

M.Sc. GRADUATE PROGRAM

Graduate students must take 15-18 credits from compulsory courses, 6-9 credits from elective courses, 2 credit from seminar and 6 credits from thesis, overall 32 credits to receive M.Sc. degree.

Curriculum for the Degree of Master of Eng. in Civil Engineering, Major *Water Engineering and Hydraulic Structures*

COURSE CODE	COURSE TITLE	CREDITS
Semester I		
1610500	Engineering Mathematics	3
1614575	Advanced Hydraulics	3
1614578	Numerical Methods in Water Engineering	3
1614715	Water Waves Mechanics	3
Semester II		
1614598	Hydraulic Structures	3
1614600	Concrete Dams	3

M.Sc. students may take “Finite Element Method” or “Hydrodynamics” instead of “Numerical Methods in Water Engineering”.		
2 Elective Courses From		
1612529	Finite Element Method	3
1614577	Hydrodynamics	3
1614602	Hydraulic Models	3
1614604	Marine Structures	3
Semester III		
9010503	Seminar	2
9010606	M.Sc. Project	6
Semester IV		
9010606	M.Sc. Project (Continue)	0

Ph.D. GRADUATE PROGRAM

The complete Ph.D. program consists of 15 credits of coursework and 21 credits of thesis. Students must pass the written and oral comprehensive exam after completion of courses.

Curriculum for the Degree of Doctor of Philosophy in Civil Engineering, Major *Civil Engineering, Minor Water Engineering and Hydraulic Structures*

The complete Ph.D. program consists of 15 credits of coursework and 21 credits of thesis.

A - Courses: (15 Units)

1614702	Advanced Hydrodynamics	3
1614710	Computational Hydraulics II	3
1614713	Sediment and Erosion Engineering	3
1614715	Turbulence Models	3

B - The Ph.D. students must pass the written and oral comprehensive exam after completion of their coursework.

C – Thesis (21 Units)

9010724	Thesis	6
9010724	Thesis	6
9010724	Thesis	6
9010724	Thesis	3

COURSE DESCRIPTIONS

1610500 Engineering Mathematics

3 Cr.

Review on Basic Mathematics, Special Functions, Calculus of Variations, Difference Equations, Vectors and Matrices, Fourier Analysis, Partial Differential Equations, Complex Analysis.

Instructor: Dr. Mohammadreza Chamani, Dr. Milad Aminzadeh

1614575 Advanced Hydraulics

3 Cr.

Special topics in hydraulic engineering (The two-lake problem, the simultaneous procedure solution, cavitation in hydraulic structures,...), Rapidly varied flow, Supercritical flow in open channels and transitions, Spatially varied flow, Unsteady flow in rivers and open channels, Fluvial hydraulics, Reservoir and river flow routing, Hydraulics of mobile bed channels.

Instructor: Dr. Abdorreza Kabiri-Samani

1614577 Hydrodynamics

3 Cr.

Flow of an ideal fluid, flow of a real fluid, graphical flow nets, numerical analysis and experimental analogies, standard patterns of flow, conformal transformation

Instructor: Dr. Mohammadreza Chamani

1614578 Numerical Methods in Water Engineering

3 Cr.

Basic partial differential equations used in surface and subsurface hydrology. Basic concepts of finite difference and finite element methods. Application of numerical methods using the related equations.

Instructor: Dr. Mohammad Navid Moghim, Dr. Milad Aminzadeh

1614598 Hydraulic Structures

3 Cr.

Elements of dam engineering, Types of dams, characteristics and design considerations, Dam outlet works hydraulics, Types and design of dam spillways, Hydraulics of energy dissipaters, Hydraulics of intakes and bottom outlets, Design of gates and valves, Diversion works, Hydroelectric power development, Dam safety and instrumentation.

Instructor: Dr. Abdorreza Kabiri-Samani

1614600 Concrete Dams

3 Cr.

An introduction to dam engineering, Definition and types of concrete dams, Site assessment, selection and selection of type of dam criteria, Loads in dam engineering, Earthquake loading and risk analysis, Dynamic loading, Thermal loading, Gravity dams analysis, Arch dams analysis, Buttress dams analysis, Stability of dams, Boundary conditions, Fluid-structure interaction, Modeling of the dam-reservoir system, Experimental studies of small scale dam models, Concrete dam construction, Dam safety, Instrumentation and surveillance.

Instructor: Dr. Mohammadreza Eftekhari, Dr. Abdorreza Kabiri-Samani

1614715 Hydraulic Models

3 Cr.

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Instructor: Dr. Mohammad Navid Moghim

1614604 Marine Structures

3 Cr.

An Introduction to Hydrodynamics, Airy Wave Theory, Higher order and stretch wave theories, Irregular Sea States, Environmental Loads on Offshore Structures, Wind Loads, Wave Loads, Transverse (Lift) wave loads, Diffraction wave forces, Effect of compliancy (relative motion), Seismic Loads, Types of Offshore structures, Structural Analysis, Foundation Design.

Instructor: -**1614715 Water Waves Mechanics**

3 Cr.

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Instructor: Dr. Mohammad Navid Moghim**1614702 Advanced Hydrodynamics**

3 Cr.

Vector algebra, divergence, curl, polar and cylindrical coordinates, body forces, pressure, Reynolds analogy, vortices, Stokes law, motion equations, continuity, circulation, Navier-Stokes Equations for laminar and turbulent flows, inviscid flow, incompressible irrotational flow, Laplace equations, Kelvin theory, Balsius theory, flow field, viscous flow, low Reynolds flow, boundary layer, instability of flow, turbulence, turbulent boundary layer, separation, drag and lift forces

Instructor: Dr. Abdorreza Kabiri-Samani, Dr. Mohammad Reza Chamani**1614710 Computational Hydraulics**

3 Cr.

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Instructor: -**1614713 Sediment and Erosion Engineering**

3 Cr.

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Instructor: Dr. Mohammad Reza Chamani**1614715 Turbulence Models**

3 Cr.

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Instructor: Dr. Mohammad Navid Moghim