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SPSM 5000 Space Environment (3)

This course is designed to provide students an overview of the concepts, terminology and math they will encounter in their Space Systems Operations Management degree Emphasis Area. It covers the space environment, including the ionosphere, the magnetosphere, radiation, human factors and limitations, solar effects, near-Earth and deep space operations, propulsion systems, satellite communications systems, spacecraft design, ground control and supporting infrastructures, manning, technical support, outsourcing, and large-scale long-term space operations. It also includes the orbital elements within the space environment and the broad range of parameters and constraints of navigation and operations in space are explored. Students are introduced to the mathematics of orbital mechanics and determination techniques, and learn how to calculate orbital parameters.

SPSM 5300 Remote Sensing Analysis Concepts and Geospatial Information System Technology (3)

Introduction and overview of satellite-based remote sensing including the evolution of national and international imagery policies and the growth of the commercial industry. Practical exposure to data types, imagery manipulation applications, software tools, and future technology developments is included.

SPSM 5310 Remote Sensing and Geospatial Information System Applications (3)

Commercial and civil applications such as homeland security, emergency management, forestry, urban planning, property assessment, natural resources management, utilities, etc., from business, marketing, and management standpoints are studied. Practical application, case study, and hands-on exercises using Webster University Space Lab resources and imagery products form a significant portion of the curriculum.

SPSM 5320 Remote Sensing and Geospatial Imagery Analysis (3)

Methods for deriving economic advantage and increasing resource management effectiveness through the use of remotely sensed imagery products are studied. Basic techniques for the analysis of imagery will be combined with hands-on use of current and evolving software applications and tools.

SPSM 5330 Geospatial Information System (GIS) Technologies (3)

Geospatial Information Systems (GIS) processes and their support of integrated applications, analysis, and resource management methods are examined. Instruction includes practical application and hands-on exposure to current and evolving GIS manipulation software applications and tools available in the Webster University Space Lab.

SPSM 5340 GPS - Position Determination and Coordinate Applications (3)

This course focuses on the use of Global Positioning System (GPS) and gives the student hands-on experience with the space-based radio navigation system. This course examines current and future GPS applications that lend themselves to use in a variety of mapping, cartography, surveying, geological formation and resource location and identification. Students may explore basic navigation, map coordinate systems, differential GPS position determination and surveying applications and then integrate this knowledge with the remote sensing applications knowledge. **This course may not be used to substitute for SPSM 5800.**

SPSM 5360 Practical Research in Remote Sensing Analysis and Geospatial Information Systems (3)

Focused on federal, state, local municipality and commercial cartography and mapping projects using imagery as a base. This applications course will include practical lab instruction on the primary systems for Earth projection as well as basic cartography and topography skills. The course complements previous topics by providing a synthesis of the primary applications of remotely sensed data and GIS products. The student is expected to synthesize and integrate the learning experience acquired in the certificate program and to evaluate current relevant topics. Internships or practical research projects are considered appropriate for demonstration of student research in conjunction with the completion of this course. These projects may have a direct application relative to the student's current employment or professional development for future career advancement.

SPSM 5600 Space Systems Acquisition Law (3)

The law and legal processes associated with government acquisition and procurement are explored. An overview of government acquisitions and procurement management is presented, with particular attention given to the legal framework in which these activities must take place. The Federal Acquisition Regular (FAR) or the Uniform Commercial Code (UCC) may be specific areas addressed in this course. **Students who have completed PROC 5810 or PROC 5890 may not waive this course**.

SPSM 5650 Space Systems Contracting (3)

Students will be exposed to the major principles and concepts of the government contracting process, application of the Federal Acquisition Regulation (FAR), and integrating contracting activities into space systems acquisitions. Students examine the acquisition strategy development and contract definition processes, and the roles of the program manager and contracting officer. Contract types and application are presented with emphasis on: requirements/capabilities development; the Request for Proposals (RFP) process; awards; protests; dispute resolution; risk; and government contracting agencies' roles and responsibilities. Contractors; use of the Bid and Proposal (B&P) process, along with socio-economic and domestic preference policies, will be explored.

SPSM 5700 Space Commanding Systems (3)

This course is recommended only for space systems engineering and technical management track students due to the technical content and hands-on nature. This course provides hands-on commanding of spacecraft systems using an industry standard COTS software product. Students will be exposed to establishing commands and receiving and reading telemetry from (simulated) satellites. **Prerequisites**: Students should have a programming course, minimum BASIC or C++, as well as completion of SPSM 5740, prior to taking this course.

SPSM 5710 Space Communications Systems (3)

This course examines the technical aspects of satellite communication systems, including an extensive evaluation of space, ground and user segments. Topics include space communications design and performance analysis, design trade-offs, antenna design and performance, link equation, focused beam and power management, attenuation, modulation, scintillation, jamming and anti-jamming techniques, encoding and decoding, encryption and decryption, access, error detection and correction, frequency hopping, spread spectrum, CDMA,

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TDMA, FDMA and other access schemes. This course presents an in-depth analysis of current and future trends in satellite communication systems development and technologies such as Laser, Satellite-to-Satellite, Direct Broadcast, Global Cellular and WiFi support.

SPSM 5730 Space Operations Research (3)

Students examine modeling techniques that assist in the decision-making process of space operations. Linear, nonlinear, integer, and dynamic programming techniques applicable to space operations are among the deterministic mathematical methods explored.

SPSM 5740 Space Systems Orbital Mechanics (3)

Students examine the basic application of orbital maneuvers, ground traces, ballistic trajectories, mathematics associated with the solution of the two- or three-body problem, satellite stability and attitude control, and boost/re-entry dynamics and attitude control. The theory of basic navigation guidance and control, the dynamics of interplanetary travel, and the effects of space environment and debris are explored.

SPSM 5750 Space Systems Engineering (3)

Students examine a wide range of engineering issues and consider factors that affect spacecraft design. Topics include human factors engineering, logistics support, long-duration low-Earth and deep space operations, design trade-offs, risk identification, and mitigation techniques. Use of tele-robotics and interactive virtual environmental support systems, computer-based modeling and simulation tools, and other current engineering considerations are studied.

SPSM 5760 Space Bio-Astronautics (3)

Students examine the broad range of environmental stresses on the human element for short- and long-duration space travel, including psychological and physiological effects. Pressure, temperature, G-forces, and radiation are among the specific stresses considered. The extension of space operations and human survivability and considerations that affect spacecraft and spacesuit designs, are studied. Consumables such as food, water, breathable air, and fuel are addressed with respect to manned space travel.

SPSM 5770 Space Operations Management (3)

Students examine various operations issues such as launch facilities, Space Vehicle design and development, ground control infrastructure, and end user support operations. Manning, technical support, outsourcing and other issues impacting operations management are included. The International Space Station (ISS) may be used as a potential course topic for examining large-scale low-Earth operations. Long-term projects such as lunar and Mars missions are potential projects for research.

SPSM 5800 GPS Space Radio Navigation Systems (3)

This course focuses primarily on the Global Positioning System (GPS) and gives the student hands-on experience with a space-based radio navigation system. This course examines current and future GPS applications. Students will explore basic navigation, map coordinate systems, and then integrate this knowledge by understanding the GPS satellite navigation signal properties, capabilities and limitations. Differential GPS and Continuous Broadcast Service will be addressed. Additional information on other radio navigation systems may be included. **This course may not be used to substitute for SPSM 5340.**

SPSM 5900 Space Commercialization (3)

Students examine the early development of space operations from the first rocket and satellite launches; U.S. and international policies and their effect on space operations; orbit topologies and the impact they have on the space, ground and user segments. Current initiatives in the commercialization of space including: launch services; the NASA technology transfer programs; satellite communications - voice and data services, direct broadcast TV; remote sensing; radio navigation; mining, manufacturing and tourism. Examination of commercial space services, spaceports and the assessment of business risks associated with new start-ups and competing terrestrial services is integral. Included will be a review of the U.S. International Traffic in Arms Regulation (ITAR) and Export Administration Regulation (EAR) and the impact they have on U.S. space business competitiveness. Investments and incentives for commercial development of new space business ventures, as well as legal issues with areas such as geostationary rights, international sovereignty and claim of rights of off-world resource ownership, limitations of World Radio Frequency allocations, and a broad spectrum of current trends in commercial space operations will be explored.

SPSM 5910 Space Systems Integration (3)

Students examine those system engineering processes that facilitate the design, development, integration, manufacture, deployment, sustainment, and disposal of space systems. The course identifies those criteria needed to reduce risks and ensure that performance integrity, compatibility, testing, and validation of functional and physical requirements are met. Aspects of the Program Management Institute (PMI®), Government Extension to the Program Management Book of Knowledge (PMBOK®) may be addressed.

SPSM 5930 Space Systems Law and Policy (3)

Students examine national and international efforts to establish space policies, laws, and treaties. The policy positions of the United States, as defined by presidential administrations, and other nations' positions will be included. The development of future national space priorities and their impact on national and international space law and policy will be discussed. The workings of the UN Committee on Peaceful Uses of Outer Space (COPUOS) to establish international treaties, work legal aspects of outer space law through the complexity of interrelationships of those countries, companies and agencies involved with major space systems worldwide will be examined. Upcoming issues related to the expansion of mankind’s presence beyond Earth and impacts to existing treaties may be included.

SPSM 5940 Space Decision Support Systems (3)

This course is designed toward the understanding and application of decision support systems and technology tools. The student will examine the various stages of DSS development and use in assisting the manager in making effective decisions relevant to space operations or planning activities. Decision-making processes appropriate for effective control, strategic planning, and management information systems, and the role that computers have in presenting complex data to decision makers are examined.

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SPSM 5950 Space Systems Project Management (3)

Students examine those processes used by space system managers to engage and communicate with stake holders, plan, organize, coordinate, and direct the efforts of functional staff, other technical, and project groups in accomplishing the objectives of space system programs and projects. Project cost and personal work estimating are included. Relevant aspects of the Program Management Institute (PMI®), Program Management Book of Knowledge (PMBOK®) may be addressed.

SPSM 5990 Issues in Space Operations (3)

Current, timely and significant issues in space operations are examined. The course focuses on existing and proposed theories and practices, with emphasis given to new and emerging topics in the field. Significant or advanced topics may be addressed in these issues courses. May be repeated for credit if content differs.

SPSM 6000 Practical Research in Space Operations (3)

The student is expected to synthesize and integrate the learning experiences acquired in space operations and to evaluate current topics relative to this major. Specific projects or delivery methods will include space-related technical and engineering areas of emphasis. Internships or practical research projects are considered appropriate applications of student research in conjunction with the completion of this course. **Prerequisite**: Successful completion of all required core courses in this major and declaration of the thesis option in accordance with the thesis policy (as applicable).