



Graduate Level – Course Descriptions

(For Masters in Civil, Applied Environmental Science & Technology, Arctic)

AEST A601 Aquatic Process Chemistry 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST, CE, or BIOL graduate programs, or gain instructor approval.

An introduction to fundamental aquatic chemistry concepts frequently encountered in environmental science and engineering. An equilibrium approach with an emphasis on treatment process and natural water chemistry is employed. Both a qualitative and quantitative understanding of equilibrium calculations and the ability to apply both graphical and algebraic/numerical solution techniques to chemistry problems.

- Offered alternate fall semesters.

AEST A602 Water Quality Management 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST, CE, or BIOL graduate programs, or gain instructor approval.

An assessment of the rationale, concepts, institutions, and engineering aspects of water quality management. Regulatory processes, monitoring strategies and statistics, flow and mixing characteristics, pollutant chemistry, assessment strategies, point and nonpoint source characteristics, the Total Maximum Daily Load (TMDL) process, and mitigation measures are covered.

- Offered fall semesters.

AEST A603 Solid Waste Management 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST, CE, or BIOL graduate programs, or gain instructor approval.

Planning, collecting and disposing of solid waste; techniques of collection, transportation, disposal and resource recovery; solid waste environmental regulations and relationships to water, air, and land pollution; hazardous waste management.

- Offered fall semesters.

AEST A604 Regulatory and Permitting Processes 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST, CE, or BIOL graduate programs, or gain instructor approval.

Introductory graduate level course on understanding and navigating environmental laws and regulations. Students will learn the principles of the major environmental laws in the U.S., practice interpreting regulations, and prepare permits.

- Offered fall semesters.

AEST A608 Fundamentals of Air Pollution 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST, CE, or BIOL graduate programs, or gain instructor approval.

Air pollution terminology and their definitions. Sources and effects of air pollution. Meteorology and its relationship to air pollution. Pollution modeling and prediction. Combustion generated air pollution. Energy and air pollution. Regulations at the federal, state, and local levels. Indoor air quality.

- Offered as warranted.

AEST A613 Remediation 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST, CE, or BIOL graduate programs, or gain instructor approval.

Fundamentals and applications of technologies for the remediation of contaminated sites. Site characterization techniques and fundamental microbial, chemical, and physical concepts are presented to provide a basis for the design and operation of specific on-site and in-situ technologies.

- Offered alternate springs.

AEST A699 AEST Thesis 1-6 CR

Registration Restrictions: Registrants must be enrolled in the AEST graduate program.

Arranged between the advisor and the student. Generally the student has been admitted to candidacy for the master's degree and a thesis committee is formed. The student must take an oral exam defending the thesis.

CE A441 Introduction to Environmental Engineering 3 CR

Prerequisites: CHEM A106 and (ES A341 or concurrent enrollment).

Registration Restrictions: "Civil Engineering Professional" status or approval by the Civil Engineering Department Chair.

Introduction to the fundamentals of environmental engineering. Includes the theory and application of water and wastewater engineering, water supply concepts, wastewater characteristics, treatment and disposal, solid waste management and air pollution control.

- Offered fall semesters.

CE A600 Fundamentals of Environmental Science and Engineering 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST or CE graduate programs, or gain instructor approval.

A fundamental course in environmental science and engineering for students who have strong undergraduate training in the sciences or engineering. Provides basic and specialized understanding of essentially all fundamental aspects of the field with a focus upon aquatic and terrestrial environments. Emphasis is placed upon the fundamentals of biological, chemical, and physical science which underlie both natural and cultural environmental effects. Includes the use and application of equilibrium processes, mass and energy balances, processes that occur in natural systems and others.

- Offered fall semesters

CE A603 Arctic Engineering 3 CR

Registration Restrictions: Graduate standing with a baccalaureate degree in engineering.
May be stacked with: CE A403.

Introduces a broad spectrum of engineering challenges unique to cold regions. Physical principles and practical data collection methods, analyses, designs, and construction methods are discussed. Students gain a working knowledge of cold regions engineering problems and modern solutions as a basis for more detailed study.

- Offered fall & spring semesters.

CE A605 Chemical and Physical Water and Wastewater Treatment Processes 3 CR

Registration Restrictions: Registrants must be enrolled in the AEST or CE graduate programs, or gain instructor approval.

The theory and design of chemical and physical unit processes utilizing the treatment of water and wastewater. Sedimentation and flotation, ion exchange, adsorption, coagulation, precipitation, filtration, disinfection, reverse osmosis and aeration theories will be studied. Design problems for all unit processes.

- Offered alternate spring semesters.

CE A606 Biological Treatment Processes 3 CR

Registration Restrictions: Registrants must be enrolled in AEST or CE graduate programs, or gain instructor approval.

Study of the theoretical and biological processes including activated sludge, trickling filters, lagoons, sludge digestion and processing, septic tanks, analysis and design, nutrient removal processes, biology of polluted waters, economics, state and federal regulations.

- Offered spring semesters.

CE A631 Structural Finite Elements 3 CR

Prerequisites: ES A301 and CE A431.

Introduction to finite element and computer methods in structural analysis. Matrix algebra, the slope-deflection and the direct stiffness methods will be reviewed. Topics include: finite elements and corresponding matrix equations for a truss, for a beam and for frame structures, organization of typical computer programs, two-dimensional stress-strain problems, eigenvalue problems, and practical applications of engineering software.

- Offered fall semesters.

CE A633 Structural Dynamics 3 CR

Prerequisites: CE A431 and MATH A302.

Covers the theory of structural dynamics, including single and multiple degree of freedom systems subjected to earthquake and other excitations. Application to analysis and design of civil engineering structures is emphasized.

- Offered fall semesters.

CE A634 Earthquake Engineering 3 CR

Prerequisites: CE A431 and CE A432 and CE A433 and CE A633.

Registration Restrictions: Good computer skills and basic understanding of finite element method is preferred.

Introduces basic seismic concepts, design principles, criteria for design and construction of buildings subject to earthquake ground motions. Also includes technology of reducing earthquake loads through seismic isolation.

- Offered alternate spring semesters.

CE A662 Surface Water Dynamics 3 CR

Prerequisites: ES A341.

Principles of open channel flow, ice covered flow, unsteady flow, and stream flow as a sediment and pollution transport agent.

- Offered alternate fall semesters.

CE A663 Ground Water Dynamics 3 CR

Prerequisites: ES A341.

Fundamentals of geohydrology, hydraulics of flow through porous media, well hydraulics, ground water pollution, and ground water resources development.

- Offered alternate spring semesters.

ES A411 Northern Design 3 CR

Registration Restrictions: Senior standing or graduate standing in an accredited program in architecture or engineering, or instructor permission.

Introduction to design and maintenance of facilities in northern climates to construct sustainable, energy-efficient and durable buildings and infrastructure suitable for the unique needs of northern inhabitants.

- Offered fall semesters.

ESM A450 Economic Analysis and Operations 3 CR

Registration Restrictions: BSCE students require a "Civil Engineering Professional" status or approval by the Civil Engineering department chair.

Special Note: Not offered for credit toward the Master of Science in engineering management or science management.

Fundamentals of engineering economy, project scheduling, estimating, legal principles, professional ethics, and human relations.

- Offered fall and spring semesters.

ESM A601 Engineers in Organizations 3 CR

Registration Restrictions: BS degree in Engineering or in a physical science.

Development of organizations and techniques appropriate to managing engineering and scientific effort. Included will be a study of engineering and scientific activity and personnel in order to organize, motivate, evaluate, develop, and coordinate for maximum

effectiveness, with due consideration to the goals of individuals.

- See ESM department for next time course is offered.

ESM A605 Engineering Economy 3 CR

The science of fiscal decision making. Graduate level studies in problems of replacement, economic selections, income tax accounting, engineering evaluation and introduction to the problems of depreciation.

- See ESPM department for next time course is offered.

ESM A608 Legal Environment for Engineering Management 3 CR

Devoted to those aspects of law specifically related to technical management: contracts, sales, real property, business organization, labor, patents, and insurance.

- See ESPM department for next time course is offered.

ESM A610 Cost Estimating 3 CR

Registration Restrictions: BS degree in Engineering or in a physical science or faculty permission. May be stacked with: ESM A401.

Principles, practices and procedures used in the preparation of engineering cost estimates. Exposition of the basic concepts and steps required to develop engineering type, labor and material based, and parametric cost estimates. Preparation of cost proposals and study of bidding procedures. Students will manage the student project teams, prepare a research paper, and make a class presentation.

- See ESPM department for next time course is offered.

ESM A613 Management of Technical People 3 CR

Registration Restrictions: BS degree in Engineering or in a physical science.

Human factors with which engineers and scientists will be involved in the work place. Includes labor and union concerns, human relations as a major factor in supervision, and other problems of the engineer or scientist in working with people.

- See ESPM department for next time course is offered.

ME A664 Corrosion Processes and Engineering 3 CR

Prerequisites: ES A346. Registration Restrictions: Prerequisite and graduate standing, or faculty permission.

The study of different corrosion processes and mechanisms. Topics include the concepts, materials, and mechanisms of corrosion with application to engineering design for corrosion prevention.

- See Engineering department for next time course is offered.

ME A685 Arctic Heat and Mass Transfer 3 CR

Prerequisites: ES A346. Registration Restrictions: Graduate standing, with a degree in engineering or physical science, or upper class standing in an accredited undergraduate program in these categories.

Application of the principles of heat and mass transfer with special emphasis on application to problems encountered in the Arctic such as ice and frost formation, permafrost, condensation, and heat loss in structures.

- Offered fall semesters.

ME A687 Arctic Materials Engineering 3 CR

Prerequisites: CE A603.

The performance of materials subjected to temperature extremes typical of the Arctic are examined. Specific topics covered include metallic and nonmetallic solids, fuels and lubricants, batteries, electrical considerations, corrosions and human performance.

- See Engineering department for next time course is offered.

PM A601 Project Management Fundamentals 3 CR

Registration Restrictions: Graduate level standing.

Special Note: It is highly recommended that PM A601 be taken in the first semester.

Fundamental concepts of project process, stakeholders and organization environment necessary for successful project management. Team-based term projects will be developed, discussed, and presented. Major project management software will be introduced.

- See ESPM department for next time course is offered.

