

# ENVIRONMENTAL SCIENCE & MANAGEMENT (ESM)

College of Agricultural & Environmental Sciences

## ESM 008 – Water Quality at Risk (3 units)

*Course Description:* Natural and human threats to water quality. Balance of science and policy in all aspects of attaining, maintaining, and managing water quality, water contamination. Decoding popular media coverage of water quality and water contamination.

*Learning Activities:* Lecture 2 hour(s), Discussion 1 hour(s).

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 008. (Formerly ERS 008.)

*Cross Listing:* SAS 008.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE) or Social Sciences (SS); Scientific Literacy (SL); Writing Experience (WE).

## ESM 092 – Internship (1-12 units)

*Course Description:* Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty.

*Prerequisite(s):* Consent of instructor; lower division standing.

*Learning Activities:* Internship 3-36 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

## ESM 098 – Directed Group Study (1-5 units)

*Course Description:* Primarily for lower division students.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable 1-5 hour(s).

*Grade Mode:* Pass/No Pass only.

## ESM 098F – Student Facilitated Course Development (1-3 units)

*Course Description:* Student-facilitated (taught) course intended for lower division students.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable 1-3 hour(s).

*Grade Mode:* Pass/No Pass only.

## ESM 099 – Special Study for Undergraduates (1-5 units)

*Course Description:* Special study for undergraduates.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable.

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

## ESM 100 – Principles of Hydrologic Science (4 units)

*Course Description:* Topics include hydrology (surface and ground water), hydraulic flow through porous media, water in the soil-plant-atmosphere continuum, water quality, flow through open channels, and representative water-resource problems.

*Prerequisite(s):* CHE 002B; MAT 016B; (PHY 007A or PHY 009A).

*Learning Activities:* Lecture 4 hour(s).

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 100. (Formerly ERS 100.)

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

## ESM 108 – Environmental Monitoring (3 units)

This version has ended; see updated course, below.

*Course Description:* Instrumentation and methods for environmental and ecological monitoring; GPS, sensors, datalogging, and GIS. Wide range of measurement techniques for environmental parameters.

*Prerequisite(s):* EVE 101; ESP 100; ETX 101; WFC 100; ERS 100; SSC 100; ENH 100; LDA 050; or the equivalent for any of these courses.

*Learning Activities:* Lecture/Discussion 2 hour(s), Laboratory 2 hour(s), Fieldwork.

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 108. (Formerly ERS 108.)

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL).

## ESM 108 – Environmental Monitoring (3 units)

*Course Description:* Instrumentation and methods for environmental and ecological monitoring; GPS, sensors, datalogging, and GIS. Wide range of measurement techniques for environmental parameters.

*Prerequisite(s):* (ESP 100 or EVE 101); (SSC 100 or WFC 100 or ESM 100).

*Learning Activities:* Lecture/Discussion 2 hour(s), Laboratory 2 hour(s), Fieldwork.

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 108. (Formerly ERS 108.)

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL).

This course version is effective from, and including: Winter Quarter 2024.

## ESM 110 – Irrigation Systems & Water Management (4 units)

*Course Description:* Soil and plant aspects of irrigation and drainage. Soil-water principles including water storage and movement, plant response to irrigation, water use by crops, irrigation systems (i.e., micro-irrigation, sprinkler irrigation and surface irrigation), and related salinity and water quality impacts.

*Prerequisite(s):* PHY 007A; SSC 100 recommended.

*Learning Activities:* Lecture 3 hour(s), Laboratory 3 hour(s).

*Cross Listing:* ABT 110, HYD 110.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL).

### ESM 118 – Evapotranspiration Principles, Measurement & Modeling (4 units)

*Course Description:* Estimation of evapotranspiration (ET) for irrigation management and water resources planning; including the basic principles and key factors controlling evaporation and ET rates, methods of measuring these factors in the field and remotely, and determination of likely water requirements for crops and various landscape conditions as needed for water resources planning.

*Prerequisite(s):* HYD 124 C or better; consent of instructor.

*Learning Activities:* Lecture 3 hour(s), Laboratory 3 hour(s).

*Cross Listing:* HYD 118; EBS 148.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

### ESM 120 – Global Environmental Interactions (4 units)

*Course Description:* Relationships among climate, hydrology, biogeochemical cycles, soils and vegetation distribution in diverse landscapes and biomes. Emphasis on physical, chemical, and biological processes affecting ecosystems from the poles to the equator, and human impacts on the environment.

*Prerequisite(s):* One college level chemistry course; one college level biology course.

*Learning Activities:* Lecture 3 hour(s), Discussion 1 hour(s).

*Enrollment Restriction(s):* Limited to 25 students per discussion section; not open to students who have successfully completed ERS 060 or 120. (Formerly ERS 060 & 120.)

*Grade Mode:* Letter.

### ESM 121 – Water Science & Management (3 units)

*Course Description:* Role of water as an essential natural resource in contemporary society. Aspects of the scientific method, including descriptions of natural phenomena and underlying physical causes. Water for cities, agriculture, industry, wildlife and recreation; case studies of water management.

*Prerequisite(s):* PHY 010 or GEL 001.

*Learning Activities:* Lecture 2 hour(s), Discussion 1 hour(s).

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 121. (Formerly ERS 121.)

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

### ESM 125 – River Conservation (4 units)

*Course Description:* Law, policy, science, and practice used in managing rivers with the aim of balancing human societal needs and those of riparian and aquatic species.

*Prerequisite(s):* ESM 100 or ESM 108 or ESM 120 or ESM 121 or GEL 001 or GEL 050 or HYD 010 or HYD 141 or HYD 143 or SSC 100 or EVE 101 or ESP 100 or ESP 001 or ESP 110 or WFC 010 or WFC 051 or ECI 040 or ECI 100.

*Learning Activities:* Lecture/Discussion 3 hour(s), Extensive Problem Solving.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Oral Skills (OL); Quantitative Literacy (QL); Scientific Literacy (SL).

### ESM 131 – Air as a Resource (3 units)

*Course Description:* Degradation of the atmospheric resource, historical aspects and effects of air pollution examined. Evaluation of primary gaseous and particulate pollutants and discussion of their impact.

*Prerequisite(s):* (CHE 010 or CHE 002A); CHE 002B.

*Learning Activities:* Lecture 2 hour(s), Discussion 1 hour(s).

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 131. (Formerly ERS 131.)

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

### ESM 141 – Role of Fire in Natural Ecosystems (4 units)

*Course Description:* Fire regimes and roles in major North American vegetation types, especially in the west. Physics of fire, fire effects on organisms and ecosystem functioning, reconstructing fire histories, fire in resource management, and fire use by indigenous people.

*Prerequisite(s):* (BIS 002A or PLS 002); (BIS 002B or BIS 002C); basic biological, ecology/evolution concepts.

*Learning Activities:* Lecture 3 hour(s), Term Paper.

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 141. (Formerly ERS 141.)

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL); Writing Experience (WE).

### ESM 144 – Trees & Forests (4 units)

*Course Description:* Biological structure and function of trees as organisms; understanding of forests as communities and as ecosystems; use of forests by humans; tree phenology, photosynthesis, respiration, soil processes, life histories, dormancy, forest biodiversity, and agroforestry.

*Prerequisite(s):* PLS 002 or BIS 001C or BIS 002C.

*Learning Activities:* Lecture 3 hour(s), Discussion 1 hour(s).

*Credit Limitation(s):* Not open for credit to students who have completed PLB 144 or ENH 144 or ERS 144. (Formerly PLB 144 or ENH 144 or ERS 144.)

*Cross Listing:* PLS 144.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

### ESM 185 – Aerial Photo Interpretation & Remote Sensing (4 units)

*Course Description:* Basics of remote sensing and photogrammetry, grids and map projections, aerial photo interpretation, sensors and platforms for aerial and space photography and non-photographic imaging systems, aerial thermography, microwave sensing, and introduction to remote sensing applications.

*Prerequisite(s):* Upper division standing.

*Learning Activities:* Lecture 2 hour(s), Laboratory 4 hour(s).

*Enrollment Restriction(s):* Not open to students who have successfully completed ERS 185. (Formerly ERS 185.)

*Grade Mode:* Letter.

**ESM 186 – Environmental Remote Sensing (5 units)**

*Course Description:* Overview of satellite, airborne, and ground-based remote sensing, building on properties of electromagnetic radiation. Applications include hydrologic processes, weather and climate, ecology and land use, soils, geology, forestry, and agriculture. Computer based analysis and visualization of images and processing techniques.

*Prerequisite(s):* MAT 016B; (PHY 007C or PHY 009B); upper division standing; LDA 150 recommended.

*Learning Activities:* Lecture 3 hour(s), Laboratory 6 hour(s).

*Enrollment Restriction(s):* Not open to students who have successfully completed HYD 186 or ERS 186. (Formerly HYD 186 & formerly ERS 186.)

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Visual Literacy (VL).

**ESM 192 – Internship (1-12 units)**

*Course Description:* Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty.

*Prerequisite(s):* Consent of instructor; completion of 84 units.

*Learning Activities:* Internship 3-36 hour(s).

*Grade Mode:* Pass/No Pass only.

**ESM 194H – Senior Honor Thesis (2-6 units)**

*Course Description:* Independent study, guided research on an environmentally related subject of special interest to the student.

*Prerequisite(s):* Senior standing, overall GPA of 3.50 or higher and consent of master advisor.

*Learning Activities:* Independent Study 2-6 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Writing Experience (WE).

**ESM 195 – Integrating Environmental Science & Management (2 units)**

*Course Description:* Practical aspects of environmental improvement through integrated analyses of contemporary issues or problems associated with advocacy, regulation, science and resource management from the perspectives of the physical and ecological sciences and current policy/management.

*Prerequisite(s):* Consent of instructor; senior status in Environmental Science Management major or other environmental science major (e.g. Environmental Resource Science; Environmental Biology Management; Environmental Toxicology; Environmental Policy Analysis Planning; Wildlife, Fish, Conservation Biology; Hydrologic Science).

*Learning Activities:* Lecture/Discussion 2 hour(s).

*Repeat Credit:* May be repeated 2 time(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE) or Social Sciences (SS).

**ESM 198 – Directed Group Study (1-5 units)**

*Course Description:* Directed group study.

*Learning Activities:* Variable.

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

**ESM 198F – Student Facilitated Course (1-3 units)**

*Course Description:* Student-facilitated (taught) course intended for upper division students.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable 1-3 hour(s).

*Enrollment Restriction(s):* Restricted to upper division standing or consent of instructor.

*Grade Mode:* Pass/No Pass only.

**ESM 199 – Special Study for Advanced Undergraduates (1-5 units)**

*Course Description:* Special study for advanced undergraduates.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable.

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

**ESM 199FA – Student Teaching Course Development (1-3 units)**

*Course Description:* Under the supervision of a faculty member, an undergraduate student plans and develops the course they will teach under 098F/198F.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable 1-3 hour(s).

*Enrollment Restriction(s):* Restricted to upper division standing.

*Grade Mode:* Pass/No Pass only.

**ESM 199FB – Student Teaching Course Development (1-3 units)**

*Course Description:* Student facilitated. Under the supervision of a faculty member, an undergraduate student teaches a course under 098F/198F.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable 1-3 hour(s).

*Grade Mode:* Pass/No Pass only.