambient air; indoor air pollution; sources; control; case study; atmospheric reactions of sulfur; and nitrogen compounds; carbon burden on atmosphere and major reactions; chemistry of the greenhouse gases; volatile organic compounds (VOCs); photochemical smog; particulate matter; analysis of atmospheric samples (SO_2, NO_2, O_3).

Course Code: CHEMY 617 Course Title: Organic Contaminants in the Environment (3-0-3)
Types of anthropogenic organic contaminants; sources and routes of entry to the environment; chemistry of the

transformation of organic contaminants in the environment; chemical structures; properties; environmental behavior and ecotoxicology of organic contaminants; toxicity and mode of action; bioavailability and bioaccumulation; human health effects of organic contaminants; endocrine disrupting organic chemicals (EDCs); environmental and human health effects of EDCs; analytical methods for the detection and characterization of organic contaminants; treatment methods for the removal of organic contaminants.

Course Code: CHEMY 618 Course Title: Corrosion and Environment (3-2-3)
Corrosion principles; electrochemical; environmental and materials aspects; forms of corrosion; uniform attack; galvanic corrosion; crevice corrosion; pitting, intergranular corrosion; selective leaching; erosion corrosion; stress corrosion and fretting; corrosion fatigue; hydrogen damage; corrosion testing techniques; corrosion control; materials selection; design; environment control; cathodic and anodic protection; coatings; high temperature corrosion and case studies; Related practical work.

Course Code: CHEMY 619 Course Title: Environmental Impacts of Energy (3-0-3)
Energy resources; non-renewable energy resources and environmental issues; fossil fuels (coal, petroleum and natural gas) formation; classification; properties and environmental aspect of fossil fuels during exploration; production; transportation and combustion; nuclear energy reactors and environmental aspects of nuclear energy/radioactive waste disposal; future prospects nuclear fusion; renewable energy resources (hydroelectricity, wind energy, solar energy, geothermal energy, biomass and biogas) and assessment of their environmental aspects.

Course Code: CHEMY 620 Course Title: Nanomaterials for Environmental Remediation (3-0-3)
Overview of nanotechnology and environment; nanomaterials preparation methods; nanomaterials characterization; size and shape dependent properties; nanomaterials for the removal of pollutants (dyes, heavy metals, chlorinated organic, etc.); application of nanomaterials in environmental remediation.

Course Code: CHEMY 621 Course Title: Industrial Effluents and Emission Analysis (3-0-3)
Classification of industrial effluents; analysis of effluents to NEQS parameters; the most common industrial gaseous; liquid and solid pollutants; cleaner production; impact of industry on water resources; industrial water quality and treatment options; toxicity of industrial wastewater; measures of toxicity; kinetics models for toxic substrates and dealing with toxicity; physical chemical processes for the treatment of industrial wastes; anaerobic industrial wastewater treatment.

Course Code: CHEMY 699 Course Title: Thesis (0-27-9)
The thesis should demonstrate that the student has the capacity to carry out original research, the ability to review appropriate background material, formulate and address significant questions, to obtain, collate, and analyze appropriate data to draw logical conclusions there-from, to integrate in a meaningful way the new knowledge into the greater body of existing knowledge and state its significance. The final thesis will be submitted to the Department's Postgraduate Committee and can be either original research work and/or a creative project. Moreover, the thesis will be defended in public before an internal and external examiner who will be appointed as per university policy.