SYEN 640 Systems Thinking and Analysis  
Credits 3.3 Lecture Hours.  
Introduction to the systems thinking process and the fundamental considerations associated with the engineering of large-scale systems or system of systems.  
Prerequisites: Graduate classification; MATH 304 or approval of instructor.

SYEN 641 Systems Engineering Methods and Frameworks  
Credits 3.3 Lecture Hours.  
Concepts, methodologies, methods and tools for discovery, definition, analysis, design, creation and sustainment of systems involving information, physical and human elements; architecture modeling methods include IDEF/UIPDM; systems engineering frameworks include DoDAF/MoDAF and Zachman; analysis tools include executable architectures to assess consistency, interoperability and performance.  
Prerequisite: MATH 304 or approval of instructor.

SYEN 642 Systems Performance Modeling  
Credits 3.3 Lecture Hours.  
Development and formulation of models to evaluate and improve system performance; Survey of Math Programming; decision trees; simulation models; and economic evaluation of systems; examples and applications of linear programming, nonlinear programming, integer programming, systems simulation, multi-objective formulations, solution interpretation and sensitivity analysis.

SYEN 643/ISEN 670 Theory of Socio-Technical Systems  
Credits 3.3 Lecture Hours.  
Philosophy, origins, theory, principles and methodologies of complex socio-technical systems; emphasis on holistic thinking for systems engineering; systems approach; cybernetics; complexity science; physical and biological systems; social, economic and political systems; network representations of systems; real-world decision-making; system dynamics; emergent behavior; systems architecture; engineered systems today and in the future.  
Prerequisite: Graduate classification.  
Cross Listing: ISEN 670/SYEN 643.

SYEN 644 Decision Making Under Uncertainty in Systems Engineering  
Credits 3.3 Lecture Hours.  
Formulating models and making engineering decisions about systems and systems of systems operating under uncertainty; review of probabilistic modeling and statistical analysis; risk analysis and assessment for complex stochastic systems; mathematical decision theory, heuristic decision methods, value-driven decision making, sequential decision problems, real options theory and deferred decision making.  
Prerequisite: Graduate classification.

SYEN 645/ISEN 665 Management of Engineering Systems  
Credits 3.3 Lecture Hours.  
Theory and practice of leadership and management in engineering organizations; focus on both “hard” skills (systems engineering process, project management, planning, forecasting, financial analysis) and “soft” skills (leadership styles, motivation, teamwork, managing creative people, navigating informal networks); science and technology policy; economic implications of engineering and technology.  
Prerequisite: Graduate classification.  
Cross Listing: ISEN 665/SYEN 645.