

Hydrological Science				
Course Title	Credits	Last Offered	Emphasis Area	Description
ABE 527 Computer Models in Environmental and NR Engineering	3	S18	Computation & design	operation, pumping plant characteristics and efficiency, hydraulic network analysis, system evaluation
*AGRY 337 Environmental Hydrology	3	S19	Watershed Hydrology	This course was developed to provide an introduction to watershed hydrology for students from a variety of academic backgrounds. In general, it covers both the basics of how water moves through the environment, water waves, and current theories as to how hydrologic response is modified by environmental change at a variety of spatial scales. There are no prerequisites and this course can serve as the first in a series focused on watershed management, water quality or planning.

*CE 440 Urban Hydraulics	3	F18	Urban water systems	Sources and distribution of water in urban environment, including surface reservoir requirements, utilization of groundwater, and distribution systems. Analysis of sewer systems and drainage courses for the disposal of both wastewater and storm water. Pumps and lift stations. Urban planning and storm drainage practice. The course employs the basic principles of hydraulics to design of hydraulic structures. It combines hydraulics and urban drainage issues. Topics include (i) water distribution systems, (ii) pump design and selection, (iii) sanitary sewer design, and (iv) storm sewer design. Basic rainfall runoff relationships, design of storage structures, and unit hydrograph theory are also covered.
*CE 443 Introductory Environmental Fluid Mechanics	3	F17	Hydraulics	Pressure and hydrostatics in environmental flows; surface tension and viscosity; boundary layers; drag and lift; sediment transport; open channel flow; jets and plumes
*CE 456 Wastewater Treatment	3	F18	Wastewater	Fundamental concepts and design procedures for the treatment of municipal and industrial water and wastewaters. Problem assessment; determination of water and wastewater characteristics, biological, physical, and chemical treatment methods, process design, and disposal of residues.

CE 540 Open Channel Hydraulics	3	F18	General water cycle	Energy and momentum principles, design of open channels for uniform and nonuniform flow, boundary layer and roughness effects, flow over spillways, energy dissipation, flow in channels of nonlinear alignment and nonprismatic section.
CE 542 Hydrology	3	F18	General water cycle	Meteorology; precipitation; stream flow, evaporation, and transpiration; subsurface flows, well hydraulics; runoff relations and hydrographs; elements of stream flow routing, frequency and duration studies; extreme values statistics applied to flood and drought forecasting; application of hydrologic techniques.
CE 543 Coastal Engineering	3	S18	Hydrology	Water waves; Coastal circulation; Coastal structure design
CE 544 Subsurface hydrology	3	S17	General water cycle	Basic principles of fluid flow in saturated and unsaturated materials. Darcy's law, well hydraulics, determination of hydraulic properties of aquifers. Infiltration theory. Discussions of artificial recharge, land subsidence, saltwater intrusion, ground water quality and contamination.

CE 545 Sediment transport engineering	3	S18	Contaminant Transport	Sediment properties and the mechanics of sediment transport. Threshold of movement. Riverbed load and suspended load theories. Regime theory and stable channel design. River diversion problems. Erosion. Geomorphologic and water quality aspects.
CE 547 Transport Processes in Surface Waters	3	F17	Contaminant Transport	Four main topics are covered: (1) density-stratified two-layer systems in lakes and channels, with applications to mixed-layer growth, oil-spill containment, salinity intrusions, (2) advection-diffusion modeling in channels, including analytical solutions to steady and unsteady, one- and two-dimensional problems, (3) mechanisms of diffusional transport, including turbulence in channels and longitudinal shear dispersion, and (4) near-field analysis of discharges, including similarity analyses of jets and plumes.
CE 549 Computational Watershed Hydrology	3	S19	Computation & design	Use of professional computer programs for the calculation of the runoff from complex basins. Generation of unit hydrographs. Calculation of losses, channel and reservoir routing, parameter optimization, and application of Kinematic wave technique to urban catchments. Offered in alternate years.

CE 641 Statistical Hydrology	3	F16	Surface water	Probability distributions applicable to hydrologic events; analysis of extremes, floods and droughts; statistical association between hydrologic variables. Analysis of hydrologic time series. Spectral and parametric formulation of stochastic models of rainfall, runoff, rainfall-runoff transfer, and other hydrologic variables. Application of Markov chains and point processes to the sequence of rainfall and other hydrologic events. Prerequisite: CE 54200, STAT 51600.
EAPS 584 Hydrogeology	3	F17	General water cycle	Investigates the qualitative and quantitative aspects of ground water location, occurrence, movement, evaluation, and development, and the influence of man upon this resource. Geologic and engineering aspects of ground water systems are discussed. Classroom teaching is complemented by problem sets and field trips.
EAPS 680 Contaminant hydrogeology	3	F18	Hydrological Sciences	Covers the basic theory and applications of problem-solving exercises in hydrogeology, fluid mechanics, and chemistry of contaminated sites; flow and transport equations and models; investigational methods; remediation methods; case studies; and pertinent environmental laws. Prerequisite: CS 15800, CHM 11600, EAS 58400, MA 26200.

*Students can have up to 6 credits of 300-400 level courses applied to their plan of study.