

## STUDY PLAN

### MASTER IN (Civil Engineering/Water and Environment) (Thesis Track)

Plan Number			2005	T
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#### I. GENERAL RULES CONDITIONS:

1. These requirements shall conform with the general frame of the program of Graduate Studies.
2. Background requirements for Master Program:
  - a- Bachelor Degree in Civil Engineering. & Bachelor Degree in Highway and Bridges Engineering
  - b- Bachelor Degree in Chemical Engineering
  - c- Bachelor Degree in Environmental Engineering

#### II. SPECIAL CONDITIONS: None.

#### III. THE STUDY PLAN : Studying ( 33) Credit Hours as follows:

##### 1. Obligatory courses: (18) Credit Hours:

Course No.	Course Title	Credit hrs.	Theory	Prac.	Pre-request
0901731	Numerical Methods	3	3	-	-
0901760	Engineering Hydraulics	3	3	-	-
0901761	Surface Water Hydrology	3	3	-	-
0901771	Biological Treatment of Wastewater	3	3	-	-
0901773	Unit Operation in Water and Wastewater	3	3	-	-
0901775	Physicochemical Treatment	3	3	-	-

##### 2. Elective Courses: Studying (6) Credit hours from the following:

Course No.	Course Title	Credit hrs.	Theory	Prac.	Pre-request
0901762	Design of Hydraulic Structures	3	3	-	-
0901763	Groundwater Hydrology	3	3	-	-
0901764	Sediment Transport	3	3	-	-
0901765	Water Resources Engineering	3	3	-	-
0901770	Water Chemistry and Microbiology	3	3	-	-
0901772	Air Pollution	3	3	-	-
0901774	Solid Waste Management	3	3	-	-
0901776	Simulation in Environmental Engineering	3	3	-	-
0901791	Special Topics in Civil Engineering	3	3	-	-

##### 3. Thesis: 9 Credit hours (0901799).

## STUDY PLAN

### MASTER IN (Civil Engineering/Water and Environment) (None Thesis Track)

Plan Number			2005	N
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#### IV. GENERAL RULES CONDITIONS:

1. These requirements shall conform with the general frame of the program of Graduate Studies.
2. Background requirements for Master Program:
  - a- Bachelor Degree in Civil Engineering.
  - b- Bachelor Degree in Chemical Engineering
  - c- Bachelor Degree in Environmental Engineering

#### V. SPECIAL CONDITIONS: None.

#### VI. THE STUDY PLAN : Studying ( 33) Credit Hours as follows:

##### 1. Obligatory courses: (24) Credit Hours:

Course No.	Course Title	Credit hrs.	Theory	Prac.	Pre-request
0901731	Numerical Methods	3	3	-	-
0901760	Engineering Hydraulics	3	3	-	-
0901761	Surface Water Hydrology	3	3	-	-
0901765	Water Resources Engineering	3	3	-	-
0901770	Water Chemistry and Microbiology	3	3	-	-
0901771	Biological Treatment of Wastewater	3	3	-	-
0901773	Unit Operation in Water and Wastewater	3	3	-	-
0901775	Physicochemical Treatment	3	3	-	-

##### 2. Elective Courses: Studying (9) Credit hours from the following:

Course No.	Course Title	Credit hrs.	Theory	Prac.	Pre-request
0901762	Design of Hydraulic Structures	3	3	-	-
0901763	Groundwater Hydrology	3	3	-	-
0901764	Sediment Transport	3	3	-	-
0901772	Air pollution	3	3	-	-
0901774	Solid Waste Management	3	3	-	-
0901776	Simulation in Environmental Engineering	3	3	-	-
0901791	Special Topics in Civil Engineerin				

##### 2. A comprehensive exam (0901798).

## Course Description

### **0901731 Numerical Methods (3 credit hours)**

Mathematical preliminaries, computer precision, loss of significance, error propagation, linear and nonlinear systems of algebraic equations, interpolating polynomials, numerical differentiation and integration, numerical solution of ordinary differential equations (ODE), initial and boundary values, linear and nonlinear systems, approximation theory, direct methods, iterative techniques (Eigenvalues), numerical solution of partial-differential equations (PDE), elliptic, parabolic, hyperbolic, finite differences, characteristics and boundary integral equation methods, curve fitting, least squares, Spline, Fourier approximation, discrete and fast Fourier transforms, numerical algorithms for advanced engineering problems.

### **0901760 Engineering Hydraulics (3 credit hours)**

Steady incompressible flow in pressure conduits, centrifugal and axial flow pumps, pipe-machine systems, unsteady flow in closed conduits and water hammer, flow measurements, hydraulic similitude and model techniques, channel transitions and controls.

### **0901761 Surface Water Hydrology (3 credit hours)**

Hydrologic process in nature, rainfall-runoff analysis, measurement of surface water flow, unit hydrograph analysis, hydrologic statistics and probability theory, hydrologic routing, computer models in surface hydrology and their application.

### **0901762 Design of Hydraulic Structures (3 credit hours)**

Seepage and uplift pressure, flownets, Lane's weighted creep theory, lateral seepage, numerical methods, irrigation structures, main canal intake, weirs, head regulators, cross regulators, drop structures, spillways, gates, siphons, outlet structures, drainage structures, drain junction, culverts, manholes, hydroelectric structures, component parts, hydraulic similitude and modeling of hydraulic structures.

### **0901763 Ground Water Hydrology (3 credit hours)**

Definitions and types of aquifers, physical properties of aquifers. Darcy's law and hydraulic conductivity, steady and unsteady radial flow in confined, unconfined and leaky aquifers, well flow near aquifer boundaries, multiple well systems. Partially penetrating wells and well losses, testing wells for yield, land subsidence and ground water, ground water modeling techniques, artificial recharge of ground water.

### **0901764 Sediment Transport (3 credit hours)**

Sediment properties, threshold of particle movement, transport of sand by air, sediment movement by water, bed features and channels resistance, sediment load, transport as bed load, transport as suspended load, estimation of total load, stable channel design, regime approach, tractive force method,

transport of sediment in pipe lines, cohesion and its implication on the transport rate.

**0901765 Water Resources Engineering (3 credit hours)**

Introduction to quantitative hydrology, probability concepts in planning, reservoirs and dams, engineering economy in water resources, water supply systems, planning for water resources development and management, water laws and treaties.

**0901770 Water Chemistry and Microbiology (3 credit hours)**

Chemical equilibrium, Kinetic and thermodynamic approach, equilibrium constants, solubility equilibrium, complexation and oxidation reduction equilibrium, activity and activity coefficients basic, concepts from organic chemistry, basic concepts from microbiology.

**0901771 Biological Treatment of Wastewater (3 credit hours)**

Principles of biological oxidation, treatment Kinetics, aeration and mass transfer principles, design of treatment processes, Activated sludge, trickling filters, stabilization ponds, sludge handling and treatment, aerobic and anaerobic digestion, anaerobic filters, anaerobic ponds, anaerobic contact processes, principle and design for nitrification-denitrification.

**0901772 Air Pollution (3 credit hours)**

Background and basic definitions, sources of air pollution, atmospheric transport of pollutants, properties of gaseous and particulate matter, sampling, analysis and design (theory, equipment and techniques), physical analysis of particles and specific tests, acid and alkaline rains and their hazards on public health, particulate and gases control methods and their design, odor control, noise pollution.

**0901773 Unit Operations In Water and Wastewater (3 credit hours)**

Physical , chemical and biological analysis of water and wastewater, operating lab scale models on the application and the theory of biological and physicochemical treatment processes, processes to include sedimentation, water softening, coagulation flocculation, ion exchange, adsorption and aeration, determination of biological constants, activated sludge, and others.

**0901774 Solid Waste Management (3 credit hours)**

Quantities and composition of refuse, collection and transport methods, principles and design of disposal methods: sanitary landfill, incineration, grinding, composting, salvage and reclamation.

**0901775 Physicochemical Treatment (3 credit hours)**

Process dynamics, reactions and reactors Kinetics, practical aspects of reactor design, process analysis and design of mixing, coagulation flocculation, sedimentation, filtration, water softening, lime soda-ash, adsorption, ion exchange, disinfection, sludge handling and disposal.

**0901776 Simulation in Environmental  
Engineering**

**(3 credit hours)**

Material balance formulation, mass transfer processes, biological and chemical kinetics, ideal flow reactors, general flow systems, gas Exchange and stream reparation dissolved exchange and stream reparation, dissolved oxygen balance equations, streams, lakes and estuarine analysis, modeling of biochemical oxygen demand, nitrification, photosynthesis and other water quality parameters, general applications.

**0901791 Special Topics in Civil Eng.**

**(3 credit hours)**

Structured presentation of new and developing areas of knowledge in civil engineering offered by the faculty in their specialized areas of expertise to augment the formal courses available.

