### Engineering and Science Management (ESM)

#### ESM F422  Engineering Decisions
- **3 Credits**
- Offered Spring
- Risk and uncertainty in engineering decisions. Basic applied probability and statistics, data analysis, regression analysis and time series.
- Practical applications of decision tools: linear programming, inventory analysis, queuing, network models and utility theory. Engineering judgment and uncertainty. Public safety and ethics.
- **Recommended:** Calculus through MATH F302.
- **Stacked with:** ESM F622.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F450  Economic Analysis and Operations (W)
- **3 Credits**
- Offered Fall and Summer
- Fundamentals of engineering economy, project scheduling, estimating, legal principles, professional ethics and human relations. Not offered for credit toward the M.S. degree in Engineering Management or Science Management.
- **Prerequisites:** WRTG F111X, WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X; ES F201 or CS F201; senior standing in engineering.
- **Special Notes:** Undergraduate engineering students who are taking graduate ESM courses as technical electives should have completed or be concurrently enrolled in ESM F450.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F492  Engineering Mgt Seminar
- **1 Credit**
- **Lecture + Lab + Other:** 0 + 0 + 0

#### ESM F492P  Engineering Mgt Seminar
- **1 Credit**
- **Lecture + Lab + Other:** 0 + 0 + 0

#### ESM F601  Managing and Leading Engineering Organizations
- **3 Credits**
- Offered As Demand Warrants
- Leadership knowledge and skills as applied to motivation, direction and communication within engineering and technical organizations, and their relations with other organizations and the public. Leadership training complements management knowledge and activities such as organizational structures, planning, monitoring, directing and controlling. The general tools of management are reviewed including management theory, communications, conflict management and resolution.
- **Recommended:** B.S. degree in engineering or physical science or permission of instructor.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F605  Engineering Economic Analysis
- **3 Credits**
- Offered As Demand Warrants
- The economic basis of engineering decisions. Graduate level studies of capital investment analysis techniques, including present worth, annual cash flow and rate of return. Applications to replacement problems, benefits/cost analysis and capital budgeting. Consideration of impacts of depreciation accounting, income taxes and inflation. Risk and uncertainty in economic decisions. Simulation.
- **Recommended:** Graduate standing.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F608  Legal Principles for Engineering Management
- **3 Credits**
- Offered As Demand Warrants
- Those aspects of law specifically related to technical management. Contracts, sales, real property, business organization, labor, patents and insurance.
- **Recommended:** Graduate standing.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F609  Project Management
- **3 Credits**
- Offered As Demand Warrants
- Organizing, planning, scheduling and controlling projects. Use of CPM and PERT; computer applications. Case studies of project management problems and solutions.
- **Recommended:** Graduate standing.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F621  Operations Research
- **3 Credits**
- Offered As Demand Warrants
- **Recommended:** MATH F253X, STAT F200X.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F622  Engineering Decisions
- **3 Credits**
- Offered As Demand Warrants
- Risk and uncertainty in engineering decisions. Basic applied probability and statistics, data analysis, regression analysis and time series.
- Practical applications of decision tools: linear programming, inventory analysis, queuing, network models, utility theory. Engineering judgment and uncertainty. Public safety and ethics. A class project and paper are required.
- **Recommended:** Calculus through MATH F302.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F684  Engineering Management Project
- **3 Credits**
- Offered As Demand Warrants
- Comprehensive study of an actual engineering management problem resulting in reports and presentations which include recommendations for action.
- **Prerequisites:** Standing in Engineering Science Management.
- **Lecture + Lab + Other:** 3 + 0 + 0

#### ESM F692  Engineering Mgt Seminar
- **1 Credit**
- **Lecture + Lab + Other:** 0 + 0 + 0

#### ESM F698  Non-Thesis Research/Project
- **1-6 Credits**
- **Lecture + Lab + Other:** 0 + 0 + 0

#### ESM F699  Thesis
- **1-9 Credits**
- **Lecture + Lab + Other:** 0 + 0 + 0