



DISTANCE LEARNING CATALOG
2011-2012

TABLE OF CONTENTS

| | |
|---|-----------|
| Overview of Programs..... | 1 |
| Degree Programs | 1 |
| Certificate Programs | 2 |
| Sample Education Plans..... | 7 |
| Course Offerings by Program..... | 8 |
| Course Offerings by Term | 10 |
| Courses Offered by Arrangement..... | 12 |
| Complete List of Courses Offered Via DL..... | 12 |
| Course Descriptions | 13 |



AIR FORCE INSTITUTE OF TECHNOLOGY

School of Engineering and Management

Office of Extension Services

❖ Distance Learning Degree Programs (1)

AFIT currently offers one master's degree program via DL, in Systems Engineering. Students select one of two specialty tracks to complete the program.

Master's Degree in Systems Engineering (GSE)

Degree Requirements:

48 credits, comprised of: 16 core credit hours, 12 specialty track credit hours, 1 math course, 1 analysis course, and a 12-credit thesis project

Core Courses (4 required):

SENG 520 Systems Engineering Design

CSCE 590 Engineering of Software-Intensive Systems

SENG 640 Systems Architecture

SENG 610 Systems Engineering Management

Specialty Tracks (1 required):

| | Space Systems Track | Logistics Track |
|--------------------------------|----------------------------------|--|
| Specialty Track Courses | MECH 532 ASYS 631 PHYS 519 | LOGM 568 LOGM 567 LOGM 644 LOGM 565 |
| Math Course | STAT 583 | STAT 583 |
| Analysis Course | QMGT 680 | QMGT 680 |
| Thesis Prep Course | SENG 629 | SENG 629 |

Thesis Project:

SENG 799 Thesis Project (12 credits, offered via DL as arranged)

Note: All AFIT DL courses in this catalog can be taken with access to a telephone and high-speed internet connection. Most individual work is performed asynchronously (on your own time), although all courses are offered in conjunction with the AFIT academic calendar. Most courses have a weekly webinar, which gives students an opportunity to interact directly with the instructor and fellow classmates.

Students can sign up individually, but a group of students forming a cohort from a single base or organization can be very beneficial.

For more info about admissions requirements, tuition rates, etc., call AFIT's Extension Services Office at (937) 255-3636 x7422 (DSN 785), or visit us on-line at: <http://www.afit.edu/en/dl>.

AIR FORCE INSTITUTE OF TECHNOLOGY

School of Engineering and Management

Office of Extension Services

❖ Distance Learning Certificate Programs (5)

AFIT currently offers five graduate certificate programs via DL. These certificate programs consist of four-to-six carefully selected courses, designed to impart a degree of competency and expertise in a technical or managerial area related to defense.

Graduate Systems Engineering Certificate Program (SEC)

Target Audience:

Active duty military, DoD civilians, and contractors may enroll with traditional engineering backgrounds.

Expected Completion Time:

15-18 months, part-time

Applicant Qualifications:

Prospective applicants are expected to have a Bachelor's Degree in engineering (or in some closely-related technical discipline), to include Calculus and Differential Equations, with a GPA of 3.0 or better.

Required Courses (4):

SENG 520 Systems Engineering Design

CSCE 590 Engineering of Software-Intensive Systems

SENG 640 Systems Architecture

SENG 610 Systems Engineering Management

Project Course (1):

SENG 797 Group Design Project

Graduate Space Systems Certificate Program (SSC)

Target Audience:

The Graduate Space Systems Certificate Program is designed for students with traditional engineering backgrounds (mechanical, electrical, aerospace, etc.) and produces graduates who can effectively approach and analyze complex space-related problems, design feasible solutions, and select an appropriate solution. Specific objectives are as follows:

- A graduate will have a general understanding of the purpose and requirements for all spacecraft subsystems and how these subsystems relate to the spacecraft payload and missions.
- A graduate will have a thorough understanding of orbital mechanics and the space environment and how these might affect the spacecraft mission.
- A graduate will have the skills to effectively participate in the evaluation of both competing designs as well as proposed processes from competing contractors.

Expected Completion Time:

12 months, part-time.

Applicant Qualifications:

Prospective applicants are expected to have a Bachelor's Degree with a GPA of 3.0 or better, with courses in Calculus, Differential Equations, Calculus-based Physics, and Dynamical Systems.

Required Courses (3):

MECH 532 Introduction to Space Flight Dynamics
ASYS 631 Spacecraft Systems Engineering
PHYS 519 The Space Environment

Elective Courses (1 required):

OENG 530 Fundamentals of IR & MASINT Phenomenology
SS 613 Military Satellite Communications (offered via DL through NPS)

Graduate Supply Chain Management Certificate Program (SCM)

Target Audience:

Individuals seeking graduate level education in the fundamentals of Supply Chain Management (SCM), with particular emphasis on Department of Defense (DoD) and Air Force specific applications. In addition, lean operations related to Air Force Smart Operations for the 21st Century (AFSO21) will be covered. Finally, statistical data analysis and basic quantitative modeling, to include linear programming, simulation analysis, and heuristics, are included.

The objectives of this program are to educate Air Force Logistics Readiness Officers (LROs), civilians, and other DoD personnel in the above topics and to enable them to apply state of the art analytical and problem solving techniques to Air Force and DoD specific supply chain management problems, as well as enabling them to utilize the concepts of lean in similar situations

Expected Completion Time:

15 months, part-time.

Admission Requirements:

Applicants should hold a Bachelor's degree with a 3.0 or above, to include a math background at least at the college algebra level

The Supply Chain Management Certificate Program (SCM) is an organizationally funded program that targets individuals within the acquisition or logistics career fields working at depots, labs, acquisition centers or program offices, or headquarters.

Qualified applicants admitted into the program will normally be funded for their tuition by a federal agency ("unit funded"). Academic qualification requirements aside, applicants who are not unit funded will be admitted by exception, on a case-by-case basis only. In short, entry into the SCM program requires both academic acceptance into the program and agreement on the organizational funding mechanism. The program starts each winter quarter in agreement with the AFIT Academic Calendar.

Required Courses (5):

LOGM 568 Introduction to Supply Chain Management
LOGM 567 Lean Operations Management
OPER 501 Quantitative Decision Making
STAT 583 Introduction to Probability and Statistics
LOGM 565 Strategic Sourcing

Graduate Test and Evaluation Certificate Program (TECP)

Target Audience:

The TECP is an organizational funded program that targets individuals within the acquisition or analysis career fields working within research, developmental, or operational test stationed at engineering centers, test ranges, test centers, program offices or headquarters.

The AFIT Test and Evaluation Certificate Program (TECP) provides students a fundamental understanding in the basic concepts required for supporting analysis in the Test and Evaluation (T&E) Community. Particular emphasis is given to incorporating past, present, and future DoD T&E examples from all aspects of test (developmental, operational, etc) into the curriculum to tailor the applications of the methodology and approaches within each course. Current T&E focus in design of experiments (DOE) and reliability, maintainability, and availability (RM&A) analysis are addressed in required courses to complete the T&E Certificate Program. TECP targets individuals within the acquisition or analysis career fields working within research, developmental, or operational test stationed at engineering centers, test ranges, test centers, program offices or headquarters. The TECP also provides an avenue for personnel interested in completing an AFIT Master's Degree in Operations Research. The central three courses in the certificate program would most likely be transferable to an AFIT Master's program as well as other civilian universities near the student's home station.

Expected Completion Time:

15-18 months, Part Time

Admission Requirements:

Prospective applicants are expected to have a Bachelor's Degree in an appropriate engineering or scientific discipline. A Minimum GPA average of 3.00, successful completion of undergraduate calculus I and II, persistent dedication for entire program and admittance into AFIT TECP, are required.

Qualified applicants admitted into the program will normally be funded for their enrollment by a federal agency ("unit funded"). Academic qualification requirements aside, applicants who are not unit funded may be admitted by exception, on a case-by-case basis only. In short, entry into the TECP requires both academic acceptance into the program and agreement on the organizational funding mechanism.

Required Courses (4):

STAT 583 Introduction to Probability and Statistics
OPER 679 Empirical Modeling
OPER 688 Operational Experimentation
LOGM 634 Reliability, Maintainability and Supportability

Project Course (1):

OPER 791 Capstone Research Project

Advanced Geospatial Intelligence Certificate Program (AGI)

Target Audience:

Analysts and researchers working in the intelligence field; specifically, MASINT analysts, algorithm and program developers, system instructors, MASINT users and collection managers, missile warning and missile defense analysts, and those working in planning, programming, and force modernization programs. Applicants should have a degree in engineering or physics with a strong background in mathematics or physics.

Expected Completion Time:

12 + months. This does not include the labs that you must take here at AFIT in a two week session.

Admission Requirements:

Prospective applicants are expected to have some demonstrable past, present, or impending connection to the intelligence community, or to an organization that supports intelligence efforts.

Required Courses (4):

OENG 530 Fundamentals of IR & MASINT Phenomenology
OENG 531 Overhead Non-Imaging IR & AGI/MASINT Collection Systems
OENG 533 Multispectral and Hyperspectral MASINT Exploitation
EENG 532 Intro to Radar and Synthetic Aperture Systems

Required Labs (4):

OENG 536 IR & MASINT Fundamentals Lab (*lab for OENG 530*)
OENG 537* ONIR MASINT Collection Systems Lab (*lab for OENG 531*)
OENG 539* Multi- and Hyper-Spectral MASINT Lab (*lab for OENG 533*)
EENG 538* Synthetic Aperture Radar Lab (*lab for EENG 532*)

Required Seminar (1):

OENG 535 MASINT for the Warfighter Seminar

*As of this printing, OENG 536 is the only lab available via DL. The other three labs must be taken in a 2-week resident session offered in September, provided there is sufficient student enrollment.

AIR FORCE INSTITUTE OF TECHNOLOGY

School of Engineering and Management
Office of Extension Services

Course Offerings by Program: *These listings show course prerequisites, the number of credits for each course, and the term each course is offered via DL.*

Master's Degree in Systems Engineering (GSE) Sample Education Plan

| Course | Title | Credits | Qtr | Year | Remarks |
|---|---|---------|-----|------|----------------|
| SYSTEMS ENGINEERING CORE (ALL 4 COURSES REQUIRED) | | | | | |
| SENG 520 | Systems Eng Design | 4 | FA | ? | SE Core |
| CSCE 590 | Eng of S/W Intensive Sys | 4 | WI | ? | SE Core |
| SENG 640 | Systems Architecture (prereq SENG 520) | 4 | SP | ? | SE Core |
| SENG 610 | System Engineering Management | 4 | SU | ? | SE Core |
| SPACE SYSTEMS TRACK | | | | | |
| STAT 583 | Intro to Probability & Stats | 4 | FA | ? | Math/Stat Rqmt |
| MECH 532 | Intro to Space Flight Dyn | 4 | WI | ? | Track |
| ASYS 631 | Spacecraft Sys Eng (prereq MECH 532) | 4 | SU | ? | Track |
| PHYS 519 | The Space Environment | 4 | SU | ? | Track |
| QMGT 680 | Project Risk Analysis (prereq STAT 583) | 3 | FA | ? | Analysis Rqmt |
| SENG 629 | Research Seminar | 1 | FA | ? | Thesis Prep |
| LOGISTICS SYSTEMS TRACK | | | | | |
| STAT 583 | Intro to Probability & Stats | 4 | FA | ? | Math/Stat Rqmt |
| LOGM 568 | Intro to Supply Chain Mgmt | 3 | WI | ? | Track |
| LOGM 567 | Lean Operations Mgmt (prereq LOGM 568) | 4 | SP | ? | Track |
| LOGM 644 | Current Topics in Logistics (prereq LOGM 568) | 3 | SU | ? | Track |
| QMGT 680 | Project Risk Analysis (prereq STAT 583) | 3 | FA | ? | Analysis Rqmt |
| SENG 629 | Research Seminar | 1 | FA | ? | Thesis Prep |
| LOGM 565 | Strategic Sourcing (prereq LOGM 568) | 3 | WI | ? | Track |
| SE ANALYTICS TRACK | | | | | |
| STAT 583 | Intro to Probability & Stats | 4 | FA | ? | Math/Stat Rqmt |
| SENG 653 | Concept Refinement and Systems Analysis | 4 | WI | ? | Track |
| SENG 570 | Lean for Scientists and Engineers | 4 | SP | ? | Track |
| SENG 740 | Advance Topics in Architecture | 4 | SU | ? | Track |
| QMGT 680 | Project Risk Analysis | 3 | FA | ? | Analysis Rqmt |
| SENG 629 | Research Seminar | 1 | FA | ? | Thesis Prep |
| THESIS – Graduation requirement is 12 credits. Plan to distribute over 3 academic quarters. Thesis work should not be planned while enrolled in other courses. | | | | | |
| SENG 799 | Thesis Research | 4 | ? | ? | Thesis Rqmt |
| SENG 799 | Thesis Research | 4 | ? | ? | Thesis Rqmt |
| SENG 799 | Thesis Research (Oral Defense) | 4 | ? | ? | Thesis Rqmt |

Select ONE

Graduate Systems Engineering Certificate Program (SEC)

This program can be started in the fall term

| Term | Credits | Course | Title | Prereqs |
|-------------|----------------|---------------|---|---------------------------|
| FA | 4 | SENG 520 | Systems Engineering Design | none |
| WI | 4 | CSCE 590 | Engineering of Software-Intensive Systems | none |
| SP | 4 | SENG 640 | Systems Architecture | SENG 520 CSCE 590* |
| SU | 4 | SENG 610 | Systems Engineering Management | SENG 520 or equivalent |
| As arranged | 4 | SENG 797 | Group Design Project | other certificate courses |

*CSCE 590 is a co-requisite for SENG 640

Graduate Space Systems Certificate Program (SSC)

This program can be started in the winter or summer terms

| Term | Credits | Course | Title | Prereqs |
|-------------|----------------|---------------|-----------------------------------|----------------|
| WI | 4 | MECH 532 | Intro to Space Flight Dynamics | none |
| SP | 4 | ASYS 631 | Spacecraft Systems Engineering | MECH 532 |
| SU | 4 | PHYS 519 | The Space Environment | none |
| FA/SP | 3 | OENG 530 | Fund of IR & MASINT Phenomenology | none |

Graduate Supply Chain Management Certificate Program (SCM)

This program can be started in the winter term

| Term | Credits | Course | Title | Prereqs |
|-------------|----------------|---------------|----------------------------------|----------------|
| WI | 3 | LOGM 568 | Intro to Supply Chain Management | none |
| SP | 5 | LOGM 567 | Lean Operations Management | LOGM 568 |
| SU | 3 | OPER 501 | Quantitative Decision Making | none |
| FA | 4 | STAT 583 | Intro to Probability and Stats | none |
| WI | 3 | LOGM 565 | Strategic Sourcing | LOGM 568 |

Advanced Geospatial Intelligence Certificate Program (AGI)

This program can be started in the fall or spring terms

| Term | Credits | Course | Title | Prereqs |
|-------------|----------------|---------------|---|-----------------------------------|
| FA/SP | 3 | OENG 530 | Fund of IR & MASINT Phenomenology | none |
| WI/SU | 3 | OENG 531 | Overhead Non-Imaging IR Collection Systems | OENG 530 |
| FA/SP | 3 | OENG 533 | Multi- and Hyper-Spectral Exploitation | OENG 530 OENG 531 |
| WI/SU | 3 | EENG 532 | Intro to Radar and Synthetic Aperture Systems | OENG 530 |
| FA/SP | 1 | OENG 536 | IR & MASINT Fundamentals (OENG 530) Lab | OENG 530* |
| As arr. | 1 | OENG 535 | MASINT for the Warfighter Seminar | At least 7 credits in AGI program |

*OENG 530 is a *co-requisite* for OENG 536

Graduate Test and Evaluation Certificate Program (TECP)

This program can be started in the fall term

| Term | Credits | Course | Title | Prereqs |
|-------------|----------------|---------------|---|---------------------------|
| FA | 4 | STAT 583 | Intro to Probability and Statistics | none |
| WI | 3 | OPER 679 | Empirical Modeling | STAT 583 |
| SP | 3 | OPER 688 | Operational Experimentation | STAT 583 |
| SU | 3 | LOGM 634 | Reliability, Maintainability and Supportability | STAT 583 |
| FA | 3 | OPER 791 | Capstone Research Project | Other certificate courses |

AIR FORCE INSTITUTE OF TECHNOLOGY

School of Engineering and Management

Office of Extension Services

Course Offerings by Term:

Programs Key: GSE = Systems Engineering Degree (S=Space Systems Track; L=Logistics Track); SEC = Systems Engineering Certificate; SSC = Space Systems Certificate; SCM = Supply Chain Management Certificate; ACP = Advanced Geospatial Intelligence Certificate

Fall Term

| Course | Title | Credits | GSE | SEC | SSC | SCM | AGI | TECP |
|----------|--|---------|-----|-----|-----|-----|-----|------|
| LOGM 634 | Rely, Maintain, and Support | 3 | | | | | | X |
| OENG 530 | Fund of IR & MASINT Phenomenology | 3 | | | X | | X | |
| OENG 533 | Multi- and Hyper-Spectral Exploitation | 3 | | | | | X | |
| OENG 536 | IR and MASINT Fund. (OENG 530) Lab | 1 | | | | | X | |
| OPER 791 | Capstone Research Project | 3 | | | | | | X |
| QMG 680 | Project Risk Analysis | 4 | S/L | | | | | |
| SENG 520 | Systems Engineering Design | 4 | X | X | | | | |
| STAT 583 | Intro to Probability & Statistics | 4 | X | | | | | X |

Winter Term

| Course | Title | Credits | GSE | SEC | SSC | SCM | AGI | TECP |
|----------|--------------------------------------|---------|-----|-----|-----|-----|-----|------|
| CSCE 590 | Engineering of SW-Intensive Systems | 4 | X | X | | | | |
| EENG 532 | Radar and Synthetic Aperture Systems | 3 | | | | | X | |
| LOGM 565 | Strategic Sourcing | 3 | L | | | X | | |
| LOGM 568 | Intro to Supply Chain Management | 3 | L | | | X | | |
| MECH 532 | Intro to Space Flight Dynamics | 4 | S | | X | | | |
| OENG 531 | Overhead Non-Imaging IR Collection | 3 | | | | | X | |
| OPER 679 | Empirical Modeling | 3 | | | | | | X |
| STAT 583 | Intro to Probability and Statistics | 4 | X | | | | | X |

Spring Term

| Course | Title | Credits | GSE | SEC | SSC | SCM | AGI | TECP |
|----------|--|---------|-----|-----|-----|-----|-----|------|
| ASYS 631 | Spacecraft Systems Engineering | 4 | S | | X | | | |
| LOGM 567 | Lean Operations Management | 3 | L | | | X | | |
| OENG 530 | Fund of IR & MASINT Phenomenology | 3 | | | X | | X | |
| OENG 533 | Multi- and Hyper-Spectral Exploitation | 3 | | | | | X | |
| OENG 536 | IR & MASINT Fund (OENG 530) Lab | 1 | | | | | X | |
| OPER 688 | Operational Experimentation | 3 | | | | | | X |
| SENG 640 | Systems Architecture | 4 | X | X | | | | |

Summer Term

| Course | Title | Credits | GSE | SEC | SSC | SCM | AGI | TECP |
|---------------|---|----------------|------------|------------|------------|------------|------------|-------------|
| EENG 532 | Radar and Synthetic Aperture Systems | 3 | | | | | X | |
| LOGM 634 | Reliability, Maintainability & Supportability | 3 | | | | | | X |
| LOGM 644 | Current and Emerging Topics in Logistics | 3 | L | | | | | |
| OENG 531 | Overhead Non-Imaging IR Collection | 3 | | | | | X | |
| OPER 501 | Quantitative Decision Making | 3 | | | | X | | |
| PHYS 519 | The Space Environment | 4 | S | | X | | | |
| SENG 610 | Systems Engineering Management | 4 | X | X | | | | |

AIR FORCE INSTITUTE OF TECHNOLOGY

School of Engineering and Management

Office of Extension Services

Courses Offered by Arrangement:

| Course | Title | Credits | GSE | SEC | SSC | SCM | AGI |
|----------|--|---------|-----|-----|-----|-----|-----|
| MATH 001 | Math and Physics Review | 0 | | | | X | X |
| OENG 535 | MASINT for the Warfighter Seminar | 1 | | | | | X |
| SENG 629 | Research Methods Seminar | 1 | X | | | | |
| SENG 797 | Systems Engineering Group Design Project | 4 | | X | | | |
| SENG 799 | Systems Engineering Thesis Project | 12 | X | | | | |
| SS 613 | Military Satellite Communications** | 3 | | | X | | |

**SS 613 is a Naval Postgraduate School course that can be used as an AFIT Space Systems Certificate elective.

Complete List of Courses Offered Via DL:

| Course | Title | Term(s) Offered |
|----------|--|-----------------|
| ASYS 631 | Spacecraft Systems Engineering | SP |
| CSCE 590 | Engineering of SW-Intensive Systems | WI |
| EENG 532 | Radar and Synthetic Aperture Systems | WI, SU |
| LOGM 565 | Strategic Sourcing | WI |
| LOGM 567 | Lean Operations Management | SP, SU |
| LOGM 568 | Intro to Supply Chain Management | WI |
| LOGM 634 | Reliability, Maintainability, and Supportability | SU |
| LOGM 644 | Current and Emerging Topics in Logistics | SU |
| MECH 532 | Intro to Space Flight Dynamics | WI |
| OENG 530 | Fund of IR & MASINT Phenomenology | FA, SP |
| OENG 531 | Overhead Non-Imaging IR Collection | SU, WI |
| OENG 533 | Multi- and Hyper-Spectral Exploitation | FA, SP |
| OENG 535 | MASINT for the Warfighter Seminar | As arranged |
| OENG 536 | IR & MASINT Fund. (OENG 530) Lab | FA, SP |
| OPER 501 | Quantitative Decision Making | SU |
| OPER 679 | Empirical Modeling | WI |
| OPER 688 | Operational Experimentation | SP |
| OPER 791 | Capstone Research Project | FA |
| PHYS 519 | The Space Environment | SU |
| QMGT 680 | Project Risk Analysis | FA |
| SENG 520 | Systems Engineering Design | FA |
| SENG 610 | Systems Engineering Management | SU |
| SENG 640 | Systems Architecture | SP |
| SENG 629 | Research Methods Seminar | As arranged |
| SENG 797 | Systems Engineering Group Design Project | As arranged |
| SENG 799 | Systems Engineering Thesis Project | As arranged |
| STAT 583 | Intro to Probability and Statistics | FA, WI |

AIR FORCE INSTITUTE OF TECHNOLOGY

School of Engineering and Management

Office of Extension Services

Course Descriptions: *Descriptions for each AFIT DL course are listed here. This section is sorted by Course Number.*

ASYS 631 Spacecraft Systems Engineering 4 credit hours

This course provides a detailed introduction to the design of complex space systems. The key elements and subsystems of several important classes of space systems are presented. The systematic approach necessary to effectively design space systems is illustrated through case studies. Individual or group design projects are conducted and presented.

Prerequisites: MECH 532 **Term:** Spring

CSCE 590 Engineering Software-Intensive Systems 4 credit hours

This course explores the unique challenges faced by teams engineering large-scale software-intensive systems (i.e., systems which have a large software component). Techniques in software requirements elicitation, object-oriented design, and quality assurance are presented in the context of an iterative software development process. Particular attention is paid to object-oriented modeling using the Unified Modeling Language (UML) and real-world case studies of software development within commercial and government organizations. Techniques to facilitate the engineering of reliable and secure software systems are introduced. This course is an introduction to software engineering for experienced engineers whose area of expertise is outside computer science. This course will enable them to more effectively communicate with software users and developers and make sound management decisions with respect to software-intensive systems development.

Prerequisites: none **Term:** Winter

EENG 532 Fundamentals of IR and MASINT Technology 3 credit hours

This course lays the groundwork for solving MASINT remote sensing problems, with emphasis on IR technology. Both the signature and metric aspects of MASINT will be considered. Topics include source characteristics, radiometry, atmospheric and propagation effects, optics, detectors, and elementary signal/image processing.

Prerequisites: OENG 530 **Term:** Winter, Summer

LOGM 565 Strategic Sourcing 3 credit hours

This course provides an introduction to and overview of the strategic sourcing process including topics such as supplier selection, supplier evaluation, negotiation, contract management, supplier development, e-procurement, buyer-supplier relationships, strategic cost management, and purchasing law and ethics.

Prerequisites: LOGM 568 **Term:** Winter

LOGM 567 Lean Operations Management 4 credit hours

This course examines the fundamentals of operations (and services) management with a focus on leaning those organizations and systems responsible for the manufacture of goods and the creations of services. The course establishes the fundamental concepts associated with operations management before introducing the theoretic and practical elements of leanness. The topics covered include: MRP, Forecasting, Queuing and layout, quality assurance, statistical process control, and project management. Additionally, value stream mapping, waste minimization, Jidoko quality, Kaizen, JIT, Heijunka, 5 S's, visual control, Six Sigma and agility are discussed. The course concludes with discussions of the USAF's lean initiatives and lean tools.

Prerequisites: LOGM 568 **Term:** Spring

LOGM 568 Intro to Supply Chain Management 3 credit hours

This course examines physical distribution theory, concepts, and practices as applied in both commercial and DoD organizations. Elements of the physical distribution system (e.g., inventory, warehousing, materials handling, packaging and transportation) are considered singly and interactively. Emphasis is on linkages which must be recognized in the design and management of physical distribution systems. The commercial and DoD environments are compared and contrasted; and, physical distribution issues impacting strategic mobility are analyzed.

Prerequisites: none *Term:* Winter

LOGM 634 Reliability, Maintainability & Supportability 3 credit hours

Creating and sustaining military capability is the purpose of military leadership and management. Reliability and maintainability (R&M) are component characteristics which define the ability of a product to perform its specified functions throughout its operational life. Component R&M of the military system are primary determinants of military capability. This course teaches fundamental R&M concepts. Additionally, probability theory is discussed and employed as a tool to quantitatively define these concepts. Course Topics include the measures which quantitatively define component R&M, the relationship between R&M, and the prediction of R&M measures.

Prerequisites: none *Term:* Summer

LOGM 644 Current and Emerging Topics in Logistics 3 credit hours

This course is a survey of current and emerging issues in logistics. Topics will be selected by instructor(s) and students based on their relevance to pressing DoD and USAF concerns. The purpose of this course is two-fold: First, to provide problems for students to solve using their core knowledge and logistics problems solving techniques. Second, to develop a high-level of expertise in the most critical logistics challenges they will face in their follow-on assignments. Course materials will be developed and sourced during the topic exploration phase.

Prerequisites: none *Term:* Summer

MECH 532 Introductory Space Flight Dynamics 4 credit hours

Formulation and solution of the two-body problem in three dimensions. Orbital elements, reference frames, coordinate transformations, orbit determination methods, basic orbital maneuvers. Formulation and description of basic attitude dynamics and control concepts, including spin, dual-spin, three-axis, and gravity gradient stabilization.

Prerequisites: none *Term:* Winter

OENG 530 Fundamentals of IR and MASINT Phenomenology 3 credit hours

This course lays the groundwork for solving MASINT remote sensing problems, with emphasis on IR technology. Both the signature and metric aspects of MASINT will be considered. Topics include source characteristics, radiometry, atmospheric and propagation effects, optics, detectors, and elementary signal/image processing.

Prerequisites: Strong background in math & physics *Term:* Fall, Spring

OENG 531 Overhead Non-Imaging IR & MASINT Collection Sys. 3 credit hours

The principles developed in OENG 530 will first be applied to the classic surveillance and early warning problem of detecting and identifying the long range missile threat, and will then be extended into the modern age of “hard” targets. Current sensor technology and data processing methods for extraction of signatures and metrics will also be discussed.

Prerequisites: OENG 530 **Term:** Winter, Summer

OENG 533 Multispectral and Hyperspectral MASINT Exploitation 3 credit hours

Examines the information that can be extracted from multispectral and hyperspectral data sets collected by MASINT sensors. Introduces the concepts of signature exploitation for materials identification and pattern recognition. Techniques covered include background suppression, principle components, Bayesian statistics, and neural network processing.

Prerequisites: OENG 530 **Term:** Fall, Spring

OENG 535 MASINT for the Warfighter Seminar 1 credit hour

Seminars will present MASINT topics of interest to the Intelligence Community, and will take advantage of the knowledge and experience of users and practitioners of MASINT IR/SAR data products.

Prerequisites: At least 9 credits in the AGI Certificate Program **Term:** as arranged

OENG 536 IR and MASINT Fundamentals Lab 1 credit hour

This Lab provides hands-on exercises in fundamentals of MASINT data processing and analysis including application of radiation source, propagation, and collection algorithms and techniques. Spreadsheets will be used for lab assignments.

Corequisites: OENG 530 **Term:** Fall, Spring

OPER 501 Quantitative Decision Making 3 credit hours

This is an introductory course in management science applications for the logistics, systems, acquisition and transportation manager. Emphasis is on understanding and applying the techniques to managerial problem solving and decision making. Major topics include linear programming, decision theory, networks, and queuing theory.

Prerequisites: none **Term:** Summer

OPER 679 Empirical Modeling 3 credit hours

Analysis of experimental and observational data from engineering systems, focus on empirical model building using observation data for characterization, estimation, inference and prediction.

Prerequisites: STAT 583 **Term:** Winter

OPER 688 Operational Experimentation 3 credit hours

As an introduction to designing experiments for operational testing and evaluation, this is an applied course intended for operations analysts who perform experiments or serve as advisors to experimentation. A statistical approach to the design and analysis of experiments is provided as a means to efficiently study and comprehend the underlying process of system being evaluated. Insight gained leads to improved system performance and quality.

Prerequisites: STAT 583 **Term:** Spring

OPER 791 Capstone Research Project 3 credit hours

A research topic is selected from problems of interest to USAF and DoD. This topic is thoroughly investigated by the student, and the findings, recommendations, and conclusions are presented as a graduate research paper under the supervision of an AFIT faculty member.

Prerequisites: other cert. courses **Term:** Fall

PHYS 519 The Space Environment 4 credit hours

The near-earth environment, from the surface to geosynchronous altitude, is that in which satellites and astronauts must operate. This course is concerned with the radiation, particles, and general conditions encountered in the Earth's atmosphere, ionosphere, and magnetosphere. Specific effects that may be studied include spacecraft thermal equilibrium, orbit decay, spacecraft charging, space-to-ground communications, atmospheric chemistry, Van Allen belts, and solar phenomena.

Prerequisites: none **Term:** Summer

QMGT 680 Project Risk Analysis 3 credit hours

This course covers the concept of project risk with an emphasis on formal risk analysis methods. The course exposes students to a variety of approaches for evaluating risk and uncertainty as they apply to a dynamic decision-making environment. Topics include defining risk, DoD risk policy, risk identification, risk handling, qualitative and quantitative risk methods. Both analytical and simulation methods for quantifying cost risk will be discussed. In order to cover simulation methods, the general method of Monte Carlo simulation will be introduced. Methods of nominal ratings and scoring models will be introduced. The problem of integrated risk analysis into a total measure risk will be discussed. Methods for documenting and presenting risk analysis will complete the course.

Prerequisites: STAT 583 or STAT 521 **Term:** Fall

SENG 520 Systems Engineering Design 4 credit hours

This course provides a broad introduction to the structured approach necessary for the design of complex systems. The formulation of systems problems and the approach to their solution will be emphasized. Basic mathematical techniques available to the systems engineer are presented. The design process will be illustrated through the review of past design efforts, and the application to a problem of current interest.

Prerequisites: none **Term:** Fall

SENG 610 Systems Engineering Process and Management 4 credit hours

This is a graduate course primarily intended for the Master of Science program in Systems Engineering. It will provide an overview of the Systems Engineering process and selected topics from Systems Engineering Management. Topics include a model based-approach to key systems engineering design activities, process modeling, requirements analysis and functional allocation, trade-off analysis, and management of cost, schedule and risk.

Prerequisites: SENG 520 **Term:** Summer

SENG 640 Systems Architecture 4 credit hours

This course provides the foundations for developing and evaluating architectures for systems of systems. The process for generating a functional, physical and operational architecture from a top level operations concept will be developed. Both structure and applied to DoD concept problems. Generation of required DoD architecture products will be discussed. The course will also cover the generation of executable architecture models for evaluating the behavior system concepts.

Prerequisites: SENG 520 **Corequisite:** SENG 590 **Term:** Spring

SENG 629 Research Methods Seminar 1 credit hour

This course provides preparatory research methods for students planning their Systems Engineering thesis. It provides an understanding of the basic methods and tools for planning and conducting research, and concepts related to scientific inquiry. The course will provide a foundation for students in planning, scoping, defining objectives, purpose and approach of their own engineering and research project.

Prerequisites: none **Term:** as arranged

SENG 797 Group Design Project 4 credit hours

A design student on a topic of current Air Force interest (which may be classified) is selected as a class project. The class develops its own organizational structure to suit the problem, develops a statement of work and conducts the study. Progress reports and final reports are given to the sponsoring organization, as required. A formal written report is prepared by the group. This class may be either one or two quarters in length. If it extends over two quarters, no credit is given until the end of the last quarter.

Prerequisite: Completion of all other Systems Eng. certificate courses **Term:** as arranged

Note: Students electing to reapply for the Systems Engineering degree program before completing the Systems Engineering Certificate program should plan to not take SENG 797, but complete SENG 799 at the conclusion of their degree program instead.

SENG 799 Group Design (Thesis) Project 12 credit hours

A design study on a topic of current Air Force interest (which may be classified) is selected as a class project. The class develops its own organizational structure to suit the problem, develops a statement of work and conducts the study. Progress reports and final reports are given to the sponsoring organization, as required. A formal written report is prepared by the group and accepted by the faculty in lieu of the Master's thesis. This course typical extends over three quarters, and no grade is assigned until the end of the last quarter.

Prerequisites: Completion of other Sys. Eng. MS degree program courses **Term:** as arranged

STAT 583 Introduction to Probability and Statistics 4 credit hours

Basic concepts of probability and statistics with computer science applications are covered. Topics include: Permutations and combinations; random variables; probability distributions; estimation and confidence intervals; hypothesis testing.

Prerequisites: none **Term:** Fall, Winter

SS 613 Military Satellite Communications 4 credit hours

MILSATCOM mission analysis, systems design, and applications. This course will cover requirements, tactical employment, system architectures, satellite design and performance, terminal design and performance, associated information systems, link budget calculations, telemetry and control and IO/IW implications. The student will be expected to create SATCOM solutions for Navy and Marine scenarios.

Prerequisites: none **Term:** See Note

Note: This course is offered via DL through the Naval Postgraduate School in Monterey, CA.